

Threatened Birds of Asia:

The BirdLife International Red Data Book

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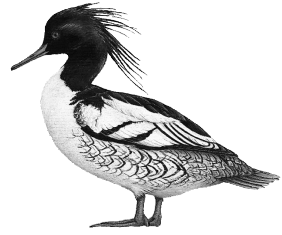
SCALY-SIDED MERGANSER

Mergus squamatus

Critical ☐ —

Endangered ☐ —

Vulnerable ☒ A2b,c,d; C1



This migratory riverine duck has a small, declining population as a result of habitat loss, illegal hunting and disturbance. It is predicted that these threats will result in an accelerated rate of decline in the near future. It therefore qualifies as Vulnerable.

DISTRIBUTION The Scaly-sided Merganser breeds in south-east Russia, North Korea and north-east China. Some birds winter on the lower reaches of rivers in south-east Russia, but most of the world population is thought to winter in central and southern China (Hughes and Hunter 1994). Small numbers winter in Japan, South Korea and Taiwan, and there are a handful of records from Myanmar, Thailand and northern Vietnam.

■ **RUSSIA** The species breeds along mountain rivers on both the eastern and western slopes of the Sikhote-Alin' range and the major rivers in the lower Amur river drainage in the Russian Far East, in Khabarovsk, Amur, Jewish Autonomous Region and Primorye (Roslyakov 1984, Stepanyan 1990, B. A. Voronov *in litt.* 1998). The largest known breeding concentrations are in the Bikin and Iman river basins in Primorye. There are a few records from Koryakia and Kamchatka, to the north of the breeding grounds, and an unconfirmed report from well to the west of the known range (see Remarks 1). Records (by province) are from:

■ **Koryakia** head of **Natalii bay** (Natalya bay), Bering Sea coast, dead female found, September 1925 (Buturlin 1934);

■ **Kamchatka** **Mednyy island** (Copper island), Commander islands, two adult males and an immature male collected, June 1911, two females collected, May 1954 (Marakov 1962, Dement'ev and Gladkov 1951–1954, Ivanov 1976, male in AMNH);

■ **Khabarovsk** **Bol'shaya Iska river** (Iska river), Nikolaevskiy district, 30 km north of Nikolaevsk-on-Amur, near Schast'ya bay in the south-west Sea of Okhotsk, two males collected, September 1960, and the species “probably breeds” (Yakhontov 1976a); **Amgun' river**, Poliny Osipenko and Ul'chskiy districts, along the valley up to 80 km south of Nikolaevsk-on-Amur, “rare” breeder (Roslyakov 1981b; see Remarks 2); **Bichi river**, basin of Udy' lake, Ul'chskiy district, “rare” breeder (Roslyakov 1981b; see Remarks 2); **Evoron lake**, “rare” passage migrant (Roslyakov 1981b; see Remarks 2); Amgun' river from Gakkan mountain to the **Badzhal river mouth**, Solnechnyi district, c.120 km west of Postyshevo, seen in August 1974, “rare” breeder (B. A. Voronov *in litt.* 1998); **Goryun river** (Gorin river), “rare” breeder (Roslyakov 1981b; see Remarks 2); **Gur river**, a right-side tributary of the Amur, Amurskiy and Komsomol'ski districts, “rare” breeder (Roslyakov 1981b; see Remarks 2); **Bolon' lake**, Amurskiy district, “rare” passage migrant (Roslyakov 1984); **Kharpi river**, Bolon' lake basin, Amurskiy district, “rare” breeder (Roslyakov 1981b; see Remarks 2); **Kur river**, “rare” breeder (Roslyakov 1981b, Shibnev 1989a; see Remarks 2), male collected at Ivankovtsy (New Garmakhta settlement), 80 km north-west of Khabarovsk, August 1910 (Buturlin 1910a, Chersky 1915, Dement'ev 1933), near the weather station “Kur”, 10 km below the mouth of the Yarap river, June 1975 (B. A. Voronov *in litt.* 1998); **Anyuy river**, Nanaiskiy district, “rare” breeder (Yakhontov 1976a, Roslyakov 1981b; see Remarks 2), on upper Anyuy river between the Udzhaki river and the Tormasu river, broods seen, July 1981 (B. A. Voronov *in litt.* 1998); **Tormasu river**, left-bank tributary of Anyuy river, c.50 km above Arsen'ev settlement, female shot from a flock of five, September 1959, “probable

breeder" (Nechaev 1963); **Tumnin river**, undated (Roslyakov 1985); **Urmi river**, Khabarovskiy district, "rare" breeder (Roslyakov 1981b, Shibnev 1989a; see Remarks 2); **Khor river**, "rare" breeder (Roslyakov 1981b; see Remarks 2), between Sooli river and Sukpay river, above Sukpay settlement, three flocks each of 25–30 birds, late September 1959, "probable breeder" (Nechaev 1963), upper and middle reaches in Lazo district, July 1978 (B. A. Voronov *in litt.* 1998); **Botchi river** and Mul'pa river, Tatarskiy Strait, Sovgavanskiy district, c.150 km south of Sovetskaya Gavan', broods seen, July 1966, "scarce" breeder (B. A. Voronov *in litt.* 1998); **Sukpay river**, left-bank tributary of the Khor river, "rare" breeder but "numerous" broods recorded 250 km south-east of Khabarovsk, 1965–1969 (Yakhontov 1976a), 200 km south-east of Khabarovsk, July 1978 (B. A. Voronov *in litt.* 1998); **Chuken river**, left-bank tributary of the Khor river, 50 km downstream of Sukpay settlement, flock of eight, October 1959, July 1978, "breeds" (Nechaev 1963, B. A. Voronov *in litt.* 1998); **Kafe river**, left-bank tributary of the Khor river, 15 km downstream of Gvasyugi, May–June 1980, "rare" breeder (B. A. Voronov *in litt.* 1998); **Katen river**, left-bank tributary of the Khor river, c.25 km downstream of Gvasyugi, May–June 1980, "rare" breeder (B. A. Voronov *in litt.* 1998); **Matay river** (Motai river), left-bank tributary of the Khor river, Lazo district, juvenile collected, July 1930 (Dement'ev 1933, Buturlin 1934), "rare" breeder (Vorob'ev 1954), south of Bichevaya settlement, May–June 1980 (B. A. Voronov *in litt.* 1998); Tur river (untraced), undated (Roslyakov 1985);

■ **Amur** upper Dep river, below its confluence with the **Tungala river**, adult female collected, female with brood of seven young still unable to fly and three single birds, August 1977, c.600 km to the north-west of the previously known range (Dymin and Kostin 1977); upper Dep river, above the mouth of the **Ninni river**, one duckling captured, 1977 (Kostin and Dymin 1977);

■ **Jewish Autonomous Region Bira river**, undated (Roslyakov 1985); upper **Pompeyevka river**, Obluchenskiy district, south of the Bureya range, a total of 7–11 adults (singles, pairs and a group of three unpaired birds) and eight broods recorded along a 12 km stretch, May–July 1976 (Smirenskiy 1977), broods noted in 1988 and 1992 (B. A. Voronov *in litt.* 1998);

■ **Primorye Samarga river** basin, eastern slopes of the Sikhote-Alin' range, three broods (of four, five and 11 unfledged young) seen on 140 km of river, July 1985 (Yelsukov 1994); **Yedinka river** (Edinka river), northern Primorye, 25 broods counted over three successive years on a 61 km stretch of river (Semenchenko and Ermolenko 1988), 11 broods totalling 71 ducklings and 41 full-winged birds seen along the coast from Upolnomochennaya bay to the Yedinka river, including a group of 14 at the mouth of the Malaya Kema river, July 1987 (Yelsukov 1994); **Bachelaza river**, "common" until the 1960s (Shibnev 1976d, 1985); **Bikin river** basin, from Verkhniy Krasnyy Pereval village upstream to the source, the most important breeding area for this species in Russia, first recorded in 1948 and "common" until the 1960s, since when numbers have fallen noticeably (Shibnev 1976d, 1985, Bocharnikov and Shibnev 1994), one brood on the Klyuchevaya river, June 1995, up to 13 counted on a 50 km stretch of river between Verkhniy Krasnyy Pereval and Krasnyy Yar villages, April 1996, indicating that their numbers may have halved there since the 1980s (Mikhailov and Shibnev 1998); **Zeva river**, "common" until the 1960s (Shibnev 1976d, 1985); **Ulunga river**, "common" until the 1960s (Shibnev 1976d, 1985); **Kkhutsin river** (Khutsin river), undated (Yakhontov 1976a); **Zabolochennaya river**, from the Sakhalinski stream to the confluence with the Serebryanaya river, eight broods totalling 56 seen on 45 km of river in 1975, on the Serebryanka river, from Zimovyeyiny stream to Kolokovy stream, six broods totalling 26 birds seen on 15 km of river in 1958, female and pair seen on 75 km of river in June 1983 (Yelsukov 1994); Sakhambe river, **Terneyskiy district**, flock of 13, mostly males, April 1971 (Komarov 1976); middle reaches of the **Tatibe river**, a tributary of the Iman river, adult and immature females collected, May and July 1951 (Piechocki 1956); **Iman river** basin (Bol'shaya Ussurka), the second most important breeding area in Russia (Surmach and Zaykin 1994), male collected on the lower

Iman near Lawlu, April 1933 (Dement'ev 1933, Dement'ev and Gladkov 1951–1954), “common” breeding species on the middle and upper reaches, late 1940s (Piechocki 1956), “rather common” on the middle reaches (Dement'ev and Gladkov 1951–1954), 25 seen upstream from Vostretsova, May 1994 (I. Lewis *in litt.* 1999); **Takema mountains**, undated (Dement'ev and Gladkov 1951–1954, Yelsukov 1982); **Poludennaya river**, western slopes of the Sikhote-Alin' State Reserve, undated (Dement'ev and Gladkov 1951–1954, Yelsukov 1982); **Kema river**, undated (Isakov 1985); **Kolumbe river**, western slopes of the Sikhote-Alin' State Reserve, undated (Dement'ev and Gladkov 1951–1954, Yelsukov 1982); **Tayezhnaya river**, brood of 10, a solitary bird and groups of five, six, seven, eight and 25 unfledged birds seen on 70 km of river, August 1983 (Yelsukov 1994); all rivers on the eastern slopes in the **Sikhote-Alin' State Reserve** (in the central Sikhote-Alin' range), undated (Dement'ev and Gladkov 1951–1954, Yelsukov 1982); **Sitsa mountains**, undated (Dement'ev and Gladkov 1951–1954, Yelsukov 1982); **Sitsa river**, “frequently seen” 57 km from the mouth, September 1940, two broods of 8–12 seen 75 km from the mouth, July–August 1940, single birds collected on the Bichan and Fata rivers, tributaries of the Sitsa river, in April 1941, when a nest was found on the Fata river (Dement'ev and Gladkov 1951–1954); **Belimbe mountains**, undated (Dement'ev and Gladkov 1951–1954, Yelsukov 1982); rivers around **Terney bay**, wintering regularly on unfrozen sections of the rivers (Dement'ev and Gladkov 1951–1954); **Khanka lake**, “vagrant” (Bocharnikov 1990); **Dzhigitovka river**, three females seen on 60 km of river, June 1983 (Yelsukov 1994); **Sadaga river**, Olginski district, 1960–1971 (Morgun 1976); **Avvakumovka river** and its tributaries (the Armazovka and Vasilovka rivers), Ol'ga bay, eastern slopes of the Sikhote-Alin' range, 16 breeding pairs counted on a 170 km stretch of river, summer 1984 (Labzyuk 1988); **Kaban'ya river mouth**, brood of 14 ducklings seen, plus 10 moulting adults on the sea 7 km to the north, July 1977 (Yelsukov 1994); **Lazovskiy State Reserve** and adjacent areas, eastern slopes of the Sikhote-Alin' range, breeding on the largest rivers in the area and their tributaries—**Margaritovo river** (Margaritovka river), **Perekatnaya river**, **Benevka river**, **Ivanovka river** and **Sudzukhe river** (Kievka river)—with 4–5 nesting pairs in 1969, 10 breeding pairs in June 1983 along an 83 km stretch of the Kievka river and seven breeding pairs in 1984 (Litvinenko and Shibaev 1965, Pugachuk 1974, Kolomiytsev 1985); Tachingouza river, **Sudzhinskiy State Reserve**, regularly wintering (Dement'ev and Gladkov 1951–1954).

■ **JAPAN** The species is a scarce winter visitor to Honshu, Shikoku and Kyushu, with records (by island and prefecture) as follows:

Honshu ■ **Tokyo** unspecified localities, undated (OSJ 2000); ■ **Niigata** Niibo dam, **Sado island**, female, January–April 1989 (Kondo 1989); **Agano-gawa river**, Yokogoshi-machi, Nakakanbara-gun, adult male found dead, February 1987 (Kazama 1988), male, December 1987 (Kondo 1989); ■ **Toyama** Yasui, **Fukuno-machi**, Higashitonami-gun, January 1986 (WBSJ Toyama Chapter database); **Inotani**, Hosoiri-mura, Nei-gun, January 1989 (WBSJ Toyama Chapter database); ■ **Gifu** Kiso-gawa river, **Unuma-cho**, Kakamigahara-shi, one, January–April 1995 (WBSJ Gifu Chapter database); Kiso-gawa river, Kawashima-cho, **Hashima-gun**, male and female, February 1986, female, winter 1986/1987, two immature males and a female, winter 1987/1988, and wintering in subsequent years (Ito 1988, WBSJ database, WBSJ Research Division 1988 in Brazil 1991); Kiso-gawa river, **Kaizu-cho**, Kaisu-gun, male, January 1988 (Ito 1988); ■ **Shizuoka** **Fuji-gawa river mouth**, December 1987 (WBSJ Minamifuji Chapter database); ■ **Aichi** unspecified localities, undated (OSJ 2000); ■ **Shiga** **Biwa-ko**, Nishiazai-cho, Ika-gun, female, March 1996 (*Birder* 96/5); ■ **Wakayama** **Kino-kawa river**, Katsuragi-cho, Ito-gun, female, January 1992, male, January 1993 (WBSJ Wakayama Chapter database; also WBSJ 1992), male, February 1993 (*Birder* 93/4); ■ **Tottori** **Hino-gawa river**, Hiezu-son, Saihaku-gun, April 1997 (WBSJ Tottori Chapter database); Hatto-gawa river, Koge-cho, **Yazu-gun**, December 1993 (WBSJ Tottori Chapter database); ■ **Shimane**

unspecified localities, undated (OSJ 2000); ■ **Okayama** unspecified localities, undated (OSJ 2000); ■ **Hiroshima Gono-kawa** river (Eno-kawa river), Kawane, Takamiya-cho, Takata-gun, male and three females (or young males), January 1998 (WBSJ Hiroshima Chapter database); ■ **Haji dam** reservoir, Yachiyo-cho, Takata-gun, female, January 1993 (WBSJ Hiroshima Branch 1998); ■ **Kake-cho**, Yamagata-gun, male, January 1993 (WBSJ Hiroshima Chapter database); ■ **Ashida-gawa** river, Fukuyama-shi, male, January 1992 (WBSJ Hiroshima Branch 1998); ■ **Tateiwa dam** reservoir, Yoshiwa-mura, ■ **Saeki-gun**, female, December 1991, one, January 1992, female, November 1992, male, November 1994, male and female, March 1994 (WBSJ Hiroshima Branch 1998);

■ **Shikoku Ehime** Kanogawa dam reservoir, ■ **Hijikawa-cho**, Kitagun and Nomura-cho, Higashiwa-gun, female, January–March 1997 (WBSJ Ehime Chapter database);

■ **Kyushu Miyazaki** Mi-ike pond, ■ **Takaharu-cho**, Nishimorokata-gun, female, January–March 1996 (*Birder* 96/3, 96/4, 96/5); ■ **Miyazaki-shi**, female, February 1991 (WBSJ 1991); ■ **Miyakonojo-shi**, male, January–March 1996 (WBSJ 1997), female, November 1996 (WBSJ 1998); ■ **Kagoshima Beppu-gawa river mouth** and Omo-gawa, Aira-cho, Aira-gun, one, February–March 1990 (WBSJ 1990);

■ **Iriomote-jima** island, male at Urauchi river, December 1995 to February 1996 (McWhirter *et al.* 1996; also OSJ 2000).

■ **KOREA ■ NORTH KOREA** The species is “extremely rare” in North Korea (MKN and KUT 1987) but probably nests in the north-east of the country (Tomek 1999), with records (by province) as follows: ■ **North Hamgyong Musan**, Hozando, April 1912 (male in AMNH); ■ **Mayangdon Chosuji** (Mayang Chosuji) reservoir, c.70 km north of Chongjin, pair and a single bird, May 1986, apparently breeding (MKN and KUT 1987, Scott 1989, Chong and Morishita 1996), male and two females, September 1989 (Fiebig 1993), breeding visitor which arrives in April (Chong and Morishita 1996); ■ **lower Oranchnon river**, spring c.1995 (Chong and Morishita 1996); ■ **Janghungri** (Changhung-ri), Muryong-gun, March 1958 (Won 1963, Tomek 1999); unspecified localities, collected, April 1912 (Austin 1948, Won 1963, male in AMNH), one collected, March 1958 (MKN and KUT 1987); ■ **Ryanggang Samjiyon lake**, below Mt Paekdusan, 60 km north of Hyesan, undated (Scott 1989, Chong and Morishita 1996).

■ **SOUTH KOREA** The species is a rare visitor, mainly in winter, with records (by province) as follows: ■ **Kangwon Cheolweon** (Cholwon), c.10 wintering regularly since 1992 (Park Jin-young verbally 1995), pairs seen in the DMZ (Demilitarised Zone) since 1995 (Lee Woo-shin *in litt.* 1997); ■ **Dong river**, Geomun-ri, ■ **Yongwol-gun**, one (undated) (Lee Woo-shin *in litt.* 1997); ■ **Kyonggi and Seoul Imjin river**, male, February 1992 (Chalmers 1992 in Zhao Zhengjie *et al.* 1993); ■ **Han river**, north of Seoul, male and five females, December 1997 (Konrad 1998), reported to occur regularly (A. Braünlich *in litt.* 1999); ■ **Seoul**, one, June 1927 (Won 1963), one, November 1927, and young male (undated) obtained in Seoul market (Austin 1948, Gore and Won 1971); ■ **South Chungchong Taech'ong lake** (Daechong lake), Taejon city (Daejon), 2–3 in winter since 1996 (Lee Woo-shin *in litt.* 1997), pair, winter 1997/1998 (B. Wright *in litt.* 1999).

■ **CHINA ■ MAINLAND CHINA** The species breeds in north-east China, in Heilongjiang, Jilin and Inner Mongolia, and disperses widely to the east and south in winter. Records (by province) are from:

■ **Heilongjiang Xiao Hinggan Ling** (Lesser Xingan mountains), May 1979 (female in WUCN); ■ **Luancui river** (mapped as ■ **Cuiluan**, which is on the middle reaches of the Luancui), tributary of the Tanwang river (presumably inside Bishui Chinese Merganser Nature Reserve), breeds, but none found during a survey in 1990 (Zhao Zhengjie *et al.* 1994a); ■ **Honghe Nature Reserve**, recorded “in recent years” (Zhao Zhengjie *et al.* 1994a), breeds (Liu Donglai *et al.* 1986); ■ **Naoli He** river, recorded “in recent years” (Zhao Zhengjie *et al.* 1994a); ■ **Qixing He** river, recorded “in recent years” (Zhao Zhengjie *et al.* 1994a); ■ **Nancha river**, tributary of the

Tanwang river (presumably inside Bishui Chinese Merganser Nature Reserve), breeding (Zhao Zhengjie *et al.* 1994a); **Dailing**, Yichun city (presumably inside Bishui Chinese Merganser Nature Reserve), August 1956 (three specimens in ASCN), May–June 1979 (two specimens in NEFUCN), at Yong Cui and Bi Shi, one pair and four young birds collected in 1980 and two females in May 1989 (Zhao Zhengjie *et al.* 1994a), on the Tanwang river, near Dailing, June 1984, breeding (Scott 1989, Zhao Zhengjie *et al.* 1994a), May 1986 (Groh 1986), five, June 1988 (Alström *et al.* 1988), two males along a river north of Dailing, September 1990, a forestry bureau guide reporting that 50 pairs bred in this area and were present from April to late September (King and Jin Longrong 1992–1993), female with eight chicks, June 1991 (P. Alström, U. Olsson and D. Zetterström *in litt.* 2000), but fewer than six breeding pairs found during surveys, 1994–1995 (Liu Bowen *in litt.* 1998); **Xinglong Nature Reserve**, recorded “in recent years” (Zhao Zhengjie *et al.* 1994a); **Tailai county**, June 1979 (specimen in NEFUCN); near **Shanhetun** (Jablonja), male, March 1925 (Meise 1934; also Zhao Zhengjie *et al.* 1994a); Xiaobei Hu lake, **Ning'an county**, important breeding site and migration stopover, 76 seen in September 1997, 40–50 in April 1998, and 14 young birds on 12 August 1998 (M. Rank *in litt.* 1998, Li Wenfa 1999); **Jingpo Hu** (Chingpo Hu, Kingpaihu) lake, Mudanjiang city, “large numbers” seen and four collected, autumn (including October) 1931, when local fishermen reported that they bred there (Piechocki 1956, Dement'ev and Gladkov 1951–1954, male in FMNH);

■ **Jilin** breeding along several rivers on the north-east slope of the Changbai Shan mountains, including: **Gudong He** (outside Changbai Shan Nature Reserve), collected and regularly seen, 1965–1966, but not found during a survey in 1978 (Zhao Zhengjie *et al.* 1993); upper **Toudaobai He**, c.50 km upstream from the village of Baomatun (inside Changbai Shan Nature Reserve), recorded during surveys in 1977–1978 and 1989–1991 (Zhao Zhengjie *et al.* 1993); **Sandaobai He** (outside Changbai Shan Nature Reserve), recorded during a survey in 1978 and one collected, but not during surveys in recent years, the only recent record being two seen in April 1991 on a channel connecting this river and Tuodaobai He (Zhao Zhengjie *et al.* 1993); **Wanzhu**, Changbai Shan mountains, June 1965 (two specimens in ASCN); upper **Jin Jiang** and **Man Jiang** rivers, where a maximum of 20 pairs are estimated to breed (Zhao Zhengjie *et al.* 1993); **Yalu Jiang** river, two, November 1989 (Zhao Zhengjie *et al.* 1994a);

■ **Liaoning Xianrendong National Nature Reserve**, Zhuanghe county, undated (Liu Donglai *et al.* 1986); **Yalu Jiang** river, “very rare winter visitor” (Han Xiaodong *et al.* 1991);

■ **Inner Mongolia** 150 km south of **Hailar**, south-west slopes of Da Hinggan Ling (Greater Xingan mountains), young birds recorded, 1956 (Zhao Zhengjie *et al.* 1994a); Hunghuaerhchi, **Yimin He** (Iming-gol) river, pair, August 1956 (Piechocki 1956);

■ **Qinghai Dobo** (“Heitsuitse”), on the Xining river (Sining-ho), male collected, January 1929, 2,400 m (Stresemann *et al.* 1937–1938, Vaurie 1972); **Xining city**, winter visitor (unspecified years) (Zheng Shengwu 1994);

■ **Gansu Lanzhou**, four, January 1991 (Waterbird Specialist Group 1994);

■ **Ningxia Yongning county**, winter visitor (unspecified years) (Zheng Shengwu 1994); **Qingtongxia city**, winter visitor (unspecified years) (Zheng Shengwu 1994);

■ **Sichuan** Yangtze river, between Chongqing (Congqing) and **Wanxian**, 16 birds, December 1990–March 1991 (Zhao Zhengjie *et al.* 1994a); Sequ river, Seda county, **Garzê prefecture** (Ganzi prefecture), undated (Dai Bo *et al.* 1994); **Ya'an county** (Yachow), several, November–December 1908 (Thayer and Bangs 1912); **Hongya** (Kungyachsien, Hung-ya-hsien), several, November–December 1908 (Thayer and Bangs 1912, two specimens in MCZ); **Leshan** (Kiating), several, November–December 1908 (Thayer and Bangs 1912);

■ **Yunnan Lashihai lake**, Lijiang county, six, March 1997 (Yang Lan and Yang Xiaojun 1997), May 1998 (Li Yun 1998);

■ **Guizhou Cao Hai Nature Reserve**, undated (Liu Donglai *et al.* 1986); **Guiding county**, two females obtained from local people, November 1986 (Zhao Zhengjie *et al.* 1994a); **Duyun city**, 600–800 m, several, January 1975, on mountain streams (Zhu Jingyi *et al.* 1998); **Zhangbu**,

Pingtang county, female collected and several seen, January 1975, 600–800 m, on mountain streams (Wu Zhi-kang *et al.* 1986, Zhu Jingyi *et al.* 1998); unspecified locality, one collected before 1931 (Yen 1934);

■ **Hebei** unspecified localities, on migration (unspecified years) (Cheng Tso-hsin 1987);

■ **Tianjin Tianjin** (Tientsin), undated (Dement'ev and Gladkov 1951–1954);

■ **Shandong Changdao National Nature Reserve**, winter 1990 (Zhao Zhengjie 1993, Zhao Zhengjie *et al.* 1994a); **Changshan islands**, Changdao county, recorded in November (unspecified year) (Fan Qiangdong and Xu Jianmin 1996); **Huang He Sanjiaozhou Nature Reserve** (Yellow River delta), passage migrant (unspecified years) (Zhao Yanmao and Song Chaoshu 1995); Bahe Gang, **Weihai city**, nine, 1995–1997, a “passage migrant” (Yan Liqin *et al.* 1998); **Rongcheng Nature Reserve**, winter visitor to Zhuduoshan and Rongcheng coast (Scott 1989), winter 1984 (Zhao Zhengjie 1993, Zhao Zhengjie *et al.* 1994a); **Qingdao**, March 1937 (specimen in ASCN), three, January 1992 (Waterbird Specialist Group 1994), “rare” in the coastal wetlands of Qingdao (Liu Daiji *et al.* 1994); **Weishan Hu** lake, at Nanyang Hu, Dushan Hu and Zhaoyang Hu, Nansi Hu lakes, “rare” during surveys in 1988–1991 (Feng Zhilu *et al.* 1996);

■ **Hubei Yichang** (I-ch'ang, Yichang), several, November–December 1907 or 1908 (Thayer and Bangs 1912, specimen in MCZ);

■ **Anhui Feidong**, three females obtained and others seen, undated (Zhao Zhengjie *et al.* 1994a); unspecified locality, November 1914 (specimen in ASCN);

■ **Jiangsu Yancheng Nature Reserve**, Xiangshu, Binhai, Sheyang, Da Feng and Dongtai counties, “occasional visitor”, undated (Wang Hui 1991), six, January 1990, 12, January 1991 (Waterbird Specialist Group 1994), 18, winter 1995/1996 (Miyabayashi and Mundkur 1999); **Gaoyou Hu**, 40 km north of Yangzhou, January 1990 (Perennou *et al.* 1990, Waterbird Specialist Group 1994, Miyabayashi and Mundkur 1999); Dongtai **Liulishe**, two, November 1991 (Waterbird Specialist Group 1994); **Shaobo Hu** (Shabo lake), 15 km north of Yangzhou, January 1990 (Perennou *et al.* 1990, Waterbird Specialist Group 1994, Miyabayashi and Mundkur 1999);

■ **Shanghai Shanghai** area, male collected, December 1924 (Sowerby 1943), December 1924, November 1926, November 1932 (three specimens in ASCN);

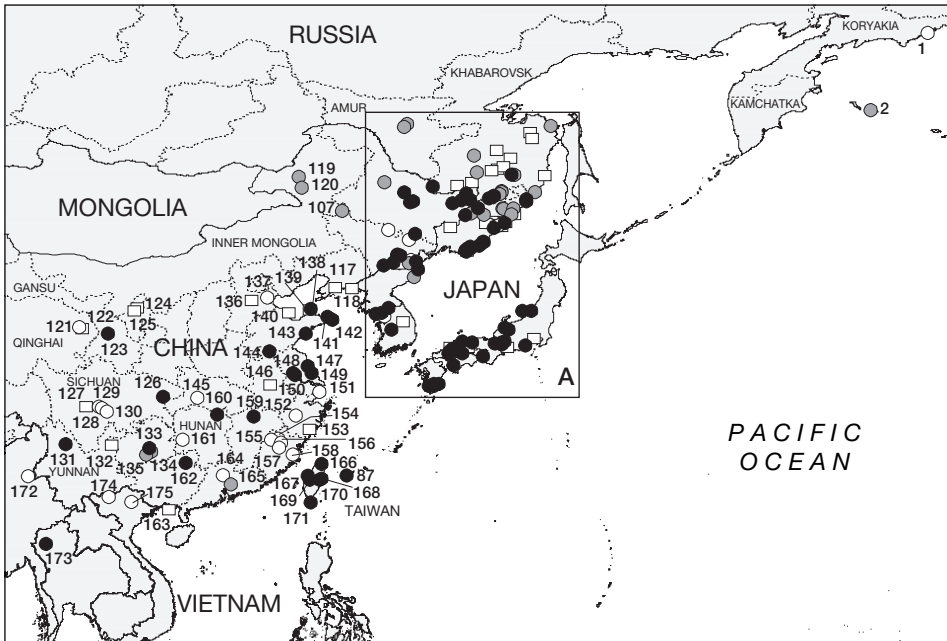
■ **Zhejiang Lanxi county** (Lan-chi), December 1926 (female in FMNH); **Yongjia county**, female collected, undated (Zhuge Yang 1990); unspecified locality, January 1975 (male in WUCN);

■ **Fujian** “Shaowu river”, **Shaowu county**, female collected, January 1941 (Cheng Tso-hsin 1941); Min river, central Fujian, two males collected from a small flock, December 1908, male collected, February 1911, female collected at **Jianyang** (Kienyang), March 1914, female collected at **Kienningfu**, December 1915, female collected at **Nanping** (Yenping Fu), December 1917 (La Touche 1917, 1925–1934, five specimens in MCZ); near **Fuzhou**, November 1923 (specimen in ASCN; also Sowerby 1943); “Sin-n-fu” or “Hsing-hwa-fu” (untraced), male collected in December and female in February (Martens 1910);

■ **Jiangxi Wucheng**, Poyang Hu lake, male, December 1989 (Kazmierczak 1990b, Turnbull 1990 in Zhao Zhengjie *et al.* 1994a), wintering population of 100 birds found in 1999 in Yiyang county on a 10 km stretch of the Xinjiang river, which flows into Poyang Hu lake (*Oriental Bird Club Bull.* 32 [2000]: 31);

■ **Hunan Dong Dongting Hu Nature Reserve** (East Dongting lake), winter visitor to the Dongting lakes (Scott 1989), four, January 1990, four, February 1991, six, December 1991 (Waterbird Specialist Group 1994), at Caisang Hu lake, six, 1991, two, winter 1993/1994 (Lei Gang and Qian Weirong 1998, Lei Gang *in litt.* 1998, Song Fazong *in litt.* 1998); **Qianyang** (Chien-yang), Yuan river, pair, December 1898 (Ogilvie-Grant 1900b,c, female in BMNH; see Remarks 2);

■ **Guangxi Guilin prefecture**, 1982–1990 (Li Hanhua *et al.* 1991); northern **Beibu bay**, “very rare” winter visitor, only one or two records (Zhou Fang *et al.* 1999);



The distribution of Scaly-sided Merganser *Mergus squamatus*: (1) Natalii bay; (2) Mednyy island; (3) Bol'shaya Iska river; (4) Amgun' river; (5) Bichi river; (6) Evoron lake; (7) Badzhai river mouth; (8) Goryun river; (9) Gur river; (10) Bolon' lake; (11) Kharpi river; (12) Kur river; (13) Anyuy river; (14) Tormasu river; (15) Tumnin river; (16) Urmi river; (17) Khor river; (18) Botchi river; (19) Sukpay river; (20) Chuken river; (21) Kafe river; (22) Katen river; (23) Matay river; (24) Tungala river; (25) Ninni river; (26) Bira river; (27) Pompeyevka river; (28) Samarga river; (29) Yedinka river; (30) Bachelaza river; (31) Bikin river; (32) Zeva river; (33) Ulunga river; (34) Kkhutsin river; (35) Zabolochennaya river; (36) Terneyskiy district; (37) Tatibe river; (38) Iman river; (39) Takema mountains; (40) Poludennaya river; (41) Kema river; (42) Kolumbe river; (43) Tayezhnaya river; (44) Sikhote-Alin' State Reserve; (45) Sitsa mountains; (46) Sitsa river; (47) Belimbe mountains; (48) Terney bay; (49) Khanka lake; (50) Dzhigitovka river; (51) Sadaga river; (52) Avvakumovka river; (53) Kaban'ya river mouth; (54) Margaritovo river; (55) Perekatnaya river; (56) Lazovskiy State Reserve; (57) Benevka river; (58) Sudzukhinskiy State Reserve; (59) Ivanovka river; (60) Sudzuke river; (61) Tokyo; (62) Sado island; (63) Agano-gawa; (64) Fukuno-machi; (65) Inotani; (66) Unuma-cho; (67) Hashima-gun; (68) Kaizu-cho; (69) Fuji-gawa river mouth; (70) Aichi; (71) Biwa-ko; (72) Kino-kawa; (73) Hino-gawa; (74) Yazu-gun; (75) Shimane; (76) Okayama; (77) Gono-kawa; (78) Haji dam; (79) Kake-cho; (80) Ashida-gawa; (81) Saeki-gun; (82) Hijikawa-cho; (83) Takaharu-cho; (84) Miyazaki-shi; (85) Miyakonojo-shi; (86) Beppu-gawa river mouth; (87) Iriomote-jima; (88) Musan; (89) Mayagdon Chosuji; (90) Orangchon river; (91) Janghungri; (92) Samjiyon lake; (93) Cheolweon; (94) Yongwol-gun; (95) Imjin river; (96) Han river; (97) Seoul; (98) Taech'ong lake; (99) Xiao Hinggan Ling; (100) Cuiluan; (101) Honghe Nature Reserve; (102) Naoli He; (103) Qixing He; (104) Nancha river; (105) Dailing; (106) Xinglong Nature Reserve; (107) Tailai county; (108) Shanhetun; (109) Ning'an county; (110) Jingpo Hu; (111) Gudong He; (112) Toudaobai He; (113) Sandaobai He; (114) Wanzhu; (115) Jin Jiang; (116) Yalu Jiang; (117) Xianrendong National Nature Reserve; (118) Yalu Jiang; (119) Hailar; (120) Yimin He; (121) Dobo; (122) Xining city; (123) Lanzhou; (124) Yongning county; (125) Qingtongxia city; (126) Wanxian; (127) Garzê prefecture; (128) Ya'an county; (129) Hongya; (130) Leshan; (131) Lashai lake; (132) Cao Hai Nature Reserve; (133) Guiding county; (134) Duyun city; (135) Zhangbu; (136) Hebei; (137) Tianjin; (138) Changdao National Nature Reserve; (139) Changshan islands; (140) Huang He Sanjiaozhou Nature Reserve; (141) Weihai city; (142) Rongcheng Nature Reserve; (143) Qingdao; (144) Weishan Hu; (145) Yichang; (146) Feidong; (147) Yancheng Nature Reserve; (148) Gaoyou Hu; (149) Liulishu; (150) Shaobo Hu; (151) Shanghai; (152) Lanxi county; (153) Yongjia county; (154) Jianyang; (155) Shaowu county; (156) Kienningfu; (157) Nanping; (158) Fuzhou; (159) Wucheng; (160) Dong Dongting Hu Nature Reserve; (161) Qianyang; (162) Guilin prefecture; (163) Beibu bay; (164) Yungkong river; (165) Longhua; (166) Chinshan; (167) Tatu estuary; (168) Hualien river; (169) Nantou county; (170) Liyutan; (171) Lungluan Tan; (172) Bhamo; (173) Doi Inthanon National Park; (174) Lao Kay; (175) Bac Kan.

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

■ **Guangdong Yunkong river**, April 1916 (male in ZMB); **Longhua**, Longmen, December 1973 (female in SCIN).

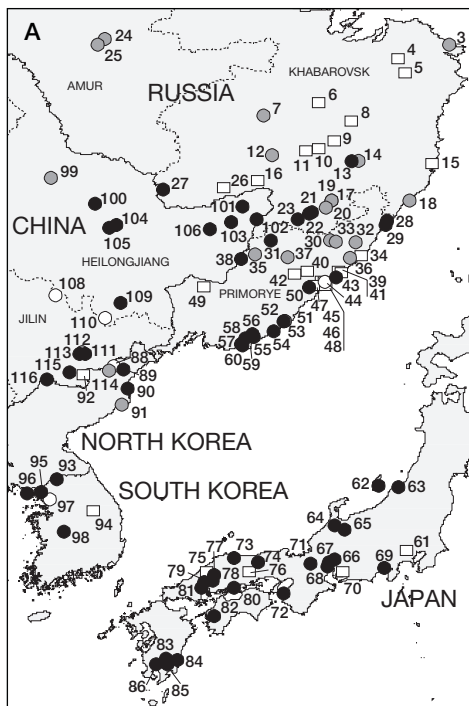
■ **TAIWAN** This species is a rare non-breeding visitor, thus: **Chinshan**, Taipei, one, March–April 1992 (CWBF database); **Tatu estuary**, Taichung county, three, November 1987 (Tsai 1987); middle reaches of the **Hualien river**, Hualien county, two, 1997 (CWBF database); **Chubin**, **Nantou county**, one, February 1993 (CWBF database); **Liyutan**, Hualien county, one, February–March 1996 (CWBF database); **Lungluan Tan**, Pingtung county, November 1988 and November 1989 (Wang Chia-hsiong *et al.* 1991), one, winter 1990 (CWBF database), one, January 1999 (*Oriental Bird Club Bull.* 30 [1999]: 50–58]; Pingdong harbour (untraced), three, 1981 (Zhao Zhengjie *et al.* 1994a).

■ **MYANMAR** There is a single record, although it was not mentioned by Smythies (1986), presumably either because he was unaware of it or because he had evidence indicating that it was erroneous: **Bhamo**, one collected, undated (Hartert 1915 in Dement'ev 1933).

■ **THAILAND** There is a single record: **Doi Inthanon National Park**, immature, 400–500 m, January–February 1991 (P. D. Round *in litt.* in Zhao Zhengjie *et al.* 1993, Round and Verbelen 1997, D. Dann *in litt.* 1999).

The distribution of Scaly-sided Merganser *Mergus squamatus* (map A): (3) Bol'shaya Iska river; (4) Amgun' river; (5) Bichi river; (6) Evoron lake; (7) Badzhal river mouth; (8) Goryun river; (9) Gur river; (10) Bolon' lake; (11) Kharpri river; (12) Kur river; (13) Anyuy river; (14) Tormasu river; (15) Tumnin river; (16) Urmi river; (17) Khor river; (18) Botchi river; (19) Sukpay river; (20) Chuken river; (21) Kafe river; (22) Katen river; (23) Matay river; (24) Tungala river; (25) Ninni river; (26) Bira river; (27) Pompeyevka river; (28) Samarga river; (29) Yedinka river; (30) Bachelaza river; (31) Bikin river; (32) Zeva river; (33) Ulunga river; (34) Kkhutsin river; (35) Zabolochennaya river; (36) Terneyskiy district; (37) Tatibe river; (38) Iman river; (39) Takema mountains; (40) Poludennaya river; (41) Kema river; (42) Kolumbe river; (43) Tayezhnaya river; (44) Sikhote-Alin' State Reserve; (45) Sitsa mountains; (46) Sitsa river; (47) Belimbe mountains; (48) Terney bay; (49) Khanka lake; (50) Dzhigitovka river; (51) Sadaga river; (52) Avvakumovka river; (53) Kaban'ya river mouth; (54) Margaritovo river; (55) Perekatnaya river; (56) Lazovskiy State Reserve; (57) Benevka river; (58) Sudzukhinskiy State Reserve; (59) Ivanovka river; (60) Sudzukhe river; (61) Tokyo; (62) Sado island; (63) Agano-gawa; (64) Fukuno-machi; (65) Inotani; (66) Unuma-cho; (67) Hashima-gun; (68) Kaizu-cho; (69) Fuji-gawa river mouth; (70) Aichi; (71) Biwa-ko; (72) Kino-kawa; (73) Hino-gawa; (74) Yazu-gun; (75) Shimane; (76) Okayama; (77) Gono-kawa; (78) Haji dam; (79) Kake-cho; (80) Ashida-gawa; (81) Saeki-gun; (82) Hijikawa-cho; (83) Takaharu-cho; (84) Miyazaki-shi; (85) Miyakonojo-shi; (86) Beppu-gawa river mouth; (88) Musan; (89) Mayangdon Chosui; (90) Orangchon river; (91) Janghungri; (92) Samjiyon lake; (93) Cheolweon; (94) Yongwol-gun; (95) Imjin river; (96) Han river; (97) Seoul; (98) Taech'ong lake; (99) Xiao Hinggan Ling; (100) Cuiluan; (101) Honghe Nature Reserve; (102) Naoli He; (103) Qixing He; (104) Nancha river; (105) Dailing; (106) Xinglong Nature Reserve; (108) Shanhetun; (109) Ning'an county; (110) Jingpo Hu; (111) Gudong He; (112) Toudaobai He; (113) Sandaobai He; (114) Wanzhu; (115) Jin Jiang; (116) Yalu Jiang.

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



■ **VIETNAM** There are two records: Red River at **Lao Kay** (Laokay), group of five or six, 1915 (Delacour and Jabouille 1931); Cau river near **Bac Kan**, two males collected, December 1926 (Delacour *et al.* 1928, Delacour and Jabouille 1931, male in MNHN).

POPULATION The world population of Scaly-sided Merganser was recently estimated to total 3,600–4,500 birds, and it is believed to be declining (Rose and Scott 1997). Earlier estimates included c.1,200 pairs (Hughes and Bocharnikov 1992), 1,200–1,500 pairs (Zhao Zhengjie *et al.* 1994a) and c.4,000 individuals (Rose and Scott 1994). Given the declines in its numbers that have been reported from several parts of its range (see below), it is reasonable to suggest that it may now total fewer than 4,000 birds, including fewer than 2,500 mature individuals.

Russia The largest numbers breed in Russia, where in the early 1980s there were estimated to be c.1,000 pairs in Primorye and c.100 pairs in Khabarovsk, but by 1990 the total number in Ussuriland (i.e. Primorye and the part of Khabarovsk to the east of the Amur river) was estimated at c.950 pairs. In the three decades from 1960 to 1990 the species's numbers declined significantly, with the most pronounced decrease on the rivers in the northern Sikhote-Alin' mountains (Bocharnikov 1990). Elsewhere in the Sikhote-Alin', a significant decline was observed between the early 1970s and the early 1980s, but numbers had begun to stabilise by the end of the 1980s, and by the early 1990s a slight increase was noted in some areas (Kolomiitsev 1992, Bocharnikov and Shibnev 1994, Surmach and Zaykin 1994).

The Bikin river basin in Primorye is probably the most important known breeding area for this species in the world. In 1980–1981, the breeding density in the middle reaches of the Bikin river was found to be one pair per 6–8 km, with one pair per 3.8 km in the most densely populated stretches, and it was considered that the population there had declined by a factor of 1.5–2.0 in the 10-year period from 1971 to 1981 (Kolomiitsev 1985). The available data on population densities there suggest that, after a sharp decline in the 1970s and 1980s, the species increased again after the mid-1980s; however, the recent increase in the estimated population may have been a result of improved survey techniques (Bocharnikov and Shibnev 1994). The total population in the Bikin river basin was estimated at 120–150 pairs in the early 1980s and c.200 in 1990 (Bocharnikov 1990). In the 1990s, 150–200 pairs were estimated, with a maximum density of 8.1 birds per 10 km found on the upper reaches of the river and up to 6.1 per 10 km on the middle reaches (Bocharnikov and Shibnev 1994). Early spring counts in 1996 indicated that the numbers of Scaly-sided Mergansers had halved since the 1980s; however, it is possible that the numbers of the species had been overestimated in many previous counts because of confusion between their broods and those of the Common Merganser *Mergus merganser* (Mikhailov and Shibnev 1998).

The Iman river basin in Primorye also supports a large population. This was estimated at 140 pairs in 1991, with a mean brood size of 6.9 young, although these figures must be viewed with some caution, as they include an estimate of 33 pairs from 225 km of river where breeding was not confirmed; data were only collected up to 6 July, so the brood size does not take into account the continued or even increased mortality as the season progressed towards the onset of the hunting season; and the figures are only for 1990–1991, with indications that this was a peak period for the species in this area (Surmach and Zaykin 1994). A comparison with the reports of Scaly-sided Merganser broods in the Iman river basin in the 1960s by Spangenberg (1965) suggested that the breeding density had not changed substantially there since that time. An estimate by Bocharnikov (1990) that there are 350 pairs in the Iman river basin included extrapolation for unsuitable stretches of river and did not take into account the (considerable) differences in brood density between “braided” (multiple) and single river channels (Surmach and Zaykin 1994).

Other important breeding populations are found on the rivers on the eastern slope of the Sikhote-Alin' mountains in Khabarovsk and Primorye, which were estimated to total c.400

pairs by Bocharnikov (1990). Censuses in Lazovski State Reserve found the highest density, one pair per 3.8 km of river, in the middle reaches of the Kievka (Sudzukhe) river, and one pair per 6.5 km on the other suitable rivers in the reserve (Kolomiytsev 1985). In the Avvakumovka river basin, 16 pairs were counted along 170 km of river, or one pair per 10.6 km (Labzyuk 1988). On the Yedinka river, 25 broods were counted along 61 km of river, a density of one pair per 2.4 km (Semenchenko and Ermolenko 1988). In 1958–1975, densities in the Sikhote-Alin' State Reserve varied from one brood per 3.0 km to one per 5.6 km (Yelsukov 1982). The most pronounced declines in the population of this species have been on the mountain streams in the northern Sikhote-Alin' mountains. On the Sukpai river, 22 broods were counted along 50 km of river in June–July 1965 (one brood per 2.3 km), eight broods were on the same stretch in 1966, four broods in 1967 and only one brood in 1969 (Yakhontov 1976a), a more than 20-fold decline in the number of broods (Bocharnikov 1990). In the Khabarovsk region there are a maximum of 250 birds, and in the Jewish Autonomous Region there are no more than 10–15 pairs (B. A. Voronov *in litt.* 1998).

China The total breeding population in China has been estimated at 200–250 pairs, with an important concentration of 40–50 pairs in the Changbai Shan mountains in Jilin province, but their numbers have declined significantly (Zhao Zhengjie *et al.* 1993, 1994a). In the Changbai Shan, an average population density of 7.2 individuals per 10 km was found on the Toudaobai river (on the upper reaches c.50 km upstream from the village of Baomatun, in good primary forest inside the Changbai Shan Nature Reserve) in April–May 1976–1978, but surveys at the same time of year and in the same place in 1989, 1990 and 1991 found densities of 6.6, 6.3 and 5.0 respectively (Zhao Zhengjie *et al.* 1993, 1994a). A maximum of 20 pairs are estimated to breed on the upper reaches of the Man Jiang and Jin Jiang rivers (Zhao Zhengjie *et al.* 1993). This species was once common on the Gudong He river, but it is apparently now extinct there (Liu Bowen *in litt.* 1998). None was found in the Da Hinggan Ling (Greater Xingan mountains) in Heilongjiang during surveys in 1984–1985 and 1987–1988, although specimens had been collected there in 1979, indicating that a dramatic reduction in numbers had taken place, and that few individuals survive (Zhao Zhengjie *et al.* 1994a). It used to be widely distributed in the Xiao Hinggan Ling (Lesser Xingan mountains), but it has also declined significantly there. It was only found on the Yongcui river during surveys of the entire mountain range in 1994–1995, when it was estimated that fewer than six pairs were breeding (Liu Bowen *in litt.* 1998). However, a forestry bureau guide reported that 50 pairs were breeding in the Dailing area in 1990 (King and Jin Longrong 1992–1993). An important breeding population (of “several dozen”) was located at Jingpo Hu in Heilongjiang in 1997–1998 (Li Wenfa 1999), and the largest known wintering population (of 100 birds) was found in 1999 in Yiyang county, Jiangxi, on a 10 km stretch of the Xinjiang river, which flows into Poyang Hu lake (*Oriental Bird Club Bull.* 32 [2000]: 31).

Korea Numbers on the Korean Peninsula appear to be relatively small, but the species may prove to have been under-recorded. In North Korea, it breeds in small numbers on Mayang Chosuji reservoir (Chong and Morishita 1996). In South Korea, it is estimated that fewer than 10 individuals occur in winter (Lee Woo Shin *in litt.* 1997).

Non-breeding range This species disperses widely outside the breeding season, and few large wintering concentrations are known. It is a scarce visitor to many provinces of China and to Japan, and it appears to occur only as a vagrant or rare winter visitor in South-East Asia.

ECOLOGY Habitat The Scaly-sided Merganser breeds along rivers with tall riverine forest, mainly within the temperate conifer-broadleaf forest zone in the Russian Far East and north-east China (Roslyakov 1984, Stepanyan 1990). Its density is high in mixed coniferous and broadleaf forests on the western slopes of the Sikhote-Alin' mountains (in Russia), and mixed coniferous and broadleaf forest below 900 m is also its main habitat in China, but it is most

commonly found in broadleaf forest on the eastern slopes of the Sikhote-Alin' mountains and it occurs in birch forest in the upper reaches of the rivers on the western slopes (Bocharnikov 1990, Zhao Zhengjie *et al.* 1993, 1994b). In its riverine forest habitats in Russia, typical tree species include elm *Ulmus propinqua*, lime *Tilia amurensis* and *T. mandshurica* and poplar *Populus maximowiczii* (Bocharnikov 1990), and in the Changbai Shan Nature Reserve in China they include black pine *Pinus koraiensis*, Daimyo oak *Quercus dentata*, poplar *Populus*, Amur linden *Tilia amurensis*, Manchurian ash *Fraxinus mandshurica* and mono maple *Acer mono* (Zhao Zhengjie *et al.* 1995). In the main breeding areas in both Russia and China, it is found in primary (old-growth) forests (e.g. Zhao Zhengjie *et al.* 1993, 1995), and the only breeding-season record from secondary forest (with some areas of old-growth forest) is from the Dailing area in Heilongjiang (King and Jin Longrong 1992–1993). Old-growth forest provides this hole-nesting species with an abundance of potential nest sites, particularly in the older, rotting trees (Kolomiitsev 1985, Zhao Zhengjie *et al.* 1995).

On arrival in the breeding grounds, the birds frequent lakes and larger rivers, before moving to smaller tributaries to breed; in Russia, they prefer to breed on undisturbed rivers in the mountains and foothills with clean rapid waters, shingle islands, deep stretches and shoals, and the highest breeding densities are found on the middle stretches of the larger mountain rivers (Kolomiitsev 1985, Yelsukov 1994). In China, they favour winding food-rich rivers with clear water, slow currents, gravel or rocky substrates and many meanders (Zhao Zhengjie *et al.* 1993, 1994b, 1995, Zhao Zhengjie and Pao Zhengjie 1998). On the eastern slopes of the Sikhote-Alin' mountains, Scaly-sided Merganser is recorded mainly on the lower and middle reaches of the rivers; on the western slopes, it is mainly found near the sources of the rivers, and is absent in the middle and lower reaches which are forested with conifers (Yelsukov 1994). Outside the breeding season, from October to March, the species feeds in big rivers outside forests (Zhao Zhengjie and Pao Zhengjie 1998).

Food During the breeding season, females usually fly 1–2 km from the nest to feed, and the chosen feeding site regularly differs within the 3–4 km long breeding territory (Kolomiitsev 1985, Bocharnikov and Shibnev 1994). At this time of year, the birds seek food for c.14–15 hours per day, with short periods of loafing, preening or bathing. They usually forage in small groups of up to three birds (sometimes more during migratory periods). Analysis of the food of this species suggests that it is a relatively specialised feeder in terms of its preferred prey and feeding sites. It usually selects rivers with a gravel substrate and feeds mainly on benthic organisms, especially during the breeding season (Zhao Zhengjie *et al.* undated, Zhao Zhengjie and Pao Zhengjie 1998). In the Changbai Shan mountains in China its main foods are larvae of stoneflies *Plecoptera* and caddisflies *Phryganeidae*, shrimps, crayfish, beetles, loach *Misgurnus anguillicaudatus*, lenok *Brachymystax lenok*, sculpin *Mesocottus haitej*, grayling *Thymallus articus grubei* and lamprey *Lampetra morii*, etc., which live under the gravel or in crevices on the riverbed; caddisfly larvae and small fish are the major prey during the breeding season, the former being at the larval stage in June–July when it comprises 90% of the species's food, while after July its food changes to small fish, shrimps and crayfish and, especially in September, the newly hatched fry of small fishes are its main food (Zhao Zhengjie *et al.* undated, 1994b, Zhao Zhengjie and Pao Zhengjie 1998). During field observations in Russia, it has been observed to take only fish, apparently small fish and the fry of large fish, the composition probably depending on the habitat, time of year and seasonal distribution of the prey species: in the upper reaches, the main food is the fry of grayling, lenok, minnow *Phoxinus phoxinus*, chebak (Amur ide) *Leuciscus waleckii* and probably loach, while in the middle reaches it is minnow, gudgeon *Gobio gobio*, loach, and the fry of chebak and other fish species (Bocharnikov and Shibnev 1994). The stomachs of three adults collected in May contained freshwater fish *Cottus* sp. and two frogs, and those of eight juveniles collected in July–September contained the bones of small fish, small *Gaidropsarus* and *Trichoptera*

larvae (Yelsukov 1994). This species has few competitors for food during the breeding season, but from October to March, when it feeds in big rivers outside forests, it occurs together with other diving ducks that are potential competitors for food, e.g. Common Merganser *Mergus merganser*, Red-breasted Merganser *M. serrator*, Goldeneye *Bucephala clangula*, etc. (Zhao Zhengjie *et al.* undated, Zhao Zhengjie and Pao Zhengjie 1998).

Breeding Scaly-sided Mergansers are usually monogamous, and the females start to breed in their third year (Kolomiytsev 1992). Birds begin to arrive in the breeding areas in late March, when pairs begin to form, and in mid-April the pairs start to occupy breeding territories (2–8 km of river) (Shibnev 1985, Zhao Zhengjie *et al.* 1994b, 1995). However, groups and pairs were recorded on the Bikin river (prior to nesting) until the middle of May, indicating that there was a considerable spread in the commencement of breeding, which was confirmed later in the season by sightings of broods of different ages (Bocharnikov and Shibnev 1994). By early June, when incubation has begun, males form flocks of 10–25 birds and leave the breeding grounds to moult in some areas of the Sea of Japan and the Sea of Okhotsk (Kolomiytsev 1985). On the Bikin river, the males move to the relatively undisturbed upper reaches to moult (Bocharnikov 1990). In summer, the species is usually ecologically segregated from other mergansers, but it has been found breeding alongside Common Merganser *M. merganser* in the Samarga river basin on the eastern slopes of the Sikhote-Alin' range (Yelsukov 1994).

The females nest in tree holes (or nest-boxes), 1.5–18 m above the ground, which they line with down and grass; they usually nest in riverside trees, often overhanging the water, but nests have been found up to 100–120 m from the riverbank (Yelsukov 1982, Flint and Vinokurov 1984, Bocharnikov and Shibnev 1994, Yelsukov 1994, Zhao Zhengjie *et al.* 1994b, 1995). The trees chosen for nesting include oak *Quercus dentata*, elm *Ulmus propinqua* and poplar *Populus maximowiczii* and *P. ussuriensis*, sometimes near highways and villages (Bocharnikov and Shibnev 1994, Yelsukov 1994, Zhao Zhengjie *et al.* 1994b, 1995). Particular nest holes are sometimes occupied by this species for several years (Bocharnikov and Shibnev 1994). A report by a forestry bureau guide at Dailing, in Heilongjiang, that they nest on the ground along the local rivers (King and Jin Longrong 1992–1993) is presumably erroneous and the result of confusion with another species.

Egg-laying begins in the second half of April and continues throughout much of May, although most clutches are laid by early May; the clutch size varies from 4 to 12 eggs, exceptionally 14, and averages 10–11 (Kolomiytsev 1992, Zhao Zhengjie *et al.* 1994b, 1995). Normally one clutch is laid per year, but if the first is destroyed a replacement may be laid (Kolomiytsev 1992). Incubation is by the female, and lasts for 31–35 days (Zhao Zhengjie *et al.* 1994b, 1995). The earliest broods hatch in mid-May, but the main hatching period occurs between late May and early June, and ducklings from replacement clutches may continue to appear until mid-June (Bocharnikov 1990, Kolomiytsev 1992, Bocharnikov and Shibnev 1994). The ducklings leave the nest 48–60 hours after hatching (Kolomiytsev 1992). Brood size varies from one to 15 ducklings, with mean brood size in different parts of the range varying from 5.9 to 7.7 (Kolomiytsev 1992). In the central Sikhote-Alin' mountains, records of broods in 1957–1990, broken down by month, were: one brood (eight ducklings) in May, 41 broods (average 8.0 ducklings) in June, 65 broods (average 6.2 ducklings) in July and 44 broods (average 7.0 ducklings) in August (Yelsukov 1994). The juveniles congregate in groups of 20 or more birds with one female, and a group of 48 without a female has been seen in July; most of them fledge in the last ten days of August, at around eight weeks of age (Labzyuk 1988, Bocharnikov 1990, Hughes and Bocharnikov 1992, Bocharnikov and Shibnev 1994).

Migration This species is present on the breeding grounds in Russia and China between late March or April and October, and disperses widely to the south during the winter months. In the Sikhote-Alin' mountains, the earliest arrival date recorded on the eastern slopes was 9 March, and the main arrival took place on 2–8 April; on the western slopes the first birds

arrived later, on 24 March (Bocharnikov 1990). In the central Sikhote-Alin' mountains birds were never recorded before 15 March, and the average return date was 9 April (Yelsukov 1994). They moved onto the breeding areas in the middle and upper sections of the Bikin river and its tributaries by the second week of April, some 7–10 days later than the Common Merganser (Shibnev 1976d). In the Changbai Shan mountains they arrive between early and late March and remain until the end of October (Zhao Zhengjie *et al.* 1994b, Zhao Zhengjie and Pao Zhengjie 1998). Males leave the breeding areas around early June (see Breeding above). Females with juveniles leave the breeding areas in Russia between mid-September and early October (Rakhilin 1976b, Kolomiitsev 1985), and the autumn migration of males occurs by mid-September (Kolomiitsev 1995). The species begins to leave the Bikin river in the middle of September, but most birds depart downriver between 6 and 20 October, when they are already in non-breeding plumage; by the beginning of October there are almost none left in the upper reaches of the river, most birds having moved to the middle and lower reaches on the first stage of their migration to the wintering grounds, and by the end of October there are only single birds left on the Bikin, with the only winter record in February 1969 (Bocharnikov and Shibnev 1994). They leave the Iman river basin between late September and early October (Surmach and Zaykin 1994).

THREATS In the 1960s and 1970s, Scaly-sided Merganser numbers declined sharply in the northern Sikhote-Alin' mountains, coinciding with a period of intense economic development of the taiga; the primary forests in the valleys of all large rivers in its Russian range changed greatly, but large-scale deforestation in river valleys was then forbidden and the rapid decline in its population was halted (Kolomiitsev 1985, 1992, Bocharnikov 1990, Bocharnikov and Shibnev 1994, Surmach and Zaykin 1994). However, large-scale logging may be resumed in the near future (Mikhailov and Shibnev 1998), and other threats which currently affect it there include forest fires, illegal hunting, drowning in fishermen's nets, disturbance through the intensive use of motorboats during the breeding season, river pollution and natural predators (Kolomiitsev 1992, Bocharnikov 1990, Bocharnikov and Shibnev 1994, Surmach and Zaykin 1994, Mikhailov and Shibnev 1998, B. A. Voronov *in litt.* 1998). The species continues to decline rapidly in its Chinese breeding range because of deforestation, illegal hunting, human disturbance and the use of poisons and/or explosives for fishing (Zhao Zhengjie *et al.* 1994a), and it has now disappeared from much of its previous range there (Hughes and Hunter 1994).

Habitat loss The direct effects of logging (see Remarks 3) on this duck are not known, but it undoubtedly has a serious detrimental effect on the ecosystem as a whole, and the indirect effects, which include the increased accessibility to the area for poachers, are also great (Bocharnikov and Shibnev 1994). *Russia* Logging concessions have recently been granted in the largest remaining virgin forests in its Russian breeding range, including in the Bikin river basin; several logging companies continue to cut forests in the lower and middle Bikin, and a joint Russian-South Korean company is exploiting the old-growth spruce-fir forests on the mountainous plateau of the Bikin watershed (Mikhailov and Shibnev 1998). The deforestation of the latter area is now close to a critical point which will result in marked changes to the hydrology of the Bikin river, and damage to the Manchurian-type riparian forests in the watershed (Mikhailov and Shibnev 1998). Several companies have repeatedly tried to obtain consent from district and regional administrations for the exploitation of primary forests in the upper Bikin basin, namely in the upper reaches of the Zeva and Kilou rivers, but these attempts have been resisted by local (the Udege-Nanai Society of Krasnyi Yar) and international organisations (Mikhailov and Shibnev 1998). A Malaysian company is likely soon to obtain permission to start exploiting virgin forests along the Samarga river (Mikhailov and Shibnev 1998). Logging is already widespread in the upper Iman river, taking full advantage of the road system which extends up the Iman valley and over the Sikhote-Alin' mountains (Hughes

Table 1. Changes in the extent of natural habitats within this species range in north-east China. The data in this table are reproduced from MacKinnon *et al.* (1996), and show the estimated areas (both original and remaining in km²) of presumably suitable habitats within this species's known breeding range, and the area of each habitat estimated within existing protected areas. However, it is important to note that this only gives an indication of the extent of reduction of presumed habitats, as there is no information on the time-scale over which they have been lost, and this species does not necessarily occur throughout each habitat in this part of China.

Habitat	Original	Remaining	%	Protected	%
coniferous/broadleaf mixed forest	46,073	27,349	59	1,500	3.3
cold coniferous forest	188,662	87,457	46	3,428	1.8
deciduous broadleaf forest	289,652	157,696	54	4,016	1.4
temperate coniferous forest	10,855	4,342	40	65	0.6

and Bocharnikov 1992). Further economic expansion into the middle and upper reaches of the Iman river would undoubtedly cause further declines, and in particular the planned construction of a hydro-electric dam in the middle reaches seriously threatens the survival of this species there: the dam would immediately flood about a quarter of its present breeding range, and the increase in the human population linked to its construction would cause further declines (Surmach and Zaykin 1994). *China* In China, a substantial proportion of the forest habitat of this species has been cleared (see Table 1), and much of the remaining forest is likely to have been degraded. For example, the establishment of the Baihe Forestry Department in the Changbai Shan mountains in the 1970s resulted in increased logging and road construction there, and caused a decline in the population of this species (Zhao Zhengjie *et al.* 1993).

Illegal hunting *Russia* The hunting of this species has been officially banned in Russia since 1974 (Kolosov 1983). During the 1980s, relatively effective conservation measures existed for this species in the Bikin river basin, and prior to 1988 it was estimated that the number illegally shot did not exceed 20 birds per year; however, following a change in government policy in 1988, local inhabitants and the representatives of the indigenous Udege and Nanai people were given licences to shoot any species of duck at any time of year (Bocharnikov and Shibnev 1994). The number of Scaup-sided Mergansers shot has increased to 80–100 birds per year, mainly on their return to the breeding grounds when they frequent open channels and allow motorboats to approach relatively closely; they are shot for sport and for shooting practice, and not for food, as they have an unpleasant fishy taste and smell (Bocharnikov and Shibnev 1994). In the Iman river basin, there was little or no poaching of this species before the arrival of boat engines, but when these became available poaching pressure increased sharply, mainly in the lower half of the basin; according to the local inhabitants, it subsequently fell but has recently begun to rise again and has spread to the middle reaches of the river as a result of an influx of people from outside the region (Surmach and Zaykin 1994). During studies in 1989–1991, several birds were found to have been shot, mainly accidentally, but the virtual absence of summering non-breeders and the large proportion of broods without a female (22%) suggested that poaching was occurring during the survey period (Surmach and Zaykin 1994). They were only shot in significant numbers on autumn migration under unusual circumstances, such as a mass migration in autumn 1990, when professional hunters reported that they shot “dozens” because they flew very close to their boats in an attempt to avoid attack by birds of prey, and significant numbers were shot by musk-rat hunters during the merganser's week-long feeding movements to lowland lakes (Surmach and Zaykin 1994). On the Samarga river, birds are frequently shot from motorboats using rifles, and they are also shot in spring and autumn during the open hunting season (Yelsukov 1994). *China* Illegal hunting also takes place in China (Zhao Zhengjie *et al.* 1994a), including in the wintering range where this species was recorded in hunters' bags during a study of hunting pressure in the Yangtze valley in 1987–1992 (Lu Jianjian 1993a).

Mortality in fishing nets *Russia* Scaly-sided Mergansers are drowned in fishing nets on all the rivers where they breed in Primorye (Surmach and Zaykin 1994). On the rivers in the eastern slopes of Sikhote-Alin', Kolomiitsev (1986) reported that 20% of the annual production of young died in this way, as the rivers there are heavily fished for migratory salmonids (*Oncorhynchus masu* and *O. keta*). These fish have now practically disappeared from the Iman river basin, so poachers have much less interest in that area, and only 15% of the poachers had caught mergansers in their nets; however, the level of poaching there is increasing because of an increase in fish stocks, the country's difficult food situation and the reduction in the manpower of the Fish Inspectorate because of a lack of finance, and at the start of the 1990s it was speculated that this might lead to increased mortality in fishing nets (Surmach and Zaykin 1994). The most serious threat to this species in the central Sikhote-Alin' mountains is illegal fishing during the migration of sturgeons *Acipenser schrenkii*, when large numbers of both adults and young are caught and drowned in fishing nets set across rivers (Yelsukov 1994).

Disturbance *Russia* In the Bikin river basin, river traffic of motorboats appeared to have two major negative effects on the survival of the young of this species, through the disturbance and subsequent fragmentation of broods, and through direct persecution; in 1948 the local people only travelled short distances along the rivers using poles and oars for propulsion, leaving many sections of river inaccessible to humans, so that large numbers of this species were seen (Bocharnikov and Shibnev 1994). The first boat engines appeared in the early 1960s, which immediately increased access to the middle and upper reaches of the rivers to hunters and fishermen; the mass adoption of motorboats in the 1970s coincided with an apparent mass decline in the numbers of the species (Bocharnikov and Shibnev 1994). Throughout the Sikhote-Alin' mountains, the level of disturbance is increasing every year, and may start to affect this species seriously in the near future; some of the river basins which it inhabits were once virtually inaccessible but are now quickly being developed, and considerable disturbance is now caused by river traffic (Yelsukov 1994). For example, on the Samarga river motorboats are practically the only means of transport between villages, causing serious disturbance, and birds are frequently shot from the boats using rifles (Yelsukov 1994). Tourists visit the River Armu, the second most important breeding area for Scaly-sided Merganser in the Iman river basin, in order to raft downriver, and up to 10 parties have been counted per day: this may split family groups early in the brood period, although older broods can outpace the rafts (Surmach and Zaykin 1994). In the Iman river basin, timber-rafting took place for several decades on most of the large tributaries, and appears to have had a major effect on the numbers of Scaly-sided Merganser there, as their numbers increased sharply three years after the timber-rafting ceased in 1988, presumably when the birds reared in the favourable reproductive seasons (following the cessation of rafting) first began to breed; however, local people noticed a marked increase also in fish catches at this time, which could perhaps have been the real reason for the increase in the numbers of Scaly-sided Merganser (Surmach and Zaykin 1994).

Pollution *Russia* The mining of minerals in the Bikin river basin is seriously affecting the quality of this species's habitat: in addition to the direct pollution of the water with heavy metals, the increased amount of clay in suspension may lead to the river becoming unsuitable for many fish and/or make it harder for birds to catch fish; increased silt deposition in the spawning grounds could prevent the development of fish eggs, and reduce the fish populations which provide the main source of food (Bocharnikov and Shibnev 1994). There are two major industrial installations in the Iman river basin whose activities are linked with water pollution, a plant which extracts and processes complex ores in the headwaters of the Dalnyaya river and a gold-mining complex on the upper Kolumbe, and Scaly-sided Merganser were not found breeding in either river system during a survey in 1991 (Surmach and Zaykin 1994). *China* In China this species is affected by the illegal use of poisons and explosives for fishing (Zhao Zhengjie *et al.* 1994a).

Competition and predation Several other fish-eating bird species occur in the Bikin river basin, but the only potentially serious competitor to this species is the Common Merganser; although there is no direct evidence to indicate that competition occurs between these two species, their apparently similar ecological requirements would suggest that competition may occur, especially as the Common Merganser appears to have increased recently in this area (Bocharnikov and Shibnev 1994). In the Iman river basin there is apparently no competition for feeding opportunities with the other fish-eating species on the river, Common Merganser and Great Cormorant *Phalacrocorax carbo*, as their respective distributions only overlap slightly and the fish stocks are not yet depleted enough to be limiting; however, it is possible that if Cormorants continue to penetrate further into the middle reaches (a tendency which has already been observed) there will be some competition (Surmach and Zaykin 1994). In the Iman river basin there is apparently no competition for nest holes with other birds, as these are still available in abundance in the valley forests (Surmach and Zaykin 1994). The introduced mink *Mustela vison* causes a “low level” of mortality to this species, but it is difficult to quantify the losses (Hughes and Bocharnikov 1992). Several predators may take the young of Scaly-sided Mergansers (Bocharnikov and Shibnev 1994). There is a report of an adult of this species being attacked (unsuccessfully) by a Goshawk *Accipiter gentilis*, and unusually high numbers of migrating Scaly-sided Merganser in the Iman river basin in 1990 occurred at the same time as an unusual influx of birds of prey (Surmach and Zaykin 1994).

MEASURES TAKEN Legislation Scaly-sided Merganser is a Nationally Protected Species (First Class) in China, a protected species (category 1) in North Korea and a protected species in South Korea, and it is listed as threatened in Russia (Kolosov 1983). In the Iman river basin, hunting is banned on the main channel, and the level of poaching is low when this species flies down these channels during the autumn migration because of the presence of representatives of nature conservation organisations, who arrive for the beginning of the musk-rat hunting season (Surmach and Zaykin 1994).

Habitat protection Russia Large-scale logging took place in the Russian breeding range of this species in the 1960s and 1970s, but deforestation in river valleys was then forbidden (Bocharnikov 1990; but see Threats above). Plans to log the Bikin river basin were stopped by order of the Russian Supreme Court in 1992, following an appeal by local environmentalists on the grounds that there was no environmental impact assessment and no consultation at the local level (Survival International in Callaghan and Green 1993). Despite the widespread commercial logging that has been carried out in the Iman river basin, the forests in the middle and upper reaches of the river remain in good condition; selective logging was carried out 60 years ago, but there is now a 5 km wide belt of forest along the banks of the river where commercial felling is prohibited (Surmach and Zaykin 1994). **China** At Dailing in Heilongjiang, a forestry bureau guide reported that cutting trees along the river is no longer allowed (King and Jin Longrong 1992–1993). **North Korea** At Mayang Chosuji reservoir in North Korea, fishing and the felling of trees around the reservoir are banned by the government (MKN and KUT 1987).

Protected areas Russia All of the nature reserves in its Russian breeding range are in southern Ussuriland, and they only protect small, isolated blocks of virgin forest (Mikhailov and Shibnev 1998). The only relatively large protected area in the region is the Sikhote-Alin’ State Biosphere Reserve (Mikhailov and Shibnev 1998), which is an important stronghold of the Scaly-sided Merganser in the central Sikhote-Alin’ mountains (Yelsukov 1994). The species is also protected in the Bureinsky, Botchinskiy and Lazovski State Reserves, and Verkhnehorski and Verkhnekurski wildlife refuges (S. G. Surmach *in litt.* 1997, B. A. Voronov *in litt.* 1997; see Distribution). There are no reserves further north in Ussuriland, where the largest areas of virgin forest remain (Mikhailov and Shibnev 1998), notably the most important breeding grounds of the Scaly-sided Merganser in the Bikin and Iman river basins. **China**

Only a small number of reserves used to afford this species any protection (Hughes and Hunter 1994), but several important new protected areas have recently been established. The populations on the Tuodaobai and Man Jiang rivers are protected inside the Changbai Shan Nature Reserve, and the decline on these rivers has not been so severe as elsewhere (Zhao Zhengjie *et al.* 1994a). Yongcui He Nature Reserve (near Dailing in Heilongjiang) was established in 1997 especially for this species (Liu Bowen *in litt.* 1998), and an important breeding population is protected in Jingpo Hu Nature Reserve in Heilongjiang (see Liu Donglai *et al.* 1986). In Heilongjiang, it is also recorded from the Hong He and Xing Long Nature Reserves (Zhao Zhengjie *et al.* 1994a) and Bishui Chinese Merganser Nature Reserve (see Distribution). It has been found in several reserves on its wintering grounds, including Xianrendong National Nature Reserve in Liaoning, Cao Hai Nature Reserve in Guizhou, Yellow River Delta, Rongcheng, Changdao and Qingdao Bird Nature Reserves in Shandong, and East Dongting Lake Nature Reserve in Hunan (see Liu Donglai *et al.* 1986 and Distribution). The area near Poyang Hu lake in Jiangxi where a large wintering population was found in 1999 is reported to be sparsely populated and unpolluted, and to have been established as a nature reserve (*Oriental Bird Club Bull.* 32 [2000]: 31).

Research *Russia* In Russia, the biology and distribution of this species in the Bikin river basin were studied by Shibnev (1985), and further intensive population surveys and studies of its breeding ecology were conducted there in the mid-1980s and 1990s (Hughes and Bocharnikov 1992, Bocharnikov and Shibnev 1994, Mikhailov and Shibnev 1998). A systematic study of the bird populations in the Iman river basin was conducted in 1989–1991, as part of a combined ecological study related to the proposed construction of a hydro-electric complex in the middle reaches of the river, and the Scaly-sided Merganser was one of the priority subjects of the research (Surmach and Zaykin 1994). *China* Its ecology was studied from 1976–1978 and 1985–1991 on the Tuodaobai He river and elsewhere in the Changbai Shan Nature Reserve and from 1994–1995 on the Yongcui river in the Xiao Hinggan Ling (Lesser Xingan mountains) in Heilongjiang (Zhao Zhengjie *et al.* undated, 1994b, Zhao Zhengjie *et al.* 1995, Zhao Zhengjie and Pao Zhengjie 1998). *North Korea* Research has been conducted on this species on inland waters, especially in Paektu-san and also in the Ryanggan-do, Hamgyongpuk-to and Chagang-do areas (MKN and KUT 1987).

MEASURES PROPOSED *Habitat protection* In the breeding range, the preservation of forest along riverbanks is essential for the conservation of this species (V. A. Dugintsov *in litt.* 1997). *Russia* In Russia it has been suggested that nesting places could be located and given special protection (V. A. Dugintsov *in litt.* 1997), and that the nesting success of this species could be improved by providing nest-boxes (Bocharnikov 1990). The provision of nest-boxes is likely to be particularly appropriate in secondary forests where many of the older trees have been removed and the availability of tree holes is likely to be a limiting factor on breeding success. S. G. Surmach *in litt.* (1998) proposed that the planned construction of a hydro-electric dam in the middle reaches of the Iman river should be reconsidered. *China* In the Chinese breeding areas, Zhao Zhengjie *et al.* (1993) proposed that mature forest within 30–50 m of the riverbanks should be protected. At Xiaobei Hu lake in Heilongjiang, logging should be banned in the watershed of the lake or within 500 m of the lakeshore, and the development of resorts should be stopped or suspended (Li Wenfa 1999).

Protected areas Although this species occurs in several nature reserves (see Measures Taken), a high proportion of the population breeds outside protected areas, and new reserves have been proposed in several parts of its range. *Russia* The largest known breeding population in the Bikin river basin is currently unprotected, and the creation of a reserve there is a high priority (Bocharnikov 1990, Glushchenko *et al.* 1996), to protect one of the largest areas of virgin forest that remains in this part of Russia (Mikhailov and Shibnev 1998). Bocharnikov and Shibnev (1994) proposed that a national park should be established there, both to preserve

the natural fauna and flora, and to recognise the interests of concerned parties through the establishment of a protected zone, an area for scientific and commercial tourism and zones for sport, commercial hunting and fishing—given the large-scale disturbance to this species caused by motorboats, some reserve areas must be established where entry is prohibited during the breeding season; they suggested that existing and proposed plans for commercial projects and logging should be examined by an independent scientific body of experts, in order to assess, among other things, the possible consequences for Scaly-sided Merganser. If a new reserve is to be established in the Bikin river basin, it is important to reconcile the needs of the indigenous Udege and Nanai people, who live by hunting, trapping and fishing, with the formal and often strict conservation rules that would normally apply in a reserve (Mikhailov and Shibnev 1998). If the planned construction of a hydro-electric dam in the middle reaches of the Iman river were to proceed, Surmach and Zaykin (1994) suggested that the only way to reduce the impact on the population of this species would be to establish the entire Armu basin as a strict nature reserve, as this largely undeveloped region supports about one-third of the Iman river basin breeding population. Yelsukov (1994) stated that, although the Sikhote-Alin' State Biosphere Reserve remains a major stronghold for the species in the central Sikhote-Alin' mountains, ongoing threats to the areas surrounding the reserve must be addressed if the current population of this species is to be maintained. A recent proposal is that the entire central Sikhote-Alin' range should be included in the World Heritage List, in recognition of its international importance for conserving biodiversity (Bocharnikov 1996 in Mikhailov and Shibnev 1998). *China* Zhao Zhengjie *et al.* (1993) suggested that more protected areas need to be established to protect its breeding habitat. New nature reserves have been proposed to protect the important breeding population at Xiaobei Hu lake (Li Wenfa 1999) and the recently discovered wintering population at Lashihai lake in Yunnan (Li Yun 1998).

Research Several major surveys and ecological studies of this species have been completed (see Measures Taken), but further work is required. *Russia* Bocharnikov and Shibnev (1994) suggested that more extensive synchronised surveys and more information on bird movements are required in order to obtain more accurate information on the size of the population in the Bikin river basin; they proposed the establishment of an international centre there for research into rare animal species, with the main objective of developing research projects designed to formulate appropriate conservation objectives for each threatened species (including Scaly-sided Merganser and Blakiston's Fish-owl *Ketupa blakistoni*). *China* Further research is required on its breeding distribution and ecology in order to develop more effective conservation measures (Zhao Zhengjie *et al.* 1993), and the identification and protection of the most important wintering areas is an immediate conservation priority (Hughes and Hunter 1994). *North Korea* Regular surveys are required at wetlands in the north to clarify its distribution and population (Rim Chu-yon *in litt.* 1997), and hence any conservation measures that are required. *Vietnam* A winter survey of waterbodies in northern Vietnam is required to clarify the true status of this species in the country (Eames and Tordoff *in prep.*).

Education *Russia* The conservation status of this species in Russia depends greatly on how the hunting laws are kept; education programmes designed to raise public awareness of the unique value of this species in the Sikhote-Alin' ecosystem are required to help reduce the levels of illegal hunting (Bocharnikov 1990). A total ban on hunting of this species combined with an education programme is essential to counter the recent increase in the numbers shot in the Bikin river basin, but there are currently no means by which this could be implemented; an education programme would have a realistic chance of success there, given that this species is shot for sport rather than for food (Bocharnikov and Shibnev 1994). Education programmes could also encourage fishermen to take measures to reduce the incidence of drowning in fishing nets and the level of disturbance by boats. *China* Public education is required to help promote the conservation of this species at Xiaobei Hu lake in Heilongjiang (Li Wenfa 1999).

REMARKS (1) Buturlin (1934) considered that the description of two mergansers collected in the south-western foothills of the Ural mountains, between the rivers Sakmara and Eek (c.51°45'N 57°0'E), in autumn 1852 included “nothing which would show that these two birds were not two young stragglers of *M. squamatus*”. However, there have been no subsequent reports of this species from western or central Russia. (2) There has been some confusion between this species and Common Merganser *Mergus merganser* in the past, and sight (and even specimen) records, especially of female and immature birds, should be regarded with some caution. For example, a report of a newly discovered wintering site for Scaly-sided Merganser at Feidong in Anhui by Zhao Zhengjie (1993) was based on a misidentified Common Merganser (Wang Qishan *in litt.* 1999), and a female specimen in BMNH from Qianyang (Chien-yang) in Hunan resembles a Common Merganser and may have been misidentified (C. R. Robson verbally 1994). The records of Scaly-sided Merganser published by Roslyakov (1981b) should be regarded with some caution, as other fieldworkers have not found it subsequently during surveys in the same areas (AVA). (3) It is not certain that “logging” is the appropriate word: in tropical forests this implies selection of particular trees, leaving many trees standing, but in the temperate forests of the Russian Far East, where tree species diversity is much lower, the practice seems to be closer to clear-felling.