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## The World's Waterfowl in the 21st Century: A 2010 Supplement to *Ducks, Geese, and Swans of the World*

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# The World's Waterfowl in the 21<sup>st</sup> Century:

A 2010 Supplement to *Ducks, Geese, and Swans of the World*

Paul A. Johnsgard

## Pages xvii-xxiii: Introduction to the Family Anatidae

Since the 1978 publication of my *Ducks, Geese and Swans of the World* hundreds if not thousands of publications on the Anatidae have appeared, making a comprehensive literature supplement and text updating impossible. Janet Kear's (2005) survey of the waterfowl family Anatidae and closely related screamers of the family Anhimidae included more than 3,700 references, of which a significant proportion appeared later than 1978. My revision of the Anseriformes (families Anatidae and Anhimidae) for the 2<sup>nd</sup> edition of J. C. Peters' *Check-List of the Birds of the World* (Johnsgard, 1979) closely followed the classification structure and taxonomic sequence that had been used in this book, except for the absence of a tribe category, which was excluded in order to conform with the categories that had traditionally been used in earlier volumes of the *Check-List*. In addition to incorporating some more

recent taxonomic changes, I have revised several of the range maps to conform with more current information. For these updates I have relied largely on Kear (2005).

Other important waterfowl books published since 1978 and covering the entire waterfowl family include an identification guide to the waterfowl, illustrated by color paintings of all species (Madge & Burn, 1988), and two books by Frank Todd (1979, 1996) that are especially notable for their excellent color photographic illustrations.

In addition to these world surveys, several smaller taxonomic groups of waterfowl have been monographed. They include the whistling ducks (Bolen & Rylander, 1983), mute swan (Birkhead & Perrins, 1986), whooper swan (Brazil, 2003), snow goose (Batt, 1996; Cooke, Rockwell & Lane, 1995), Canada goose (Hanson, 1997), Hawaiian goose (Kear & Berger, 1980), upland goose (Summers & McAdam, 1993), common shelduck (Patterson 1982), muscovy duck (Donkin, 1989), wood

**Table 1.** Comparative Anatidae Classifications of Johnsgard and Livezey, as summarized by Kear (2005).

Johnsgard (1978)	Livezey (1997)
Order Anseriformes	Order Anseriformes
Family Anatidae	Family Anhimidae (2 genera, 3 spp.)
Subfamily Anseranatinae	Family Anseranatidae (1 genus, 1 species)
Tribe Anseranatini (1 genus, 1 species)	Family Anatidae
Subfamily Anserinae	Subfamily Dendrocygninae
Tribe Dendrocygnini (1 genus, 9 spp.)	Tribe Dendrocygnini (2 genera, 9 spp.)
Tribe Anserini (4 genera, 21 spp.)	Tribe Thalassornini (1 genus, 1 species)
Tribe Cereopsini (1 genus, 1 species)	Subfamily Anserinae
Tribe Stictonettini (1 genus, 1 species)	Tribe Cereopsini (1 genus, 1 species)
Subfamily Anatinae	Tribe Anserini (3 genera, 16 spp.)
Tribe Tadornini (5 genera, 15 spp.)	Tribe Cygnini (3 genera, 8 spp.)
Tribe Tachyerini (1 genus 3 spp.)	Subfamily Stictonettinae (1 genus, 1 species)
Tribe Cairinini (9 genera, 13 spp.)	Subfamily Tadorninae
Tribe Merganettini (1 genus, 1 species)	Tribe Plectropterini (2 genera, 3 spp.)
Tribe Anatini (4 genera, 39 spp.)	Tribe Tadornini (6 genera, 15 spp.)
Tribe Aythyini (3 genera, 16 spp.)	Tribe Merganettini (3 genera, 6 spp.)
Tribe Mergini (8 genera, 20 spp.)	Subfamily Anatinae
Tribe Oxyurini (3 genera, 8 spp.)	Tribe Malacochynchini (2 genera, 2 spp.)
	Tribe Anatini (11 genera, 60 spp.)
	Tribe Aythyini (4 genera, 17 spp.)
	Tribe Mergini (10 genera, 22 spp.)
	Tribe Oxyurini (4 genera, 9 spp.)

duck & mandarin duck (Lever, 1989, Shurtleff & Savage, 1996), and stiff-tailed ducks (Johnsgard & Carbonell, 1996).

Also since 1978, many taxonomic studies have been performed (see literature listing that follows this supplement), but the most ambitious of these were the molecular/morphological studies of B. C. Livezey. Because Kear's 2005 monograph generally followed Livezey's (1997) proposed taxonomy, a comparative overview of the two is shown in Table 1.

It may be seen that the two taxonomies are very similar, at least as to their broad sequential organization. I recognized a total of one family, three subfamilies, 13 tribes, 45 genera and 151 species, while Livezey accepted three families, five subfamilies, 13 tribes, 55 genera and 173 species of Recent Anatidae. Kear generally followed Livezey's taxonomy, but recognized 52 genera and 165 Recent anatid species.

In addition to reviewing some new information on the biologies of the world's extant wa-

terfowl, an updated assessment of the status of rare and threatened waterfowl is provided here. Excluding the crested shelduck and pink-headed duck (both now very probably extinct), according to the International Union for the Conservation of Nature & Natural Resources (IUCN, 2006) there are four critically endangered species, nine endangered species, and 12 vulnerable species of waterfowl, as summarized below:

### **Critically Endangered, Endangered, and Vulnerable Species and Subspecies of Anatidae**

(adapted from *TWSG News* 15:3–5. 2006, and listed in this book's taxonomic sequence).

### **Species**

*Critically endangered species:* Campbell Island teal (considered a Campbell Island race of brown teal *A. chlorotis* in this book), Lay-

san duck (considered a Laysan Island race of northern mallard *A. platyrhynchos* in this book), Madagascar pochard, Brazilian merganser. (Also listed are the now almost certainly extinct crested shelduck and the similarly vanished pink-headed duck).

*Endangered species:* swan goose, white-winged duck, blue duck, Hawaiian duck (considered a race of northern mallard *A. platyrhynchos* in this book), Madagascar teal, brown teal, Meller's duck, scaly-sided (Chinese) merganser, white-headed duck

*Vulnerable species:* West Indian whistling duck, lesser white-fronted goose, Hawaiian goose, red-breasted goose, Salvadori's duck, Baikal teal, Auckland Island teal (considered an Auckland Island race of brown teal *A. chlorotis* in this book), Philippine duck, Eaton's pintail (considered a Kerguelen Island race of northern pintail *A. acuta* in this book), marbled teal, Baer's pochard (called Siberian white-eye in this book), Steller's eider

### Subspecies

*Critically endangered subspecies:* Borrero's cinnamon teal

*Endangered subspecies:* Madagascar white-backed duck, Andaman gray teal, New Zealand gray duck, Galápagos white-cheeked pintail, Crozet Islands northern pintail, tropical cinnamon teal, Colombian ruddy duck

*Vulnerable subspecies:* Recherche Islands Cape Barren goose (undescribed in 1978, and thus was not included in this book), Midden-dorf's bean goose, thick-billed bean goose, tule greater white-fronted goose, dusky Canada goose, Australian cotton pygmy goose, Peruvian torrent duck, Colombian torrent duck, Merida speckled teal

### Species Accounts (pp. 2–385)

In the following updating of species information, emphasis is placed on those species

and populations for which significant conservation, taxonomic, or behavioral information has appeared since 1978. No attempt has been made to update all aspects of these species' biology and status. The 2005 monograph by Kear comprehensively summarized published Anseriformes literature through 2004, and *The Birds of North America* monograph series documenting all North American species breeding north of Mexico and published between 1993 and 2003 has comprehensive literature surveys. Alternative English names shown in parentheses below are those used by Kear (2005) or other recent authorities. The conservation categories of "endangered", "critically endangered" and "vulnerable" refer to their IUCN classification status; individual countries, states and conservation organizations may use different terminology or classification criteria. Endangered and vulnerable species are also listed and internationally protected by CITES (the Convention on International Trade in Endangered Species), as well as by individual countries or other geo-political entities.

### Pp. 2–4: Subfamily Anseranatinae; Tribe Anseranatini (Magpie Goose)

Most authorities now recognize that the magpie goose is the most generalized surviving species of the Anatidae, and that the family Anatidae exhibits a close phyletic relationship with the South American screamers (Anhimidae). The Anseriformes in turn are part of an ancient Cenozoic lineage that is most related to the gallinaceous birds, as I first suggested in 1960 on the basis of hybridization data, and as Sibley & Monroe (1990) later documented. Livizey (1997) has supported this position, as have Dzerzhinsky (1995), Mayr & Clark (2003), and others.

**Magpie Goose.** This enigmatic species is now well studied, and continues to survive fairly well in northern Australia and southern New Guinea. Field studies (Marchant & Higgins, 1990; Whitehead, 1999) have confirmed my ob-

servations on captive birds that more than one female contributes to the clutch, and that both sexes incubate. Additionally, copulation occurs on the nest, which is unique in the Anatidae. Parents feed their young bill-to-bill. Such parental feeding has otherwise been observed among other Anatidae only in the musk duck, but also occurs in the related South American screamers of the family Anhimidae (Kear, 2005).

#### **Pp. 5–100: Subfamily Anserinae**

Most taxonomic workers now recognize the geese and swans as closely related, and some have also included the whistling ducks within this subfamily, following the precedent of Delacour and Mayr (1945). In contrast, Sibley and Monroe (1990) separated the geese from the swans as two subfamilies, whereas Livizey (1977) included three tribes (Cereopsini, Anserini, and Cygnini) within his subfamily Anserinae. Although I (1978) placed the Australian genus *Stictonetta* as a monotypically distinct tribe within the subfamily Anserinae, Livizey (1977) erected a monotypic subfamily for the freckled duck.

#### **Pp. 5–26: Tribe Dendrocygnini (Whistling or Tree Ducks)**

The typical whistling ducks have long been recognized as a closely-knit genus of waterfowl, and their affinities with the true geese and swans rather than with typical ducks were first recognized by Delacour and Mayr (1945). Sibley and Monroe (1990) erected a separate family Dendrocygnidae (containing the whistling ducks *Dendrocygna* and the white-backed duck *Thalassornis*) between the Anseranatidae (magpie goose) and the remaining typical Anatidae, emphasizing their isolated position, while Livizey (1977) gave the whistling ducks a subfamilial status, with *Dendrocygna* comprising one tribe, and *Thalassornis* a second.

**Spotted Whistling Duck.** This East Indian species still remains very poorly studied. Its world population might number about 10,000 to 25,000 birds (Kear, 2005).

**Plumed Whistling Duck.** The breeding biology of this Australian species has been summarized by Marchant & Higgins (1990). Its world population might number from about 100,000 to in excess of one million birds (Kear, 2005). The inked areas on the range map indicate regions of densest populations.

**Fulvous Whistling Duck.** The North American population of this extremely widely distributed species was monographed in *The Birds of North America* (Hohman & Lee, 2001, No. 562). The estimated world population is of about one million each in the Western Hemisphere and Africa, and about 20,000 in southern Asia (Kear, 2005).

**Wandering Whistling Duck.** The breeding biology of this East Indian and Australian species has been summarized by Marchant & Higgins (1990). The inked areas on the range map indicate regions of densest Australian populations. It may have a global population in the range of 100,000–1,000,000 birds (Kear, 2005).

**Lesser Whistling Duck.** This poorly studied Indian and southeast Asian species may have a global population in the range of 100,000–1,000,000 million birds (Kear, 2005).

**White-faced Whistling Duck.** The breeding biology of this South American and African species has been summarized by Brown *et al.* (1982). Its world population might number at least one million in South America, 1–2 million in Africa, and 20,000–50,000 in Madagascar (Kear, 2005).

**Cuban (West Indian) Whistling Duck.** This species is considered vulnerable by the IUCN and is listed in Appendix II of CITES. Its range is the smallest of any whistling duck, and its declining population may be somewhat in excess of 10,000 birds, with some locally extirpated island populations (Kear, 2005). Popula-



tions are known to still exist on the Bahamas, Turks & Caicos, Cuba, Cayman, Jamaica, Dominican Republic, Puerto Rico, and Antigua islands.

**Black-bellied Whistling Duck.** The North American population of this Western Hemisphere species was monographed in *The Birds of North America* (James & Thompson, 2001, No. 578). The world population may be about 100,000 to one million birds in the northern race's population, and over one million for the southern race (Kear, 2005).

**White-backed Duck.** Following my recognition (1967) of its dendrocygnine affinities, most recent studies have confirmed this previously unsuspected relationship of the African white-backed duck, which had until then been considered an aberrant stiff-tail. The Madagascar race of this species is considered endangered. Woolaver and Nichols (2006) conducted a nesting survey of the Madagascar race in 2001 at Lake Antsamaka in western Madagascar. They found a total of 37, indicating the significance of this single site for the conservation of this insular subspecies. Young, *et al.* (2006) suggested that an earlier population estimate of 2,500–5,000 total birds in Madagascar (Delany & Scott, 2002) may be too optimistic. Its African population may be in the range of 10,000 to 25,000 birds (Kear, 2005).

#### **Pp. 28–89: Tribe Anserini (Swans and True Geese)**

Except for Sibley and Monroe's (1990) separation of the geese and swans into two subfamilies, taxonomists have generally associated these two as closely related. Sibley and Monroe (1990) collectively grouped the true geese, Cape Barren goose, sheldgeese, shelducks and perching ducks within their subfamily Anatinae. Livizey (1977) recognized the geese and swans as constituting separate tribes, and also placed the Cape Barren goose on the anserine

side of the anserine–anatine divide, as did I (1965).

**Mute Swan.** The North American population of this Eurasian swan was monographed in *The Birds of North America* (Ciaranca, Allin, & Jones, 1997, No. 273). Since 1978 the North American range of this introduced swan has increased substantially, causing foraging competition with native waterfowl species and other ecological damage. By 2000 there were 15,000–20,000 mute swans in North America, centered on Chesapeake Bay and the Great Lakes, and smaller introduced populations are present in Australia and New Zealand. The Eurasian population probably numbers more than 565,000 (Kear, 2005).

**Black Swan.** The global population estimates of this Australian swan includes widely varying estimates of 13,800–156,000 birds in eastern Australia (no estimates available for western Australia), and 35,000–60,000 in New Zealand. Small numbers also occur on Chatham Island (Kear, 2005). Regions of denser Australian and New Zealand populations have been inked on the distribution map.

**Black-necked Swan.** The total population of this South American swan is probably in excess of 100,000 birds, about half of which are in Argentina. The isolated Falkland Islands population consists of about 750–1,500 birds (Kear, 2005).

**Trumpeter Swan.** This North American species was monographed in *The Birds of North America* (Mitchell, 1994, No. 105). Once considered nationally endangered by the U.S. Fish & Wildlife Service, this great swan was never in any real danger, owing to then-undocumented populations in western Canada and southern Alaska (Mitchell, 1994; Kear, 2005). Recent total population estimates of this group exceed 20,000 birds, many of which occur in central and southern Alaska (see revised map, with inked areas showing major populations). The Rocky Mountain population (3,700 birds in

2000) extends in Canada from Yukon Territory southeast to central Alberta. The southernmost part of that population in the U.S. has been declining, with under 400 birds in the Greater Yellowstone region. There is also a Pacific Coast population (about 25,000 wintering birds, mostly in Washington State), and an introduced Interior population of at least 3,000 birds in the northern Great Plains and Great Lakes States. This last group is centered in scattered restoration sites from South Dakota to Ontario, with large populations in Minnesota and Michigan. Breeding now occurs in at least Minnesota, Iowa, Wisconsin, Ohio, Michigan and Ontario. Restoration efforts are being made in Arkansas. The species is protected across its range, except for allowance for mistaken kills in states where tundra swans also could be legally killed (Montana, Utah and Nevada).

**Whooper Swan.** The autumn Icelandic population of this Eurasian swan numbered about 14,000 birds in the 1980's, while the northwestern European population was nearly 60,000 in the 1990's. Additionally, perhaps 20,000 wintered in western Asia during the 1990's, and about 30,000–60,000 might winter in China, Japan and Korea (Kear, 2005). The species is incompletely protected across its range.

**Whistling Swan (Tundra Swan).** The North American population of this Holarctic species was monographed in *The Birds of North America* (Limpert & Earnst, 1994, No. 89). Its breeding behavior has been studied by Hawkins (1986). The whistling swan is now generally considered to be conspecific with the Eurasian Bewick's swan, *C. c. bewickii*, the two having been merged taxonomically and given the collective name tundra swan by the American and British Ornithologists' Unions during the early 1980's. By the late 1980's the population estimates were of about 87,000 birds for the western U.S. population (legally hunted since 1962) and about 64,000 for the eastern one (hunted since 1984) (Kear, 2005). By 2009 the eastern and western U.S. populations were each es-

timated at about 100,000 birds (U.S.F.W.S., 2009). The annual kill of the western swan population includes subsistence hunting in Alaska that might account for about 10,000 swans and eggs annually, plus controlled legal hunting in Alaska, Montana, Utah and Nevada that may account for an additional 1,200–1,500 annually. In the Atlantic flyway Virginia and North Carolina allow limited hunting on a permit-only system.

**Bewick's Swan (Tundra Swan).** Since 1983 the Eurasian Bewick's swan has generally been considered to be conspecific with the North American whistling swan, *C. c. columbianus*, the two now collectively known as the tundra swan. Wintering numbers in western Europe have ranged from about 16,000 birds in the 1980's to 29,000 in the mid-1990's. An estimated 86,000 winter in eastern Asia (Kear, 2005).

**Coscoroba Swan.** Although no overall estimates of populations of this South American swan are available, it is listed as endangered in Chile, and probably is in danger of extinction in Brazil (Kear, 2005). Its global population may be in excess of 25,000 birds (Wetlands International, 2002)

**Swan Goose.** This Eurasian species is considered endangered by the IUCN. Its current breeding range is now considerably smaller than I had mapped it (see revised map, with inked areas showing approximate currently known breeding range). The center of its breeding range is now the border area between Russia, Mongolia and China. Its world population may be about 50,000–60,000 birds (Delany & Scott, 2002; Kear, 2005).

**Bean Goose.** The Middendorf's (*middendorffii*) and thick-billed (*serrirostris*) Asian races of this Eurasian species are considered vulnerable. The population of *serrirostris* has been estimated at 50,000–70,000 birds, and that of *middendorffii* at 45,000–65,000. Other population estimates include 100,000 for *fabalis*, and 600,000 for *rossicus* (Kear, 2005). The pink-

footed goose, *A. brachyrhynchos*, of Greenland, Iceland and Svalbard was considered a race of the bean goose in 1978.

**Pink-footed Goose.** This North Atlantic near-relative of the bean goose has a small Greenland breeding population of about 5,000 pairs, an Icelandic population of 40,000–50,000 pairs, and had a gradually increasing Svalbard (Spitzbergen) population of up to 38,500 by the late 1990's (Kear, 2005).

**(Greater) White-fronted Goose.** The North American population this Holarctic goose was monographed in *The Birds of North America* (Elly & Dzubin, 1994, No. 131). The tule race *elgasi* of this widespread species is considered vulnerable; its breeding region has recently been found to be centered near Cook Inlet, Alaska. The North American 2009 Pacific flyway winter population was estimated at about 537,000 birds, or 14 percent under the 2000 estimate, and the mid-continent fall population was about 752,000, or well below the 2000 estimate (U.S.F.W.S., 2009). The tule race *elgasi* of this widespread species is relatively vulnerable; its previously unknown breeding grounds were recently determined to be near Cook Inlet, Alaska. The average U.S. hunter kill of white-fronts nationally during the five years 2004–8 has been about 277,000 birds, and has exhibited a progressively increasing trend-line, contrary to its apparently downward overall population trends. Estimated total annual Canadian kills from 1990–1998 ranged from about 29,000–79,000. The population of the west Greenland race *flavirostris* has dropped rapidly during the past ten years, and by 2009 may have declined to less than 30,000. Fox and Stroud (1988) have described this race's breeding biology.

**Lesser White-fronted Goose.** This Eurasian goose is considered vulnerable by the IUCN. It has a fragmented and declining population associated with high hunting pressures during migration and on its wintering grounds. Its current known breeding range is now con-

siderably smaller than I had mapped it (see revised range map, with inked areas showing approximate major known breeding regions). Most breeding now occurs in three areas of Russia; the White Sea to Ural/Yamal, the southern Tamy, and northeastern Siberia. The world population may be less than 50,000 birds (Kear, 2005).

**Greylag Goose.** The northwestern European population of this Eurasian goose was of about 200,000 birds in 1995. There is also a central European/North African population of about 28,000, a Black Sea population of about at least 54,000, a southwestern Asian population of 106,000–183,000, and additional southern and eastern Asian populations of perhaps 50,000–100,000 birds (Kear, 2005).

**Bar-headed Goose.** The current, although still poorly known, breeding and wintering ranges of this alpine-breeding and possibly threatened Asian goose are considerably smaller and more fragmented than I originally mapped them; see the revised range map of the presumptive breeding regions, which are shown by inked areas. Its world population may be in the range of 32,000–36,000 birds (Kear, 2005).

**Snow Goose.** This tundra-nesting goose of arctic North America (and also breeding on Wrangel Island, Siberia) was monographed in *The Birds of North America* (Mowbray, Cooke, & Ganter, 2000, No. 514). Winter or spring 2009 population estimates include about 1.4 million greater snow geese and nearly four million lesser snow geese (U.S.F.W.S., 2009). In spite of greatly relaxed hunting regulations, all the populations of this species are still increasing, and wintering areas have expanded to include much of the southern Great Plains. The estimated average national kill of snow geese during 2004–8 was 565,000, of which about 27 percent were blue-morph phenotypes. Estimated total annual Canadian kills from 1990–1998 ranged from about 38,000–106,000 for white morph lessers, and 33,000–66,000 for blue-morph lessers. The annual Canadian



kills for greater snow geese during that period ranged from 29,000–102,000. This total kill represents only about ten percent of the estimated national population of snow geese, which has proven too little to control population growth, in spite of a decade of federal efforts to control the population by promoting almost unlimited sport hunting.

**Ross's Goose.** This small North American near-relative of the snow goose was monographed in *The Birds of North America* (Ryder & Alisauskas, 1995, No. 162). Partly because of the difficulties in field separation from snow geese, no attempts are made to inventory all Ross's geese, but one of the largest nesting colonies (Karrak Lake in Canada's Queen Maud Gulf) had 726,000 birds in 2008, comprising a substantial portion of this gradually increasing population (U.S.F.W.S., 2009). A few blue-morph individuals have been documented, which are believed to result from hybridization with blue-morph snow geese. Wintering now extends over much of the same parts of the southern Great Plains that are used by snow geese. Ross' goose kills in the U.S. have also increased greatly in recent years, with a mean of 78,000 during the five years 2004–8, and an estimated maximum of 106,000 in 2001. Estimated total annual Canadian kills from 1990–1998 ranged from about 2,000–29,000.

**Emperor Goose.** This northeastern Siberian and Alaskan goose was monographed in *The Birds of North America* (Petersen, Schmutz, & Rockwell, 1994, No. 97), and its status on the Alaska Peninsula was documented by Petersen & Gill (1982). In 2009 the estimated North American population was 91,200 birds, or 42 percent higher than the 2000 estimate (U.S.F.W.S., 2009). Some subsistence hunting occurs in Alaska, with about 2,000–3,000 birds taken annually on the Yukon–Kuskokwim Delta. Eisenhauer and Kirkpatrick (1977) have described the species' behavior and ecology.

**Hawaiian Goose (Nene).** This endemic Hawaiian goose was monographed in *The Birds*

*of North America* (Banko, Black, & Banko, 1999, No. 434). It is now considered vulnerable, having been saved from likely extinction by captive breeding. After extensive captive breeding and re-introduction efforts, the Hawaiian population in 1997 was nearly 900 birds, on Hawaii, Maui and Kauai, with most on them centered at Hawaii Volcanoes National Park. The wild populations have not yet become self-sustaining, except perhaps on Kauai (Rave *et al.*, 2004; Kear, 2005).

**Canada Goose.** This iconic North American goose was monographed in *The Birds of North America* (Mowbray *et al.*, 2003, No. 682). The dusky race (*occidentalis*) of this species is considered vulnerable by the IUCN, and its spring 2009 population was estimated at 6,700. The other large forms of Canada goose have been generally increasing in population size, especially the giant race *maxima*, which by 2009 was estimated at 1.9 million birds. The average annual hunter kill in the U.S. during the five years 2004–8 has totaled about 2.65 million birds, and kills have been progressively increasing since the 1960's. Estimated total annual Canadian kills from 1990–1998 for large Canada geese ranged from about 183,000–274,000. All told, there may have been more than five million Canada geese in North America in 2009 (U.S.F.W.S., 2009), as well as some smaller introduced populations in Europe (Britain, France, Netherlands, Belgium, Germany, Denmark, Norway, Sweden, Finland, Russia and Ukraine) and New Zealand. Some large-bodied Canada geese from northern Quebec have recently colonized western Greenland, where a few cackling geese have long nested. Dickson (2000) provided a summary of the Canadian breeding populations of Canada and cackling geese and their distributions.

In 2004 the small tundra-breeding forms *hutchinsii*, *taverneri*, *leucopareia* and *minima* were designated by the American Ornithologists' Union as specifically distinct from the larger races (*canadensis*, *interior*, *maxima*, *moffitti*, *parvipes*, *occidentalis*, and *fulva*), and now

bear the collective English name cackling goose (*B. hutchinsii*). The Aleutian cackling goose, (*B. h. leucopareia*), listed as nationally endangered in 1967, has been delisted, and by 2009 its population had reached about 80,000 birds. The 2009 estimates for the other cackling goose races included 160,000 for nominate *minima*, about 220,000 for the Richardson's or Baffin Island cackling goose *hutchinsii*, and about 60,000 for the Alaskan cackling goose *taverneri* (U.S.F.W.S., 2009). Excluding the Alaska-breeding *leucopareia*, for which recent population estimates are lacking, the 2009 cackling goose population totaled about 450,000 birds. Estimated total annual Canadian kills of all "small Canada geese" from 1990–1998 ranged from about 50,000–107,000. Hunter-kill data for cackling geese in the U.S. are not yet available, as they have not been distinguished from larger Canada geese during national surveys. Dickson (2000) provided a summary of the Canadian breeding populations of Canada and cackling geese and their distributions.

**Barnacle Goose.** This North Atlantic and Eurasian goose has four breeding populations, with recent estimates of 120,000 birds in Russia, 32,000 in Greenland, 13,700 in Svalbard, and 12,000 in Iceland (Kear, 2005). It has been reported from at least 15 states and two Canadian provinces, mainly along the Atlantic seaboard, but also inland to as far west as Texas, Nebraska and Alberta.

**Brant Goose (Brent).** The North American population of this circumpolar goose was monographed in *The Birds of North America* (Reed *et al.*, 1998, No. 337). In 2007 the Pacific Flyway winter population was estimated at 147,300 birds, and the Atlantic Flyway at 151,300 in 2009. The geographically intermediate population nesting in the Parry Islands of Canada's high arctic's Queen Elizabeth Islands group was estimated at 16,200 in 2009 (U.S.F.W.S., 2009). Current estimates of the Eurasian populations of brant are not available, but Owen (1980) and Madge & Burn (1988) provided some earlier estimates. The

average annual hunter-kill estimate in the U.S. for the Atlantic brant during the five years 2004–8 has been about 23,000, and these averages have remained relatively stable since the 1960's. Much smaller average U.S. kills of about 3,000 were estimated for Pacific flyway black brant during that period. These Pacific Coast estimates also have been fairly stable recently, but have trended much lower than they were during the 1960's. Estimated total annual Canadian kills from 1990–1998 ranged from about 300–1,600 for Atlantic brant, and 300–1,200 for black brant.

**Red-breasted Goose.** This small Eurasian goose is considered vulnerable by the IUCN. The world population of this species may be about 88,000 birds (Wetlands International, 2002), and most breeding occurs on the Tamy, Gydan, and Yamal peninsulas. Wintering grounds are now much contracted, and have become limited to the west coast of the Baltic Sea, mostly in Bulgaria and Romania (Kear, 2005).

#### Pp. 91–95: Tribe Cereopsini (Cape Barren Goose)

The Cape Barren Goose is evidently a transitional form between the anatine and anserine groups of waterfowl. It was included by Delacour and Mayr (1945) with the sheldgeese and other anatines, in part because of its contrasting downy plumage pattern, its bodily proportions and its aggressive behavior. Delacour later (1954) concluded that its taxonomic placement was uncertain. Livizey (1997) placed it on the anserine side of the anserine-anatine divide, as I have also done.

**Cape Barren Goose.** This endemic Australian species was described in detail by Marchant & Higgins (1990). The Recherche Islands race *C. n. grisea* (which was documented in 1980 and thus did not appear in this book) is considered vulnerable. This isolated population occurs off

the south coast of Western Australia on the Recherche Archipelago, and may consist of no more than 250–650 birds. The species' nominate race numbers about 20,000 birds and may be increasing (Kear, 2005).

**Pp. 97–100: Tribe Stictonettini (Freckled Duck)**

Following my 1965 recognition of the freckled duck's anserine affinities, most recent studies have confirmed the somewhat tenuous relationship of the aberrant freckled duck with the anserine swans, geese and whistling ducks, rather than with the anatine ducks. Sibley and Monroe (1990) erected a monotypic subfamily for the bird, between the stifftails and swans, as did Livizey (1997), who placed it between the swans and the tadornine assemblage.

**Freckled Duck.** This endemic Australian species was described in detail by Marchant & Higgins (1990). Little was known of this taxonomically puzzling species' breeding biology and social behavior in 1975, when my book was published. The species' molting pattern seems to be different from both single annual molt of anserines and the double annual molt of anatines, with body feathers being replaced continuously throughout the year. As in some anserines, the male may build a platform nest that the female adopts. In the wild at least, as in dabbling ducks the pair-bond is seasonal, lasting until the clutch is laid; the male plays no role in brood-rearing. The only conspicuous male sexual display is the "axle-grind," which has no apparent counterparts among dabbling ducks. There are also no specific displays associated with copulation. The species is fully protected, with a total population that is evidently highly variable but possibly has ranged from 5,000–120,000 birds over a several-decade period (Fulagar *et al.*, 1990; Kear, 2005). The inked lines on the range map indicate the species approximate range limits, which vary greatly according to Australian water conditions.

**Pp. 101–361: Subfamily Anatinae**

This largest subfamily of the Anatidae contained 35 genera in Delacour and Mayr's (1945) seminal classification, as compared with 34 in this book, 37 in Sibley and Monroe's (1990) taxonomy, and 32 in Livizey's (1997) proposed classification. In various classifications the anatine genera constitute from 60 percent (Livizey) to 83 percent (Delacour and Mayr) of the entire family Anatidae, indicating the group's relatively high ecological importance and worldwide biological success. The most widely distributed of all waterfowl species (mallard, pintail, gadwall, green-winged teal, *etc.*) are among its members, as are most of the world's rarest living waterfowl.

**Pp. 101–131: Tribe Tadornini (Sheldgeese and Shelducks)**

The shelducks and sheldgeese are a fairly well-defined group that has been recognized as a tribe in most recent classifications since Delacour and Mayr's classic 1945 revision. The possible inclusion or exclusion of the steamer ducks *Tachyeres* represents one of the few taxonomic association problems. I excluded them from the shelducks and placed them in a separate tribe because of their unusual locomotory adaptations and plumage features, whereas most recent workers have considered them typical tadornines. However, Livizey (1997) also removed the steamer ducks from the typical shelducks and incorporated them into a third tribe (Merganettini) within the tadornine subfamily. This seemingly odd tribal alliance consists of three structurally and behaviorally diverse genera (*Merganetta*, *Hymenolaimus*, and *Tachyeres*). Livizey (1997) also removed the African spur-winged goose and the comb duck from the perching duck tribe and gave them tribal rank (Plectropterini) within his subfamily Tadorninae.

**Blue-winged Goose.** This African endemic was described in detail by Brown, Urban & Newman (1982). The species is highly localized, but may still be locally common. Its estimated population is 5,000–15,000 individuals (Wetlands International, 2002). The dashed line indicates the species' probable historic distribution, and the inked areas its current distribution.

**Andean Goose.** This is a little-studied Andean species, with an estimated total population of 25,000–100,000 individuals (Rose & Scott, 1997).

**Magellan (Upland) Goose.** This Andean endemic was described in detail by Summers & McAdam (1993). It is a very common sheldgoose, with a Falkland Islands population of about 200,000 birds, and a Patagonian population of 100,000–1,000,000 (Kear, 2005). Sheep farmers have long considered this species a pest, and at least in earlier times vast numbers were killed or their eggs destroyed.

**Kelp Goose.** The estimated populations of this South American species are 25,000–40,000 birds in the Falkland Islands, plus about 25,000–100,000 in mainland South America (Rose & Scott, 1997; Woods & Woods, 1997).

**Ashy-headed Goose.** The estimated world population of this South American sheldgoose is 25,000–100,000 birds, and is thought to be declining (Rose & Scott, 1997). Small numbers regularly reach the Falkland Islands, where it is known to have bred.

**Ruddy-headed Goose.** The estimated Falkland Islands population of this South American sheldgoose is 35,000–60,000 birds, and is thought to be declining. Only small numbers remain in mainland South America (Rose & Scott, 1997).

**Orinoco Goose.** The estimated world population of this South American sheldgoose is 25,000–100,000 birds, and is thought to be declining (Wetlands International, 2002).

**Egyptian Goose.** This African endemic shelduck was described in detail by Brown, Urban

& Newman (1982). Its population in eastern and southern Africa has been estimated at 200,000–500,000 birds, and the West African population may consist of 10,000–25,000 more. Introductions have resulted in a few hundred birds in Britain, a similar number in Belgium, and a few thousand in the Netherlands (Kear, 2005).

**Ruddy Shelduck.** This widespread Eurasian shelduck has two small African populations totaling a few thousand birds, and four larger and mostly migratory Asian populations. They include about 20,000 birds breeding from Greece to the Black Sea, about 35,000 breeding from Turkey to central Asia, about 50,000 occurring from central Asia to southeastern Asia, and 50,000–100,000 in eastern Asia. The European and African populations have been declining, but the Asian population is stable or increasing (Kear, 2005).

**Cape (South African) Shelduck.** This African endemic shelduck was described in detail by Brown, Urban & Newman (1982). Its population has been estimated at 50,000 birds (Wetlands International 2002). The inked area on the range map shows the region of highest population density.

**Australian Shelduck.** This endemic Australian shelduck was described in detail by Marchant & Higgins (1990). Its population has been judged to be in excess of 300,000 birds in most years (Kear, 2005). The inked areas on the range map indicate regions of densest populations.

**New Zealand (Paradise) Shelduck.** This endemic New Zealand shelduck was described in detail by Marchant & Higgins (1990). Its population has been estimated at more than 300,000 birds (Kear, 2005). The inked areas on the range map indicate regions of densest populations.

**Crested Shelduck.** No new information is available on this almost certainly extinct Asian shelduck. Kear (2005) concluded that it survived until at least into the 1850's, and reported sightings have been made as recently as 1964, on some islands south of Vladivostok.



**Northern (Common) Shelduck.** This is the most abundant of all shelducks, with large populations in northwestern Europe (300,000 birds), the Black Sea and Mediterranean (75,000), western Asia, the Caspian Sea and Middle East (80,000), central and southern Asia (25,000–100,000) and eastern Asia (100,000–150,000) (Wetlands International, 2002).

**Radjah Shelduck.** This Australasian species was described in detail by Marchant & Higgins (1990). Its population is thought to consist of 10,000–100,000 birds in New Guinea and the Moluccas, and 150,000 in northern Australia (Wetlands International, 2002). The inked areas on the range map indicate regions of densest Australian populations.

#### **Pp. 133–139: Tribe Tachyerini (Steamer Ducks)**

In my 1975 book I recognized three species of steamer ducks, following Delacour and Mayr (1945). However, a fourth species, the white-headed or Chubut steamer duck (*Tachyeres leucocephalus*), was described in 1981 from Argentina (coastal Chubut Province) by Humphrey & Thompson. In addition to my recognition of a separate tribe for the group, Johnson and Sorenson (1999) have also cast some doubt as to the inclusion of steamer ducks within the Tadornini. Yet, it seems evident that the steamer ducks are part of a general assemblage of waterfowl in which territorial behavior and associated morphologies have been evolved to maximum levels, generally resulting in strong sexual dimorphism in adult size, behavior and sometimes also plumage. As noted above, Livizey (1986; 1997) grouped *Tachyeres* with *Merganetta* and *Hymenolaimus* into a newly constituted tribe (Merganettini) within his subfamily Tadorninae, but these three genera have very few biological and behavioral characteristics in common, either with one another or with typical shelducks.

**Flying Steamer Duck.** This widespread South American steamer duck has an estimated and apparently declining population of 1,000–25,000 birds on mainland South America, and 600–1,200 on the Falkland Islands (Kear, 2005).

**Magellanic Flightless Steamer Duck.** The estimated population of this mainland South American steamer duck is 25,000–48,000 birds (Wetlands International, 2002). Contrary to my range map, it does not extend north along the coast of Argentina during winter.

**Falkland Steamer Duck.** The estimated population of this Falkland Islands species is 27,000–48,000 birds (Wetlands International, 2002). A close relative is the similarly flightless white-headed steamer duck of coastal Argentina (see inked area on Map 47), which was described after my book appeared (Humphrey & Thompson, 1981) and has an estimated population of less than 10,000 (Wetlands International, 2002).

#### **Pp. 141–169: Tribe Cairinini (Perching Ducks)**

Delacour and Mayr (1945) were the first to define this assemblage of mostly hole-nesting waterfowl. These authors believed the nearest relatives of the perching ducks to be the sea ducks, but I pointed out in 1960 that hybridization data supports the view that the perching ducks' nearest relatives are the dabbling ducks (Anatini). Since 1945 the tribe has remained largely intact, except for the addition of the ringed teal (*Callonetta*), based on my behavioral observations (1960). I also noted (1968) that some of the tribe's members, such as *Plectropterus*, *Sarkidiornis*, and *Cairina* seem to be behaviorally much more primitive than the others, and that these forms may represent ancient survivors from a kind of generalized anatine condition. Livizey (1986, 1997) removed two of these three genera, the spur-winged goose and comb duck, from this tribe, and placed them within the Tadorninae, al-

though he indicated some uncertainty over this placement.

**Spur-winged Goose.** This African endemic goose-like species was described in detail by Brown, Urban & Newman (1982). Its breeding biology has been studied by Clark (1980). Its West African population has been estimated at 200,000–300,000 birds and has been decreasing, while the southern African population has been stable at 50,000–100,000 (Kear, 2005).

**Muscovy Duck.** Donkin (1989) has provided an general account of this long-domesticated but otherwise little-studied Neotropical species, and its biology in the wild has been described by Sick (1993). Feral populations of semi-tame birds have developed in some extra-limital areas, such as in Florida. A declining world population estimate of 100,000–1,000,000 has been suggested (Wetlands International, 2002).

**White-winged Duck.** This southeastern Asian perching duck is classified as endangered by the IUCN. Green (1993) has reviewed this species' biology, and its status in Laos was documented by Evans, Robichand, & Tizard (1996). A fairly recent population estimate is 450 birds in India, Bangladesh and Myanmar. 200 elsewhere in southeastern Asia (Vietnam, Laos, Cambodia, and Thailand), and 150 in Sumatra (Wetlands International, 2002)

**Hartlaub's Duck.** This woodland-dependent African endemic perching duck was described in detail by Brown, Urban & Newman (1982). Its West African population has been estimated at less than 1,000 birds (Wetlands International, 2002), while the eastern African population may be in the range of 10,000–50,000 (Rose & Scott, 1997).

**Comb Duck** (including the South American comb duck, *S. sylvicola*). This Old World and South American perching duck was described in detail by Brown, Urban & Newman (1982). Its Old World component includes about 50,000–100,000 birds in western Africa, and 100,000–500,000 in southern Africa. There

are also populations in Madagascar (10,000–25,000), and Asia (about 6,000) (Kear, 2005). The South American population *sylvicola* is sometimes given species-level status.

**Green Pygmy Goose.** This Australian and New Guinea pygmy goose was described in detail by Marchant & Higgins (1990). The inked areas on the range map indicate regions of densest Australian populations. Its world population has not yet been estimated.

**Cotton Pygmy Goose (Cotton Teal).** This pygmy goose's world population has been estimated at up to 1,000,000 birds in eastern and southeastern Asia, 10,000–100,000 in southern Asia, 7,500 in Queensland, and under 1,000 in New Guinea (Wetlands International, 2002). The Australian race of this species is classified as vulnerable by the IUCN. An action plan for its conservation has recently been published (Garnett & Crowley, 2006).

**African Pygmy Goose.** This African endemic pygmy goose was described in detail by Brown, Urban & Newman (1982). Population estimates include 20,000–30,000 birds in West Africa, 100,000–250,000 in southwestern Africa, and 5,000–10,000 in Madagascar (Scott & Rose, 1997).

**Ringed Teal.** Following my 1960 recognition of the South American ringed teal's perching duck affinities, most recent studies have confirmed this relationship. Its world population has been estimated at 10,000–100,000 birds (Wetlands International, 2002). It may be residential over the entire mapped range, including that indicated as wintering range. Brewer (2001) has described this species' breeding behavior in captivity.

**North American Wood Duck.** This North American perching duck was monographed in *The Birds of North America* (Hepp & Bellrose, 1995, No. 169). Population estimates include 2,800,000 birds for eastern North America, 665,000 for central regions, and 66,000 for western regions (Wetlands International, 2002).

The average annual hunter kill in the U.S. during the five years 2004–8 has been about 1.11 million birds, and has exhibited a gradually increasing long-term trend-line since the 1960's. Estimated total annual Canadian kills from 1990–1998 ranged from about 100,000–138,000.

**Mandarin Duck.** Shurtleff and Savage (1996) have monographed this Asian perching duck, with an emphasis on the introduced British population of several thousand birds. The main populations (China, Korea, Taiwan) are probably declining owing to forest losses; the dashed line indicates the apparent recent major breeding range on the Asian mainland. Population estimates include 20,000 birds for China, 5,000 for Korea, and 350–500 for Taiwan (Wetlands International, 2002).

**Australian Wood Duck.** This endemic Australian perching duck was described in detail by Marchant & Higgins (1990). Its population is apparently quite variable, as is typical of Australian ducks, but in eastern Australia alone it may consist at times of anywhere from 500,000 to a million birds (Kear, 2005). The inked areas on the range map indicate regions of densest populations.

**Brazilian Teal.** Population estimates include 100,000–1,000,000 birds for the northern race and 10,000–100,000 for the southern race of this South American perching duck (Wetlands International, 2002).

#### **Pp. 171–175: Tribe Merganettini (Torrent Duck)**

The highly specialized Andean torrent duck has long posed problems for taxonomists, both as to its tribal relationships and the number of species and subspecies that should be admitted. I placed it in a monotypic tribe, genus and species within the Anatinae, but was uncertain about its nearest relationships even after extensive field observations. Sibley & Monroe (1990) placed it between *Amazonetta* and *Hymenolai-*

*mus*, within the tribe Anatini. Livizey (1997) expanded the tribe Merganettini to also include *Tachyeres* and *Hymenolaimus*, although these three genera could scarcely be more divergent from one another both structurally and behaviorally. It is clear that the torrent duck's relationships are still a puzzle.

**Torrent Duck.** The Peruvian and Colombian races of this South American river-dwelling species are classified as vulnerable. The inked areas on the range map show approximate current distributions of the three races. The population of *armata* has been roughly judged at 4,000–10,000 birds, of *leucogenis* at 9,000–13,000, and *colombiana* at 7,000–12,000. No new information has appeared on the biology of the torrent duck in nature, but Eldridge (1979, 1986) has described this species' courtship displays in captivity. They appear to be unique, including the behaviors associated with copulation, which often provide the best clues to a species' relationships.

#### **Pp. 177–270: Tribe Anatini (Dabbling Ducks)**

The taxonomic composition of this tribe has always centered on the broadly-defined genus *Anas*, with the addition of some additional genera that don't fit the overall dabbling-duck pattern. Sibley & Monroe (1990) expanded the tribe to include 89 species of "typical ducks", including most perching ducks, but excluding the tadornine shelducks and sheldgeese. Livezey (1997) recognized 60 species, and included the typical perching ducks in the tribe, except for *Plectropterus* and *Sarkidiornis*. He also removed the Australian pink-eared duck (*Malacorhynchus*) and New Guinea's Salvadori's duck (*Salvadorina*) from the Anatini and erected an unexpected tribe for them, the Malacorhynchini. I removed *Marmaronetta* and *Rhodonessa* from Delacour and Mayr's original tribe Anatini, largely on the basis of both's aythyine (pochard-like) structural features, and on the marbled teal's pochard-like copulatory behavior. Livizey



(1997) also included these two genera in the pochard tribe, but distinguished them as constituting two monotypic subtribes.

**Blue Duck.** This endemic and unique New Zealand species was described in detail by Marchant & Higgins (1990), and is classified as endangered. Its total population was estimated at 500 pairs in 2003 (Kear, 2005). It is mostly limited to the forested mountains of central North Island and western South Island (inked areas of map). It has long been considered a highly aberrant and probably ancient member of the dabbling duck group, with no apparent near relatives. Eldridge (1985) has provided an inventory of its distinctive social displays, which are highly limited and seem to function both as agonistic and pair-maintenance signals. The blue duck's relationships are still obscure, but Livezey (1997) grouped it with the steamer ducks (*Tachyeres*) and torrent duck (*Merganetta*) as the third member of an expanded tribe Merganettini within his shellduck subfamily Tadorninae.

**Salvadori's Duck.** Recent observations on territorial behavior of this little-known New Guinea species have been reported by Straus (2006). It is considered vulnerable by the IUCN, and its total population has been estimated at 2,500–10,000 individuals (Rose & Scott, 1997). It is probably still present in small numbers over much of its original range in the mountains of Papua, Indonesia and Papua, New Guinea (inked area of map). Its relationships are about as uncertain as those of the blue duck and pink-eared duck; all three have usually been placed in the tribe Anatini for lack of more certain information.

**African Black Duck.** This African endemic mallard-like duck was described in detail by Brown, Urban & Newman (1982). Its population has been estimated as up to 10,000 birds in West Africa, 2,000–5,000 in Ethiopia, 10,000–25,000 in East Africa, and 20,000–50,000 in southern Africa (Rose & Scott, 1997; Kear, 2005).

**Eurasian Wigeon.** This Eurasian wigeon's world population has been estimated as 1.5 million birds in northwestern Europe, 300,000 in the Black Sea–Mediterranean region, 250,000 in southwestern Asia/northeastern Africa, 250,000 in southern Asia, and 500,000–1,000,000 in eastern Asia (Kear, 2005). It has become increasingly reported in North America since the 1970's, and few if any states lack records for this species. During the 2008–9 Audubon Christmas Bird Count the greatest number seen at any single U.S. location was 112, at Padilla Bay, Washington, and 113 were seen at Ladner, British Columbia in 2006–7. Total U.S. hunter-kills have averaged about 1,200 annually since 1994. Estimated total annual Canadian kills from 1990–1998 ranged from about 50–300. Eurasian wigeons thus have comprised about 0.3–0.15 percent of all wigeons identified among the U.S. and Canadian hunter-kill surveys. In spite of all these recent occurrences, there is still no evidence of Eurasian wigeons breeding in North America,

**American Wigeon.** This North American wigeon was monographed in *The Birds of North America* (Mowbray, 1999, No. 401). North American breeding grounds surveys in 2009 indicated a total population of 2.47 million birds (U.S.F.W.S., 2009). Total U.S. kills have averaged about 796,000 during the five years 2004–8, with no clear long-term directional trend. Estimated total annual Canadian kills from 1990–1998 ranged from about 37,000–51,000.

**Chiloe Wigeon.** This South American wigeon's world population has been estimated as 100,000–1,000,000 birds (Wetlands International, 2002). Brewer (1997) has described its breeding behavior in captivity.

**Falcated Duck.** This East Asian species' world population has been estimated as 100,000–1,000,000 birds (Rose & Scott, 1997). It is very rare to casual in the western and central Aleutians, and as of 2007 there were multiple falcated duck records for British Columbia, and at least three records for Washington State.



**Gadwall.** The North American population of this Northern Hemisphere species was monographed in *The Birds of North America* (Leschack, McKnight, & Hepp, 1997, No. 283). North American breeding grounds surveys in 2009 indicated a total population of 3.05 million birds (U.S.F.W.S., 2009). The average annual hunter kill in the U.S. during the five years 2004–8 was about 1.46 million birds, and has exhibited a long-term increase since the 1960's. Estimated total annual Canadian kills from 1990–1998 ranged from about 32,000–50,000. The Old World population may be more than 750,000 birds (Kear, 2005).

**Baikal Teal.** This East Asian teal is considered vulnerable by the IUCN. It appears to be seriously declining, with a much smaller breeding and wintering ranges than were shown on my map. Breeding apparently now occurs only in eastern Siberia in the drainages of the Khatanga and Yana rivers, and west of the Sea of Okhotsk in Yakut Autonomous Republic as shown by the larger inked areas. The other inked areas also show currently known wintering regions of South Korea, Japan and China. Distributional changes were described in BirdLife International (2001). South Korea now supports the largest numbers of wintering birds, up to a maximum of about 400,000 birds (Kear, 2005). The Baikal teal is very rare to casual in western Alaska, and as of 2007 there were varying numbers of Pacific Coast records for British Columbia, Washington, Oregon and California. There have also been sightings from at least six other states.

**Green-winged Teal.** The North American population of this Northern Hemisphere teal was monographed in *The Birds of North America* (Johnson, 1995, No. 193). Some recent authors (e.g., Sangster *et al.* 2001; Kear, 2005) have specifically separated the Eurasian form (“Eurasian teal”) from the American one, in which case the American green-winged teal becomes *A. carolinensis*. North American breeding grounds surveys in 2009 indicated a total population of 3.44 million birds (U.S.F.W.S., 2009).

Total U.S. kills have averaged about 1.72 million birds, and have exhibited a gradually increasing long-term trend-line since the 1960's. Estimated total annual Canadian kills from 1990–1998 ranged from about 93,000–145,000. The Old World population is probably in excess of two million birds (Kear, 2005). Several hundred birds of the Eurasian form are seen annually during Audubon Christmas Bird Counts at Unalaska Island, Alaska, and some Eurasian green-winged teal have also regularly been reported among the Canadian hunter-kill data.

**Speckled Teal.** This South American teal's population has been estimated as over a million birds in southern South America for the widespread race *flavirostris*, 25,000–100,000 birds for the Andean race *oxyptera*, and under 20,000 for the northern races *andium* and *altipetans* (Wetlands International, 2002). The most northerly race *altipetans* in Colombia and Venezuela is considered vulnerable by the IUCN.

**Cape Teal.** This African endemic teal was described in detail by Brown, Urban & Newman (1982). This species' total population has been estimated as probably over 35,000 in southern Africa (but far less than earlier estimates of up to 250,000), and over 25,000 for the Lake Chad and Rift Valley populations, with the population around Lake Chad localized and very small (Wetlands International, 2002; Kear 2005).

**Madagascar Teal.** This endemic teal is considered endangered by the IUCN. A 2003 survey in northwestern Madagascar produced an estimate of 150–200 birds (Joiner, Razelfindrjao, & Young, 2005). Safford (1993) also performed a regional survey. The species' entire population has been estimated as 1,500–2,500 birds (Delany & Scott, 2002), and is limited to the western coast of Madagascar.

**Gray Teal** (including the Indonesian teal, *A. gibberifrons*, Sunda teal, *Anas gracilis*, and Andaman teal, *A. albogularis*, all of which were considered subspecies in this book). This Aus-

tralasian teal was described in detail by Marchant & Higgins (1990), and the inked areas on the range map indicate regions of densest Australian populations. The Andaman race of this widespread species is considered endangered. A survey in 2003–2004 revealed a maximum of 674 Andaman teal on these islands, mostly on South Andaman Island (Vijayan, Murugan, & Mamannan, 2006).

**Chestnut Teal.** This Australian teal was described in detail by Marchant & Higgins (1990). Its population was estimated at about 21,000 birds in southeastern Australia during the 1980's, and about 1,000 in southwestern Australia (Kear, 2005). The inked areas on the range map indicate regions of densest populations.

**Brown Teal** (including the Auckland Island teal, *A. auklandica* and Campbell Island teal, *A. nesiotis*, both of which were considered subspecies of *chlorotis* in this book). This rare insular teal complex was described in detail by Marchant & Higgins (1990).

The nominate New Zealand race of the brown teal is endangered by the IUCN and is one of the rarest of all ducks. By 1999 the world population was no more than 1,000 birds, with most of them on Great Barrier Island, and the rest in Northland (Teal Bay and Mimiwhangata). In 2005 a release of 62 captive-raised birds was made around Port Charles at the tip of the Coromandel Peninsula, which has shown some early signs of success (Hayes, 2006).

The Auckland Island form is considered vulnerable by the IUCN, with populations on all the small peripheral islands (Ewing, Enderby, Rose, Ocean, Adams, Disappointment, and Dundas). The population on Auckland Island itself was extirpated as a result of introduced mammals. There are no estimates of total population size of this inconspicuous species.

The Campbell Island form is critically endangered, with a tiny relict population of probably less than 100 birds surviving on Dent Island, an islet of about 60 acres. After the completion of a massive rat-eradication program

on Campbell Island, 105 captive-bred teal were released there in 2004 and 2005. A survey in 2006 reported five different age-groups of ducklings to be present (Anonymous, 2006b).

**Mallard** (here including the northern mallard, *A. p. platyrhynchos*, mottled duck, *A. p. fulvigula*, Mexican duck, *A. p. diazi*, Hawaiian duck, *A. p. wyvilliana*, & Laysan duck, *A. p. laysanensis*). Several forms of this species as here defined were monographed as separate species in *The Birds of North America*, including the northern mallard (Drilling, Titman, & McKinney, 2002, No. 658); mottled duck (Moorman & Gray, 1994, No. 81); Hawaiian duck (Engilis, Uyehara, & Giffin, 2003 No. 694); and Laysan duck (Moulton & Marshall, 1996, No. 242). The 2009 North American breeding mallard population was estimated at 8.5 million birds, and 13 percent above the long-term average (U.S.F.W.S., 2009a). The average annual hunter kill of mallards in the U.S. during the five years 2004–8 was about 4.62 million birds, and has exhibited no clear long-term trend-line. Estimated total annual Canadian kills from 1990–1998 ranged from about 537,000–734,000. Areas occupied by introduced mallard populations in Australia and New Zealand are shown by inking on Map 75. The widespread northern mallard may have a worldwide population in excess of 25 million birds (Kear, 2005).

The mottled duck of the U.S. Gulf Coast region has a population of about 56,000 birds in Florida, and 500,000–800,000 in Texas and Louisiana (*The Birds of North America*, No. 81). The average annual hunter kill nationally of mottled ducks during the five years 2004–8 has been about 70,000 birds and, although estimates have remained fairly steady recently, have gradually declined since the 1960's. The Mexican duck might have a total U.S./Mexican population in the vicinity of 55,000 (Wetlands International, 2002), but probable introgressive hybridization with northern mallards and mottled ducks makes any population estimate suspect, especially in the northern parts of its range. During the five years 2004–8 the

estimated U.S. hunter kill of “Mexican-like” ducks has averaged about 2,750 birds, but has exhibited great annual fluctuations and no clear long-term trend since the 1960’s.

The extra-limital Hawaiian duck (koloa) is considered endangered, Hawaiian ducks judged to be genetically “pure” include only about 2,000 birds on Kauai and nearby Nihau, plus about 200 on Hawaii (Kear, 2005; *The Birds of North America*, No. 694). Those on Oahu and Maui appear to be hybrids with northern mallards, and the same may be true of some of those present on Hawaii. The inset map shows the resident Hawaiian distribution of presumably genetically pure birds. During the 2008–9 Audubon Christmas Bird Count the greatest number seen at any single location was 552, on Kauai.

The extra-limital Laysan duck is critically endangered. A group of 42 Laysan ducks were captured on Laysan Island and transferred to Sand Island of Midway Atoll National Wildlife Refuge in 2004 and 2005. Recent observations indicate that the Midway population has since increased significantly, and by 2006 38 nests were found there (Jarret, 2006). During the 2008–9 Audubon Christmas Bird Count the greatest number seen at any single location was 345, at Laysan Island.

**North American Black Duck.** This near-relative of the mallard was monographed in *The Birds of North America* (Longcore *et al.*, 2000, No. 481). The 2009 winter surveys of this species indicated a population of about 210,000 birds, while recent breeding surveys suggest that about 500,000 birds might be present (U.S.F.W.S., 2009). Rose & Scott (1997) suggested a population of 210,000 for the Atlantic flyway, and 90,000 for the Mississippi flyway. Even more of the black duck’s original range has been impacted by competition from and hybridization with northern mallards than was true during the 1970’s. Most evidence indicates that black ducks have been in a long-term population decline in eastern North America over much of the 20<sup>th</sup> century, espe-

cially relative to mallards in that same region. Hunter kills of black ducks in the Atlantic flyway have dropped in recent years (2004–2008) to about one-third of those occurring in the late 1960’s (90,000 in 2008). However, kills of black x mallard hybrids have shown a very slight increase since then, with a long-term average of about 8,000 birds taken in the Atlantic flyway, an amount equivalent to nearly ten percent of total recent average kills for the black duck in that flyway. Estimated total annual Canadian kills from 1990–1998 ranged from about 153,000–243,000, while in the U.S. there was an average nationwide kill of about 125,000 for the years 2004–8. Estimated total annual Canadian kills from 1990–1998 ranged from about 153,000–243,000, or about double the total recent U.S. kill estimates.

**Meller’s Duck.** This Madagascan mallard-like duck is considered endangered, with a world population estimated at 2,000–5,000 birds (Rose & Scott, 1997; Kear, 2005). It is now limited to eastern parts of the island and its high plateau. A few introduced birds may also survive on Mauritius Island. Its behavior in captivity was studied by Young (1999), who reported that the male courtship displays are distinctly mallard-like, but lack the down-up posture. The grunt-whistle and head-up-tail-up are correspondingly more important, and both sexes perform independent nod-swimming. Otherwise, the male’s display repertoire is essentially mallard-like.

**Yellow-billed Duck.** This African endemic mallard-like duck was described in detail by Brown, Urban & Newman (1982). Its subpopulations were estimated at 20,000–60,000 birds in eastern Africa, more than 100,000 in southern Africa, and 20,000–50,000 northern East Africa (Wetlands International, 2002).

**Gray (Pacific Black) Duck.** This Australasian mallard-like duck was described in detail by Marchant & Higgins (1990). The New Zealand race of this species has hybridized extensively with northern mallards and is considered en-



dangered. The Australian population may range from about 500,000 to more than a million (Marchant & Higgins, 1990; Kear, 2005). The part of the Australian range having the densest populations is indicated by inking.

**Spot-billed Duck.** Populations of this widely-ranging Asian mallard-like duck include 50,000–100,000 birds in southern Asia (*poecilorhyncha*), 800,000–1,000,000 in eastern Asia (*zonorhyncha*), and 100,000,000 in southeastern Asia (*har-ringtoni*) (Miyabashi & Mundkur, 1999).

**Philippine Duck.** This Philippine endemic mallard-like duck is considered vulnerable by the IUCN. Wetlands International (2002) estimated a possibly declining population of less than 10,000 birds. Most records are from Luzon and Mindanao, with concentrations reported from Polillo Island and Subic Bay, Luzon.

**Crested Duck.** The courtship displays of this aberrant South American duck have been studied by Kaltenhäuser (1971) and more recently by Stevens, Young & McKinney (2004), and differ in several ways from those of typical *Anas* species. Its taxonomic position remains controversial, and it is often placed in the monotypic genus *Lophonetta*, and among the shelducks. The size of the South American population is unknown, but the Falkland Islands population might consist of 10,000–25,000 birds (Rose & Scott, 1997).

**Bronze-winged Duck.** No population estimates are yet available for this little-studied South American duck. Its taxonomic position is controversial, and it is often placed in the monotypic genus *Speculanas*.

**Northern Pintail** (including the Kerguelen Island or Eaton's pintail, *eatoni*, here considered a subspecies). The North American population of this Northern Hemisphere pintail was monographed in *The Birds of North America* (Austin & Miller, 1995, No. 163). North American breeding grounds surveys in 2009 indicated a total population of 3.22 million birds (U.S.F.W.S., 2009). The average annual hunter

kill in the U.S. during the five years 2004–8 has been about 442,000, but has declined greatly from a high of nearly two million in the 1970's. Estimated total annual Canadian kills from 1990–1998 ranged from about 33,000–72,000. The world population of the northern pintail also includes well over two million birds in Europe and Asia. The population of the Kerguelen Island form *eatoni* may have numbered about 45,000–60,000 in the 1960's to 1980's, and is considered vulnerable, while the Crozet Island race *drygalskii* was probably about 1,000–1,350 individuals during that period, and is critically endangered (Green, 1992b). Derrickson (1977) has described the species' breeding behavior.

**Yellow-billed (Brown) Pintail.** The population of the nominate race *spinicauda* of this South American pintail has been estimated at 100,000–1,000,000 birds (Rose & Scott, 1997). The isolated South Georgia population *georgica* may consist of a few thousand individuals, and the Colombian race *nicefori* is extinct.

**White-cheeked (Bahama) Pintail.** The population of the West Indian race of this Neotropical pintail has been estimated at 75,000 birds, while the South American population may be in the range of 100,000–1,000,000 (Wetlands International, 2002). The Galápagos Islands race is considered endangered; a survey in 2006 revealed only 266 individuals, mostly on Isabella Island (Uxcategui and Naranjo, 2006). This pintail only very rarely strays to southern Florida, and has been reported along the Gulf Coast as far west as Texas.

**Red-billed Teal.** This African and Madagascan endemic teal was described in detail by Brown, Urban & Newman (1982). Rose & Scott (1997) estimated its population to include 500,000–1,000,000 birds in southern Africa, 100,000–300,000 in eastern Africa, and 15,000–30,000 in Madagascar.

**Silver (Versicolor) Teal.** Wetlands International (2002) estimated the population of this South American teal to include 25,000–100,000



birds for the lowland forms *versicolor* and *fretensis*, and 100,000–1,000,000 for the Andean-dwelling race *puna*.

**Hottentot Teal.** This African endemic teal was described in detail by Brown, Urban & Newman (1982). Wetlands International (2002) estimated its population to include 1,000–5,000 birds in Chad, 25,000–100,000 in eastern and southern Africa, and 5,000–10,000 in Madagascar.

**Garganey.** Most population estimates of this Eurasian teal are from Africa, where wintering of the western Palaearctic population occurs. There, estimates generally have ranged from about 500,000–2,500,000 birds. The Asian population is poorly documented, but Rose & Scott (1997) estimated 250,000 birds wintering in southern Asia and 100,000–1,000,000 in southeastern and eastern Asia. It more rarely is seen along both North American coasts, primarily the Pacific Coast. As of 2007 there were several records for British Columbia, and at least two each for Washington, Oregon and Idaho. Garganeys have now been reported from at least 30 states and seven Canadian provinces.

**Blue-winged Teal.** This North American teal was monographed in *The Birds of North America* (Rohwer, Johnson, & Loos, 2002, No. 625). North American breeding grounds surveys in 2009 indicated a total population of 7.3 million birds (U.S.F.W.S., 2009). The average annual hunter kill in the U.S. for combined blue-winged and cinnamon teal during the five years 2004–8 has been about 870,000 birds, and has been quite variable annually. Estimated total annual Canadian kills from 1990–1998 ranged from about 22,000–53,000. These two species cannot be reliably distinguished during autumn and are considered collectively in hunter-kill statistics.

**Cinnamon Teal.** The North American population of this Western Hemisphere teal was monographed in *The Birds of North America* (Gammonley, 1996, No. 209). The major populations have been estimated as 260,000 birds

for *septentrionalis*, 25,000–100,000 for *cyanoptera* and 10,000–100,000 for *orinomus* (Wetlands International, 2002). In northern South America the Borrero's race *borreroi* is critically endangered, and may number fewer than 250 birds. The race *tropica* is endangered, and has been estimated at under 10,000 birds.

**Red Shoveler.** This South American shoveler's population has been estimated as 100,000–1,000,000 birds (Wetlands International, 2002).

**Cape Shoveler.** This African endemic shoveler was described in detail by Brown, Urban & Newman (1982). Its population has been estimated as 20,000–50,000 individuals (Rose & Scott, 1997).

**Australian Shoveler.** This Australian and New Zealand shoveler was described in detail by Marchant & Higgins (1990). The world population is variable but may range from 100,000–300,000 birds, about equally divided between Australia and New Zealand (Kear, 2005). The inked areas on the range map indicate regions of densest populations.

**Northern Shoveler.** The North American population of this Northern Hemisphere shoveler was monographed in *The Birds of North America* (Dubowy, 1996, No. 217). North American breeding grounds surveys in 2009 indicated a total population of 4.38 million birds (U.S.F.W.S., 2009). The average annual hunter kill in the U.S. during the five years 2004–8 has been about 613,000 birds, and apparently has been slowly increasing, but the estimates have been variable from year to year since the 1960's. Estimated total annual Canadian kills from 1990–1998 ranged from about 10,000–27,000. The Old World population may number 1.5–2 million birds (Wetlands International, 2002).

**Pink-eared Duck.** This endemic Australian species was described in detail by Marchant & Higgins (1990). The affinities of the pink-eared duck are still highly elusive. Some taxonomists have recently suggested that it is the

sole survivor of an ancient lineage (Harshman, 1996, Sraml *et al.*, 1996). The Australian population has been estimated at from over 100,000 to over a million birds (Kear, 2005).

#### **Pp. 271–310: Tribe Aythyini (Pochards)**

The pochards are a fairly compact and easily recognized group of diving ducks, with close evolutionary affinities to the dabbling ducks of the tribe Anatini. However, they are less closely related to the other two tribes of structurally similar diving ducks whose feet are similarly large and placed posteriorly for efficient diving and underwater swimming, the sea ducks and stiff-tailed ducks.

**Marbled Teal.** This Near East and west Asian species is considered vulnerable, and its breeding and wintering ranges are now substantially smaller and more fragmented than what was mapped in my book. Inked areas indicate approximate recent known breeding regions (Kear, 2005). Breeding now occurs only in three separate regions. One group breeds in Spain, Morocco, Algeria and Tunisia. A second breeding region includes Turkey, Israel, Jordan and Syria. The third region includes Azerbaijan, Armenia, Russia, Turkmenistan, Uzbekistan, Tajikistan, Kazakhstan, Iraq, Iran, Afghanistan, Pakistan and India. The world population has been estimated as 14,000–26,000 birds (Wetlands International, 2002). Following my 1961 recognition of the marbled teal's aythyine affinities, most recent studies have confirmed this relationship. Livizey (1997) placed the marbled teal in a monotypic subtribe of the pochards.

**Pink-headed Duck.** Following my 1961 recognition of the Indian pink-headed duck's aythyine affinities, most recent studies have confirmed this relationship. Livizey (1997) placed the pink-headed duck in a monotypic subtribe of the pochards. Some unconvincing sightings of this species have recently been made

in the Kachin State of Myanmar (Anonymous, 2006e).

**Red-crested Pochard.** This Eurasian pochard's population has been estimated as 50,000 birds in southwestern and central Europe, 20,000–43,500 in southeast Europe, 250,000 in southwestern Asia, and 25,000–100,000 in southern Asia (Wetlands International 2002).

**Rosybill.** This South American pochard's population has been estimated as being in excess of one million birds (Wetlands International 2002).

**Southern Pochard.** This African and South American pochard was described in detail by Brown, Urban & Newman (1982). This species' African population has been estimated as 30,000–70,000 birds. The South American population was estimated at 10,000–25,000 on the Atlantic drainage and under 2,500 in western South America (Wetlands International, 2002).

**Common Pochard.** The Black Sea/Mediterranean wintering population of this Eurasian pochard has been estimated at 1,000,000 birds, but declining. The southwestern Asia population may additionally comprise 350,000, southern Asia 100,000–1,000,000, and eastern and southeastern Asia 600,000–1,000,000 (Kear, 2005).

**Canvasback.** This North American pochard was monographed in *The Birds of North America* (Mowbray, 2002, No. 659). North American breeding grounds surveys in 2009 indicated a total population of 662,000 birds (U.S.F.W.S., 2009). The average annual hunter kill in the U.S. during the five years 2004–8 has been about 68,000 birds, but both the yearly figures and longer trend-lines since the 1960's have been highly variable. Estimated total annual Canadian kills from 1990–1998 ranged from about 5,000–13,000.

**Redhead.** This North American pochard was monographed in *The Birds of North America* (Woodin & Michot, 2003, No. 695). North American breeding grounds surveys in 2009 in-

licated a total population of 1.04 million birds (U.S.F.W.S., 2009). The average annual hunter kill in the U.S. during the five years 2004–8 has been about 148,000 birds, but the yearly kill estimates have been fairly variable since the 1960's. Estimated total annual Canadian kills from 1990–1998 ranged from about 11,000–22,000.

**Ring-necked Duck.** This North American pochard was monographed in *The Birds of North America* (Hohman & Eberhardt, 1998, No. 329). Its breeding behavior has been studied by Hohman (1984). Eastern North American breeding grounds surveys in 2009 indicated a total population of 551,000 birds (U.S.F.W.S., 2009). The average annual hunter kills in the U.S. during the five years 2004–8 have been about 513,000 birds, and have exhibited a long-term progressive increase since the 1960's. Estimated total annual Canadian kills from 1990–1998 ranged from about 57,000–110,000. Some previously unrecognized breeding areas are shown by inking on the species' revised range map. Australian White-eye (Hardhead). This endemic Australian pochard was described in detail by Marchant & Higgins (1990). According to them, peak continental numbers may reach 620,000 birds but, like many other Australian waterfowl, populations are highly variable depending on water conditions. The inked areas on the range map indicate regions of densest populations.

**Siberian White-eye (Baer's Pochard).** This East Asian pochard is considered vulnerable. It breeds in the Ussuri and Amur basins in Russia and northeastern China. Although not mapped, some wintering also occurs in Japan. The total world population may number up to 20,000 birds (Wetlands International, 2002).

**Eurasian (Ferruginous) Pochard.** A conservation action plan for this declining Eurasian pochard has recently been published (Anonymous, 2006d). Its total winter population may number 40,000–100,000 birds, although accurate censusing of this inconspicuous species is very difficult (Kear, 2005).

**Madagascar White-eye.** This endemic Madagascan pochard is critically endangered. Thought to be perhaps extinct, it had last been seen in 1960 at Lake Aloatra, but a single male was captured in 1991. However, later searches of Lake Aloatra during the 1990's failed. More recently, a total of 13 birds (including four young) were found during bird surveys in a remote part of northern Madagascar (Anonymous, 2006a).

**Tufted Duck.** This Eurasian pochard's population includes about 1,000,000 birds wintering in northwestern and western Europe, 600,000 in central Europe, the Black Sea and the Mediterranean, 200,000 wintering in northeast Africa, 100,000–1,000,000 wintering in central and southern Asia, and 500,000–1,000,000 in eastern and southeastern Asia (Wetlands International 2002). It has become increasingly commonly reported in North America since the 1970's. Mostly observed along the Atlantic and Pacific coasts during winter, it has been reported from at least 15 states and seven provinces, including all the Atlantic and Pacific coastal states and provinces. It is rare to uncommon in the western and central Aleutians, and rarer elsewhere in Alaska. It is seen nearly every winter in British Columbia (usually around Victoria, Vancouver and Ladner), and as of 2007 there were about 50 records for Washington, at least 18 for Oregon and several for California.

**New Zealand Scaup.** This endemic New Zealand pochard was described in detail by Marchant & Higgins (1990). Its total population may number less than 10,000 birds (Kear, 2005).

**Greater Scaup.** This Northern Hemisphere pochard was monographed in *The Birds of North America* (Kessel, Rocque, & Barclay, 2002, No. 650). Its world population might include about 750,000 birds in North America, 310,000 in northwestern Europe, 200,000–500,000 in the Black, Caspian and Mediterranean region, and 200,000–4,00,000 in eastern Asia (Kear, 2005). The average annual hunter kill in the U.S. dur-



ing the five years 2004–8 has been about 59,000 birds, and has exhibited a long-term decline since the 1960's. Estimated total annual Canadian kills from 1990–1998 ranged from about 12,000–27,000.

**Lesser Scaup.** This North American species was monographed in *The Birds of North America* (Austin, Custer, & Afton, 1998, No. 338). Its breeding ecology has been studied by Hammell (1973). Breeding grounds surveys in 2009 indicated a total population of 4.7 million scaup of both species (U.S.F.W.S., 2009). Nearly 90 percent of the scaups surveyed in the U.S. might be lessers (Bellrose, 1980). The average annual hunter kill in the U.S. during the five years 2004–8 has been about 235,000 birds, but has exhibited a long-term decline from a peak of about 600,000 during the 1980's. Estimated total annual Canadian kills from 1990–1998 ranged from about 41,000–71,000.

### Pp. 311–361: Tribe Mergini (Sea Ducks)

The sea ducks were first recognized as constituting a distinct tribe by Delacour and Mayr (1945), who separated them from the mostly fresh-water pochards. They are ecologically and behaviorally diverse, but are mostly temperate- or arctic-breeding birds adapted to marine life and vertebrate or invertebrate foods. They usually dive for animal foods, sometimes to great depths, or may capture their prey in lakes or rivers. Two subgroups are fairly evident, namely the more ponderous eiders and the remaining and more agile sea ducks. The nearest relatives of the sea ducks remain controversial; the dabbling ducks–pochard clade (Donne-Gousse, Laudet, and Hanni, 2002), the shelducks (Madsen *et al.*, 1988), and the stiff-tailed ducks (Livizey, 1986) have all been suggested. Most surprisingly, even the non-diving and freshwater-adapted ringed teal (*Callo-netta*), usually considered a perching duck, has been suggested by some to be a member of the sea duck group (Donne-Gousse, Laudet & Hanni, 2002).

**Common Eider.** The North American population of this Northern Hemisphere sea duck was monographed in *The Birds of North America* (Goudie, Robertson, & Reed, 2000, No. 546). Wintering counts of *dresseri* off the Atlantic coast of the U.S. and Canada have revealed about 340,000 birds. There are believed to be about 100,000 *v-nigra* in Canada and Alaska, plus about 20,000 in eastern Siberia. The largest population component consists of 1.31.7 million individuals of nominate *mollissima* in western Eurasia. There are also estimates for *borealis* of 600,000–900,000 in Iceland, 30,000–300,000 in Greenland, and 40,000–80,000 in Svalbard (Rose & Scott, 1997; Kear, 2005). The two other races (*sedentaria* and *faeroeensis*) have apparently not yet been surveyed, but their populations are probably fairly small. The average annual U.S. hunter-kill during the five years 2004–8 has been about 20,600 birds, but has been declining since the 1990's. Estimated total annual Canadian kills from 1990–1998 ranged from about 11,000–39,000.

**King Eider.** The North American population of this Northern Hemisphere sea duck was monographed in *The Birds of North America* (Suydam, 2000, No. 491). This species' North American breeding population estimates include about 10,000–35,000 birds in Alaska, 200,000–260,000 in western Canada and 280,000 in eastern Canada. The Greenland, European and western Siberia populations add about 300,000 birds. There are no overall estimates of central and eastern Siberian numbers (Kear, 2005). The average annual U.S. hunter-kill during the five years 2004–8 has been only about 100 birds, and annual Canadian kills from 1990–2008 have ranged up to about 700 birds.

**Spectacled Eider.** The North American population of this northeast Asian and Alaskan sea duck was monographed in *The Birds of North America* (Petersen, Grand, & Dau, 2000, No. 547). Its breeding biology and productivity in Alaska have been studied by Bart & Earnst (2004) and by Grand & Flint (1997). Dau & Kischinski (1977) have tracked the species' distri-



bution and seasonal movements. The previously unknown pelagic wintering grounds of this species in the Bering Sea were finally discovered in the late 1990's (stippled area on revised range map). The world population, based on counts of concentrations of wintering birds, may have been over 330,000 in the 1990's (Peterson, Leonard, & Douglas, 1999).

**Steller's Eider.** The North American population of this northeast Asian and Alaskan sea duck was monographed in *The Birds of North America* (Frederickson, 2001, No. 571). Its status is considered vulnerable, and its world population declined about 50 percent during the last four decades of the past century, from about 400,000–500,000 birds to 220,000 during the late 1990's. In southeastern Alaska population estimates dropped nearly 50 percent from 137,900 to 69,000 between 1992 and 2000 (Kear, 2005).

**Labrador Duck.** This extinct North Atlantic sea duck was monographed in *The Birds of North America* (Chilton, 1997, No. 307), and Kear (2005) has also summarized what little is known of it.

**Harlequin Duck.** The North American population of this eastern Asian and North American sea duck was monographed in *The Birds of North America* (Robertson & Goudie, 1999, No. 466). Gowans, Robertson & Cooke (1997) and Dzinbal (1982) have described the harlequin duck's breeding behavior. In addition to a population of about 14,000 birds in Iceland, there are about 165,000 in western North America and perhaps 50,000–100,000 in Siberia (Kear, 2005). The numbers breeding in Greenland and eastern Canada are still unknown. The average annual hunter-kill in the U.S. during the five years 2004–8 has been about 1,100 birds, but the long-term averages since the 1960's have been fairly variable. Estimated total annual Canadian kills from 1990–1998 have ranged up to about 400 birds.

**Long-tailed Duck.** The North American population of this circumpolar sea duck was mono-

graphed in *The Birds of North America* (Robertson & Savard, 2002, No. 651). The world population may include 4.6 million birds in western Siberia and northern Europe, 2.7 million in North America, 100,000–1,000,000 in eastern Asia, and about 150,000 in Iceland and Greenland (Rose & Scott, 1997). The average annual hunter-kill in the U.S. during the five years 2004–8 has been about 28,200, and has exhibited a long-term progressive increase since the 1960's. Estimated total annual Canadian kills from 1990–1998 ranged from about 5,000–10,000.

**Black (Common) Scoter.** The North American population of this Northern Hemisphere sea duck was monographed in *The Birds of North America* (Bordage & Savard, 1995, No. 177). There are no comprehensive population estimates available for either of the two races. The average annual hunter-kill in the U.S. during the five years 2004–8 has been about 12,000 birds, but yearly estimates have been rather variable. Estimated total annual Canadian kills for seven years between 1969 and 1993 ranged from about 4,000–8,000.

**Surf Scoter.** This North American sea duck was monographed in *The Birds of North America* (Bordage, & Reed, 1998, No. 363). Its breeding range poorly known but is apparently concentrated in Alaska and northeastern Canada (inked), rather than in western and central Canada, as was originally indicated on the species' range map. Its population is only very poorly documented, but Rose & Scott (1997) suggested a stable population of 765,000 birds. The average annual hunter-kill in the U.S. during the five years 2004–8 has been about 33,400 birds, and has exhibited a gradually increasing long-term trend since the 1960's. Estimated total annual Canadian kills from 1990–1998 ranged from about 5,000–19,000.

**White-winged (Velvet) Scoter.** The North American population of this Northern Hemisphere sea duck was monographed in *The Birds of North America* (Brown & Fredrickson,

1997, No. 274). Brown & Brown (1981) have described its nesting biology. The North American population (*deglandi*) may consist of about 1,000,000 birds, while the eastern Asian population (*stejnegeri*) might have 600,000–1,000,000 birds. The nominate race *fusca* may include 1,000,000 birds in northwestern Europe (Rose & Scott, 1997; Kear, 2005). The average annual hunter kill in the U.S. during the five years 2004–8 has been about 8,500 birds, and has exhibited a gradually declining long-term trendline since the 1960's. Estimated total annual Canadian kills from 1990–1998 ranged from about 4,000–10,000.

**Common Goldeneye.** The North American population of this Northern Hemisphere sea duck was monographed in *The Birds of North America* (Eadie, Mallory, & Lumsden, 1995 No. 170). Afton & Sayler. (1982) have described the species' breeding behavior. Eastern North American breeding ground surveys in 2009 indicated a total population of 369,000 goldeneyes, nearly all of which would be commons (U.S.F.W.S., 2009). The entire North American population might total about 1.5 million birds, as compared with 300,000–450,000 in Europe and 50,000–100,000 in eastern Asia (Kear, 2005). The average annual hunter kill in the U.S. during the five years 2004–8 has been about 75,400 birds, and appears to be quite stable since the 1960's. Estimated total annual Canadian kills from 1990–1998 ranged from about 25,000–77,000.

**Barrow's Goldeneye.** This North American and North Atlantic sea duck was monographed in *The Birds of North America* (Eadie, Savard, & Mallory, 2000, No. 548). The Icelandic population numbers about 2,000 birds, but North American estimates are still only fragmentary. Minimum estimated totals exist for Alaska (45,000), British Columbia (70,000–126,000) and the Pacific Coast states (under 8,000) (Kear, 2005); small numbers also occur along the Rocky Mountain range south locally to Wyoming and northern Colorado. The size of the eastern Canada population is un-

known, but several thousand winter along the St. Lawrence River, and others winter south to Maine. The average annual hunter kill in the U.S. during the five years 2004–8 has been about 5,200 birds, and appears to have been stable since the 1960's. Estimated total annual Canadian kills from 1990–1998 ranged from about 500–3,700.

**Bufflehead.** This North American sea duck was monographed in *The Birds of North America* (Gauthier, 1993, No. 67). Eastern North American breeding grounds surveys in 2009 indicated a total population of only 27,000 birds (U.S.F.W.S., 2009). Thus, an estimate of one million birds for all of North America (Wetlands International, 2002) seems optimistic, but the species has certainly been increasing in recent decades. The average annual hunter kill in the U.S. during the five years 2004–8 has been about 189,000 birds, and has been gradually increasing since the 1960's. The estimated total annual Canadian kills from 1990–1998 ranged from about 18,000–37,000. Accepting those figures, a North American population of at least 500,000 birds would seem realistic.

**Smew.** Total population estimates of this Eurasian merganser include 125,000–135,000 birds for western Eurasia, plus 35,000 in the Black Sea, eastern Mediterranean region, and 25,000–100,000 in eastern Asia (Scott & Rose, 1996; Kear, 2005).

**Hooded Merganser.** This North American merganser was monographed in *The Birds of North America* (Dugger, Dugger, & Fredrickson, 1994, No. 98). No reliable recent estimates of its overall population are available. The average annual hunter-kill in the U.S. during the five years 2004–8 has been about 84,800 birds, and has exhibited an increasing trend since the 1960's. The estimated total annual Canadian kills from 1990–1998 ranged from about 14,000–29,000. If about total 100,000 birds are killed annually by sport hunters it would suggest that the species' total population must number in the several hundreds of thousands.

**Brazilian Merganser.** This South American species is critically endangered. Its currently known range is much more restricted than was shown in my range map (Kear, 2005; Bruno, Alves, & Bartmann, 2006). This species' biology has been described by Bartmann (1988) and more generally summarized by Sick (1993). The South American range of this merganser now includes only a few known locations, in Goiás and Minas Gerais states. It has been extirpated from Mato Grosso do Sul, Rio de Janeiro, São Paulo, and Santa Catarina. The well-documented population in northeastern Argentina (Misiones) and in adjacent Paraguay was last observed in 1993 (when only a single bird was seen) and may now be extirpated (Kear, 2005).

**Red-breasted Merganser.** The North American population of this Northern Hemisphere merganser was monographed in *The Birds of North America* (Titman, 1999, No. 443). World population estimates include 237,000 birds in North America, 10,000–100,000 in western Greenland, 15,000–25,000 in Iceland, eastern Greenland and the United Kingdom, 125,000 in northwestern and central Europe, 50,000 in northeastern Europe, the Black Sea and Mediterranean, over 10,000 in western Siberia and central to southwestern Asia, and 25,000–100,000 in eastern Asia (Rose & Scott, 1997; Kear, 2005). The average annual hunter kill in the U.S. during the five years 2004–8 has been about 15,000 birds, and appears fairly stable since the 1960's. Estimated total annual Canadian kills from 1990–1998 ranged from about 7,000–16,000.

**Chinese (Scaly-sided) Merganser.** Reports on this little-known species' biology have been summarized by Hughes & Hunter (1994), and more recently by Bartmann (1998). Duckworth & Choi (2004), and Kear (2005). It is considered endangered by the IUCN, with a recent world estimate of 1,200 breeding pairs, mostly in far-eastern Russia (Khabarovsk, Amur, Primorye, and the Jewish Autonomous Region), adjacent North Korea, and northeastern China. The

largest numbers may be in Primorye, in the Bikin and Iman river basins. Its probable current breeding range (inked) is more dispersed and fragmented than was originally shown on my range map. It has only recently been extensively studied in the wild, including field surveys of population densities in Primorye that were conducted in 2003–2005 by Solovieva *et al.* (2006).

**Goosander (Common Merganser).** The North American population of this Northern Hemisphere merganser was monographed in *The Birds of North America* (No. 442). World population estimates include 640,000 birds in North America, 900 in Iceland, 5,000–6000 in the United Kingdom, 200,000 in northwestern and central Europe, 10,000 in northeastern Europe, the Balkans and Black Sea, 20,000 in western Siberia and the Caspian Sea, and 50,000–100,000 in eastern Asia (Kear, 2005). The average annual hunter kill in the U.S. during the five years 2004–8 has been about 18,600 birds, and has been progressively increasing since the 1960's. Estimated total annual Canadian kills from 1990–1998 ranged from about 12,000–20,000.

**Auckland Islands Merganser.** Kear (2005) has provided an excellent summary of this now-extinct island-dwelling merganser's history.

## Pp. 362–385: Tribe Oxyurini (Stiff-tailed Ducks)

The stiff-tailed ducks are mostly an easily recognized assemblage of diving ducks, with posteriorly-placed legs, large feet and usually with long, stiffened tail feathers (Johnsgard & Carbonell, 1996). The white-backed duck (*Thalassornis*), long considered an aberrant stiff-tail but lacking a long tail, was transferred to the whistling duck tribe by me in 1967 on the basis of its sexual behavior. Some more recent studies have supported this move (Harshman, 1996; Livizey, 1996b). The position of the black-headed duck (*Heteronetta*) as a transi-



tional form in early stiff-tailed duck evolution, rather than being considered an aberrant dabbling duck, has been supported by McCracken *et al.* (1999) and Livezey (1995b). Taxonomists have traditionally also included the Australian musk duck (*Biziura*) in the stiff-tail tribe, but some recent molecular analyses (Harshman, 1996, Sraml *et al.*, 1996, McCracken *et al.*, 1999) have all suggested that this strange genus may have evolved independently from the other stiff-tails. If so, its taxonomic position and rank must remain speculative.

**Black-headed Duck.** Rees & Hilgarth (1984) described this South American species' parasitic breeding. Johnsgard & Carbonell (1996) have documented its general biology, and Johnsgard (1997) has discussed its unique nest-parasitism behavior. An estimated world population of 100,000–1,000,000 birds (Rose & Scott, 1997) may be too optimistic (Kear, 2005).

**Masked Duck.** The North American population of this Neotropical stiff-tail was monographed in *The Birds of North America* (Eitner, 1999, No. 393), and Johnsgard & Carbonell (1996) have documented the biology of this species more generally. A very rough estimate of the world population is 25,000–100,000 birds (Kear, 2005). The U.S. occurrences (mostly occurring in Texas, less often in Florida and Louisiana) seem to be of periodically irruptive, the birds often appearing after tropical storms. One of very few documented U.S. breedings occurred in Live Oak County, west of Corpus Christi, in southeastern Texas, in 2007. The fledging period has been reported as 45 days (Kear, 2005), but these birds rarely fly. Owing to its secretive behavior, no reliable estimates of the U.S. population are possible. One Texas waterfowl survey in 1992–93 suggested that the state's masked duck population might be as large as 3,800 birds, which seems unrealistically high.

**Ruddy Duck.** The North American population of this Western Hemisphere stiff-tail was monographed in *The Birds of North America* (Brue,

2003, No. 696), and Johnsgard & Carbonell (1996) have documented this species more generally. The Colombian montane race (*andina*) of this pan-American species is considered endangered. The Peruvian highland form *ferruginea* has often been given specific status, but its courtship behavior nearly identical to that of nominate *jamaicensis*, and very different from that of the geographically associated Argentine blue-billed duck *O. vittata* (Johnsgard & Carbonell, 1996). The North American population has been estimated at about 500,000 birds, while *andina* might number more than 10,000 and *ferruginea* 25,000–100,000 (Wetlands International, 2002). The average annual hunter kill in the U.S. during the five years 2004–8 has been about 28,200 birds, and estimates have exhibited a long-term decline since the 1960's. Estimated total annual Canadian kills from 1990–1998 ranged from about 700–4,000. There is also a small and fairly recently (1950's) introduced population in Britain (about 5,000 birds in 2000), and also still more recently has colonized Europe from the Netherlands south to Spain and Morocco, where hybridization threatens the native white-headed duck (Kear, 2005).

**White-headed Duck.** Johnsgard & Carbonell (1996) have documented the biology of this Eurasian stiff-tail, which is considered vulnerable by the IUCN. Its recent apparent breeding distribution has been added (inked) to my range map. The species' Asian population has declined from about 100,000 birds in the 1930's to a few thousand by the late 1990's. Most breeding now occurs in Turkey, Iran, Russia, Kazakhstan, Afghanistan, Uzbekistan, and Mongolia, while resident flocks exist in Spain, Algeria and Tunisia. Up to 2,500 may still winter in Greece, Bulgaria, Romania and Azerbaijan, and a few also winter in Pakistan. The resident Spanish population numbers in the low thousands, but has been seriously affected by competition and hybridization with the introduced ruddy duck (Kear, 2005). A conservation action plan for the species has recently been published (Anonymous, 2006c).



**Maccoa Duck.** Johnsgard & Carbonell (1996) have documented the biology of this African stiff-tail, and it was also described in detail by Brown, Urban & Newman (1982). Its total world population is probably 30,000–55,000 birds, about equally divided between eastern and southern Africa (Kear, 2005).

**Argentine Blue-billed Duck (Lake Duck).** Johnsgard & Carbonell (1996) have documented the biology and behavior of this Australian stiff-tail. Sometimes considered the Patagonian replacement form of *jamaicensis*, it is instead more closely related to the African maccoa duck (Johnsgard & Nordeen, 1981). Its total population may number in the range of 10,000–100,000 birds (Kear, 2005).

**Australian Blue-billed Duck.** This endemic Australian stiff-tail was described in detail by Marchant & Higgins (1990), and by Johnsgard & Carbonell (1996). Its total population probably numbers no more than 10,000 birds (Kear, 2005). The inked areas on the range map indicate regions of densest populations.

**Musk Duck.** This endemic Australian stiff-tail was described in detail by Marchant & Higgins (1990) and by Johnsgard & Carbonell (1996). Kear (2005) followed the recommendation of Sraml *et al.* (1996) that this species should be transferred from the stiff-tails to the whistling duck tribe Dendrocygnini, based largely on molecular data. However, the musk duck shares many behavioral and anatomical similarities with the stiff-tailed ducks; their unique features are in my view largely caused by the effects of sexual selection within what is basically a lek-mating breeding system (Johnsgard, 1994; Johnsgard & Carbonell, 1996). No total population estimates are available. The inked areas on the range map indicate regions of densest populations.

## Pp. 387–400: Supplemental Literature Citations

Most of the following citations are more recent than this book's publication date of 1978, but a few earlier ones are included were among the book's original citations, usually because they have been mentioned above. For the most comprehensive available survey of post-1978 Anatidae literature, see Kear (2005).

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