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## PRELIMINARY NOTE ON THE TAXONOMY OF CANADA GEESE, *BRANTA CANADENSIS*

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The white-cheeked geese, popularly known as Canada Geese, pose difficult problems that have not yet been completely solved. They vary only slightly in general pattern, moderately in color, but so considerably in size and relative proportions that the largest as well as the smallest of all geese are found within their numerous subspecies. A few conspicuous features prove to be of little or no diagnostic importance; such is the occurrence of a black band, or spots on the throat, and of minute black specks on the cheeks. A more or less complete white ring at the base of the neck is without taxonomic significance in several forms, but it is always present in the Pacific island forms, and usually wanting in the eastern ones.

Although Canada Geese have been perhaps more carefully watched, studied, and hunted than any other waterfowls, we are still very far from understanding fully their variations. This is due to two reasons. First, series of breeding specimens are wanting from many parts of their breeding range, which remain difficult of access, and we still ignore the true identity of a number of populations, some of which have already been exterminated. Second, *Branta canadensis* shows to the greatest possible degree the various complications that often make the taxonomy of geese so confused: great individual variation in color and size; complicated post-breeding and winter migrations, causing the mixing of non-breeding birds of several subspecies; a tendency of individuals or small groups to stray far from their normal quarters and to wander in the summer; strong family ties which prevent interbreeding and mingling, making it possible for two well-characterized subspecies to breed in close proximity without mixing, and to remain isolated from each other. Two such cases occur, one in western Alaska, the other on peninsulas and islands

north of Hudson Bay. It does not seem, however, that they warrant the recognition of distinct species. Once again we probably face instances of two subspecies coming exceptionally into touch on narrow bordering areas after a long isolation, which is maintained because of internal factors. Such cases are not very uncommon, being found, for example, in *Branta bernicla* and *Parus major*.

On the contrary, evidence supplied by some breeding specimens, and many more migrating or wintering ones, shows that other subspecies interbreed in numerous border areas, producing intermediate individuals and unstable populations which we are not yet in a position to appreciate with any great degree of accuracy.

Another factor of great importance in the distribution of geese is the intervention of predators, particularly man. Various populations have changed repeatedly their nesting grounds and wintering quarters as a result of egg stealing and excessive killing. This has complicated distributional problems to a considerable degree.

In the present still unsatisfactory state of our knowledge, we can only indicate some general tendencies and recognize a limited number of sufficiently well-characterized subspecies occupying definite breeding territories. It has been proved by Hanson and Smith that the large inland form *B. c. interior* is composed of four distinct populations, having their particular breeding range and flyways. It is highly probable that more subspecies could be named if adequate series of breeding birds and better records of their habits were available. As in other geese, differences in behavior, voice, and aspect (particularly the relative proportions of the body, neck, bill, and legs, often very difficult to detect on skins) are striking in live birds, the study of which is absolutely indispensable for forming a clear opinion.

All we can now say is that, generally speaking, there is a cline from north to south; very small birds nest in the arctic tundra while large ones breed in the wooded or prairie regions to the south. Dark birds are found on the Pacific shores, and light ones in eastern America. The short-billed, short-necked forms of the tundra intergrade with the larger forms breeding farther south in several parts of the western half of the range, as a number of intermediates indicate. They do not appear to mingle to any significant extent in the east.

The degree of characterization of the different forms, their distribution, and their tendency to intergrade, or not, have no doubt been influenced by ancient climatic and other changes which have modified living conditions.

Several important contributions have recently increased considerably our knowledge of Canada Geese, particularly those of Aldrich (1946) and Conover (1948); those of particular importance after Aldrich's paper are listed at the end of this study. For descriptions and details, I refer readers to their works.

My greatest asset, however, has been the enormous documentation accumulated by the late James Moffitt, of San Francisco, which has been made available to me. Moffitt had dedicated 10 years to a patient and careful investigation of all forms of *Branta canadensis* in preparation of an exhaustive monograph of the species, which I hope to complete and edit in the future. The multitude of critical notes and measurements, the annotated lists of all the specimens preserved in the principal museums in America which he had visited, and his correspondence with a number of well-informed ornithologists, field workers, and sportsmen constitute a priceless and so far untapped source of information. His understanding of the birds is illuminating, and it has allowed me to form an opinion on several points which could not have been elucidated otherwise.

The last word on the taxonomy of Canada Geese will be said only when all the breeding populations have been carefully studied; this is not yet in sight, but I venture to offer here the most important conclusions that I have been able to reach.

I recognize at present one species, *Branta canadensis*, with 12 subspecies, although, as I have said before, others may have to be accepted later. I have had little to add or to alter to Moffitt's conclusions. I differ from Conover only in admitting one species instead of four, and in accepting three additional subspecies, being in general agreement with him as to the range and nomenclature. As to Aldrich's taxonomy, I am in accord with much of it, but I differ on some details of distribution; I cannot accept either two species, as he proposes, or the alleged existence of two different forms breeding on Bering Island on the evidence of a single specimen that is somewhat larger than the other four available ones. It is wiser, I think, to allow for an individual variation in the size of that population, which does not exceed what is often found in other subspecies. The Commander and Kurile Islands popula-

tions, apparently extinct since 1914, were the only ones found breeding on theoretically Asiatic ground. They do not seem to differ greatly from the near-by Aleutian birds (*leucopareia*), also now perhaps exterminated, but as the five Bering Islands specimens are all distinctly lighter in color, I accept for them, with some reservation, the subspecies *asiatica*. These island geese can be distinguished from the neighboring mainland forms by a distinct white collar ring, always present, and a somewhat differently shaped bill, narrow and tapering towards the tip, with a long, pointed nail. The Aleutian subspecies very likely intergraded with a larger form on the Alaska Peninsula.

The very small, dark, and purplish *minima*, confined to the shore tundra of western Alaska, does not seem to intergrade or mingle with a bigger and lighter form between the Kuskokwin River and the vicinity of Wainwright, the larger bird breeding farther inland, although sometimes in close proximity, in a different habitat, and building a different nest (Brandt). But from Wainwright to Point Barrow, intermediates and mixed pairs have been found (Bailey).

Farther east and in the interior, we may suppose, although we still lack adequate evidence of it, that Lesser Canada Geese of two subspecies exist and intergrade. Their breeding grounds, scattered throughout the inland tundra and barren grounds, are still incompletely recorded. These two subspecies consist of a number of more or less isolated populations and appear to vary a great deal; we know very little about them yet.

There do not seem to be any shore tundra geese between Barrow and the Melville Peninsula, but around the northern part of Hudson Bay, another very small shore tundra goose reappears along the sea, while the bigger one breeds farther inland, but in close proximity just as in western Alaska. The exclusively coastal forms rarely interbreed and mingle with the more interior forms as the latter do between themselves to a very great extent.

The Canada Goose occupies the whole Nearctic region, breeding in the northern parts, south to northeastern California, Nevada, Utah, and Colorado, South Dakota, Nebraska, Indiana, east to the Gulf of the St. Lawrence and Newfoundland. It trespasses into Asia on the Commander and Kurile Islands, and it also occasionally nests in western Greenland. Its breeding range no doubt extended farther south formerly, before settlement destroyed the local populations, probably to New Mexico, northern Kansas,

northwestern Arkansas, western Tennessee, and North Carolina, a vast zone in which pairs now exceptionally are found nesting, but it is difficult to ascertain whether these are genuinely wild or reintroduced birds. They winter from British Columbia, Wyoming, South Dakota, southern Wisconsin, Ohio, southern Ontario, Maine, and Nova Scotia, south to Mexico, the Gulf coast states and Florida, and are accidental elsewhere (Hawaii, Bermuda, Jamaica, etc.)

### ***Branta canadensis canadensis***

*Anas canadensis* LINNAEUS, 1758, *Systema naturae*, ed. 10, p. 123—Canada, restricted to city of Quebec (Todd).

Breeds in southeastern Baffin Island, eastern Labrador, Newfoundland, Anticosti and Magdalen Islands; formerly south to North Carolina. Winters along the Atlantic coast from New Brunswick to Georgia.

### ***Branta canadensis interior***

*Branta canadensis interior* TODD, 1938, *Auk*, vol. 55, p. 662—Port Harrison, Hudson Bay (east coast).

Breeds in western Labrador, northern Quebec, Ontario, and Manitoba around Hudson and James bays, south to about longitude 52° N., north to Churchill in the west and Hudson Strait in the east; probably farther south formerly. Intergrades with *canadensis* in the east and *moffitti* in the west. Winters from southwest Ontario, Michigan, Wisconsin, Minnesota, and Illinois south to the Atlantic, and the Gulf coast to Louisiana.

### ***Branta canadensis maxima*, new subspecies**

Similar in color to *B. c. moffitti*, pale and grayish, the upper parts buffy brown, the under parts very light, but larger and heavier (14 to 18 pounds against 8 to 13 pounds), and more elongate in shape, the neck, bill, tarsus, and middle toe considerably longer. Differs from *B. c. canadensis* in its larger size and more elongate shape, and in its paler, more even plumage, less conspicuously barred above; the under parts more uniform, the base of the hind neck and upper back not whiter than the rest; a white ring at the base of the neck often present (as in type specimen).

TYPE: Male, A.M.N.H. No. 79568, collected at Round Lake, Grant County, Minnesota, April 22, 1876, by Geo. B. Sennett.

MEASUREMENTS: Wing, 535; tail, 148; culmen, 69; tarsus, 100; middle toe, 106 mm.; 10 other males (Minnesota, North Dakota, Missouri, Nebraska, Kansas): wing, 495–535; culmen, 60–68; tarsus, 92–106; middle toe, 94–107 mm.; five females (Minnesota, North Dakota): wing, 480–502; culmen, 55–60; tarsus, 91–95; middle toe, 96–102 mm.

Bred in the great plains of the central United States, in the Dakotas, Nebraska, Kansas, Minnesota, Iowa, Missouri, western Kentucky, Tennessee, and northern Arkansas, where it was sedentary; now extinct. It was well known to sportsmen and market hunters during the last century (see W. B. Mershon, 1925, *Field and Stream*, May, pp. 26–27). Moffitt has listed 20 specimens in the various museums in the United States, and there are four downy chicks collected at Mud Lake, Marshall County, Minnesota, May 28, 1891, in the American Museum; and one from Sogan, North Dakota, May 28, 1886.

The Giant Canada Goose is named *maxima*, as J. Moffitt has indicated in his manuscript notes.

### ***Branta canadensis moffitti***

*Branta canadensis moffitti* ALDRICH, 1946, *Wilson Bull.*, vol. 58, p. 97—Blue Lake, near Coulee City, Washington.

Breeds in the Great Basin region between the Rocky Mountains and the eastern parts of the Pacific states, from northern California to central British Columbia, east to southwest Manitoba, Utah, Nevada, and Colorado. Winters from southern British Columbia and northwestern Wyoming to California and the Gulf of Mexico. Intergrades with *parvipes* and *interior*.

### ***Branta canadensis parvipes***

*Anser parvipes* CASSIN, 1852, *Proc. Acad. Nat. Sci. Philadelphia*, p. 187—Vera Cruz, Mexico.

Breeds in the treeless interior of eastern Alaska and Canada, including Southampton Island and the western part of Baffin Island, occasionally west Greenland, always away from the sea coast. Winters from Texas to Louisiana and Mexico. Distribution probably spotty, scattered throughout a large area, and yet insufficiently investigated; intergrades with other subspecies to an unknown extent.

***Branta canadensis taverneri*, new subspecies**

Resembles *B. c. parvipes*, but smaller; coloration variable, usually light as in *parvipes*, sometimes deeper; a small, usually incomplete white neck ring often present; bill short and high at the base, but broad near the tip, with a small rounded nail. It differs in the last characteristic from the otherwise closely similar *B. c. leucopareia* from the Aleutian Islands, which has a tapering bill and a long, pointed nail, and also always shows a complete, usually broad white neck ring. Size and proportions highly variable.

TYPE: Male, A.M.N.H. No. 350147, collected at Colusa, California, December 4, 1913, by H. W. Marsden.

MEASUREMENTS: Wing, 418; tail, 131; culmen, 37; tarsus, 82; middle toe, 76 mm.; 34 other males (Alaska, California): wing, 387–424; culmen, 32–38; tarsus, 70–82 mm.; 27 females: wing, 365–401; culmen, 30–38; tarsus, 66–78 mm.

Breeds in north and northwestern Alaska, a certain distance (10–12 miles) from the coast much as *parvipes* does farther east, from the base of the Alaska Peninsula east probably to the Mackenzie River delta; it intergrades with *B. c. minima* in the Wainwright region (Bailey) but not along the Bering Sea; also with *B. c. occidentalis* in southern Alaska (Conover, Brandt) and with *B. c. parvipes* in eastern Alaska (as shown by intermediate specimens), but distribution and variations are still imperfectly known. Winters from Washington to Texas and Mexico, mostly in the Sacramento and other large Californian valleys.

Named in honor of the late P. A. Taverner of Ottawa, the author of an excellent study of Canada Geese, according to Moffitt's manuscript indication. So far generally confused with *B. c. leucopareia*.

***Branta canadensis fulva*, new subspecies**

Resembles *B. c. occidentalis*, but distinctly larger, and of a less dark brown, more fulvous color, the pale borders of the feathers broader, lighter, and more conspicuous; no white neck ring as a rule; bill decidedly longer and somewhat flatter. This subspecies is practically as large as *canadensis* and *moffitti*, with a slightly smaller bill and longer legs.

TYPE: Male, A.M.N.H. No. 350141, collected at Graham Island, Queen Charlotte Islands, British Columbia, April 2, 1917, by J. A. Munro.

MEASUREMENTS: Wing, 482; tail, 142; culmen, 54; tarsus, 91; middle toe, 89 mm.; 31 other males (Vancouver, Queen Charlotte Islands, Alexander Archipelago, southern Alaska): wing, 440–513; culmen, 49–59 mm.; 17 females: wing, 432–457; culmen, 48–59 mm.

Resident on the islands and along the coast of British Columbia and southern Alaska, from the north of Vancouver Island to Glacier Bay. So far confused with *B. c. occidentalis*, although long ago Californian ornithologists indicated that the Prince William Sound population differed from those breeding farther south. Joseph Grinnell (1910, Univ. California Publ. Zool., vol. 5, p. 373) writes: "The Prince William Sound geese are still darker, even, than the Sitkan district birds, with abruptly white belly and crissum... It will be noted from the accompanying table of measurements that the Prince William Sound birds are decidedly smaller than the Sitkan district examples... Taking both coloration and size into account, the systematic status of these birds is decidedly unsatisfactory. I am using the name *occidentalis* for them only as a makeshift." The next year Swarth (1911, Univ. California Publ. Zool., vol. 7, p. 47) says: "As Grinnell... has already pointed out, the geese of the Sitkan district do not at all accord with the description of *occidentalis* as currently given."

### ***Branta canadensis occidentalis***

*Bernicla occidentalis* BAIRD, 1858, Reports of explorations and surveys for a railroad from the Mississippi to the Pacific Ocean, Birds, vol. 9, p. 766—Port Townsend, Washington.

Breeds around Price William Sound, Alaska, and perhaps farther south and north, intergrading with *B. c. taverneri* inland as shown by intermediate specimens, particularly four collected 30 miles inland from the Copper River Station, which are large, but fairly light in color; and with *B. c. leucopareia* in the northwest, as three birds from Pavlov Bay, western Alaska Peninsula, are intermediate in size, although nearer to *leucopareia* in color and in the shape of the bill. Winters (at least in part) south to Oregon, as proved by the type and other specimens collected from Sitka to Port Townsend. The wing varies between 396 and 465 mm., the culmen, between 41 and 48 mm.

The type of *B. c. occidentalis* is a fairly small (wing, 463 mm.), dark, and very reddish bird of unknown sex, with a short culmen

(43 mm.). It has a narrow, very incomplete white ring on the fore neck, rare among Pacific coast birds. It agrees generally with breeding birds collected in the Prince William Sound region.

### ***Branta canadensis leucopareia***

*Anser leucopareius* BRANDT, 1836, Bull. Sci. Acad. Saint Pétersbourg, vol. 1, p. 37—Unalaska, Aleutian Islands.

Bred in the Aleutian Islands; probably now extinct. Wintered in Japan and from British Columbia to California.

### ***Branta canadensis asiatica***

*Branta canadensis asiatica* ALDRICH, 1946, Wilson Bull., vol. 58, p. 95—Bering Island.

Bred on the Commander and north Kurile Islands; now extinct. Wintered in Japan.

### ***Branta canadensis minima***

*Branta canadensis minima* RIDGWAY, 1885, Proc. U.S. Natl. Mus., vol. 8, p. 22—Pacific coast of North America; Saint Michaels, Alaska.

Breeds on the shores of western Alaska, from Nushagak Bay to the vicinity of Wainwright, where it intergrades with *B. c. taverneri*, while it does not appear to intergrade in the rest of its range; absent from Seward Peninsula. Winters from British Columbia to California, mainly in the Sacramento and other large valleys.

### ***Branta canadensis hutchinsi***

*Anser Hutchinsii* RICHARDSON, 1832, in Swainson and Richardson, Fauna Boreali-Americana, vol. 2, p. 470—Melville Peninsula, Canada.

Breeds on the shores of the Melville Peninsula, Southampton, Baffin, Ellesmere, and probably other arctic islands, occasionally in west Greenland. Winters in Texas and Mexico.

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