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### What are Blue Ross's Geese?

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The existence of blue morph ("phase") Ross's Geese (*Chen rossii*) was first well documented by McLandress & McLandress (1979). They reported on several blue-morph birds seen and collected in California and Canada that morphologically appeared to be pure Ross's Geese and on others with intermediate traits that appeared to be hybrids with Lesser Snow Geese (*Chen caerulescens caerulescens*). They also noted that in the California wintering grounds counts held during 1976-77 there were only 3 blue morphs (0.008 percent) among the 38,825 Ross's Geese counted. At that time, only 0.02 percent of the Lesser Snow Geese wintering in California were blue morph, but sightings of blue-morph geese from central Canada were by then already slowly increasing in frequency (Dzubin 1979). Blue-morph Lesser Snow Geese currently represent about 25 percent of the Central Flyway flock of several million Lesser Snow Geese (Johnsgard 2012).

At the same time, Ross's Geese have expanded their breeding range eastwardly across Hudson Bay, and now probably comprise at least two percent of the mixed Snow/Ross's Goose flocks that migrate through Nebraska (Johnsgard 2012). Assuming that about 4.6 million Snow Geese were in the mid-continent flock during the 2013 winter surveys (U. S. Fish & Wildlife Service 2013), there might be at least 90,000 Ross's Geese in the Central Flyway, and there may be far more. In the west-central population of 725,000 "light geese" that passes through the high plains, nearly a third counted during the 2013 winter survey were Ross's Geese.

McLandress & McLandress (1979) suggested that those birds intermediate in body size and bill structure with blue-morph Lesser Snow Geese are probably the result of hybridization (Table 1). As in Lesser Snow Geese, blue plumage coloration in Ross's Geese is likely controlled by a dominant gene. Thus, blue-plumaged birds having typical Ross's Goose morphology might have resulted from back-crossing, or from recurrent mutations associated with a presumed polymorphic common ancestor of Ross's and Snow Geese. (Cooke and Cooch 1968)

Among a sample of nearly 12,000 Ross's Geese and Lesser Snow Geese from Canada and the U.S., Trauger et al. (1971) identified 32 morphologically intermediate birds. Using various population data, they estimated that 0.2-4.8 percent of the Ross's Geese in the Mississippi and Central Flyways might be hybrids. Later studies (1989-1992) suggest that the incidence of hybrids among Ross's Goose flocks is about 1.9 percent (Ryder and Alisaukis 1995).

Table 1. Measurements of Ross's Geese, Intermediates and Lesser Snow Geese.

Taxon	Sample	Culmen, mm. (avg.)	Wing, mm. (avg.)*	Source
Ross's Goose				
Adult Male	47	37-46 (41)	371-411 (394.8)	Trauger, et al., 1971
Adult Female	32	34-41 (38.5)	362-391 (376.0)	Trauger, et al., 1971
Ross's Goose (Blue)				
Adult Male	1	41.1	380	McLandress & McLandress, 1979
Intermediate				
Adult Male	4	40-48 (45.1)	414-419 (415.8)	Trauger, et al., 1971
Adult Female	4	45-50 (46.6)	382-404 (393.5)	Trauger, et al., 1971
Lesser Snow Goose				
Adult Male	32	53-61 (56.2)	428-474 (449.0)	Trauger, et al., 1971
Adult Female	36	50-59 (53.5)	438-461 (430.2)	Trauger, et al., 1971

\* Measurements are from flattened wings

The recent eastward expansion of nesting by Ross's Geese has increased breeding contacts with Lesser Snow Geese. By 2005, about 1,500 pairs of Ross's Geese were nesting on the western coastal tundra of Hudson Bay south of Cape Churchill, Manitoba, (now part of Wapusk National Park). The colony is now surrounded by nesting Lesser Snow Geese, and some mixed pairings have been observed. Furthermore, many clutches having eggs of both species have been found in various nesting areas used by both species (Trauger et al. 1971), the offspring of which might possibly imprint on and later mate with the "wrong" species.

Assuming hybrid matings are similar to matings within the species, it is likely that there are preferential matings among birds of the same plumage type in hybrid matings. In the Manitoba Lesser Snow Goose colony, where about 30 percent of the birds are blue-morph, random mate choice should result in 42 percent of the matings occurring between mixed-morph birds, whereas the actual incidence is 15 percent (Rockwell et al. 2009). Such same-morph mating preferences would presumably reduce the frequency of blue-morph hybrids to less than half of random expectations. Assuming 1.9 percent of Ross's Geese on mixed-species breeding grounds are hybrids, and that preferential same-morph mating occurs as in Lesser Snow Geese, blue-phase hybrids might thus be expected to result from about 15 percent of these mixed pairings, producing about three blue-morph hybrids per thousand Ross's Geese. Of course not all nesting grounds of Ross's Geese are of mixed-species composition, so the actual incidence is much lower.

At least two sightings of blue-morph Ross's Geese have been reported in Nebraska: one seen near Pierce in March of 1994 (Gubanyi 1996) and one in Stanton County in February, 1998, (Sharpe et al. 2001). There is also at least one South Dakota record of a blue-morph Ross's Goose and one of an apparent hybrid (Tallman et al. 2002). There are few other regional records, although David Trauger captured a probable hybrid in northwest Missouri during 1967 (Trauger et al. 1971), and I photographed an apparent white-morph hybrid among a flock of Lesser Snow Geese at Missouri's Squaw Creek National Wildlife Refuge in 2012.

One conspicuous plumage feature of purported blue-morph Ross's Geese is that the neck, back and scapular feathers are brownish black, with black foreneck feathers extending up to the throat and on the hindneck to the top of the crown, sometimes leaving only a white chin patch similar to that of a Canada Goose (*Branta canadensis*). This blackish dorsal color contrasts sharply with a (usually) white belly, hindquarters and wing-coverts, and with conspicuously white-edged secondary and tertial feathers.

The National Geographic and Sibley field guides similarly illustrate blue-morph Ross's Geese as having darker neck, back and breast coloration than do typical (homozygotic) blue-morph Snow Geese, but with contrasting white underparts. Some of the birds illustrated on the internet exhibit more dusky underparts, which might suggest that their Snow Goose parentage was homozygous for the blue gene, rather than being of the heterozygous (white-bellied) phenotype.

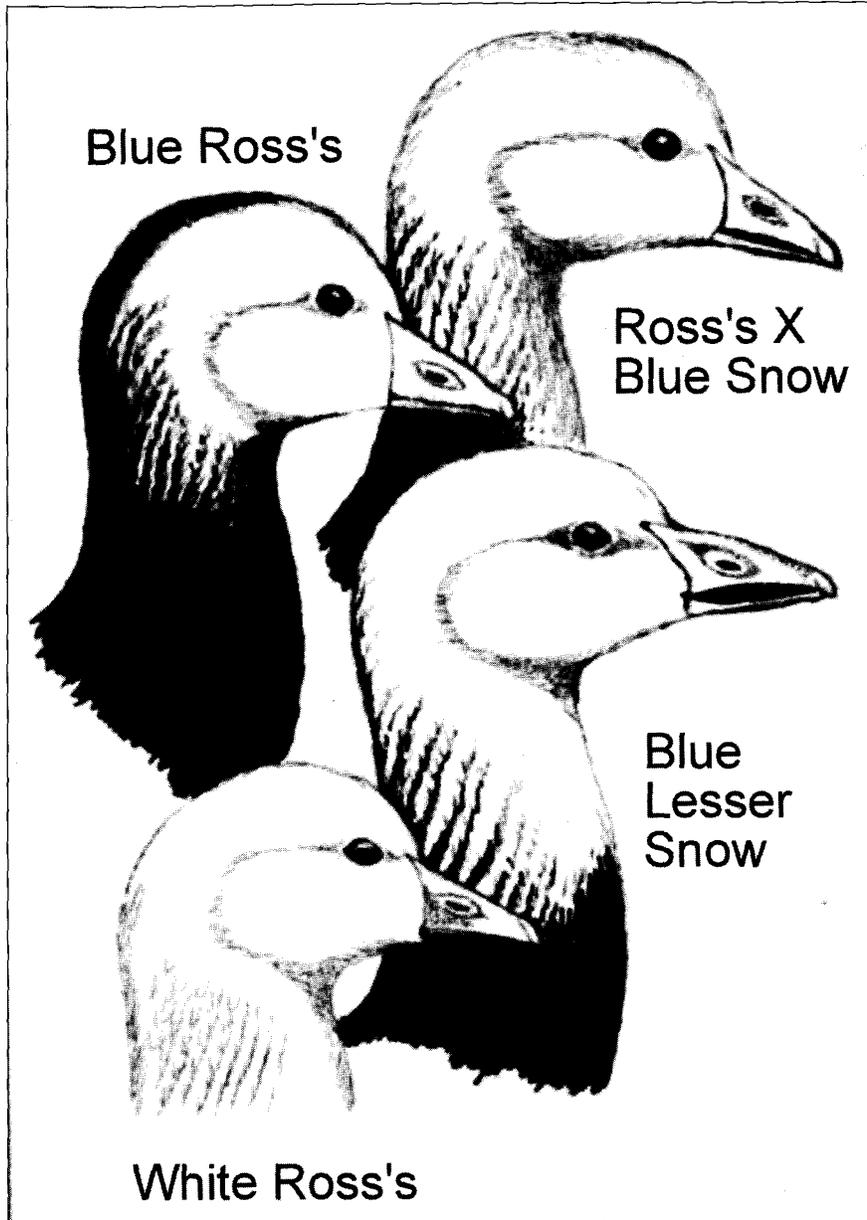


Figure 1. Adult plumage of blue-morph Ross's Goose (top left), showing dark foreneck feathers extending up to chin and dark hindneck feathers extending to top of crown, with little or no "grin patch" on stubby bill; white-morph Ross's Goose (bottom left); hybrid Ross's Goose x blue-morph Lesser Snow Goose (top right), showing less white on throat and crown and intermediate-sized "grin patch"; and blue-morph Lesser Snow Goose (bottom right), showing white throat and crown, wide "grin patch". Drawing by Paul Johnsgard, based on photos and specimens.

Photos of many putative blue-morph Ross's Geese that have been posted on the internet (<http://www.oceanwanderers.com/BlueGoose.html>) indicate that the bill structures of these birds are essentially identical to those of typical Ross's Geese, lacking black "grinning patches" along the mandibular junctions, and having a bluish gray and variably caruncled bill surface. By comparison, in presumptive hybrids the bill has a narrow black "grinning patch", and is smooth and only slightly grayish basally. The accompanying drawing (Fig. 1) is based on a variety of photographic sources, and is drawn to scale.

Because of the rapidly increasing abundance of Ross's Geese in the mid-continent light goose population (U.S. Fish & Wildlife Service 2013), there are ever-greater chances of Nebraska birders encountering probable white-morph hybrids, or blue-morph birds closely resembling Ross's geese. Future field observations should provide some clues as to what is occurring in this dynamic genetic and evolutionary phenomenon.

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