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First Report of a Snow Bunting × Lapland Longspur Hybrid

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ABSTRACT. In late April 2011, photographs of an apparent male snow bunting (*Plectrophenax nivalis*) × Lapland longspur (*Calcarius lapponicus*) hybrid were taken at St. Lewis Inlet, Newfoundland and Labrador, Canada, while the bird was foraging in a mixed flock of both species along a previously documented spring migratory route. As far as we are aware, this is the first hybridization of these species documented anywhere in the world. The bird was identified as a male on the basis of longspur nape coloration, and it appears to have the head, beak, and back coloration and patterning of a Lapland longspur, but the chin, chest and throat, and overall appearance of a snow bunting. Although our research team has banded more than 50 000 birds of both species over the past 30 years across the latitudinal range of both species, we have never observed such a hybrid. While these Arctic-breeding species overlap spatially and temporally during wintering, migration, and breeding, longspurs and buntings have distinct sexual characters and breed in different ecological niches, which may account for the reproductive isolation or low rates of hybridization of these species. While we were unable to conduct detailed morphological or genetic comparisons on this particular individual for phylogenic interpretation, this report highlights the importance of reporting field observations that may indicate ecological changes affecting the hybridization rates of these inaccessible Arctic species.

Key words: snow bunting, *Plectrophenax nivalis*, Lapland longspur, *Calcarius lapponicus*, avian hybrid, Arctic passerine

RÉSUMÉ. Vers la fin avril 2011, des photographies de ce qui ressemblait à un hybride de plectrophane des neiges mâle (*Plectrophenax nivalis*) et de plectrophane lapon (*Calcarius lapponicus*) ont été prises à l'anse St. Lewis, dans la région de Terre-Neuve et Labrador, au Canada. L'oiseau s'affairait à manger au sein d'une bande mixte composée des deux espèces le long d'une voie migratoire printanière connue. En autant que nous le sachions, il s'agit de la première hybridation de ces espèces à n'avoir jamais été répertoriée dans le monde. D'après la coloration de la nuque du plectrophane, il s'agirait d'un mâle. Cet oiseau semble aussi avoir une coloration et une typification de tête, de bec et de dos de plectrophane lapon, mais son menton, sa poitrine et sa gorge de même que son apparence générale sont celles d'un plectrophane des neiges. Même si notre équipe de recherche a bagué plus de 50 000 oiseaux des deux espèces dans le parcours de cette latitude ces 30 dernières années, nous n'avons jamais eu l'occasion d'observer un tel hybride. Bien que ces espèces nicheuses de l'Arctique se chevauchent dans le temps et dans l'espace en matière d'hivernage, de migration et de reproduction, le plectrophane lapon et le plectrophane des neiges ont des caractères sexuels distincts et se reproduisent dans des niches écologiques différentes, ce qui pourrait expliquer l'isolement reproductif ou les faibles taux d'hybridation de ces espèces. Même si nous n'avons pas été en mesure d'effectuer des comparaisons morphologiques ou génétiques détaillées chez cet individu à des fins d'interprétation phylogénique, le présent rapport fait ressortir l'importance de signaler les observations sur le terrain susceptibles de mettre en évidence les changements écologiques qui exercent une influence sur les taux d'hybridation de ces espèces inaccessibles de l'Arctique.

Mots clés : plectrophane des neiges, *Plectrophenax nivalis*, plectrophane lapon, *Calcarius lapponicus*, hybride aviaire, passereau de l'Arctique

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INTRODUCTION

The family Calcariidae consists of the genera *Calcarius*, *Rhyncophanes*, and *Plectrophenax*, forming a highly supported evolutionary group or "clade" composed of three sub-clades: a "collared" longspur clade of *Calcarius lapponicus*, *ornatus*, and *pictus*; a "snow bunting" clade comprising two *Plectrophenax* species (*nivalis* and *hyperboreus*); and one *Rhyncophanes* longspur species (*mccownii*) (Klicka et al., 2003; Alström et al., 2006; Chesser et al., 2010). Hybridization has been reported among the longspurs (e.g., *R. mccownii* × *C. ornatus*; Sibley and Pettingill, 1955), as well as between the closely related *Plectrophenax* species (Sealy, 1969; Maley and Winker, 2010; references

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in McCarthy, 2006). There are also reports of fertile eggs being produced (no hatched hybrids) from a cross of an Emberizidae species (yellowhammer – *Emberiza citrinella*) and *P. nivalis* (Fitzpatrick, 1951 in McCarthy, 2006) even though longspurs and buntings are no longer considered to be closely related to the Emberizidae (Chesser et al., 2010). The lack of reported *Calcarius* × *Plectrophenax* hybrids may be due to the limited overlap of their breeding ranges and nesting microhabitats. For example, *C. ornatus* and *R. mccownii* breed in the North American Great Plains, while *C. lapponicus*, *C. pictus*, and *Plectrophenax* sp. are Subarctic- and Arctic-breeding species (Klicka et al., 2003; Alström et al., 2006). These Subarctic- and Arctic-breeding species overlap spatially and temporally during wintering, migration, and breeding. However, longspurs select open tundra grassland, while buntings prefer rocky tundra substrate. Moreover, within these niches, they often select different nesting microhabitats (open cup nests within grassy hummocks for longspurs vs. concealed nests in rock crevices for buntings; Hussell and Montgomerie, 2002; Montgomerie and Lyon, 2011). Lapland longspurs and snow buntings show similarities in a number of natural and life history traits: male song characteristics and singing behavior, pronounced hatching asynchrony, bi-parental feeding of offspring, reliance on a brief emergence of Chironomid insects to feed offspring, and a single successful breeding attempt per year given the short summer season in the Arctic (Hussell and Montgomerie, 2002; Montgomerie and Lyon, 2011). Nonetheless, a hybridization of *C. lapponicus* and *P. nivalis* has never been reported.

Here we describe the first reported hybrid between a Lapland longspur (*C. lapponicus*; Fig. 1a) and a snow bunting (*P. nivalis*; Fig. 1b). The hybrid (Fig. 1c–f) was photographed while it was foraging in a mixed flock of both species at a migratory stopover site in St. Lewis Inlet, Newfoundland and Labrador, Canada in April 2011.

METHODS

On 29 April 2011, an unusual-looking bird, superficially similar to a snow bunting, was photographed by T. Martin in the coastal town of St. Lewis Inlet, Labrador (55° 22′ N, 55° 41′ W), while the bird was foraging with a mixed group of snow buntings and Lapland longspurs (Fig. 1). The bird had the overall appearance of a snow bunting, but several of its characteristics were consistent with those of a male Lapland longspur. Using these photographs, we evaluated the potential hybrid according to a list of plumage characteristics that are used in field identification to distinguish snow buntings from Lapland longspurs (see Table 1). We also considered the appearance of a partially albinistic or leucistic individual, as well as sexually dimorphic plumage traits of these species, for comparison with the potential hybrid.

RESULTS AND DISCUSSION

Although the potential hybrid had the overall appearance of a snow bunting, Lapland longspur characteristics of this bird are quite obvious, particularly in the head, back, and nape patterning (Fig. 1c–f). To argue that it is a snow bunting × Lapland longspur hybrid, it is first necessary to establish that the individual is not a partially albinistic (i.e., reduction in melanin) longspur. The first argument against partial albinisim is that the plumage pattern is symmetrical, since partial albinos often show uneven patterns of white whereas the potential hybrid shows uniform and bilateral plumage patterning. Secondly, the legs and eyes of the potential hybrid are dark, whereas partial albinos have both pink legs and eyes (Terres, 1980). The second possibility is that the hybrid is a leucistic (sometimes referred to as pied or piebald) Lapland longspur. Leucism is characterized by a reduction in all types of integument pigmentation, not melanin alone as in albinism (Terres, 1980). The tail and back patterning are similar to those of a Lapland longspur, although the chestnut nape characteristic of a male longspur is somewhat faded, but black replaces the brown in the back (i.e., the back is darker than it would be in a leucistic Lapland longspur). From this information, we conclude that this bird is therefore likely a snow bunting × Lapland longspur hybrid.

This bird is almost certainly a male judging by the bright chestnut, unstreaked nape consistent with a male Lapland longspur, although it appears to have characteristics of both species (see Table 1). The lack of a black bib and the white in the wings are clear snow bunting characteristics, and the bird shows snow bunting exclusive characters in the chin, throat, chest, and general blackness of plumage that would be brown on a Lapland longspur. Moreover, although we do not have a photograph of an open wing, it appears that the primary coverts and secondary or inner primary feathers are partly white on both wings, showing patterns similar to those of a snow bunting. The hybrid was photographed foraging in a group of snow buntings together with a few Lapland longspurs. The idea that this bird is indeed a male and may show the behavior of a snow bunting is confirmed by the fact that female buntings had not yet begun to move through this stopover location (T. Martin, pers. obs.). Snow buntings (and to a much lesser degree, Lapland longspurs) show a sex-specific variation in the timing of migration: males initiate migration up to six weeks earlier than females (Montgomerie and Lyon, 2011).

St. Lewis Inlet is a previously known stopover site for both species during the northward (spring) migration to breeding grounds (T. Martin, pers. obs.). Snow buntings banded during the winter in southern Ontario have been resighted and recaptured at stopover sites between the St. Lawrence River, Quebec, and Newfoundland and Labrador on their way to breeding grounds in western Greenland

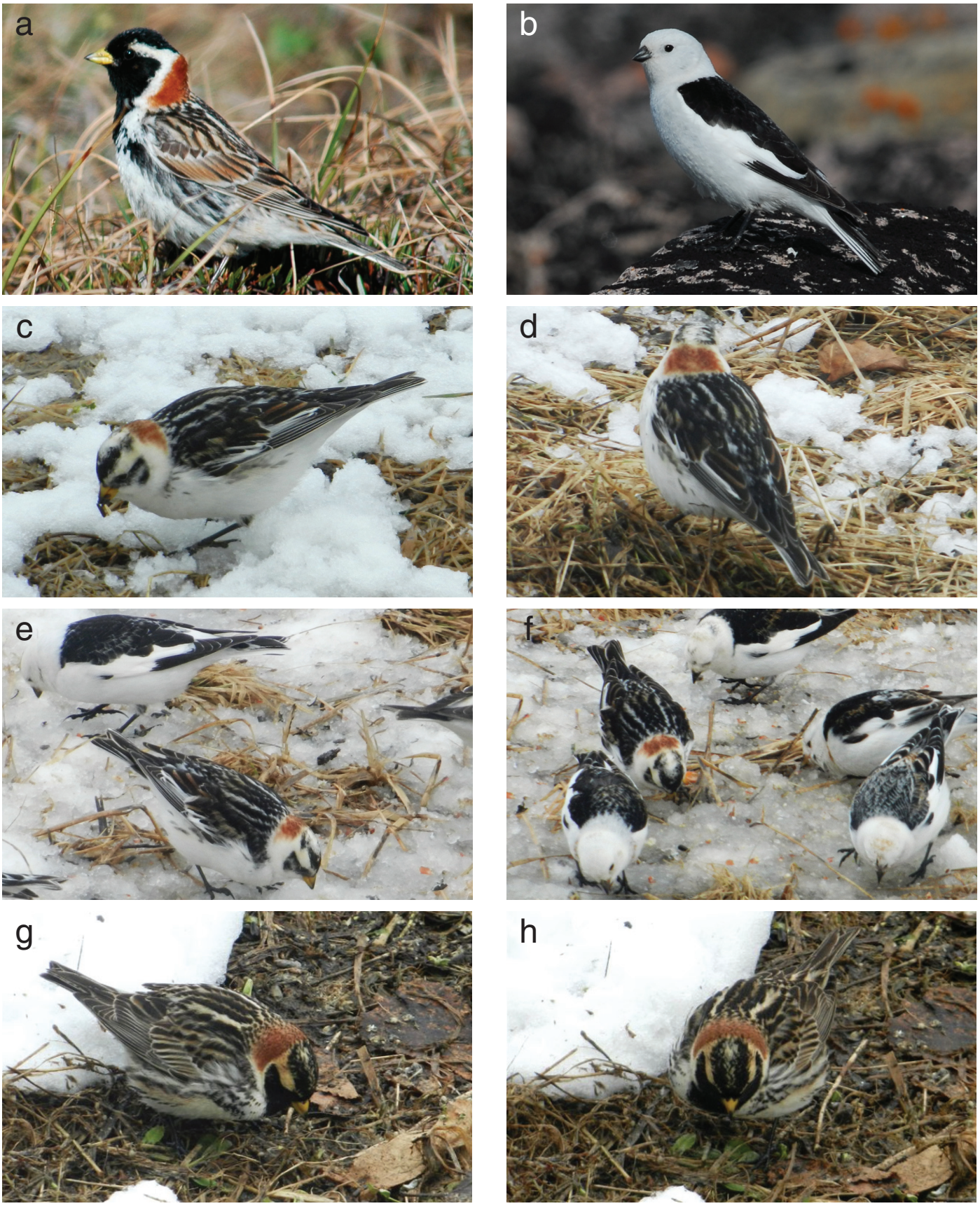

FIG. 1. (a) Adult male Lapland longspur (*C. lapponicus*) in breeding plumage. (b) Adult male snow bunting (*P. nivalis*) in breeding plumage. (c, d) Male snow bunting × Lapland longspur hybrid at stopover site. (e, f) Male hybrid with male snow buntings at stopover site. (g, h) Male Lapland longspur at stopover site. Photos: (a): © J. Shulters; (b): © S. Descamps; (c to h): © T. Martin.

TABLE 1. Summary of spring/summer phenotypic characteristics of the Lapland longspur (*C. lapponicus*), the snow bunting (*P. nivalis*), and the observed hybrid. Descriptions are based on Cramp and Perrins (1994), Hussell and Montgomerie (2002), Hussell (2004), and Montgomerie and Lyon (2011), as well as on the photographs in Figure 1 and additional photographs examined by the authors.

Character	Lapland longspur	Snow bunting	Hybrid
Forehead, crown	Black with small buffy tips and edgings to feathers. The latter broader on central and posterior crown forming faint median streak.	White	Black, with broad white median stripe on central and posterior crown, broader and more diffuse on posterior crown (Fig. 1c, e, f).
Cheek, lores	Broad pale yellowish supercilium, narrower above eye, narrower or absent in front of eye, extending over ear-coverts into a vertical bar on side of neck; (appears white in Fig. 1a, dark yellowish in Fig. 1g, h). Lores and cheek, black.	White	Broad white supercilium, narrower in front of eye and extending back to broad white vertical bar down side of neck. Black line through eye extending back to short vertical bar forming a partial cheek patch and border to the upper part of white bar on neck (Fig. 1c, e).
Nape	Broad rufous band across nape; feathers with dusky brown centers and few to many tipped with buffy yellow or black spots or smudges.	White	Rufous patch, smaller than on typical male Lapland longspur, on white background (Fig. 1d, f).
Back	Dusky brown to black, streaked with cinnamon, tawny and whitish feather edges. Two light streaks along center of back (Fig. 1g, h).	Black with white to whitish tips in fall and winter, changing to pure black in the breeding season.	Similar to Lapland longspur but blacker. Two light streaks on back like Lapland longspur (Fig. 1e, f).
Chin, Throat, Chest	Black. Some feather tips remain gray on some individuals	White	White (Fig. 1c, e)
Flanks	White streaked with black	White	White with obscure black streaks (Fig. 1c, e)
Wings	Mostly gray-black to dusky brown, with lighter buffy to yellowish edges. Leading edges of tertials and greater coverts give appearance of rufous wings when folded at rest (Obvious in Fig. 1a, but not in Fig. 1g, h.)	Large white patch across the wing formed by white lesser, median and mainly white greater coverts, secondaries and inner primaries. Outer primaries mostly black; more white at base of middle primaries.	Unclear, but at least some white in wing, which appears to be mainly on secondaries and primary coverts, similar to snow bunting. Rusty edges of tertials, similar to Lapland longspur (Fig. 1c, d, e).
Tail	Inner rectrices 1–4 brown thinly edged pale buff to rusty, R5 similar but with white wedge at tip, R6 mostly white.	Inner rectrices 1–2, black; R3, black with leading edge proximally white; R4–6, mostly white with varying amounts of black streaking at tips.	Unclear. Appears to be similar to Lapland longspur but blacker, with white in outer tail feathers (Fig. 1d, f).
Bill	Light brown to flesh gray with dark gray to black tip in winter, changing to dull pale yellow to orange with small black tip in the breeding season.	Pale yellowish orange, with dark tip in late summer, fall and winter, darkening to gray to black by late April.	Yellow with black tip, (Fig. 1c, e) similar to Lapland longspur in same flock (Fig. 1g, h).

(Brewer et al., 2006; Canadian Snow Bunting Network, unpubl. data). For example, of more than 11 000 snow buntings banded in southern Ontario between December 2010 and March 2011, four had already been encountered along this route by 30 April while on spring migration north (Canadian Snow Bunting Network, unpubl. data). In 2011, two of these resighted individuals were found at the same location where the hybrid in question was photographed (T. Martin, pers. obs.), suggesting that the potential hybrid used a similar migratory pathway and may even have wintered in the same geographic location.

Both male snow buntings and Lapland longspurs are known to force copulations on females of their own species (Hussell and Montgomerie, 2002; Montgomerie and Lyon, 2011). Recent phylogenetic analyses indicate that snow buntings and Lapland longspurs are currently separated within two sub-clades, last sharing a common ancestor between 4.2 and 6.2 million years ago (Klicka et al., 2003; Alström et al., 2006). However, Klicka et al. (2003) have still suggested considering that the entire *Calcarius*/*Plectrophenax* clade be collapsed down to the older generic epithet *Calcarius*, splitting *C. lapponicus* from the collared longspurs completely. The presence of the snow bunting × Lapland longspur hybrid could increase confidence in this idea, although hybrids are already known between more distantly related species in the Calcariidae family (i.e., *R. mccownii* × *C. ornatus*; Sibley and Pettingill, 1955). Although hybridization between non-sister avian species is well known (see Prager and Wilson, 1975), Klicka et al. (2003) have noted that the ability to hybridize should not be uncritically interpreted as evidence of close phylogenetic relationship.

Habitat alteration and climate-induced range expansions are thought to lead indirectly to increases in hybridization rates by providing areas of secondary contact among related allopatric species. Such increases in hybridization are thought to threaten species such as the golden-winged warbler (*Vermivora chrysoptera*, through hybridization with

the blue-winged warbler, *Vermivora cyanoptera*) and the arctic fox (*Vulpes lagopus*, through hybridization with the red fox (*Vulpes vulpes*) (see Hersteinssson and Macdonald, 1992; Rhymer and Simberloff, 1996). While snow buntings and Lapland longspurs occupy different nesting microhabitats, these habitats are distributed heterogeneously, and the two species exist in sympatry throughout most of their breeding range. It has been suggested that, in sympatric populations, sexual selection is a mechanism for reproductive isolation and evolutionary divergence, which are driven by differential habitat or niche partitioning. Thus, nest site microhabitat may be another factor contributing to the maintenance of reproductive isolation in these species (see Patten et al., 2004). Therefore, where habitat alteration leads to a breakdown of habitat barriers, hybridization may become increasingly prevalent (Hersteinssson and Macdonald, 1992; Rhymer and Simberloff, 1996). Climate change is thought to be contributing to complex changes in the vegetative composition of Arctic ecosystems (see Walker et al., 2006) that may reduce the distinction between breeding habitats, and thus the importance of breeding habitat preferences as a reproductive barrier for snow buntings and Lapland longspurs. While we cannot comment on the fertility or genetic identity of the reported hybrid, these observations may become increasingly important in the future for identifying possible mechanisms of population decline in these species.

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