Distribution, geographic variation, and taxonomy of *Lagopus mutus* in Greenland and northern Canada

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(Med et dansk resumé: Udbredelse, geografisk variation og taksonomi for Fjeldrypen i Grønland og det nordlige Canada)

Dedicated to Dr. phil. Finn Salomonsen on the occasion of his seventieth birthday, 31st January 1979

INTRODUCTION

Lagopus mutus (Rock Ptarmigan) is a holarctic species ranging from the High Arctic to the Alps in Europe and the Arctic region of North America as far south as central British Columbia and Newfoundland (A.O.U. 1957). The species is highly polytypic, with 22 nomenclatural subdivisions recognized by Vaurie (1965). Discussion of the morphological and geographical limits of some of the races of *L. mutus* has been complicated by the species' poor representation in most collections and by the extraordinary degree of individual and seasonal variation. Seasonal variation is particularly troublesome because *L. mutus* has three molts per year (Salomonsen 1939) and almost any specimen, regardless of when collected, has molting feathers.

Previous studies of the geographic variation of *L. mutus* in Greenland and northern Canada have led to diverse taxonomic conclusions. This, at least in part, is due to the lack of adequate comparative series from one or both of these regions. For example, although Salomonsen (1936) examined 83 specimens from Canada, he did not mention any specimens from the Canadian Arctic Archipelago except from Baffin and Ellesmere islands. Salomonsen (1950, 1950–51) later reported on additional specimens from Canada (14 males and 9 females from Ellesmere Island and Axel Heiberg) and concluded (1950–51: 165) that *L. mutus* from Baffin Island westward to Coronation Gulf are intergrades of three races. Other investigators excluded specimens from the Canadian Arctic Archipelago (Peters 1934: 30), or nearly did so (Hellmayr and Conover 1942: 207), or examined only small series from a few localities (Ridgway and Friedmann 1946: 123). The treatments by Ridgway and Friedmann (1946) and by Salomonsen (1950–51) united geographically isolated populations from Canada and Greenland under the same racial names. More recent workers have followed or have combined the treatments of Ridgway and Friedmann and of Salomonsen without benefit of comparative material from Canada and Greenland.

This paper reexamines the geographic variation of *L. mutus* in Greenland and northern Canada. I studied 42 adults from Greenland and 163 adults from 23 localities in northern Canada, all in summer and fall plumages. Most of the Greenland specimens were selected by Salomonsen (*in litt.*, 1976) as representative of the variation of the Greenland races according to his concept of the races based on examination of larger series.

My investigation primarily concerned two questions. In view of the patterns of geographic variation of the species, do the birds from the southern coasts of Greenland and those from the Hudson Bay region and surrounding areas of Canada exhibit similar morphologies? Are the birds from the Canadian Arctic Archipelago and those from the central western coast of Greenland similar morphologically? The results of my analysis were then considered in terms of the taxonomy and nomenclature of these populations

METHODS

Specimens used for comparing of plumage color and pattern and size were in summer or fall plumage. Immature birds are useful in comparing plumage (Salomonsen 1936), but only adult birds were measured. Comparisons of plumage were made by using series of similar sex, age and molt. Comparisons discussed below pertain to fall plumage. Various methods for objectively evaluating coloration proved unsatisfactory for birds with variegated and multicolored feathers. Thus, my comparisons of plumage coloration are subjective, as were those of Salomonsen (1936) and others. The age of birds was determined by examination of the outer primaries (Bergerud *et al.* 1963; Weeden and Watson 1967). Measurements to the nearest 0.1 mm were taken for bill length (from the anterior edge of the nostril to the distal tip of the upper mandible), bill width (perpendicular to the anterior edge of the nostril), and length of tail (from the tip of the longest rectrix to the point of insertion of the central rectrices). This last measurement was impossible to obtain from many specimens because the point of insertion of the central rectrices could not be determined accurately. Measurements of the wing chord (from the bend of the wing to the longest primary) were to the nearest millimeter.

RESULTS AND DISCUSSION

Distribution

Recent distribution and population data for

Table 1. Populational status of *Lagopus mutus* at certain northern North American localities. *Fjeldrypens bestandsforhold i visse arktiske nordamerikanske områder.*

Locality	Status	Reference
Adelaide Peninsula	»moderately« common breeding, 1957	MacPherson and Manning (1959)
Baffin I. (SW coast)	several observed, 1954, 1955	MacPherson and McLaren (1959)
Baffin I. (E coast)	in 621 kilometers walking, 1950	Wynne-Edwards (1952)
Banks I.	25,000, summer, 1952, 1953	Manning *et al.* (1956)
Bathurst I.	»exceedingly abundant«	Tener (1963)
Bathurst I.	18 males/sq. kilometers	MacDonald (1970)
Bylot I.	»pairs fairly common along the shore,« 1957	Tuck and Lemieux (1959)
Bylot I.	droppings numerous	Van Tyne and Drury (1959)
Cornwallis I.	one pair	Urban (1957)
Devon I.	25 observed/day, 1967	Hussell and Holroyd (1974)
Ellef Ringnes	seen occasionally, 1954	MacDonald (1961)
Ellef Ringnes	4 + pairs (Isachsen), 1960	Savile (1960)
Ellesmere I.	not reported from Eureka, 1954	Bruggemann (1953, 1954)
Ellesmere I.	10 young in August, 1962	Savile and Oliver (1964)
Ellesmere I.	scarce, 1966; very scarce, 1965	Nettleship and Maher (1973)
Jenny Lind I.	»breeds commonly«	Parmelee *et al.* (1967)
Melville I.	14 observed	Tener (1963)
Perry River	frequently seen	Hanson *et al.* (1956)
Perry River	very abundant, 10 seen in one day in May, 1963	Aleksiuk (1964)
Prince Patrick I.	10 seen, 1961	Tener (1963)
Prince of Wales I.	est. 4000 breeding, 1958	Manning and MacPherson (1961)
Victoria I.	Cambridge Bay: »nests commonly«	Parmelee *et al.* (1967)

Fig. 1. Localities in the Canadian Arctic Archipelago reported in the text for *Lagopus mutus*. Broken lines indicate approximate boundaries of the races. Numerical order of the localities are from north to south and west to east.
1, Greenland; 2, Ellesmere Island; 3, Axel Heiberg; 4, Ellef Ringnes; 5, Prince Patrick I.; 6, Melville I.; 7, Bathurst I.; 8, Cornwallis I.; 9, Devon I.; 10, Banks I.; 11, Victoria I.; 12, Prince of Wales I.; 13, Somerset I.; 14, Baffin I.; 15, Bylot I.; 16, Disko I.; 17, Jenny Lind I.; 18, Ellice R.; 19, Adelaide Peninsula; 20, Boothia Peninsula; 21, Baker Lake; 22, Quebec; 23, Labrador.
Lokaliteter nævnt i teksten. Stiplede linier angiver de omtrentlige racegrænser. Lokalitetsnavnene (se ovenfor) opgives i talrækkefølge fra nord til syd og fra vest til øst.

northern North American *L. mutus* are summarized in Table 1 and the ranges of the races, as outlined below, are shown in Fig. 1. In Greenland, *L. mutus* occurs from the coast to the edge of the icecap and the species is a resident except in the northern regions (Salomonsen 1950–51).

Geographic Variation in Size

Lagopus mutus exhibits much individual variation in size and most samples exhibit considerable overlap. Geographic variation in size is complicated by local variation. Generally, the largest birds are from northern Greenland and Ellesmere Island. Measurements of birds from several localities are given in Tables 2 and 3 and in the accounts of the races.

Wing chord. – Males with the longest wings are from northern Greenland, but there is overlap among most samples from the study area. Geographic variation in females is less consistent than in males. The two females from Taylor Island, near Victoria Island (Table 3), have longer wings than do females from northern Greenland. Parmelee *et al.* (1967) reported measurements of flattened wings of birds from the Victoria Island region that are within the range of variation of several of my samples of wing chord.

Tail length. – Males (Table 2) show more geographic variation than do females (Table 3); more northern birds having slightly longer tails than southern birds. There is nearly complete overlap in this character for all samples of both sexes.

Bill length. – The average bill length in samples from northern Greenland and Ellesmere Island is longer than in samples from elsewhere. Males with the shortest bills are from Banks, Melville, Bathurst, and Prince of Wales islands in the central region of the Canadian Arctic Archipelago (Fig. 1). Variations in females are similar to that of males.

Table 2. Measurements (in millimeters) of adult male *Lagopus mutus* from selected localities. *Mål (i mm) for adulte hanner fra udvalgte områder.*

Locality	Wing chord *Vinge*			Tail *Hale*		
	n	Mean ± SD	Range	*n*	Mean ± SD	Range
Northern Greenland	7	198.0 ± 9.7	184–215	9	117.1 ± 6.2	108.0–125.2
Ellesmere Island	5	193.0 ± 3.9	190–199	5	114.9 ± 3.0	110.4–118.6
Ellef Ringnes	3	188.0	184–193	3	111.7	105.6–118.8
Prince Patrick I.	5	184.4 ± 3.4	181–189	4	106.4	102.8–107.0
Melville I.	2	193.5	188–199	2	108.9	107.4–110.4
Bathurst I.	2	177.0	174–181	2	115.1	112.7–117.4
Banks I.	2	182.0	182–182			
Prince of Wales I.	7	187.9 ± 1.6	186–190	3	112.4	108.6–115.7
Ellice River	6	182.2 ± 5.6	175–189			
Adelaide Peninsula	6	191.0 ± 4.2	185–197	5	113.1 ± 2.4	109.3–115.4
Northern Baffin I.	3	189.7	184–194			
Southern Baffin I.	10	190.0 ± 4.9	185–199	2	109.2	105.4–113.0
Central western Greenland	7	186.8 ± 3.7	184–190	2	107.8	105.8–109.8
Southern Greenland	3	187.5	183–194	5	110.2 ± 3.2	107.8–115.6

Locality	Bill length *Næblængde*			Bill width *Næbbredde*		
	n	Mean ± SD	Range	*n*	Mean ± SD	Range
Northern Greenland	7	11.0 ± 0.36	10.5–11.5	9	8.4 ± 0.50	7.9–9.6
Ellesmere Island	5	10.4 ± 0.53	9.7–11.1	5	8.1 ± 0.29	7.7–8.4
Ellef Ringnes	3	9.5	8.6–10.2	3	7.6	7.2–7.8
Prince Patric I.	6	9.5 ± 0.51	9.1–10.4	6	7.4 ± 0.26	6.9–7.6
Melville I.	2	9.35	9.2– 9.3	2	7.65	7.5–7.7
Bathurst I.	2	9.1	8.9– 9.3	2	6.7	6.4–7.0
Banks I.	2	9.3	8.9– 9.7	2	7.1	6.7–7.5
Prince of Wales I.	7	9.3 ± 0.31	9.0– 9.8	7	7.3 ± 0.20	6.8–7.6
Ellice River	6	9.4 ± 0.49	8.9–10.2	6	7.5 ± 0.08	7.3–7.5
Adelaide Peninsula	5	9.7 ± 0.55	9.2–10.6	6	7.4 ± 0.12	7.3–7.6
Northern Baffin I.	2	9.6	9.4– 9.7	2	7.9	7.8–8.0
Southern Baffin I.	10	9.6 ± 0.39	9.1–10.4	11	7.6 ± 0.32	7.3–8.1
Central western Greenland	7	10.5 ± 0.55	9.5–11.2	8	7.9 ± 0.23	7.4–8.1
Southern Greenland	5	10.0 ± 0.44	9.4–10.5	5	7.8 ± 0.38	7.3–8.1

Differences between the samples are small and there is considerable overlap in the sexes.

Bill width. – Variations in width of bill are similar to that of length of bill.

Geographic Variation in Color

Although individual variation in color is considerable in summer and fall plumages in *L. mutus,* comparisons of series revealed variation between several of the samples. Generally, birds are pale sandy to tawny gray in northern Greenland and on certain northern Canadian islands, and become more reddish southward to the mainland of northern Canada. The background color of the dorsal region and that of the upper breast varies in pattern because of the variation in the number and distribution of the black feathers of the back and upper breast. The combination of the black feathers and the feathers producing the background color gives a vermiculated appearance.

Males from northern Greenland are, on the

Table 3. Measurements (in millimeters) of adult female *Lagopus mutus* from selected localities. *Mål (i mm) for adulte hunner fra udvalgte områder.*

Locality	Wing chord *Vinge*			Tail *Hale*		
	n	Mean ± SD	Range	*n*	Mean ± SD	Range
Northern Greenland	4	184.5	182–187	4	101.3	93.8–107.3
Ellesmere Island	5	181.8 ± 4.4	179–189	5	102.6 ± 2.4	98.9–104.2
Ellef Ringnes	3	173.0	177–191	2	98.6	96.7–10.58
Prince Patrick I.	6	176.7 ± 1.5	175–179	4	97.1	93.9–101.4
Bathurst I.	5	176.6 ± 3.8	173–182	5	107.8 ± 8.8	97.5–116.5
Banks I.	6	177.7 ± 6.0	173–189	3	93.4	88.7– 99.2
Prince of Wales I.	5	179.4 ± 3.3	177–183	3	97.5	96.3– 98.1
Taylor I.	2	196.5	193–200			
Jenny Lind I.	2	183.0	179–187			
Boothia Peninsula	3	186.3	182–189	5	98.9 ± 4.4	94.0–102.6
Baker Lake	4	180.3	175–184	3	93.6	88.8–97.40
Central western Greenland	2	178.5	177–189			
Southern Greenland	8	177.4 ± 4.0	171–183	4	103.8	99.3–111.4

Locality	Bill length *Næblængde*			Bill width *Næbbredde*		
	n	Mean ± SD	Range	*n*	Mean ± SD	Range
Northern Greenland	7	10.1	9.8–10.3	5	8.3 ± 0.53	7.6–8.9
Ellesmere Island	5	9.7 ± 0.65	9.1–10.6	5	7.2 ± 0.17	6.9–7.3
Ellef Ringnes	3	8.6	8.5– 8.7	3	7.0	6.7–7.4
Prince Patric I.	5	8.6 ± 0.24	8.3– 8.9	5	6.8 ± 0.11	6.6–6.9
Bathurst I.	5	8.8 ± 0.30	8.4– 9.2	4	7.0	6.8–7.2
Banks I.	6	8.7 ± 0.23	8.4– 8.9	6	7.2 ± 0.39	6.6–7.5
Prince of Wales I.	5	8.7 ± 0.34	8.3– 9.1	5	7.1 ± 0.28	6.8–7.5
Taylor I.				2	8.35	8.3–8.4
Victoria I.	2	8.4	8.8–10.0			
Jenny Lind I.				2	7.0	7.0–7.0
Boothia Peninsula	3	8.9	8.5– 9.2	3	7.26	7.2–7.3
Baker Lake	3	9.3	8.5–10.0	4	7.3	6.8–7.7
Central western Greenland	2	9.1	8.9– 9.2	2	7.45	7.3–7.6
Southern Greenland	8	9.7 ± 0.36	9.0–10.3	8	7.4 ± 0.26	7.0–7.6

average, buffy-gray, and the dark feathers usually are grayish-black. Only a few individuals have narrow black spots, causing the backs to appear vermiculated. Males from Ellesmere Island are similar to those from northern Greenland, but exhibit less individual variation. A reduced area of ground color resulting from the greater extent of large black feathers on the back distinguishes males from Isachsen on Ellef Ringnes from the males of northern Greenland and Ellesmere Island. Birds in the Isachsen series also are darker brownish-gray in the background color than are specimens from the east and north, and in this respect, are similar in background color to birds from Bathurst, Prince of Wales, Banks, and Baffin islands, and to samples from the mainland of Canada. Specimens from Prince Patrick Island southward to northern mainland Canada exhibit only minor geographic variation, and have the black feathers of the back replacing more of the background coloration in males from both Melville and Bathurst islands being more reddish above than birds from Prince Patrick

Table 4. Weights (gms.) of adult *Lagopus mutus* from northern Canada.
Vægtdata for adulte Fjeldryper fra det nordlige Canada.

Locality	♂♂			♀♀		
	n	Mean ± SD	Range	*n*	Mean ± SD	Range
Ellesmere Island	5	537.9 ± 45.0	475–596	4	474.9	461–503
Ellef Ringnes	2	528.8	490–568	3	504.0	438–598
Prince Patrick I.	5	491.4 ± 36.2	441–505	6	527.0 ± 61.9	454–622
Bathurst I.	2	511.0	504–518	5	510.9 ± 83.6	462–660
Prince of Wales I.	5	557.0 ± 9.8	541–566	3	496.0	480–528
Victoria I.				2	427	411–499 [a]
Adelaide Peninsula	6	600.2 ± 24.2	579–645			
Baker Lake				4	428.6	387–460

[a] Possibly not fully adult. *Måske ikke fuldt adult.*

Island. This trend is also apparent in the series from Baffin Island and the Ellice River region. Unworn specimens with mostly black backs and little rufous background color usually also have white edges bordering the black feathers, giving these birds a frosty appearance dorsally. Males from Newfoundland (= *L. m. welchi*) are definitely grayer than other examples from the study area.

Males from central west Greenland resemble those from Baffin Island, but on the average their ground color is browner and less gray and they lack the white edges to the black back feathers. Males from southern Greenland are slightly paler and grayer than males from southwestern Greenland and the examples from Canada.

Variation in dorsal and upper breast coloration in females is similar to that in males, but females from some localities exhibit more geographic variation than do males. Males from northern Greenland are similar in color to males from Ellesmere Island but females from Ellesmere Island are slightly more olive-gray and less buffy than those from northern Greenland. Females to the south of Ellesmere Island are more reddish and have more dorsal feathers than do males from the same localities. However, such specimens resemble males in having white edges on the black feathers, which produces a frosty appearing back. Females from west central Greenland resemble specimens from northeastern Canada but are slightly grayer and do not appear frosty above. The dorsal background color in females from west central Greenland is darker (blacker) than in males. Females from southern Greenland are grayer than birds of the same sex in the series from west central Greenland, Baffin Island, and Quebec. The differences in males observed between the southern Greenland series and those from all localities in northern Canada are more pronounced in females.

On the basis of size and plumage color and pattern, I conclude that the northern Greenland and Ellesmere Island specimens are more similar to each other than they are to specimens from other localities. Birds from the western central and southern coasts of Greenland differ from each other in plumage color and pattern and also differ from specimens collected in most of northern Canada in the same characters.

TAXONOMY AND NOMENCLATURE

Except for the larger specimens from northern Greenland, the races of *L. mutus* in Greenland and northern Canada are based on color and pattern of similarly sized birds. Descriptions and remarks on taxonomy and nomenclature follow in the accounts of the races.

Schiøler (1925) recognized three races in Greenland: *groenlandicus* (= *captus*) on the northern coasts, *rupestris* on the central western coast, and *reinhardti* on the southern coasts. Salomonsen (1936) considered the western central and southern coastal birds to constitute only one race, *rupestris,* but he remarked that should the southern birds be considered distinct the name *reinhardti* was available. Salomonsen (1950) divided his *rupe-*

stris into two races, *rupestris* of the southern coasts and assigned the name *saturatus* to the western central birds. The A.O.U. (1957) Check-list and Aldrich (1963) followed Salomonsen (1950; 1950–51) for the range of the species in Greenland.

Of the Greenland populations, I recognize three races: *captus* of the northern coasts, *saturatus* of the western central coast. and *reinhardti* of the southern coasts. Two races breed in northern Canada: *captus* on Ellesmere Island and intergrading to the south with *rupestris,* the race found in the remainder of northern Canada. The two races interbreed on Ellesmere Island according to the A.O.U. (1957), Aldrich (1963), and Godfrey (1966). Salomonsen (1950, 1950–51), Snyder (1957), Macpherson and Manning (1959), Manning and MacPherson (1961), and Parmelee *et al.* (1967) regarded the breeding birds in much of northern Canada as *saturatus* or as intergrades between *saturatus* and *rupestris*.

In the following accounts the descriptions are based on comparative series from several localities. Individual variation is considerable and racial identification of individual specimens is sometimes impossible (see Salomonsen 1936). Therefore, in characterizing the races, average differences and similarities were considered. The following measurements (in millimeters) are based primarily on the samples in Tables 2 and 3; averages are given in parentheses. Specimens examined are attributed to the museum collections by abbreviations given in the acknowledgments.

Lagopus mutus captus

Lagopus mutus captus Peters, 1934, Check-list Birds World, vol. 2, p. 35. New name for *Lagopus mutus groenlandicus* Schiøler, preoccupied. Germanialand, Greenland.

Description. – Background color of dorsal and upper breast regions is pale yellowish sandy to tawny gray. The black spots of the back are reduced in size and (usually) in intensity as compared to other races. Females in winter plumage frequently have a broad black lore like the males, a character not usually present in females of other races. Males and females are both larger than the other races found in Greenland and Canada. Wing: 12 males, 184–205 (195.9); females, 179–189 (183.0). Tail: 14 males, 108.0–125.2 (116.3); 9 females, 93.8–107.3 (102.0). Bill length: 12 males, 9.7–11.5 (10.8); 9 females, 9.1–10.6 (9.8).Bill width: 14 males, 7.7–9.6 (8.3); 10 females, 6.9–8.9 (7.8).

Distribution. – In Greenland, from the Blosseville Coast on the east to the northern coast of Greenland and southward on the west coast to Melville Bay (Salomonsen 1950–51); in Canada, breeds on Ellesmere Island. Intergrades between *captus* and *rupestris* are found in Ellef Ringnes westward to Prince Patrick Island.

Remarks. – Males from Ellesmere Island are indistinguishable from Greenland specimens of *captus*. Females, however, are slightly more olive-gray and have more black dorsal spots than do typical *captus* from Greenland. Greenland specimens are slightly larger than birds from Ellesmere Island, except in length of tail in females (Table 1). Specimens from Ellef Ringnes and Prince Patrick Island are considered intergrades between *captus* and *rupestris* on the basis of coloration and pattern. Birds from Prince Patrick Island are less grayish and smaller and thus resemble *rupestris,* the race to the south. The status of birds from Axel Heiberg could not be determined. Salomonsen (1950–1951) concluded that specimens from Axel Heiberg were intergrades between *captus* and *saturatus* (= *rupestris* of this treatment).

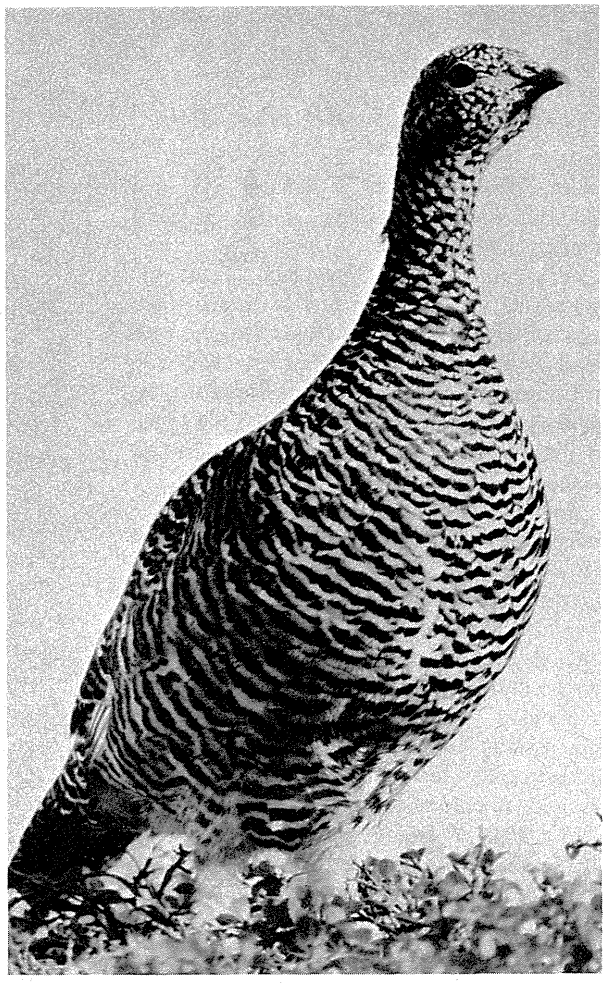
Specimens examined. – Greenland: Clavering, between Germanialand and Scoresby Land (2, ZMK), Germanialand (4, ZMK), Cape Franklin (1, USNM), Thule (4, ZMK; 2, USNM). Canada: Slidre Fjord, Ellesmere Island (10, NMC; 9, USNM; 2, MMNH), Fosheim Peninsula, Ellesmere Island (6, DMNH), Bedford Pine Island, near Ellesmere Island (1, MCZ). Intergrades of *captus>rupestris:* Isachsen, Ellef Ringnes (6, NMC). Intergrades of *rupestris>captus:* Mould Bay, Prince Patrick Island (7, USNM), Cherie Bay, Prince Patrick Island (7, USNM).

Lagopus mutus saturatus

Lagopus mutus saturatus Salomonsen, 1950, 1950, Dansk Orn. Foren. Tidsskr. 44, p. 221. Skansen, Disko Island, western Greenland.

Lagopus dispar Ross, 1819, Voy. Disc. etc., Ed. 2, Vol. 2, p. 168.

Nomen nudum based on specimens from Disko Island.



Fjeldrype ♀, Foto: Frank Wille.

Description. – Similar to *rupestris* from Canada but more brownish-rufous and less olive-brown. The backs are more saturated with black spots that lack white edges; the whitish frosty pattern typical in *rupestris* is lacking. Specimens are definitely less grayish than *captus* and are darker than *reinhardti* of southern Greenland. Birds from Disko Island are most similar to specimens from Baffin Island but are not olive-brown in ground color. The race is smaller than *captus* and similar in size to the races in southern Greenland and Canada south of Ellesmere Island. Wing: 7 males, 184–190 (186.8); 2 females, 177 and 180. Tail: 2 males, 105.8 and 109.8. Bill length: 7 males, 9.5–11.2 (10.5); 2 females, 8.9 and 9.2. Bill width: 8 males, 7.4–8.1 (7.9); 2 females, 7.3 and 7.6.

Distribution. – Breeds on the central west coast of Greenland from Upernavik District southward to Egedesminde District. Intergrades between *saturatus* and *reinhardti* are found in the Sukkertoppen and Holsteinsborg districts.

Remarks. – As indicated above, the range of *saturatus* does not include Canada; the race found in most of northern Canada is *rupestris* (A.O.U. 1957; Aldrich 1963; Godfrey 1966). This geographic arrangement of *rupestris* and *saturatus* does not agree with that of Salomonsen (1950, 1950–51), who considered the birds from northern Baffin Island and the mainland of Canada westward to Coronation Gulf as nearest to *saturatus*.

On the basis of one topotype and the description of *saturatus,* Manning and MacPherson (1961) concluded that the dividing line between the southern race, *rupestris,* and the northern birds, which they called *saturatus,* approximately followed the Arctic Circle. Their division approximates the boundary drawn by Taverner (1929) between what he regarded as a gray (southern) and yellow (northern) population. It should be noted that the topotype (NMC 18770), examined by Manning and MacPherson (1961), a July female, is the only specimen considered by Salomonsen (1936: 18) as warm rusty brown. Eight specimens from Disko Island were described by Salomonsen as »all more or less olive-grayish, olive-brown or buffish, one very warm buff.« A tenth specimen was listed by Salomonsen as »rather pale buffish or brownish-olive.« Thus, the NMC topotype appears to differ from the norm of Salomonsen's series from Disko Island, but it does agree with the original description of *saturatus*. Taverner (1929: 32–33) also examined the NMC topotype and included it in his yellow group of fall plumaged females and contrasted this group with his gray group as »more rusty, yellowish, and warm, the other grey and cold. . .« One of three specimens from Disko Island listed by Taverner (1929) is included in the gray group.

Salomonsen (1950) described *saturatus* as lacking the frosty appearance typical of *rupestris*. Manning and MacPherson (1961) stated that they examined five specimens (localities?) which agreed in ground color and in the frosted appearance. This last character was found in most of the specimens from Northern Canada that I examined. This included a series from Prince Patrick Island that, because of its grayer

ground coloration, represents a zone of intergradation with *captus;* the character of frostiness is lacking in *captus*. As noted under *L. m. rupestris,* the character of frostiness is subject to individual variation and I cannot agree that this variation is sufficiently geographic for recognizing *saturatus* in northern Canada.

Specimens examined. – Greenland: Upernavik District (3, ZMK), Disko Island (5, AMK), Holsteinsborg (4, ZMK), Godhavn (1, USMN), Christianshaab (1, USNM).

Lagopus mutus reinhardti

Tetrao reinhardi (corrected to *Reinhardti* by Hartert) Brehm, 1824, Lehrb. Naturgesch. aller eur. Vögel 2, p. 986. Julianehaab, southern Greenland.

Description. – Ground coloration ranges from slightly tawny olive-brown to grayish. The black areas of the back are reduced resulting in a salt and pepper appearance (see below). Females are especially grayer than most specimens of *saturatus* and *rupestris*. Smaller than *captus* and similar in size to the other races included in this study. Wing: 3 males, 182–194 (187.5), 8 females, 171–183 (177.4). Tail: 5 males, 107.8–115.6 (110.2); 4 females, 99.3–111.4 (103.8). Bill length: 5 males, 9.4–10.5 (10.0); 8 females, 9.0–10.3 (9.7). Bill width: 5 males, 7.3–8.1 (7.8); 8 females, 7.0–7.6 (7.4).

Distribution. – Breeds in southern Greenland from Godthaab District on the western coast southward to Julianehaab and northward along the eastern coast to the Blosseville Coast. Intergrades with *saturatus* on the west coast in the Sukkertoppen and Holsteinsborg Districts. Intergradation with *captus* was not found.

Remarks. – The characteristics of color and pattern of *reinhardti* are best developed in specimens from the southern portion of the range. Birds from Julianehaab are noticeably grayer and definitely more speckled (black and white) above than are examples from the northern part of the species range. The average of the series representing *reinhardti,* however, is paler than either *saturatus* or *rupestris*. Salomonsen (1936) considered the amount of overlap in color between the Julianehaab birds and those to the north on the west coast of Greenland too great for recognizing two southern Greenland races (*contra* Schiøler 1925). However, Salomonsen (1950) later separated the southwestern coast populations by naming *saturatus*. As in his earlier revision (Salomonsen 1936), Salomonsen (1950–1951) maintained that the birds to the south of *saturatus* should be known as *rupestris*. Hellmayr and Conover (1942) noted that the birds from the southwestern coast of Greenland are paler and more »sandy« (= less brownish?) than specimens from northwestern Canada and applied the name *reinhardti* for the entire southwestern range of the species in Greenland. It is interesting to note that four of the specimens examined by them, from Sukkertoppen, were considered intergrades between *saturatus* and the southern race (= *reinhardti*) by Salomonsen (1950–51), but more similar to *reinhardti* than *saturatus*. One of the other two specimens examined by Hellmayr and Conover (1942), from Holsteinsborg, is from the region of intergradation between *saturatus* and *reinhardti* where specimens are more similar to *saturatus* than *reinhardti*. The sixth specimen examined by Hellmayr and Conover (1942) is from Egedesminde and is within the range of *saturatus*.

Specimens examined. – Greenland: Angmagssalik District (3, ZMK), Julianehaab District (8, ZMK), Frederikshaab (1, ZMK), Godthaab (2, USNM), Sukkertoppen District (2, USNM).

Lagopus mutus rupestris

Tetrao rupestris Gmelin, 1789, Syst. Nat., vol. 1, pt. 2, p. 751.

Based on the Rock Grous of Pennant, Arctic Zool., vol. 2, p. 312. Shores of Hudson Bay.

Description. – Resembles *saturatus* but usually olive-brown to cinnamon-buff in ground color. Females are more pale yellowish in ground color than either *saturatus* or *reinhardti*. The extent of the black dorsal pattern is variable, depending partly on collection locality, but most specimens are typically dark with white edges on the black dorsal feathers, giving a frosty appearance. Some females are almost entirely black. Smaller than *captus* and similar in size to *saturatus* and *reinhardti*. Wing: 40 males, 174–199 (186.8), 33 females, 173–200 (180.3). Tail: 19 males, 99.3–111.4 (103.8); 26 females, 88.7–116.5 (100.4). Bill length: 36 males, 8.9–10.6 (9.5); 34 females, 8.3–10.0 (9.0). Bill width: 44 males, 6.4–8.0 (7.5); 34 females, 6.6–8.4 (7.2).

Distribution. – Breeds in northwestern Mackenzie District southward to central British Columbia, northern Keewatin District, and northern Quebec and Labrador, and in most of the islands in the Canadian Arctic Archipelago (see Fig. 1 for details). Intergradation between *rupestris* and *captus* occurs on Prince Patrick and on Ellef Ringnes. Intergradation between *rupestris* and *nelsoni* Stejneger, a dark brown race, takes place in northwestern Mackenzie.

Remarks. – There is considerable individual variation and some geographic variation of this race. Males from the Adelaide Peninsula and the samples from Baffin Island average larger (Table 1) than males from other localities in Canada. Males from Bathurst Island average smallest in most characters. Females having longer wings are from southeastern Victoria Island and Boothia Peninsula. Females from Prince Patrick Island have shorter wings than most samples of *rupestris* and *captus*. There is considerable weight variation between the samples of *rupestris* (Table 4). Weight differences in the geographic variation between males and females may be attributed to the gravidity of the females.

Plumage color and pattern exhibit the greatest amount of variation. Specimens having more rufous ground color generally are from the western localities. This characteristic may have led Salomonsen (1936) and others to consider western Canadian *L. mutus* racially distinct from those of eastern Canada. Ridgway and Friedmann (1946) and Salomonsen (1950–1951) regarded the birds from southeastern and southwestern Canada as *rupestris*. The variation in ground color is somewhat clinal with birds becoming less rufous and more olive-brown from west to east. Specimens from Prince Patrick and Melville Islands are slightly grayer than specimens to the south. Birds from the Ellice River of the mainland in the Northwest Territories are darker rufous than most other specimens although many examples from southern Baffin Island are similar to them in ground color. Specimens from Cornwallis Island are of questionable age, but comparison with immatures and adults from other localities reveales that the Cornwallis series is grayer than birds to the south. Cornwallis Island is probably within the zone of intergradation between *captus* and *rupestris*. Baffin Island male specimens have more black dorsal feathers than most other specimens, but there is considerable variation in the amount of black feathers throughout the series of *rupestris*. The frosty appearance is likewise subject to individual variation.

Specimens examined. – Canada: Winter Harbor, Melville Island (3 USNM), Bracebridge Inlet, Bathurst Island (5, NMC), Goodsir Inlet, Bathurst Island (2, NMC), Resolute Bay, Cornwallis Island (7, MCZ; 2, USNM; 1, NMC), Banks Island (8, NMC), Cambridge Bay, Victoria Island (2, DMNH), Taylor Island (2 MCZ), Jenny Lind Island (2 DMNH), Perry Island (1, DMNH), Prince of Wales Island (13, NMC), Somerset Island (1, ROM), Bylot Island (3, USNM), Baffin Island north of Arctic Circle (4, ROM), southern Baffin Island (7, DMNH; 5, NMC; 1, MMMN), Ellice River (6, DMNH), Adelaide Peninsula (6, NMC), Boothia Peninsula (5, ROM), Southampton Island (1, CM; 1, MMNH; 2, CU), Ungava, Quebec (6, USNM, 1, Lumsden Coll.), Baker Lake (4, Lumsden Coll.), Labrador (5, MCZ; 2, USNM; 1, CU).

SUMMARY

The races of *Lagopus mutus* found in the Canadian Arctic Archipelago and Greenland are separable on the basis of fall plumage coloration. One of the races, *captus*, found in northern Greenland and Ellesmere Island, is also larger than the forms found to the south. A frosty backed race, *rupestris*, breeds throughout the remainder of the archipelago and on the northern mainland of Canada, where it intergrades with *nelsoni* in the northwestern Mackenzie District. The race breeding in southern Greenland is grayer than *rupestris* and the name *reinhardti* is revived for this Greenland form. The central west Greenland race, *saturatus*, is darker than *reinhardti*, *rupestris*, and *captus*.

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Natural Resources (H. G. Lumsden Collection), Royal Ontario Museum (ROM), Universitetets Zoologiske Museum (ZMK), and the United States National Museum of Natural History (USNM). I thank F. Salomonsen for commenting in the taxonomic and nomenclature sections of the manuscript. Critical comments of an earlier draft of this paper by J. S. Aldrich and W. E. Godfrey are greatly appreciated.

DANSK RESUMÉ

Udbredelse, geografisk variation og taksonomi for Fjeldrypen i Grønland og det nordlige Canada.

Artiklen reviderer Fjeldrypens geografiske variation i den nordcanadiske og grønlandske del af udbredelsesområdet. Undersøgelsen bygger på 42 grønlandske eksemplarer, udvalgt af Finn Salomonsen som typiske for de grønlandske bestande, og 163 eksemplarer fra det nordlige Canada. Alle fugle var adulte i sommer- eller efterårsdragter. Tidligere undersøgelser bygger på meget utilstrækkeligt materiale fra det arktiske canadiske ørige.

Fjeldryperacerne i Grønland og arktisk Canada adskilles bedst på efterårsdragternes farver. En race, *captus,* som lever i Nordgrønland og på Ellesmere Island, er også større end sydligere former. En race med en rygtegning, der virker som om fjerdragten var rimslået, *rupestris,* yngler gennem resten af det canadiske ørige og nordlige fastland, hvor den i det nordlige Mackenzie distrikt gradvist går over i racen *nelsoni.* Racen i det sydlige Grønland er mere grå end *rupestris,* og navnet *reinhardti* genindføres for denne form. Racen *saturatus* fra det centrale Vestgrønland er mørkere end *reinhardti, rupestris* og *captus.*

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