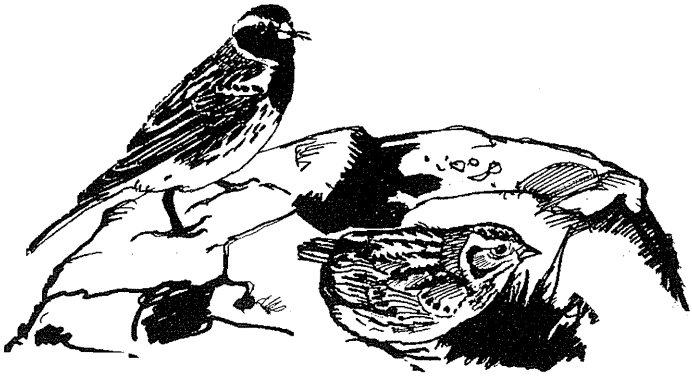
Densities and distribution of passerine birds in a coastal area of Disko Island, West Greenland, with notes on breeding performance

OLE FRIMER



(Med et dansk resumé: Tætheder og fordeling af spurvefugle i et kystnært område på Disko, Vestgrønland, med noter om yngleforhold)

Introduction

In arctic areas several quantitative studies of passerine bird populations have been carried out. However, since the pioneering work of Longstaff (1932) near the Godthåb Fjord, West Greenland (64° N, 51° W), few such studies have been made in Greenland. Joensen & Preuss (1972) investigated a coastal area at Saqqaq (70° N, 52° W), and Fowles et al. (1981) conducted a bird census in an inland locality in Eqalummiut Nunaat (67° N, 50° W). Densities of Snow Buntings *Plectrophenax nivalis* and Arctic Redpolls *Carduelis hornemanni* recorded in Northeast Greenland are given in Meltofte (1983) and Boertmann et al. (1991).

This paper presents data on densities and distribution of breeding passerine birds in a coastal area of Disko Island, West Greenland in 1990. Some data on breeding performance, predation and time of departure are included.

Four species of passerines were found breeding in the area: Wheatear *Oenanthe oenanthe*, Redpoll *Carduelis flammea*, Lapland Bunting *Calcarius lapponicus* and Snow Bunting.

Study area

The study area is situated on southernmost Disko Island (69° 15' N, 54° 30' W) immediately east of the town of Qeqertarsuaq (Godhavn). The area covers 119 ha, extending from a line near the coast (3 m a.s.l.) to the foothills of a tertiary volcanic plateau (Lyngmarksfjeld), at 240 m a.s.l. The area is bordered to the southeast by the river Røde Elv. Fig. 1 shows the most important topographical features.

The main part of the area is composed of a basaltic breccia, forming a steep southwest-facing slope (Østerlien) on a precambrian basement of gneiss in the lower western part. The breccia is mostly flat, rocky and wind-swept terrain, gently sloping from an altitude of about 70 m in the south and up to the foothills of the Lyngmarksfjeld, covering 71 ha of the area. A few streams and one pond exist on the breccia (the pond dried out during the last days of the study period). Apart from low shrubs of *Salix glauca* in the northwesternmost part (0.5 ha) and along streams, the vegetation on the breccia is sparse (Fig. 2), consist-

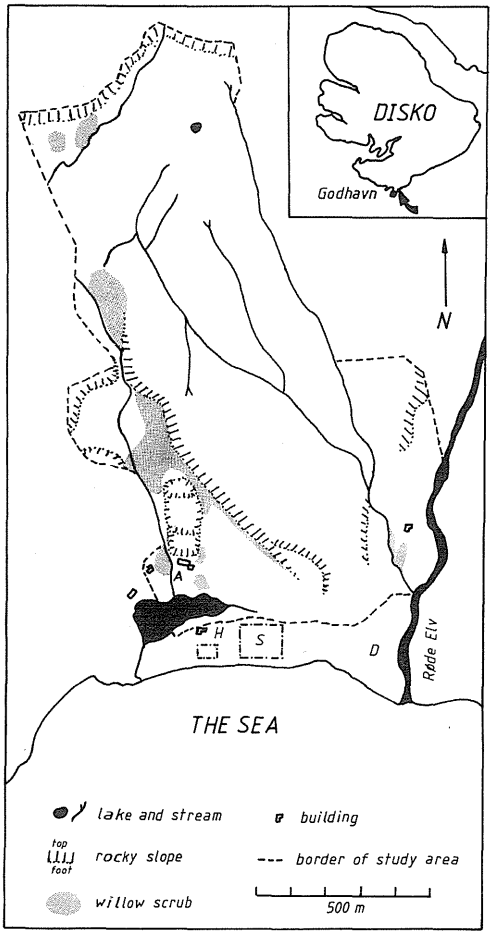


Fig. 1. Map of the study area. A = Arctic Station; H = heliport; S = sports area; D = former dump site.
Undersøgelsesområdet. A = Arktisk Station; H = heliport; S = sportsplads; D = tidligere affaldsplads.

ing of dispersed cushions of mosses with *Betula nana*, *Polygonum viviparum*, *Vaccinium uliginosum*, low *Salix glauca*, *Carex* spp., *Cassiope tetragona*, *Empetrum hermaphroditum* and lichens. Also *Cerastium alpinum*, *Pedicularis hirsuta*, *Saxifraga caespitosa*, *Saxifraga tricuspidata*, *Rhododendron lapponicum* and *Dryas integrifolia* are common. The vegetation along streams is generally richer, the dominating species being *Equisetum arvense*, *Alchemilla glomerulans*, *Salix herbacea*, *Empetrum hermaphroditum* and *Harrimanella hypnoides*.

The rest of the area, "the lowland" (48 ha), has more rocky slopes and one rocky ridge (2 ha) (Fig. 3). To the southwest is a lagoon receiving freshwater from a homothermic spring (2-4°C throughout the year), covering 1.3 ha of the area. The area is below 70 m a.s.l. to the east (along the river) and south, but rises gradually to the west (along the breccia slope) to 110 m 1.2 km inland. Three buildings, each inhabited by one family, are situated within the area (Fig. 1). The lowland vegetation is much richer than on the breccia, especially in the western part and up the slope Østerlien where a rich herb vegetation occurs. Areas of 30-50 cm *Salix glauca* scrub cover about 6 ha of the lowland (shaded in Fig. 1); the rest being *Empetrum hermaphroditum – Vaccinium uliginosum* dominated heath, mainly mixed with *Equisetum arvense*, *Salix arctophila*, *Salix herbacea*, *Betula nana*, *Carex* spp. (e.g. *C. bigelowii*), mosses, grasses (e.g. *Deschampsia flexuosa*) and lichens. Other common species are *Alchemilla glomerulans*, *Taraxacum* sp., *Dryas integrifolia*, *Cassiope tetragona*, *Phyllopdoce coerulea* and *Pedicularis lanata*. Near the lagoon, areas with *Eriophorum scheuchzeri* and *Alopecurus alpinus* occur.

The climate is low arctic, and most of the lowland was free of snow when the investigation was initiated (14 June), while on the breccia streams and depressions were snowcovered. Most of the snow disappeared during June. The temperature ranged from 0.5°C to 18°C (mean 8°C at mid-day) during the study period. Most days were sunny and the precipitation was restricted to small showers on the 13 July.

Being situated close to the town of Qeqertarsuaq, the recreational use, especially in the lower parts of the study area, is fairly intense from June to August.

Materials and methods

Altogether, 61 hours of observations in 21 days regularly distributed over the period 14 June-21 July were spent in the area. Some brief observations were made before and after this period. Using a 1:2500 map containing all distinct topographical features, the area was carefully scanned, and all nests and birds (and their activity) were recorded on visit cards. Altogether, all parts of the study area were covered six times. Cases where nests were located or broods of fledglings seen were recorded as confirmed pairs. A singing or calling bird recorded within a restricted area in at least three out of six visits, but with no nest or brood, was considered a probable pair. This "mapping method" has been described by Enemar (1959), and modified for open arctic habitats by Freedman & Svoboda (1982).

Fig. 2. Part of the breccia, looking south towards the Disko Bay.
Del af breccien set fra nord mod Disko Bugt.

Fig. 3. Southern part of the lowland (looking north), showing the steep breccia slope Østerlien to the right. In the background, the plateau Lyngmarksfjeld (722 m a. s. l.).
Sydlige del af lavlandet (set fra syd), med den stejle breccie-væg Østerlien til højre. I baggrunden ses det 722 m høje Lyngmarksfjeld.

Several nestlings were weighed with a spring balance, their feather development measured, and finally they were ringed in order to reduce the risk of confusing broods found as fledglings with broods recorded in nests.

The start of breeding was defined as the date when the clutch was initiated. This date was estimated from the hatching date or the age of young (determined according to Hussell (1972) and Madsen (1982)), assuming that one egg was laid per day (Hussell 1972), and using incubation and fledging periods given by Parmelee & Macdonald (1960), Fox (1981), Salomonsen (1981) and Madsen (1982).

Results

Densities and distribution

The number and density of breeding passerine birds in the study area are shown in Tab. 1. The distribution of pairs (Fig. 4) is based on confirmed pairs only. In Tab. 2 the densities are shown separately for the lowland and the breccia area. The overall density in the lowland was six times higher than on the breccia.

Breeding performance

Data on time of breeding and reproductive success are given in Tab. 3. One pair of Snow Buntings may have produced a second clutch, as a nest with 4 eggs was found on 14 July. This clutch, excluded from Tab. 3, was initiated around 11 July. Due to often difficult access to nests, Snow Bunting young could not be counted in all nests. All Wheatear nests and the single Redpoll nest were inaccessible, but some newly fledged broods were counted, although the number of young so obtained must be regarded as a minimum figure.

Of 19 Snow Bunting nests, 11 were situated in crevices and 8 between boulders. The mean depth of nest into crevice or boulder was 35 cm (SD 8.6, n = 11). Five of six Lapland Bunting nests were situated under *Salix glauca* scrub, and one in a low bank at a dried-out stream. Three of four Wheat-

Tab. 1. Breeding passerines in the 119 ha study area at Qeqertarsuaq/Godhavn, 1990.
Ynglende spurvefugle i det 119 ha store område ved Godhavn, Disko, 1990.

	confirmed pairs *sikre par*	probable pairs *sandsynlige par*	total pairs *par ialt*	pct of population *pct*	pairs per km^2 *par pr km^2*
Snow Bunting *Plectrophenax nivalis*	24	1	25	43	21
Lapland Bunting *Calcarius lapponicus*	16	4	20	34	17
Wheatear *Oenanthe oenanthe*	8	0	8	14	7
Redpoll *Carduelis flammea*	4	1	5	9	4
Total	52	6	58	100	49

ear nests were placed in crevices, and one between boulders. The single Redpoll nest found was situated in *Salix arctophila* on a small rockshelf several meters up the slope Østerlien.

No non-breeding passerines were recorded, though their absence was difficult to ascertain. A few unmated males of Lapland and Snow Buntings may have been present.

One other bird species was recorded breeding in the area: a pair of Rock Ptarmigan *Lagopus mutus*, which raised 11 chicks in the upper western part of the lowland.

Predation

No signs of nest predation were recorded, but two fresh plucks were found of adult Snow Bunting males, apparently killed by a Peregrine Falcon *Falco peregrinus*. On the 9 June 3-4 Snow Buntings were shot by humans within the area.

Arctic Foxes *Alopex lagopus* are rarely seen near Qeqertarsuaq in the summer period, presumably due to the occurrence of numerous sledge-dogs. However, one fox was spotted in the study area on 31 July.

Ravens *Corvus corax* and especially Iceland and Glaucous Gulls *Larus glaucoides/hyperboreus* were commonly seen flying over the area.

Time of departure

Family parties became common from early July with peak numbers in the second week of July. The first moulting Lapland and Snow Buntings were observed on 14 July.

Lapland Buntings became inconspicuous during the moulting period. Birds in winter plumage were commonly seen from mid-August, and the last Lapland Bunting was observed on 11 September.

Snow Bunting numbers dropped during the second half of July and early August when many adults appeared to leave the area to moult elsewhere, and juveniles started gathering in flocks of which some wandered out of the area. In late August flocks of Snow Buntings in winter plumage began to appear. A similar pattern was observed on Baffin Island by Wynne-Edwards (1952). The Snow Bunting numbers peaked in mid-September (largest recorded flock was 22 individuals on 18 September) and from early October onwards only small flocks of up to 4 birds were seen. The last Snow Bunting was observed on 3 November.

Small flocks of Wheatears and Redpolls stayed in the area during August; most had left by mid-September. In October only 1-2 Wheatears were seen daily in the area, the last observation being 21 October. The last Redpolls were seen on 5 October. In the period 2-18 October migrating Arctic Redpolls were observed in flocks of up to 7 individuals, and on 25 November a flock of about 15 birds was seen flying over the area (Sussie M. Nielsen, pers. comm.).

Tab. 2. Densities (pairs per km^2) of passerine birds in "the lowland" (excluding the lagoon) and on the breccia.
Tætheder (par pr km^2) af spurvefugle i "lavlandet" (excl. lagunen) og på breccien.

	"lowland" (46.7 ha)	breccia (71.0 ha)
Snow Bunting	38	10
Lapland Bunting	36	4
Wheatear	13	3
Redpoll	11	0
Total	98	17

Tab. 3. Time of breeding and reproductive success of passerine birds in the study area, 1990.
Yngletidspunkt og ungeproduktion for spurvefugle i undersøgelsesområdet, 1990.

	date of clutch initiation (June) *dato for påbegyndt kuld (juni)* mean (SD) *gennemsnit (SD)*	range *var. bredde*	mean No. of young per pair (SD) *gennemsnitlige antal unger pr par (SD)*	n
Snow Bunting	14 (6.0)	8-29	4.0 (0.8)[a]	10
Lapland Bunting	16 (6.7)	9-27	4.2 (1.1)[a]	6
Wheatear	c. 10 (4.4)	3-15	3.3 (0.4)[b]	4
Redpoll	c. 11	–	3 – [b]	1

a: nestlings (6-12 days old) *redeunger (6-12 dage gamle)*
b: newly fledged young *nyudfløjne unger*

Discussion

Densities

The overall density of passerines in the area was 49 pairs per km^2; 98 pairs per km^2 in the lowland and 17 on the breccia. The low bird density on the breccia seems to be caused by later thaw, sparse vegetation and lack of suitable nesting sites for Lapland Buntings and Redpolls. Lapland and Snow Buntings occurred at almost equal densities in the lowland, while on the breccia the latter was by far the most common.

Most of the study area was scanned rather briefly by Hansen et al. (1982) in July 1982. Fourtysix breeding pairs were found (including confimed and probable pairs); Snow Bunting 39%, Lapland Bunting 30%, Wheatear 26% and Redpoll 4%, largely in agreement with the present study.

The density in the lowland was higher than that of an area with rocky slopes of sandstone cliffs (82 ha) studied by Joensen & Preuss (1972) at Saqqaq in 1965, using much the same method (65 pairs per km^2 including 5% lakes and ponds). The main difference was a much higher density of Snow Buntings in the present study (38 pairs per km^2) compared to the Saqqaq area (18 pairs per km^2). In other areas of Greenland density estimates of Snow Buntings have been much lower. Near the Godthåb Fjord, West Greenland, 4 pairs per km^2 (Longstaff 1932); in Northeast Greenland between Mestersvig and Hertugen af Orléans Land, 3-19 territories per km^2 (Meltofte 1983, Boertmann et al. 1991); in Eqalummiut Nunaat, no breeding Snow Buntings in the censused area, owing to a lack of exposed rocks (Fowles et al. 1981).

Snow Buntings may breed in extremely high densities in areas where nest sites and food are abundant. On Baffin Island, Watson (1963) estimated 65 adult birds (including about 12% non-breeders) in a 60 ha area of grass-heath with boulders (approx. 48 breeding pairs per km^2). The rocky slopes in the lowland of the present study area, with numerous crevices and boulders, seem

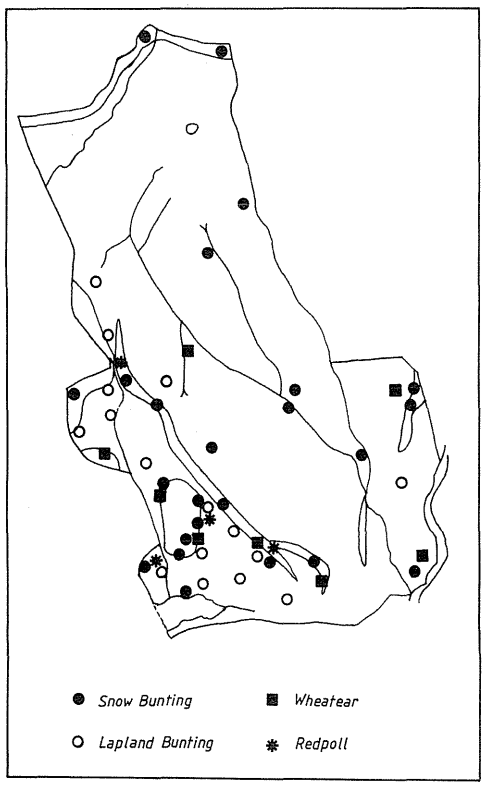


Fig. 4. The distribution of breeding passerine birds in the study area.
Fordelingen af ynglende spurvefugle i området.

to offer the species plenty of nesting possibilities, suggesting that the food supply was the limiting factor. This type of habitat is typical of southern Disko Island, which may be one of the most important breeding areas for Snow Buntings in West Greenland.

The lowland densities of the other species were similar to those found at Saqqaq (Joensen & Preuss 1972) and may be typical of this type of habitat. It should, however, be considered that the recreational use of my study area may have had some influence on bird densities.

Only a few unmated males of Lapland and Snow Buntings appeared to occur in the area. According to Meltofte (1983), most unmated Snow Buntings are forced out into marginal habitats. This may also be true for Lapland Buntings (cf. Custer & Pitelka 1977).

Breeding season

The time of breeding of all four species was broadly similar to that of the Saqqaq populations (Joensen & Preuss 1972). Most Snow Buntings started breeding in mid-June, which is typical of outer coastal areas in low-arctic Greenland (Salomonsen 1950). The mean date of laying in 6 Lapland Bunting nests, all in the lowland, was 16 June (Tab. 3). In three additional broods of fledglings the dates of laying were estimated to be around 14, 16 and 22 June. This indicates å breeding season that was more than a week later than recorded by Madsen (1982) in the lower parts of the inland locality Eqalummiut Nunaat. The difference may to some extent reflect a later invertebrate season in the cooler outer coastal areas than in inland localities. In Greenland, at low altitudes, the onset of breeding in Lapland Buntings is primarily correlated with food availability in spring and to a lesser degree with the date of thaw (see Madsen 1982). This is further supported by the time of breeding recorded at Saqqaq (Joensen & Preuss 1972) and in lower Sullorsuaq, east Disko where fledged young were seen from 2 July in 1989 (Frimer & Nielsen 1990).

The few records of the time of breeding of Wheatear and Redpoll fall within the normal range for the region (Salomonsen 1950).

From previous years, some data exist on the time of breeding of the area's passerine birds. In 1973 Snow Bunting young fledged between 6 July and 24 July and Lapland Buntings between 2 July and 24 July (Asbirk 1973), closely in agreement with the present observations. In 1982 Snow Bunting young fledged between 15 July and 3 August, with peak numbers around 22 July; juvenile Wheatears were seen from the second week of July, and one brood of Redpolls fledged 13-15 July (Hansen et al. 1982). The breeding in 1982 seems to have been 1-2 weeks delayed.

Reproductive success

Compared to other areas of Greenland, the mean reproductive success of the Snow Bunting was high (4.0). In Eqalummiut Nunaat: 2.9 fledglings per pair, with several pairs producing only one nestling (Fox 1981); at Mestersvig, Northeast Greenland: 2.5 nestlings per pair (O'Brian & Greenwood 1972) and 2.2 fledglings per pair (Asbirk & Franzmann 1978). The mean breeding success of Lapland Buntings in the present study agrees with records from Eqalummiut Nunaat (4.1 fledglings per female) (Madsen 1982).

Reproduction may seriously be affected by weather conditions and nest predation (e.g., Custer & Pitelka 1977, Fox 1981, Madsen 1982). The high breeding success of all species in the present study was a result of low precipitation in the nesting period, low predation rate and, apparently, good food conditions.

Acknowledgments

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Resumé

Tætheder og fordeling af spurvefugle i et kystnært område på Disko, Vestgrønland, med noter om yngleforhold

Denne artikel beskriver tætheder og fordeling af spurvefugle i et område på sydkysten af øen Disko i det centrale Vestgrønland. Nogle oplysninger om redeplacering, yngletidspunkt, ungeproduktion, prædation samt afrejsetidspunkter er inkluderet. Området (119 ha) er beliggende ved Københavns Universitets Arktiske Station, umiddelbart øst for Godhavn, og strækker sig fra en linie nær kysten (3 m o.h.) op til foden af et basalt-plateau (Lyngmarksfjeld) 240 m o.h. (Fig. 1).

Størstedelen af området (71 ha) består af en vegetationsfattig jævn og svagt stigende basaltbreccie (70-240 m o.h., Fig. 2), der danner en sydvest-vendt stejl klippevæg (Østerlien) i den vestlige del.

Resten af området, "lavlandet" (48 ha), ligger i øst og syd under 70 m o.h., men stiger til 110 m o.h. i den vestlige del (langs Østerlien). Lavlandet er et mere klippefyldt terræn (Fig. 3) med en rigere vegetation end på breccien. Omkring 6 ha er dækket af 30-50 cm høj blågrå pil *Salix glauca* (de grå felter i Fig. 1). Langs Østerlien findes en rig urtevegetation, medens resten af lavlandet er hede, domineret af fjeldrevling *Empetrum hermaphroditum* og mosebølle *Vaccinium uliginosum*.

Klimaet er lavarktisk, og temperaturen varierede mellem 0,5 og 18°C i undersøgelsesperioden 14. juni - 21. juli. Nedbøren begrænsede sig til små byger 13. juli, og de fleste dage var solrige.

Ialt tilbragte jeg 64 timer i området, jævnt fordelt over undersøgelsesperioden. Nogle få iagttagelser blev gjort før og efter denne periode. Ved brug af "kortlægningsmetoden", modificeret for åbne arktiske habitater (Freedman & Svoboda 1982), blev alle dele af området gennemgået seks gange. Adskillige unger blev vejet, målt, aldersbestemt og ringmærket. Resultaterne af undersøgelsen fremgår af Fig. 4 og Tab. 1, 2 og 3.

Ialt ynglede fire arter spurvefugle i området i 1990: Snespurv *Plectrophenax nivalis*, Laplandsværling *Calcarius lapponicus*, Stenpikker *Oenanthe oenanthe* og Gråsisken *Carduelis flammea*. Snespurven var den dominerende art, især på breccien, men også i lavlandet, hvor dens yngletæthed langt overgår tætheder registreret i andre dele af Grønland. Lavlandets klipper med utallige sprækker og nedfaldne stenblokke og den artsrige lave vegetation synes at tilbyde arten optimale rede- og fødebetingelser, hvilket støttes af den forholdsvis høje ungeproduktion på i gennemsnit 4 unger pr par. Denne type habitat er typisk for det sydlige Disko. Redepredation var uden større betydning i undersøgelsesområdet, f.eks. forekom Polarræv *Alopex lagopus* og Alm. Kjove *Stercorarius parasiticus* stort set ikke i yngletiden.

Den sidste Laplandsværling blev set 11. september; sidste Gråsisken 5. oktober; sidste Stenpikker 21. oktober og sidste Snespurv 3. november.

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