

Colony attendance in a Black Guillemot colony in West Greenland

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(Med et dansk resumé: Optælling af en koloni af Tejst i Vestgrønland)

Abstract Colony attendance of Black Guillemots *Cepphus grylle* was studied at a colony on Skarveø in West Greenland. Observations were conducted in the post hatching period by scan sampling birds in and near the colony every 30 minutes throughout five days. The rhythm of colony attendance varied diurnally, peaking in the early morning and again in late evening. The latter was the time of day with least variation between observation days. We found large variations in attendance levels and temporal patterns within and between three sections of the colony. For monitoring purposes the optimal census time during the post-hatching period appears to be during the evening peak, between 20:00 and 23:30 West Greenland summer time, i.e. between 18:30 and 22:00 local time.

Introduction

Developing reliable census methods has a high priority for the conservation of seabird species. Counting populations of Black Guillemots *Cepphus grylle* is particularly difficult because the nests are inaccessible (Cairns 1979, Petersen 1981). Thus, visual counts are more useful as indices of year-to-year population changes than as indicators of colony size (Cairns op.cit.). However, intensive studies of variation in colony attendance of adult birds from each colony are necessary, be-

cause colonies show different attendance patterns (Ewins 1985).

The census method for Black Guillemots, recommended by most authors, is to count displaying pairs on the sea off the colony on calm mornings during the pre-breeding season (Diamond 1996). Depending on the position and morphology of the colony, counts from a hide are recommended (Cairns 1979, Petersen 1981) although counts by unconcealed observers from a boat or from land are also useful (Ewins 1985, Hildén 1994). For

practical reasons, and because time and manpower of survey teams often are limited, most Black Guillemot censuses in Greenland have been carried out as counts of birds on the water at the breeding colony (D. Boertmann, pers. comm.).

The term 'colony attendance' refers to the number of birds visible on land and on the water near the colony. Previous results have shown that great variation occur in the relationship between colony attendance and the actual number of breeding birds in the colony (e.g. Cairns 1979, Slater 1980, Petersen 1981, Ewins 1985, Jones 1992, Hildén 1994, Murphy & Schauer 1994, Diamond 1996). Also, colony attendance is likely to fluctuate greatly both seasonally and diurnally, and in response to varying weather and feeding conditions (Hildén 1994).

Although colony attendance of Black Guillemots have been studied throughout Northern Europe and America (e.g. Suomailainen 1939, Koskimies 1949, Asbirk 1979, Cairns 1979), no such studies have been carried out in Greenland, where the Black Guillemot occurs in large numbers (Boertmann 1994).

In this study we examine temporal variation in attendance at a single colony of Black Guillemots during the post-hatching period, and the factors influencing the attendance pattern, in order to establish a reliable method for monitoring colonies. Hence, we do not discuss true population size, only the best way to monitor year-to-year-variation in colony size when monitoring during the pre-breeding season is not possible.

Materials and methods

The study was carried out at a colony of Black Guillemots (ssp. *arcticus*) located on the island Skarveø (69°15'N, 53°46'W) in Killiit (Fortunebay) northwest of Godhavn/Qeqertarsuaq on Disko Island, West Greenland. The colony is situated on a steep east-facing cliff and is about 200 m wide (Fig. 1). The lower part of the cliff is bare rock, whereas the upper part is a grassy slope, and birds were observed flying to nests in both habitats.

Researchers from the National Environmental Research Institute (NERI) in Denmark conducted a previous count of the colony at 08:00 on 25 July 2001, estimating 190 birds (Colony No. 69087, Greenland Seabird Colony Register 2008 (<http://www.dmu.dk/Greenland/Olie+og+Miljoe/Havfuglekolonier/>)). The count was made from a boat passing the colony and disturbing the birds, so that most birds were on the water in front of the nesting area.

The colony at Skarveø was observed from Qaqqaq, an island approximately 150 m from the colony. Due to the topography of Qaqqaq it was not possible to choose an observation post directly across from the colony, but the chosen post did provide a good view of the colony and the birds were not disturbed by our presence. The 24 h daylight conditions made observations possible at all times.

Our study was conducted during 22 July – 3 August 2004, in the post-hatching period. Birds were censused with 30-minute intervals by scan



Fig. 1. Skarveø as seen from the observation post. The frame marks the colony. Photo: K. Rahe. Skarveø set fra observationsposten. Kolonien er indrammet med sort firkant.

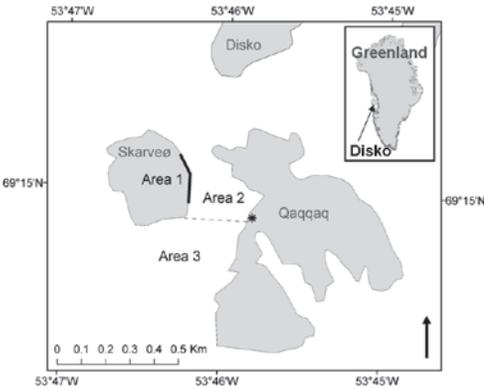


Fig. 2. Skarveø, with the colony (area 1; black bold line) the census areas 2 and 3 on the water. The asterisk marks the observation post on Qaqqaq.

Kolonien på Skarveø (fed sort linje) og de to optællingsområder på vandet ud for kolonien. Observationsposten er vist med en stjerne.

sampling (Altman 1974), by two observers using binoculars (8×35). Each scan lasted 2-5 minutes. Altogether, we conducted 240 scans, equally distributed across the day (48 scan times from 00:00 to 23:30, each of them scanned on five different days); time is given as West Greenland summer time (UTC-2 h), which is 1 h 35 min ahead of local (mean solar) time at the study site. Observations were conducted in good weather conditions allowing a clear view of the colony.

In order to obtain a better distinction between the birds in the colony on land (area 1), birds on the water in the immediate vicinity of the colony (area 2), and birds further away (area 3), birds visible within these three areas were recorded separately, including flying individuals; cf. Fig. 2.

Table 1. Variation in hourly counts of Black Guillemots, grouped in four-hour blocks. SD = Standard Deviation, CV = Coefficient of Variation

Variation i tællinger af Tejster opdelt i blokke af fire timer. SD = Standardafvigelse, CV = Variationskoefficient.

Time (four-hour block)	Mean	SD	CV
00:00 – 03:30	171	26.7	0.16
04:00 – 07:30	199	24.0	0.12
08:00 – 11:30	174	33.0	0.19
12:00 – 15:30	87	21.2	0.24
16:00 – 19:30	123	47.2	0.38
20:00 – 23:30	203	13.0	0.06

In order to find the time of day best suited for censusing Black Guillemots (many birds visible, little variation between days), we grouped all counts into blocks of four hours. We calculated mean, standard deviation (SD) and coefficient of variation (CV) for each block.

From 27 July, the proportion of flying birds at the colony during each scan was estimated and the records divided into three categories: a) few birds flying, b) some flight, but the birds still easy to count, and c) many birds flying, making them difficult to count.

Results

The number of Black Guillemots attending the colony varied significantly during the day (ANOVA: $F_{47,192} = 4.86$, $P < 0.0001$). Peak attendance was at 07:30 in the morning with an average of 235 birds visible at the colony (Fig. 3). A slightly smaller evening peak occurred at 21:30, with 217 birds attending. Minimum counts were at 15:30, when the number of visible birds dropped to a fourth of those observed at peak attendance.

Mean, standard deviation (SD) and coefficient of variation (CV) for each of the four time blocks are shown in Table 1. The results showed that the period with highest mean number and least variation was in the late evening, between 20:00 and 23:30. High numbers and low variation were also seen in the early morning, from 04:00 to 07:30.

Daily distribution of birds in the three areas was calculated (Fig. 3). The number of birds visible varied significantly during the day in area 1 ($F_{47,192} = 9.69$, $P < 0.0001$) and area 2 ($F_{47,192} = 2.39$, $P < 0.0001$), but not in area 3 ($F_{47,192} = 0.96$, $P = 0.56$). The number of birds in the three areas differed significantly from each other ($F_{2,717} = 102.7$, $P < 0.0001$).

Mean and CV were calculated for each area. Area 2 (mean = 81.7, CV = 0.66) had the highest mean number of birds. Corresponding values for area 1 were mean = 44.3, CV = 0.73, and for area 3 mean = 33.9, CV = 0.66. This means that, on average, 75% of the counted birds were seen close to the colony, either on the water or on land.

The proportion of flying birds at the scans is shown in Fig. 4. It was highest between 03:00 and 13:00, and lowest during 00:00-03:00 and 15:00-20:00.

Discussion

Strong morning attendance at Black Guillemot colonies, as here found, has been reported from Canada (Cairns 1979), Denmark (Asbirk 1979),

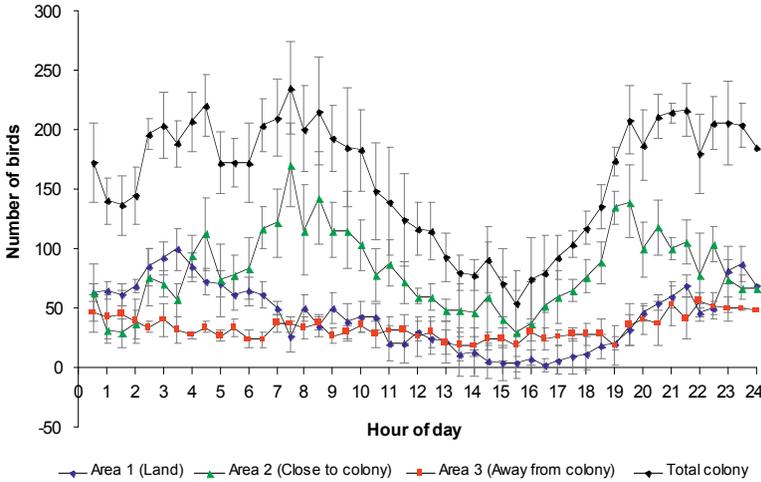


Fig. 3. Mean numbers of Black Guillemots attending the colony divided in areas 1, 2, 3, and total. Vertical bars show ± 1 standard error calculated across five censusing days.

Middelverdier af antal Tejster i kolonien inddelt i områderne 1, 2, 3 og totalt. De lodrette linier viser ± 1 standardafvigelse af middelværdien udregnet over de fem optællingsdage.

Shetland (Ewins 1985) and Finland (Hildén 1994). In addition, however, we found a distinct evening peak (Fig. 3), a pattern similar to that found by Ewins (op.cit.) during the post-hatching period. Though fluctuating, colony attendance remained high throughout the night, in accordance with the observation of Petersen (1981) that birds at higher latitudes had a merged morning and evening peak. A possible explanation is that the continuous daylight makes it possible for the birds to stay active (Petersen 1981).

The lowest day-to-day variation in attendance, as well as the peak numbers of bird present, occurred during the evening hours (20:00-23:30, corresponding to approximately 18:30-22:00 local time), so censusing attending birds for monitoring purposes (providing index values of annual population size) should be conducted at this time if surveying during the post-hatching period (Table 1). In the morning the number of attending birds may reach even higher values than in the evening (Fig. 3), but numbers tend to fluctuate more, and the proportion of flying birds is high (Fig. 4). Optimally, several counts should be conducted when censusing a Black Guillemot colony.

Several authors recommend using correction factors when conducting counts outside of the peak attendance periods (e.g. Cairns 1979, Hildén 1994). Such a practice might be useful if numbers, although low, were reasonable stable. However, our results indicate that the number of attending

birds at such times varies considerably between days, and we do not recommend using correction factors.

Previous studies have often chosen to ignore birds not within the immediate vicinity of the colony, since such birds may not belong to the colony or may not be active breeders (Ewins 1985, Hildén 1994). In our study, the majority of the

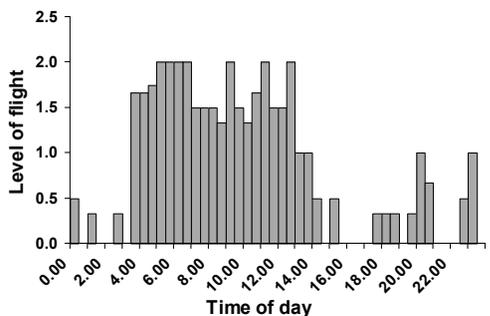


Fig. 4. Flight activity at the colony during the day. The scale ("level") used is: 0 = few birds flying, 1 = some flight activity, but the birds still easy to count, 2 = many birds flying, making it difficult to count them. Each value represents an average for the particular time of censusing.

Niveau af flyveaktivitet over døgnet. 0 = lav flyveaktivitet, 1 = middel flyveaktivitet (fuglene stadig lette at tælle), 2 = høj flyveaktivitet (fuglene svære at tælle). Hver værdi repræsenterer en middelværdi for det pågældende optællingsstidspunkt.



Ved monitoring af grønlandske tejestekolonier tælles fuglene bedst om aftenen mellem 20:00 og 23:30 (vestgrønlandsk sommertid), hvor der er flest fugle til stede, og dag-til-dag variationen er mindst.

present birds always resided in or near the colony, either on the water (area 2) or on land (area 1), and the number of birds further away (area 3) was fairly stable. In our recommended censusing periods more than 70% of the birds were in area 1 or 2 (Fig. 3). Thus, excluding the more distant birds would not affect the counts greatly.

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Resumé

Optælling af en koloni af Tejst i Vestgrønland

I perioden 22. juli – 3. august 2004, dvs. i ungetiden, undersøgtes variationen over døgnet i Tejsternes *Cepphus*

grylle tilstedeværelse ved en koloni. Formålet var at foreslå en brugbar metode til optælling af tejestkolonier og specielt at fastslå det bedste tidspunkt. Studiet blev udført på Skarveø (69°15'N, 53°46'V) i Killiit (Fortunebay) nordvest for Godhavn/Qeqertarsuaq på Disko i Vestgrønland. Antallet af fugle blev registreret ved scanninger foretaget af to observatører hver halve time døgnet rundt i sammenlagt fem døgn.

Antallet af tilstedeværende fugle varierede betydeligt gennem døgnet, med et maksimum kl. 7:30 om morgenen (maksimal middelværdi = 235 fugle) samt en lidt mindre top kl. 21:30 (middelværdi = 217 fugle). De laveste værdier blev registreret kl. 15:30, hvor antallet af fugle faldt til en fjerdedel af maksimumværdien (Fig. 3). De angivne tider er vestgrønlandsk sommertid (UTC-2 h). Antallet af fugle både på land (område 1) og på vandet umiddelbart i nærheden af kolonien (område 2) varierede signifikant over døgnet, men det ikke var tilfældet med antallet af fugle længere væk (område 3), jf. Fig. 3.

Døgnet blev inddelt i tidsblokke af fire timer, og tallene her er sammen med standardafvigelse og variationskoefficienter vist i Tabel 1. Det ses her, at variationen er lavest mellem kl. 20:00 og 23:30. Flyveaktiviteten blev estimeret til at være højest i tidsrummet 03:00-13:00 og lavest i perioderne 00:00-03:00 og 15:00-20:00 (Fig. 4).

Resultaterne indikerer, at det optimale optællings-tidspunkt i forbindelse med monitorering af år-til-år-variationen i kolonistørrelsen i perioden efter klækning er i tidsrummet kl. 20:00-23:30 (sv.t. ca 18:30-22:00 lokal-tid), hvor der er lavest variation mellem dagene og flest fugle i kolonien. Alternativt foreslår vi tidligt om morgenen i tiden 04:00-07:30 (02:30-06:00 lokal-tid). På vores anbefalede tælletidspunkter opholdt mere end 70% af de tilstedeværende fugle sig i eller tæt ved kolonien, og det ville derfor ikke have påvirket optællingen særlig meget at udelukke de fugle, som opholdt sig længere væk fra kolonien. Vi anbefaler, at der udføres adskillige tællinger fra en afstand, hvor man ikke forstyrrer fugle. På baggrund af den store dag-til-dag variation i antallet af fugle uden for spidsperioden anbefaler vi ikke brugen af tællinger på sådanne tidspunkter, med eller uden korrektionsfaktorer.

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