

BIRD MONITORING AT ZACKENBERG, NORTHEAST GREENLAND, 2008, WITH COMPARISON TO 1995-2007¹

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Abstract. During the breeding season of 2008, bird populations were monitored in a 15.8 km² area designated at Zackenberg Research Station in central Northeast Greenland. Results are presented and compared with those of previous seasons (1995-2007).

The breeding bird census revealed relatively high numbers of Sanderling (*Calidris alba*) and Dunlin (*Calidris alpina*) territories, whereas territories of Ruddy Turnstone (*Arenaria interpres*) were found in average numbers. However, only a few Ruddy Turnstones seemed to nest. The number of Red Knot (*Calidris canutus*) territories was around the average of the previous seasons. Despite the relatively late snow-melt, wader nest initiation in 2008 was average or a little later, and median first egg dates were also average in all four species. Wader nest success, however, was extremely low, and most nests suffered predation. Long-tailed Skua (*Stercorarius longicaudus*) territories were found in near-average numbers, and with an average median nest initiation date, but with a nest success well below average. Average numbers of Barnacle Goose (*Branta leucopsis*) broods were observed, and with a relatively high mean brood size early in the season and low late in the season.

Key words: Monitoring, Arctic, waders, geese, Long-tailed Skua, Rock Ptarmigan, Snow Bunting, climate.

MONITOREO DE AVES EN ZACKENBERG, NORESTE DE GROENLANDIA, 2008, Y COMPARACION CON 1995-2007

Resumen. Se monitorizaron las poblaciones de aves durante la temporada reproductiva de 2008 en el área de censado de 15.8 km² en la Zackenberg Research Station en el centro del noroeste de Groenlandia. Presentamos los resultados y los comparamos con temporadas previas de 1995 a 2007.

El censo de cría reveló un número relativamente alto de territorios de *Calidris alba* y *Calidris alpina*, mientras que los territorios de *Arenaria interpres* mostraron números promedio. Sin embargo, sólo unos pocos *Arenaria interpres* parecieron anidar. Los territorios de *Calidris canutus* estuvieron cerca del promedio de años anteriores. A

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pesar de un deshielo relativamente tardío, la iniciación de nidos de limícolas en 2008 fue promedio o algo más tardío, y las fechas medianas del primer huevo fueron cercanas al promedio en las cuatro especies. El éxito de nidificación de las limícolas, sin embargo, fue extremadamente bajo, y la mayoría de los nidos fueron depredados. Los territorios de *Stercorarius longicaudus* se encontraron en cifras promedio, y con inicio de anidación promedio, pero con un éxito de nidificación muy por debajo de la media. Números promedio de pollos de *Branta leucopsis* fueron observados, con un tamaño medio de las polladas relativamente alto a principios de temporada y bajo a finales.

Palabras clave: Monitoreo, Artico, limícolas, gansos, skua, perdiz nival, escribano, clima.

INTRODUCTION

The monitoring programme, Zackenberg Basic, based at the Zackenberg Research Station in central Northeast Greenland (Figure 1), was conducted for the 14th season. For details of the previous years, please refer to Hansen et al. (2008). This paper presents a summary of the bird monitoring portion of the BioBasis programme from the 2008 season. The results presented here will also be available in the 14th ZERO Annual Report (Jensen and Rasch 2009). Similar reports from previous seasons are available for all previous field seasons (see www.zackenberg.dk/publications.htm#ZAR).

Details on BioBasis methodology are available at the home page of NERI (<http://biobasis.dmu.dk>), the current sampling protocol (Meltofte et al. 2009) and the database are available online: <http://zackenberg.dk/sw12805.asp>.

RESULTS AND DISCUSSION

BREEDING POPULATIONS

A complete initial census was performed between 18 and 28 June [Day of year (DOY) 170 and 180, respectively], which is a late start and very late last day of census. The completion of the survey took 45 “person-hours,” which is a little above average, considering that the census took a day less than pre-2007. The weather prevented census work on several days in the period. The entire census was performed in decent weather conditions, and most parts of the 15.8 km² census area were snow free. For further details on methods, see Hansen et al. (2008) and Meltofte et al. (2008).

In addition, large parts of the census area were surveyed regularly during June, July and most of August, exceptions being the closed goose moulting area along the coast and the Aucellabjerg slopes above 350 m a.s.l. The latter were covered on only five occasions by the census taker (J. Hansen). The team of J. Reneerkens, however, searched for Sanderling (*Calidris alba*) nests and broods in the area regularly.

The total effort in June and July 2007 was similar to previous years. The results of the initial census, supplemented with records during the rest of the season (see Meltofte et al. 2008), are presented in Tables 1 and 2, along with estimates of previous seasons.

The first pair of Red-throated Divers (*Gavia stellata*) to settle was a pair in a pond at the research station on 3 June (DOY: 155), only a few days after the first diver was observed (Table 3). Four pairs attempted to breed within the census area. Two nests were found within the census area. In adjacent areas, Red-throated Diver pairs were recorded in two lakes. In Vesterport Sø, a pair nested near the nest of last season (2007). Most likely, the nest suffered predation. In Lindemandssø, a pair with a large chick was seen in August. Red-throated Divers started to form small flocks 26 July (DOY: 208). The last Red-throated Diver was heard 19 August (DOY: 232).

Sanderling territories were recorded at numbers above average for the third consecutive season, and were comparable to the previous two peak years of 2003 and 2006 (Table 2). Numbers of Dunlin (*Calidris alpina*) territories were the highest number so far found in the monitoring program. Meltofte (2006a), with the

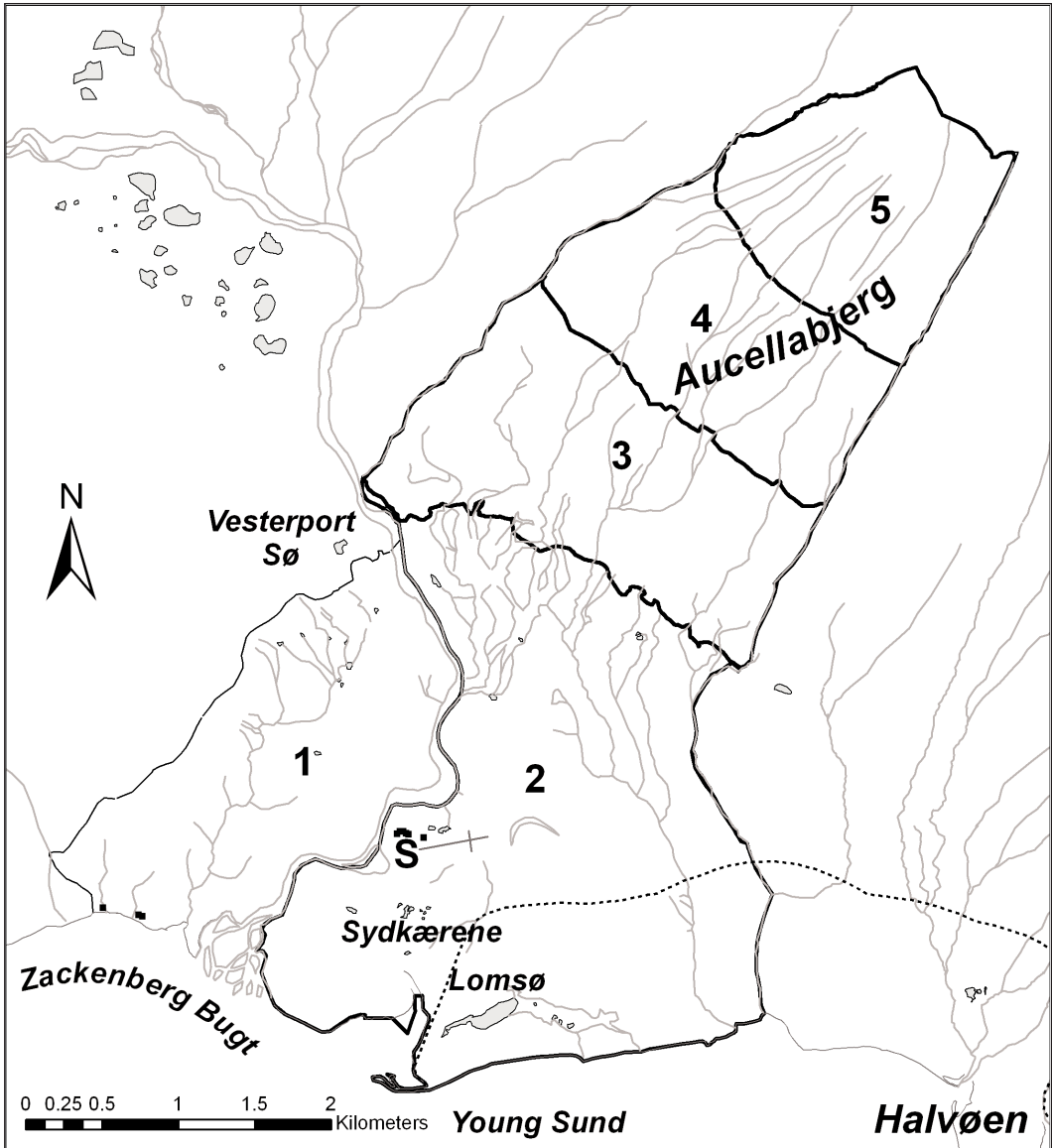


FIGURE 1. Map of the study area in Zackenbergdalen, central Northeast Greenland, with sections 1-5 of the bird census area. Also shown, selected place names mentioned in the text, the research station (S) and the border of the closed goose moulting area, 1c (broken line).

possibility that numbers were underestimated in early years. Therefore, at least some of the increase seen in numbers might be an artefact of this underestimation. Since 1996, Common Ringed Plover (*Charadrius hiaticula*) territory numbers have varied considerably, and in 2008 numbers were very low. Ruddy Turnstone

(*Arenaria interpres*) territories were found in very low numbers, continuing the decrease that followed the two-year peak of above average numbers (2005-2006; below, however, we note that breeding numbers were low). Red Knot (*Calidris canutus*) territory numbers were a little above average (Tables 2, 3).

TABLE 1. Estimated numbers of pairs/territories in four sectors of the 15.8 km² census area in Zackenbergdalen, 2008.

| Species | <50 m | 50-150 m | 150-300m | 300-600 m | |
|----------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------|
| | a.s.l. 7.77 km ² | a.s.l. 3.33 km ² | a.s.l. 2.51 km ² | a.s.l. 2.24 km ² | |
| Red-throated Diver | 4 | 0 | 0 | 0 | 4 |
| King Eider | 0-1 | 0 | 0 | 0 | 0-1 |
| Long-tailed Duck | 7-8 | 0 | 0 | 0 | 7-8 |
| Rock Ptarmigan | 0-1 | 0 | 2-3 | 0 | 2-4 |
| Common Ringed Plover | 8 | 3-6 | 0-1 | 5-7 | 16-22 |
| Red Knot | 5-7 | 10-12 | 8 | 1 | 24-28 |
| Sanderling | 37-41 | 2-4 | 13 | 8-9 | 60-67 |
| Dunlin | 82-90 | 14-17 | 1 | 0 | 97-108 |
| Ruddy Turnstone | 10-11 | 14 | 0-1 | 0 | 24-26 |
| Red-necked Phalarope | 1-2 | 0 | 0 | 0 | 1-2 |
| Red Phalarope | 1 | 0 | 0 | 0 | 1 |
| Long-tailed Skua | 9-12 | 9-11 | 0-1 | 1 | 19-25 |
| Glaucous Gull | 1 | 0 | 0 | 0 | 1 |
| Arctic Redpoll | 2 | 0 | 0 | 1 | 3 |
| Snow Bunting | 21-23 | 21-22 | 10-11 | 2-4 | 54-60 |

Neither Red-necked Phalarope (*Phalaropus lobatus*) nor Red Phalarope *P. fulicarius* nests were found in 2008. Up to two pairs of Red-necked Phalarope were seen between 1 and 12 June (DOY: 153 and 164, respectively), and a single pair of Red Phalarope was seen once on 23 June (DOY: 175).

Long-tailed Skua (*Stercorarius longicaudus*) territories were found in near-average numbers, and have varied little over the years (cf. Meltofte and Høye 2007; Table 2). Nine pairs nested in the census area (see below).

A pair of Glaucous Gulls (*Larus hyperboreus*) bred on an islet in the river, Zackenbergelven. A pair has bred on the islet since 2004. The islet is reshaped most years during surge flooding, and the nest site is not always in the same location. No chicks were seen, and nest fate is uncertain. The Glaucous Gull is a common bird at Zackenberg, and several birds can be seen most of the season patrolling the rivers, shores and fens (cf. Hansen et al. 2008).

The number of Rock Ptarmigan (*Lagopus mutus*) territories was comparable to 2006 and 2007, coming back from a low during 2002-2005. During the census, 2-4 pairs were registered. One brood was found in the census area on 17 July (DOY: 199) with nine pulli on the slopes of upper Aucellabjerg. In adjacent areas, a female

with four pulli were seen on the slopes of the mountain Zackenbergfjeld (above the border of the census area).

Numbers of Snow Bunting (*Plectrophenax nivlalis*) territories were equal to the last three years, and higher than the period 1996-2003 (Table 2).

Arctic Redpoll (*Carduelis hornemanni*) territories were few and far between, which is normal (Table 2).

REPRODUCTIVE PHENOLOGY IN WADERS

Nest initiation was a little late in one species (Ruddy Turnstone), and around average in the remainder (Table 4). Only about 7% of the egg laying in all wader nests were initiated before 10 June, and around 60% before 20 June (DOY: 172). In other words, nest initiation was fairly synchronous.

The snow cover on 10 June 2008 (DOY: 162) was approximately 71%, which equals the average of the period 1996-2007. Median nest initiation dates were around average for the previous seasons (Table 5).

REPRODUCTIVE SUCCESS IN WADERS

The overall wader nest success was extremely low in 2008. Following the modified Mayfield method (Johnson 1979), we found that 84% of

TABLE 2. Estimated numbers of pairs/territories in the 15.8 km² census area in Zackenbergdalen, 1996-2008.

| Regular breeders | | | | |
|------------------------|--------------------|---|--------------------------------|---|
| Species | No. of territories | Average min. and max. no. territories 1996-2006 | No of nests found ^a | Comments |
| Red-throated Diver | 4 | 2.2-2.6 | 2 | |
| Common Eider | 0 | 0.4-0.5 | 0 | Flocks seen in June, females with chicks in August* |
| King Eider | 0-1 | 1.4-2.1 | 0 | |
| Long-tailed Duck | 7-8 | 5.3-6.9 | 0 | |
| Rock Ptarmigan | 2-4 | 2.6-3.5 | 0 | |
| Common Ringed Plover | 16-22 | 30-36.5 | 4 | |
| Red Knot | 24-28 | 25.1-32.7 | 1 | |
| Sanderling | 60-67 | 48.8-56.7 | 29 | |
| Dunlin | 97-108 | 71.8-82 | 19 | |
| Ruddy Turnstone | 24-26 | 43-48.4 | 7 | |
| Red-necked Phalarope | 1-2 | 0.8-1.8 | 0 | |
| Long-tailed Skua | 19-25 | 18.5-22.3 | 5 | |
| Glaucous Gull | 1 | 0.3 | 1 | |
| Common Raven | 2 | - | 0 | Nests outside the census area. |
| Snow Bunting | 54-60 | 40.4-45.5 | 0 | Nests of passerines are only found oportunistically. |
| Irregular breeders | | | | |
| Species | No. of territories | Average min. and max. no. territories 1996-2006 | No of nests found ^a | Comments |
| Pink-footed Goose | 0 | 0.2 | 0 | Min. 1181 immatures migrated northwards over the area |
| Eurasian Golden Plover | 0 | 0.1 | 0 | |
| Red Phalarope | 1 | 0.6-0.8 | 1 | First nest found by BioBasis at Zackenberg |
| Snowy Owl | 0 | 0.1 | 0 | |
| Northern Wheatear | 0 | 0.2-0.5 | 0 | |
| Arctic Redpoll | 3 | 1.1-3.3 | 0 | |

^aWithin the census area

the wader nests were subjected to predation. Ruddy Turnstones suffered the lowest predation; 22% of the nests were successful. Sanderling nests suffered heavily from predation again this season, although a little less than in 2007 (Table 6). A single Sanderling nest was abandoned during laying and another two Sanderling nests were abandoned before hatching. All four common ringed plover nests that were found eventually fell victim to predation. Just one nest of red knot was found in 2008, and it suffered predation.

The Arctic fox (*Alopex lagopus*) is the likely predator of most nests, as very few nests were

found with clear signs of avian predators. The number of fox encounters was relatively high in 2008 and the minimum number of fox pups produced in the dens within the research area was record high (Table 6).

The mean clutch size across the three target species was 3.7 in 2008, which is a little below average (Table 7). Nests containing fewer than four eggs were: Common Ringed Plovers, two nests of three eggs – Sanderling; one nest of three eggs, two nest of two eggs, and two nests of one egg – Dunlin: four nests of three eggs – Ruddy Turnstone; one nest of two eggs.

In July and early August, alarm calling

TABLE 3. Dates of first observation of selected species at Zackenberg 1996-2008.

| Species | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|----------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Red-throated Diver | ≤155 | 150 | 154 | 155 | 158 | 154 | 152 | ≤155 | ≤153 | 149 | 155 | 152 | 152 |
| Pink-footed Goose | ≤155 | ≤148 | 147 | 154 | 156 | 154 | 152 | ≤154 | ≤153 | ≤139 | ≤146 | ≤145 | 136 |
| Common Eider | 165 | 153 | 175 | 180 | 163 | 161 | 163 | 163 | 169 | 155 | 163 | 172 | 164 |
| King Eider | 164 | 155 | 166 | 167 | ≤174 | 160 | 152 | ≤164 | 166 | 172 | 163 | 173 | 170 |
| Long-tailed Duck | ≤153 | 150 | 153 | 157 | 158 | 158 | 154 | 158 | 154 | 152 | 158 | 156 | 155 |
| Red-necked Phalarope | 157 | 150 | 156 | 161 | 159 | 155 | 156 | 162 | ≤153 | 147 | 157 | 148 | 153 |

TABLE 4. Median first egg dates for waders at Zackenberg 2008 as estimated from incomplete clutches, egg floating, hatching dates, as well as weights and observed sizes of pulli.

| Species | Median date | Range | N |
|----------------------|-------------|-----------|----|
| Common ringed plover | 167 | 163 - 181 | 4 |
| Red Knot | 166 | 165 - 167 | 2 |
| Sanderling | 169 | 156 - 154 | 39 |
| Dunlin | 169 | 157 - 187 | 22 |
| Ruddy Turnstone | 170 | 156 - 179 | 9 |

TABLE 5. Snow cover on 10 June (DOY: 162) together with median first egg dates for waders at Zackenberg 1995-2008. Data based on less than 10 nests/broods are in brackets, less than five are omitted. The snow cover is pooled (weighted means) from section 1, 2, 3 and 4 (see section 2.2), from where the vast majority of the egg laying phenology data originate. See Jensen and Rasch (2009) regarding estimation of snow.

| Species | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|-----------------------|-------|-------|------|-------|-------|-------|-------|------|------|------|-------|-------|------|------|
| Snow cover on 10 June | 84 | 82 | 76 | 80 | 91 | 53 | 84 | 79 | 83 | 48 | 28 | 85 | 48 | 71 |
| Sanderling | | (168) | 169 | 169 | 174.5 | 168 | 173.5 | 168 | 164 | 160 | (166) | 181 | 166 | 169 |
| Dunlin | (169) | 163.5 | 164 | 167.5 | 173 | 163.5 | 176 | 159 | 163 | 164 | 163 | 178 | 166 | 169 |
| Ruddy Turnstone | (163) | 170.5 | 164 | 163.5 | 175 | 163 | 174 | 160 | 159 | 160 | 162 | (172) | 158 | 170 |

TABLE 6. Mean nest success (%) 1996-2008 according to the modified Mayfield method (Johnson 1979). Poor data (below 125 nest days or five predations) are given in brackets. Data from species with below 50 nest days have been omitted ('-' indicates no nests at all). Nests with at least one pipped egg or one hatched young are considered successful. Also given are total numbers of adult foxes observed by the bird observer in the bird census area during June-July (away from the research station proper), along with the number of fox dens holding pups.

| Species | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 1996-2008 |
|----------------------|-------|----------|-------|-------|------|------|------|-------|-------|------|------|-------|------|-----------|
| Common Ringed Plover | | | | (60) | | (38) | | | | - | (0) | - | (2) | 48-51 |
| Red knot | - | - | | | - | | - | | | - | - | (100) | | (24) |
| Sanderling | (72) | (33-100) | (88) | 40 | (46) | 19 | (33) | 45 | 71-85 | | (7) | 3 | 5 | 22-23 |
| Dunlin | | | 28-47 | 65 | 68 | (75) | | 63 | 93 | (43) | 47 | 48 | 17 | 55-60 |
| Ruddy Turnstone | 21-68 | 67-100 | 16 | 23-28 | 29 | (60) | 52 | 21-27 | 83 | | | 36 | (22) | 38-44 |
| Red-necked Phalarope | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Red Phalarope | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| All waders | 33-63 | 52-100 | 32-37 | 42-44 | 44 | 43 | 43 | 42-44 | 87-90 | 22 | 37 | 18 | 16 | 36-39 |
| N nests | 17 | 31 | 44 | 44 | 47 | 32 | 21 | 51 | 55 | 15 | 28 | 60 | 58 | 503 |
| N nest days | 163 | 274 | 334 | 518 | 375 | 328 | 179 | 552 | 700 | 104 | 332 | 533 | 433 | 4816 |
| Fox encounters | 14 | 5 | 7 | 13 | 11 | 14 | 21 | 11 | 16 | 18 | 22 | 23 | 20 | |
| Fox dens with pups | 2 | 0 | 1 | 0 | 2 | 2 | 0-1 | 2 | 3 | 0 | 2 | 3 | 5 | |

parents of Common Ringed Plovers, Red Knots, Sanderlings, Dunlins, and turnstones – and later juveniles – were found in the fens and marshes (dunlins), on the slopes of Aucellabjerg and in the dry lowlands.

Data on chick survival is scarce, but as early as 11 June, flocks of up to 10 individuals of Long-tailed Skuas roamed the lower slopes of Aucellabjerg and the lowlands, which most likely have asserted a significant predation pressure on the chicks.

REPRODUCTIVE PHENOLOGY AND SUCCESS IN LONG-TAILED SKUAS

Eight (i.e. 80 %) of the Long-tailed Skua nests were initiated prior to the census period. In terms of nest initiation, this season was around average (Table 8), and in the census area only two nests were initiated after 20 June (DOY: 172).

Only one collared lemming (*Dicrostonyx groenlandicus*) observation was made by the chief bird observer (J. Hansen), reflecting a season with few lemmings (Table 8) – the main food resource for Arctic fox and Long-tailed Skua. The average clutch size was 1.6 eggs per nest. Only 5 chicks hatched. Nest success for Long-tailed Skuas was well below average (average nest success 1996-2007: 55%; Table 8). Most hatched chicks are thought to have suffered predation; only two are thought to have survived. The last observation was of a juvenile (accompanied by an adult) on 13 August (DOY: 226). This young bird was likely to be 40 days old.

BARNACLE GEESE

The Barnacle Goose (*Branta leucopsis*) colony on the southern face of the mountain Zackenbergfeldet was active with at least three pairs.

The colony was first found in 1964, and thereafter revisited and found still in use in 2005 and 2006 (Hansen et al. 2008).

The first families with goslings were seen on 9 July. The number of broods was 15 (Table 9), and the maximum number of goslings seen at one time was 18.

The mean brood size was high until mid July, but ended on a just 1 gosling per brood in early August (Table 9). From Isle of Islay, Western Scotland, it was reported that the percentage of young in the flocks arriving to their wintering quarters was 8.2 (Table 9; M. Ogilvie, pers. comm.).

In 2008, immature Barnacle Geese moulted in numbers well above average (1995-2007 average: 196; Table 10).

COMMON BIRDS, NOT BREEDING IN THE CENSUS AREA

A total of 1,181 individual immature Pink-footed Geese (*Anser brachyrhynchus*) were observed migrating over Zackenbergdalen northwards towards their moulting areas. Only two immature Pink-footed Geese were found moulting at Zackenberg this year (Table 11).

On 12 June (DOY: 164), the first Common Eider (*Somateria mollissima*) was seen on Lomsø (a female). In the following weeks pairs and smaller flocks were seen regularly, but at no time more than ten individuals. Ten young – possibly from the Daneborg or Sandøen colonies (c. 30-35 km west of Zackenberg) – were recorded with an adult female in the former delta, on 18 July (DOY: 200). The last adult male was seen on 23 July (DOY: 205). The 63 adults and three pulli seen at a sandy spit at the former delta on 29 July (DOY: 211) was the largest flock of the season. At Daneborg, the Common Eider colony between the dog pens was once again

TABLE 7. Mean clutch sizes in waders at Zackenberg 1995-2008. Samples of fewer than five clutches are given in brackets.

| Species | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | Mean |
|----------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|--------|--------|--------|------|
| Common Ringed Plover | (4.00) | (4.00) | (3.50) | (4.00) | (3.50) | (4.00) | (3.50) | (4.00) | (4.00) | (4.00) | | (3.75) | | (3.75) | 3.83 |
| Red knot | | | | (4.00) | (4.00) | | (4.00) | | (4.00) | (4.00) | | | (4.00) | (4.00) | 4.00 |
| Sanderling | (4.00) | 4.00 | 3.86 | 4.00 | 3.67 | 4.00 | 3.43 | 3.83 | 4.00 | 4.00 | 3.75 | 3.63 | 3.73 | 3.77 | 3.83 |
| Dunlin | | (4.00) | (3.75) | 3.90 | 3.70 | 3.93 | 3.63 | (4.00) | 4.00 | 3.92 | 4.00 | 3.13 | 3.79 | 3.67 | 3.80 |
| Ruddy Turnstone | | | 3.71 | 3.79 | 3.82 | 3.58 | 3.80 | 3.75 | 4.00 | 3.77 | 3.92 | 3.86 | (3.00) | (4.00) | 3.71 |
| Average | 4.00 | 3.93 | 3.73 | 3.94 | 3.69 | 3.93 | 3.66 | 3.96 | 3.95 | 3.97 | 3.87 | 3.38 | 3.88 | 3.73 | 3.83 |

TABLE 8. Egg-laying phenology, breeding effort and success in Long-tailed Skuas at Zackenberg 1996-2008. Median egg laying date is the date when half the supposed first clutches were laid. Number of clutches found includes replacement clutches. Mean hatching success according to the modified Mayfield method (Johnson 1979). Poor data (below 125 nest days or five predations) are given in brackets. Nests with at least one pipped egg or one hatched young are considered successful. Also given are numbers of lemming winter nests within the 2 km² lemming census area (see section 3.4). *Please note that in 2006, only one of two eggs hatched (other never hatched)..

| Long-tailed skua breeding | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|--|-------|--------|------|--------|--------|-------|-------|--------|-------|--------|-------|-------|------|
| Median 1st egg date | | 7.6 | 12.6 | 17.6 | 18.6 | 15.6 | 9.6 | 15.6 | 8.6 | 8.6 | 19.6 | 12.6 | 12.6 |
| No. of clutches found | 8 | 17 | 23 | 8 | 5 | 21 | 14 | 7 | 21 | 8 | 2 | 15 | 9 |
| No. of young hatched | 1 | 25 | 16 | 2 | 2 | 18 | 14 | 5 | 36 | 6 | 1 | 11 | 3 |
| Nest success % (Mayfield) | | (80.6) | 26.7 | (18.1) | (17.5) | 39.5 | 44.1 | (76.2) | (94) | (51.8) | (100) | 23 | 33 |
| Estimated no. of young fledged | 0 | 5 | 6 | 1 | 0 | 5 | 4 | 2 | 22 | 1 | 0 | 1 | 2 |
| Lemming winter nests pr. km ² | 224.5 | 247.2 | 467 | 227.4 | 136.8 | 208.5 | 178.3 | 66 | 238.7 | 170.8 | 189.6 | 236.8 | 75.5 |

TABLE 9. Average brood sizes of Barnacle Geese in Zackenbergdalen during July and early August, 1995-2008, together with the total number of broods brought to the valley. Samples of less than 10 broods are given in brackets. Average brood size data from autumn on the Isle of Islay in Scotland are given for comparison, including the percentage of juveniles in the population (M. Ogilvie, pers. comm.).

| Decade | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|---------------|-------|-------|-------|-------|------|-------|-------|------|-------|-------|-------|-------|-------|-------|
| Primo July | | (3.0) | 3.1 | (2.9) | 1.9 | (3.2) | (1.8) | 2.4 | (1.8) | 2.6 | (1.7) | (2.0) | 1.3 | (4) |
| Medio July | | (2.3) | 2.7 | 2.3 | 1.8 | (3.1) | (1.7) | 2.4 | (1.2) | 2.3 | 2.7 | (1.5) | 1.5 | 1.6 |
| Ultimo July | (2.0) | (3.0) | 2.6 | 2.2 | 1.7 | 3.1 | | 2.3 | (1.1) | 2.3 | (2.2) | (1.1) | (3.3) | (1.5) |
| Primo August | (2.3) | (2.3) | 2.4 | | 1.8 | | (2.0) | 2.2 | (1.2) | (1.9) | | (1.5) | - | (1) |
| No. of broods | ≥7 | 6-7 | 19-21 | ≥18 | 29 | 11 | 4 | 32 | 8 | 26 | 14 | 9 | 28 | 15 |
| Scotland | 2.0 | 2.3 | 2.0 | 2.3 | 1.9 | 2.2 | 1.9 | 2.2 | 1.6 | 2.6 | 1.7 | 1.2 | 2.1 | 1.9 |
| Per cent juv. | 7.2 | 10.3 | 6.1 | 10.5 | 8.1 | 10.8 | 7.1 | 12.5 | 6.4 | 15.9 | 6.3 | 3.2 | 9.8 | 8.2 |

censused, and estimated to hold 2,135 nests (Sirius Dog Sledge Patrol, pers. comm.; 2002-2007 average nest numbers: 2290).

A pair of King Eiders (*Somateria spectabilis*) was seen on 18 June (DOY: 170), which is a little later than usual (Table 3). The 1996-2005 average arrival date was 13 June (DOY: 164). During late June, another five pairs were seen – mainly migrating past Zackenberg or in through the valley. No nesting attempts were recorded. The last observation this year was a pair observed on 13 July (DOY: 195).

Long-tailed Ducks (*Clangula hyemalis*) were seen from 3 June (DOY: 155), with pairs seen regularly – almost daily – until late June. In early July, only a few pairs were seen. From mid-July, only females were seen in flocks of up to 22 (former delta, 4 August; DOY: 217). This is also the last record of Long-tailed Ducks from 2008. No pulli were seen in 2008.

Juveniles of both Arctic Redpoll and Snow

Bunting were seen in adjacent areas. For the Snow Bunting, several juveniles were observed within the census area.

There was an estimated two pairs of Common Raven (*Corvus corax*) roaming in the valley, both assumed to be nesting in adjacent areas. The first six juvenile birds were seen on 24 June (DOY: 176) near the research station. During July and August, birds from this flock were seen regularly around the valley, with numbers varying from one to four.

VISITORS AND VAGRANTS

Two Great Northern Divers (*Gavia immer*) were seen on 6 June (DOY: 158) on Østersøen, a lake adjacent to the Zackenberg bird census area. The same birds were seen on the shore nearby the following day (M. Bjerrum, pers. comm.). Great Northern Divers are occasionally visitors to Zackenberg, likely breeding in a neighbouring valley, Store Sødal (Meltøfte 2006b).

TABLE 10. The number of immature Pink-footed Geese and Barnacle Geese moulting in the study area at Zackenberg 1995-2008. The closed area is zone 1c (Fig. 1).

| Study area | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|---------------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| PINK-FOOTED GOOSE | | | | | | | | | | | | | | |
| Closed moulting area and further east | 310 | 246 | 247 | 5 | 127 | 35 | 0 | 30 | 41 | 11 | 17 | 27 | 0 | 0 |
| Coast west of closed area | 230 | 40 | 60? | 0 | 29 | 0 | 0 | 0 | 0 | 10 | 0 | 3 | 2 | 0 |
| Upper Zackenbergdalen | 0 | 0 | 15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 2 |
| Pink-footed Goose total | 540 | 286 | 322 | 5 | 156 | 35 | 0 | 30 | 41 | 21 | 17 | 31 | 2 | 2 |
| BARNACLE GOOSE | | | | | | | | | | | | | | |
| Closed area at Lomsø and Kystkærene | 21 | 0 | 29 | 21 | 60 | 84 | 137 | 86 | 120 | 81 | 87 | 148 | 66 | 106 |
| Coast east of closed area | >120 | 150? | 96 | 55 | 66 | 0 | 109 | 80 | 45 | 0 | 2 | 218 | 46 | 125 |
| Coast west of closed area | 0 | 0 | 0 | 0 | 0 | 30 | 0 | 0 | 0 | 0 | 29 | 29 | 106 | 65 |
| Upper Zackenbergdalen | 41 | 85 | 2 | 75 | <57 | 27 | 60 | 0 | 14 | 0 | 25 | 30 | 6 | 41 |
| Barnacle Goose total | >182 | 235? | 127 | 151 | <183 | 141 | 306 | 166 | 179 | 81 | 143 | 425 | 224 | 337 |

Gyr Falcons (*Falco rusticolus*) were spotted several times during the season. There was a single observation of one falcon on 9 May (DOY: 130). In late May, a single individual was seen on two occasions, near the research station. Only one more observation from the summer was made on 11 June. One to three Gyr Falcons were seen four times during September and October (T. Tagesson and J. Skafte, pers. comm.).

This year's most surprising visitor was a Redshank (*Tringa tetanus*) seen in the fens just south of research station on 18 and 20 June (DOY: 170 and 172, respectively). This is a very rare sighting in Northeast Greenland (cf. Boertmann 1994), and only the second record at Zackenberg. The previous Redshank record from Zackenberg dates back to 1947 (Møhl-Hansen 1949) (Table 11).

Apart from the Redshank, other non-breeding waders were recorded as well. The Eurasian Golden Plover (*Pluvialis apricaria*) was once again recorded with a single individual, from the 7 to 10 June (DOY: 162), at the foot of Aucellabjerg.

In six of thirteen seasons, Whimbrels (*Numenius phaeopus*) have been observed at Zackenberg. In 2008, a pair was seen on 17 June (DOY: 169) on the edge of a large fen area in the census area proper (Table 11). One bird was heard nearby the following day, and a "large wader" seen 25 June (DOY: 177) could have been the same bird.

On 15 May (DOY: 136), an Arctic Skua (*Stercorarius parasiticus*) was seen at Lange-mandsø, outside the census area.

Arctic Terns (*Sterna paradisaea*) were seen at Zackenberg twice this season. A flock of 45 were flying past the shores south of the research station on 10 July (DOY: 192). Three days later, another 12 flew the same way.

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TABLE 11. Numbers of individuals and observations of avian visitors and observations of avian visitors and vagrant at Zackenberg 2007, compared to the numbers of individuals observed in the preceding seasons, 1995-2006.

| Species | Visitors and vagrants | | | | | | | | | | | | | | No individual | No. observations |
|---------------------------------------|-----------------------|------|------|----------------|------|----------------|-----------------|----------------|-----------------|------|----------------|-----------------|----------------|-----------------|---------------|------------------|
| | Previous records | | | | | | | | | | | | | | | |
| | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | | |
| Great Northern Diver | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 2 | |
| Whooper Swan | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Snow Goose | 0 | 0 | 0 | 0 | 0 | 2 | 11 | 0 | 23 | 0 | 0 | 0 | 1 | 0 | 0 | |
| Canada Goose | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 ^a | 3 ^a | 0 | 0 | |
| Merlin | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Gyr Falcon | 1 | 1 | 1 | 3 | 0 | 4 | 5 | 1 | 3 | 4 | 2 | 0 | 3 ^b | 2 ^c | 4 | |
| Pintail Duck | 0 | 0 | 0 | 1 ^d | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 ^d | 0 | 0 | |
| Common Teal | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Eurasian Golden Plover | 0 | 3 | 1 | 3 | 1 | 0 | 1e | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 2 | |
| White-rumped Sandpiper | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | |
| Pectoral Sandpiper | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | |
| Purple Sandpiper | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 ^f | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Red Phalarope | 0 | 0 | 0 | 4 ^g | 0 | 0 | 4 ^e | 0 | 1 | 0 | 2 ^e | 11 ^e | 0 | 2 | 1 | |
| Common Snipe | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | |
| Whimbrel | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 2 | 1 | 0 | 1 | 2 | 3 | |
| Eurasian Curlew | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Redshank | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 ^h | 3 | |
| Pomarine Skua | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Arctic Skua | 0 | 0 | 0 | 0 | 0 | 2 | 7 | 4 | 3 | 2 | 0 | 1 | 0 | 0 ^h | 0 | |
| Great Skua | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Lesser Black-backed Gull ⁱ | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 2 | 1 | 4 | 0 | 0 | 0 | |
| Iceland Gull | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | |
| Great Black-backed Gull | 0 | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Black-legged Kittiwake | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 ^h | 0 | 0 | 0 | 0 | 0 | 0 | |
| Arctic Tern | ≈200 | 2 | 1 | 2 | 0 | 14 | 0 | 0 | 32 | 0 | 0 | 0 | 0 | 57 | 2 | |
| Snowy Owl | 0 | 0 | 2 | 1 | 1 | 1-2 | ≥4 ^h | 0 | 0 | 0 | 0 | 0 | 1b | 0 | 0 | |
| Meadow Pipit | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1c | 0 | 0 | 0 | 0 | |
| White Wagtail | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | |
| Northern Wheatear | 4 | 8 | 4 | 3 | 1-2 | 0 ^j | 0 | 0 | 0 | 2 | 1 | 4 ^b | 2 | 1 | 1 | |
| Arctic Redpoll | 7 | 9 | 16 | 23 | 8 | 5 | 3 | 6 | 31 ^b | 12 | 3 ^d | 2 | 8 ^b | 10 ^k | 14 | |
| Lapland Longspur | 0 | 0 | 0 | 0 | 1-2 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | |

^a Subspecies *interior* ^b See Hansen et al. 2008. ^c After regular season, 4 observations of 1-3 birds. ^d Northernmost records in East Greenland (cf. Bortmann 1994).
^e At least one territory, possible territory or breeding found; see Table 1. ^f Juvenile. ^g 2nd record at Zackenberg (cf. Møhl-Hansen 1949). First record during BioBasis.
^h Before the regular season, 1 in adjacent areas. ⁱ Increasing in East Greenland (Boertmann 2008). ^j One dead individual found.
^k In addition, one juvenile at Dombjerg 28 July.

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