

2007

Field report from Sand Island,
Northeast Greenland - 2007



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Background

The main aim of this study is to track the long-distance migration of two high-arctic breeding seabird species, the Arctic Tern (ARTE) and the Sabine's Gull (SAGU). By attaching small data loggers (which record ambient light level and thereby archive daily geographical position) to breeding birds in 2007, and retrieving these in 2008, a full year of migration can be tracked from the breeding colony in Northeast Greenland to the presumed wintering areas between South Africa and Antarctica.

Fieldwork was conducted over the period of 10 July to 7 August, 2007, at Sand Island (N 74.263; W 20.160), Young Sound, Northeast Greenland. Sand Island is approximately 1 km long by 0.3 km at the widest point, and peaks at only 2.5 meters above sea level at high tide. The habitat consists mostly of fine sand and gravel, but a raised section in the centre of the island has sparse vegetation, mostly willow (*Salix* sp.).

Geo-locator data loggers

Fifty geo-locator data loggers were attached to adult ARTEs and 30 to adult SAGUs, between 16 and 27 July 2007, during their incubation period. Each logger (1.4 g) was attached to a darvic ring on the leg of the bird. Total mass of the logger, darvic ring, tape, and cable tie equaled 2.0 g – approximately 2% of adult body weight in ARTEs and 1% in SAGUs.

Birds were caught at the nest using "Kieler traps" and further handling of the birds was conducted in a large tent. In addition to the attachment of data loggers, the biometrics of each bird were recorded (Table 1), as well as blood samples (for later genetic sexing of the birds) and cloacal swabs (see *Other activities*). Birds fitted with a logger were also dyed with picric acid to facilitate within-season recognition in the field. The handling time for each bird was approx. 10 minutes, however, time for the dye to dry and queuing (when several birds were caught around the same time),



Map of study area. Red arrow show location of Sand Island.



Arctic tern breeding habitat at Sand Island.



Arctic tern "logger bird" at nest.



Geo-locator data logger attached to Arctic tern leg.



added an extra 15 to 30 minutes to the overall holding period.

Post-attachment observations of “logger birds” did not indicate any unnatural behavior or specific problems due to the presence of the loggers in either species. In ARTEs, however, a higher degree of nest abandonment was observed in captured birds, compared to a control group. This was likely due to a combination of factors, including disturbance, due to the close proximity of some nests to our camp, the presence of egg predators on the island (including SAGUs), as well as our handling of the birds. ARTE “logger birds” that abandoned nests did not leave the study site, however, and were observed repeatedly within the study plots. These birds were often involved in courtship behavior, although unequivocal evidence of replacement clutches could not be found.

Table 1: Mean adult biometrics for Arctic Terns ($n = 50$) and Sabine’s Gulls ($n = 31$) on Sand Island, Northeast Greenland, 2007.

	Arctic Tern (SD)	Sabine’s Gull (SD)
Tarsus (mm)	16.31 (0.702)	33.57 (1.653)
Head & bill (mm)	71.64 (2.634)	66.82 (2.484)
Culmen (mm)	31.59 (1.577)	26.01 (1.339)
Mass (g)	105.4 (6.50)	181.7 (13.27)
Wing (mm)	280.4 (5.38)	278.4 (7.76)
Bill depth (mm)	8.2 (0.42)	8.07 (0.47)

Population size

ARTEs were found breeding over the entire area of the island, except within low lying patches with a potential risk of flooding. Breeding habitats included areas of pure sand, gravel, and the more vegetated parts of the island. A breeding population of 700-1000 pairs was



Setting the trap for Sabine’s gull capture.



Geo-locator data logger on Sabine’s gull leg.



Sabine’s gull chick age one day.



Sabine’s gull nests being plotted as way points on GPS.



estimated in 2007, based on counts of 1150 to 1500 individuals in six sub-sections across the island. A total of 109 nests were included in study plots.

Most SAGU nests (approx. 90%) were located among ARTE nests on the raised, central part of the island, where there was little risk of flooding. A breeding population of 60-65 pairs of Sabine's Gulls was estimated in 2007, with 56 nests actually found. Based on 60 pairs, the overall breeding density of SAGUs on Sand Island (0.272 km²) was 220 pairs per km². Within the central, raised part of the island (0.068 km²), however, where most SAGU nests were located, breeding density reached 780 pairs per km².

Reproductive outcome and phenology

The average clutch size of ARTEs in 2007 was 1.4, with no 3-egg clutches observed (Table 2). The first ARTE eggs hatched on 31 July. In contrast, SAGU nests contained 1-3 eggs, with an average clutch size of 1.9 (Table 2). The first SAGU eggs were observed hatching on 25 July, but this was several days ahead of all other SAGU nests.

Table 2: Mean clutch size, egg size, and calculated egg volume for Arctic Terns and Sabine's Gulls on Sand Island, Northeast Greenland, 2007. (IEV: Internal Egg Volume)

	Arctic Tern (SD)	<i>n</i>	Sabine's Gull (SD)	<i>n</i>
Clutch size	1.44 (0.50)	109	1.91 (0.68)	54
Length (L) all eggs (mm)	40.18 (1.78)	134	42.60 (1.87)	92
Width (W) all eggs (mm)	29.03 (0.75)	134	31.08 (1.10)	92
IEV all eggs (ml)	16.27 (1.24)	134	19.80 (1.99)	92
IEV A-egg (ml)	16.48 (1.30)	90	20.16 (1.84)	48
IEV B-egg (ml)	15.86 (1.00)	42	19.40 (2.05)	35
IEV C-egg (ml)	-	-	19.41 (2.39)	9



Arctic tern in midrighth sun.



Sabine's gull



CEg checking SAGU egg for hatching.



Walruses hauling out at Sand Island.



The median hatching date for both species was around 3-5 August. Unfortunately, this coincided with a series of severe weather systems (including gale force winds and torrential rains) which prevented us from checking nests daily, and resulted in both flooding of nests and high egg and chick mortality.

Of 84 ARTE eggs, 45 did not hatch due to predation or weather conditions (Table 3), while 24 of 102 SAGU eggs failed to hatch (Table 3). Only eggs from nests with a negligible level of disturbance (from researchers) were included in this estimate of egg survival.

Table 3: Apparent (until 4 August) hatching success of Arctic Tern and Sabine's Gull eggs on Sand Island, Northeast Greenland, 2007. Numbers in parenthesis indicate the percentage of the total number of eggs included in the study.

	Arctic Tern	Sabine's Gull
Eggs hatched	20 (24%)	37 (36%)
Did not hatch	45 (54%)	24 (24%)
Unknown fate	19 (23%)	41 (40%)
Total	84	102

Of 59 ARTE nests (in plots with negligible disturbance), 21 (35 %) were presumed to be still active at the last nest check on 4 August. Of the known 56 SAGU nests, 25 (45 %) appeared to be still active on 4 August. Continued severe weather conditions between 4 and 6 August, however, caused further extensive flooding across much of the island and no doubt increased egg and chick mortality considerably in both species.

Feeding observations

Over the course of the field work, ARTEs were observed to display several different food items, mainly small fish (likely polar cod) of approx. 8–10 cm, but also large crustaceans was observed on a few occasions. ARTEs were also observed plunge diving in open water close



Sabine's gull foraging close to shore.



Arctic tern nest close to high tide extension.



Sabine's gull defending territory at the shore line.



Arctic tern foraging between ice floes.



to the island, especially in the area immediately to the south of the island, which appeared to have the strongest ocean currents.

SAGUs were also observed plunge diving in open water close to the island, either together with ARTEs or in (almost) exclusive flocks of SAGUs. During capture in early to mid-incubation, one SAGU regurgitated a single food load, which included approx. 150 food items, all small (0.5 cm) amphipods. Another captured SAGU regurgitated a partly digested fish of unknown species, estimated to be of a size of 10-15 cm. During our entire time on the island, SAGU faeces had a distinctly fishy odour, suggesting that they are reliant on marine resources throughout the breeding season. In late incubation and around hatching, SAGUs were observed foraging in shallow water, particularly along the eastern shore of the island. In this area, birds (possibly in pairs) focused their attention on a specific stretch of shoreline (approx. 20-25 m) from which they drove off other intruding SAGUs.

Predation

While predation risk to adult individuals of the two focal species was restricted to the occasional visit by a Gyrfalcon, egg loss to predation was common and involved several predatory species. At least one Arctic fox had access to the island when the fjord was ice-covered and even after sea ice break-up, when loosely packed ice floes formed enough of a bridge for foxes to reach the island. We observed predation by an Arctic fox on several occasions. The fox appeared to focus its search on Common Eider nests, but paused to take ARTE and SAGU eggs from nests that it found along the way. Eggs were either eaten at the nest location or buried nearby. The fox exhibited what appeared to be an extremely high rate of nest detection in the relatively dense colony. A study plot which included 27 randomly found ARTE nests was reduced to only 7 active nests within a period of 24 hours, due entirely to fox depredation.



Incubating Sabine's gull "logger bird".



Logistic assistance from the Marin Basis group.



Walrus close-up.



Common eider incubating.



Throughout the study period, the island was visited frequently by avian egg predators. Glaucous Gulls, Arctic Skuas, and Long-tailed Skuas were observed on the island on a daily basis. Common Ravens were also seen occasionally on the island, although this species was mainly observed at the walrus haul-out, and appeared to focus mainly on eating walrus faeces.

See Appendix I for a complete list of avian species observed on Sand Island in 2007.

Other activities

A total of 72 cloacal swab samples of ARTEs ($n = 51$) and SAGUs ($n = 21$) was collected in 2007 and sent to the Danish Veterinarian Institute to be tested for of Avian Influenza (AI). The sampling from Sand Island is part of a larger AI screening program being carried out in Greenland in 2007 and 2008.

Sand Island is one of the few terrestrial walrus haul-outs in Greenland and daily (late afternoon-early evening) counts were conducted of walruses at the beach on the northwestern part of the island. From mid-July to 5 August, walrus numbers generally increased, but varied from 2 to 45 animals without any obvious seasonal time trend. On days with strong wind and heavy rain, however, only low numbers of walruses were observed.

A total of 17 avian species were observed on Sand Island (see Appendix I). Other than the two study species, those breeding on the island were restricted to Common Eiders (approx. 10-15 nests) and Long-tailed Ducks (1-2 nests). Most Common Eider nests appeared to have been depredated by Arctic foxes prior to our arrival on the island, and one female Long-tailed Duck was killed on the island by a Gyrfalcon on 22 July.

Co-workers

The 2007/2008 study in Northeast Greenland is a joint venture of the Greenland Institute of Natural Resources, the National Environmental Research Institute in Denmark, and the British Antarctic Survey. The fieldwork is conducted in close cooperation with the Marine-



Walrus bull.



Sabine's Gull eye.



Pipped Sabine's Gull eggs.



Stranded iceberg.



Basic group under the Zackenberg Ecological Research Operations (ZERO) monitoring programs.

This study on ARTE migration has been adopted by the CAFF seabird group and is part of a larger coordinated effort, with parallel research projects currently being carried out in Iceland and in Alaska.

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For further information on the 2007/2008 geo-locator study at Sand Island please contact: egevang@natur.gl



Arctic Tern with large amphipod.



The purple-colored eastern beach.



Storm in the camp.



Arctic Fox.



Appendix I

Avian species observed on Sand Island, Northeast Greenland, 2007.

English	Danish	Greenlandic	Scientific
Red-throated Diver	Rødstrubet lom	Qarsaaq	<i>Gavia stellata</i>
Common Eider	Ederfugl	Miteq	<i>Somateria mollissima</i>
Long-tailed Duck	Havlit	Alleq	<i>Clangula hyemalis</i>
Ruddy Turnstone	Stenvender	Taliffak	<i>Arenaria interpres</i>
Ringed Plover	Stor præstekrave	Tuujussuaq	<i>Charadrius hiaticula</i>
Dunlin	Almindelig ryle	Saafaarsorlak	<i>Calidris alpina</i>
Red Knot	Islandsk ryle	Qajorlak	<i>Calidris canutus</i>
Sanderling	Sandløber	Siorarsiooq	<i>Calidris alba</i>
Red Phalarope	Thorshøne	Kajuaq	<i>Phalaropus fulicarius</i>
Long-tailed Skua	Lille Kjove	Papikkaaq	<i>Stercorarius longicaudus</i>
Arctic Skua	Almindelig kjove	Isuungaq	<i>Stercorarius parasiticus</i>
Glaucous Gull	Gråmåge	Naajarujsuaq	<i>Larus hyperboreus</i>
Ivory Gull	Ismåge	Naajavaarsuk	<i>Pagophila eburnea</i>
Sabine's Gull	Sabinemåge	Taateraanaq	<i>Xema sabini</i>
Arctic Tern	Havterne	Imeqqutaalaq	<i>Sterna paradisaea</i>
Gyrfalcon	Jagtfalk	Kissaviarsuk	<i>Falco rusticolus</i>
Common Raven	Ravn	Tulugaq	<i>Corvus corax</i>



Appendix II

Coastline of Sand Island drawn from 2007 GPS track log with location of SAGU nests (n=56) indicated by stars. Location of camp site, walrus haul-out and boundaries of the raised, central section are also shown.

