

6. OBSERVATION OF SEABIRDS AND MARINE MAMMALS

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Objectives

- To obtain a better knowledge of quantitative distribution of seabirds and marine mammals, based on the presence of different water masses and fronts, determined by water temperature and salinity. Basic aspects are abundance of preys.
- To increase the volume of data, collected by the same team, using the same methodology. In this ARK XVII 1, a total of 25 species of birds was identified, as well as 5 species of whales, 1 of dolphins, 4 of seals and the polar bear.
- To compare the data with earlier results collected in this region since 1974; since 1988 under icy conditions on board of POLARSTERN, METEOR 1985; POLARSTERN 1988 ARK V 1b and V 2, 1990 ARK VII2, 1991 ARK VIII 1 and 2, 1993 ARK IX 2 and 3; DALNIE ZELENTSY (Murmansk) 1991, 1992 and 1993.
- To estimate the importance of followers within the counting. Followers are birds following a vessel for some time. They cause serious problems of counting because they circle around the vessel and are likely to be counted several times. They may sometimes outnumber the valuable counting data by a factor of 100.

Different categories of followers are to be taken into account:

- a) Birds attracted some moments, from 10 km or more, by the superstructures of POLARSTERN, e.g. *Uria aalge*, *Uria lomvia*, *Alle alle*, *Fratercula arctica*, *Cephus grylle*.
- b) Birds staying at one stop station (CTD, multi-boxcorer, ...) and sitting close at sea for ½ hour or more, to feed actively in the turbulences caused by the motors, e.g. *Fulmarus glacialis*, *Rissa tridactyla*, some skuas, some gulls, ...
- c) Real followers, following during hours, sometimes individually identified, mainly *Fulmarus glacialis* and *Rissa tridactyla*. Also to be taken into consideration are *Morus bassanus*, *Stercorarius pomarinus*, *Stercorarius parasiticus*, *Stercorarius longicaudus*, *Larus fuscus*, *Larus argentatus*, *Larus marinus*, *Pagophila eburnea*, ...

The aim on this trip is to produce a basic protocol of general application to evaluate and eliminate the drawbacks caused by these followers.

- Establish broad ecological comparison between European Arctic Seas and the Weddell Sea, Antarctica (POLARSTERN 1988 EPOS I leg 1).

Work at sea

A total of 5308 sea miles were travelled during the 40 days of navigation. For practical purposes, the cruise was divided into 7 legs or periods, totalling 680 counts of 30 minutes.

LEG	PERIOD	COUNTS
1) <u>The way North</u> From Bremerhaven (53° N) to 75° N, 15° E	19/06-24/06	128
2) <u>The 75° N transect</u> From 15° E to 15° W across the Greenland Sea	24/06-01/07	110
3) <u>ARKTIEF 2</u> Channel System of the Eastern Greenland Sea BOX 75° N – 12° W 75° N – 15° W 73° N – 13° W 73° N – 17° W	01/07-11/07	133
4) <u>Towards 79° N</u> To Svalbard and Fram Strait	11/07-12/07	51
5) <u>AWI - Hausgarten</u> BOX 80° N 07° E, 80° N 02° E 79° N 07° E 79° N 02° E	12/07-19/07	96
6) <u>The 79° N transect</u> a) Towards 80° 30' N along Spitsbergen	19/07-22/07	71
b) 79°N transect across Fram Strait and back 0°	22/07-25/07	56
7) <u>The way back*</u> From 79° N-long.0° Greenwich to Tromsø (70° N)	25/07-28/07	35
Total for the 7 legs	19/06 - 28/07/2001	680 counts

An additional 58 uncompleted counts were discarded for several reasons: sudden dense fog, unpredicted stops of POLARSTERN, fruitful discussions aboard, e-mail duties,...

*the writing of the report was stopped at sea before the end of the trip at 75°15'N (27/07 at 05 h). While countings still went on.

Preliminary results

Level of presence per species

A species is present or not in each count. The positive data introduced in a specific list of birds. At the end of the period, a percentage is obtained, relative to the total number of counts of the period. The species is then attributed to one of the 4 categories A, B, C or D, in order to situate the level of presence of that species (see species table).

Species presence

A	> 50%	of the counts of the period:	very common
B	25% - 50%	of the counts of the period:	common
C	5% - 25%	of the counts of the period:	significant
D	< 5%	of the counts of the period:	occasional

For example:

For the first period, the way North, there are two species represented in more than 50% of the counts (category A), in 65 counts or more on a total of 128 counts, namely *Fulmarus glacialis* and *Rissa tridactyla*.

Level of presence per species

Period	dates	N of 30' counts	BIRDS				Total N of species/period	SEA MAMMALS			
			A >50	B 25-50	C 5-25	D <5		whales	dolphins	seals	p. bear
1. The way North	19/06-24/06	128	2	0	6	13	18	4	1	0	0
2. The 75° N transect a) no ice b) ice	24/06-01/07	110	0	2	5	11	18	0	1	4	1
	24/06-30/06	(83)	(0)	(2)	(5)	(9)	(16)	(0)	(1)	(4)	(0)
	30/06-01/07	(27)	(0)	(2)	(4)	(5)	(11)	(0)	(0)	(4)	(1)
3. ARKTIEF 2	01/07-11/07	133	0	2	4	7	13	0	0	4	1
4. Towards 79° N	11/07-12/07	51	0	4	2	3	9	1	1	1	0
5. AWI-Hausgarten	12/07-19/07	96	2	2	3	2	9	3	1	3	0
6. The 79°N transect a) Towards 80°30'N b) 79°N transect	19/07-25/07	127	0	3	4	8	15	2	0	3	1
	19/07-22/07	(71)	(3)	(3)	(1)	(5)	(12)	(2)	(0)	(3)	(1)
	22/07-25/07	(56)	(0)	(0)	(5)	(5)	(10)	(2)	(0)	(2)	(1)
7. The way back	25/07-27/07	35	2	2	2	0	6	0	0	2	0
Total	40 days	680					25	5	1	4	1
							Total N of species				

All bird species are listed in the next table, devoted to a specific presentation for the 7 periods.

Comment: Few species are very common (categorie A) during one single period. Birds belonging to categories B and C are also relevant (common and significant) for the given period. Many species are only noted as D (occasional), sometimes during one single period. They are anecdotic for the study of food webs.

Involved species

List of the 25 observed bird species and frequency during the 7 periods

	PERIODS								
	1	2a no ice	2b ice	3	4	5	6a	6b	7
	NUMBER OF COUNTS								
	128	83	27	133	51	96	71	56	35
PROCELLARIIDAE									
<i>Fulmarus glacialis</i>	A	B	B	B	C	C	B	C	B
<i>Puffinus puffinus</i>	D	-	-	-	-	-	-	-	-
ANATIDAE									
<i>Somateria sp.</i>	-	-	-	-	-		D	-	-
SULIDAE									
<i>Morus bassanus</i>	C	-	-	-	-	-	-	-	-
SCOLOPACIDAE									
<i>Numenius phaeopus</i>	D	-	-	-	-	-	-	-	-
STERCORARIIDAE									
<i>Stercorarius skua</i>	D	D	-	-	-	-	D	-	-
<i>Stercorarius pomarinus</i>	D	C	C	C	D	-	-	D	-
<i>Stercorarius parasiticus</i>	D	D	D	D	D	D	D	-	-
<i>Stercorarius longicaudus</i>	-	-	-	D	-	-	D	D	-
LARIDAE									
<i>Larus ridibundus</i>	-	D	-	-	-	-	-	-	-
<i>Larus canus</i>	D	-	-	-	-	-	-	-	-
<i>Larus argentatus</i>	D	D	-	-	-	-	-	-	-
<i>Larus fuscus</i>	C	D	D	-	-	-	-	-	-
<i>Larus marinus</i>	D	D	-	-	-	-	-	-	-
<i>Rhodostethia rosea</i>	-	-	-	-	-	-	-	D	-
<i>Rissa tridactyla</i>	A	B	B	C	B	A	A	C	B
<i>Larus hyperboreus</i>	D	D	D	C	D	C	C	D	-
<i>Pagophila eburnea</i>	-	-	D	D	-	-	-	C	-
STERNIDAE									
<i>Sterna paradisaea</i>	-	D	-	D	-	-	D	-	-
ALCIDAE									
<i>Alle alle</i>	D	D	C	B	B	B	A	C	A
<i>Fratercula arctica</i>	C	C	-	D	B	B	B	-	C
<i>Cephus grylle</i>	-	C	-	D	-	C	B	D	C
<i>Uria aalge</i>	D	C	C	D	C	D	-	-	-
<i>Uria lomvia</i>	D	C	C	C	B	A	A	C	A
<i>Alca torda</i>	D	-	-	-	-	-	-	-	-
Number of species	18	18		13	9	9	15		6

*A= present in more than 50% of the counts; B= present in 25 to 50% of the counts;

C= present in 5 to 25 % of the counts; D= present in less than 5% of the counts.

Only 11 species, present as A, B or C, in at least one period, are of real interest in the area for the study of trophic levels and food webs, i.e.: *Fulmarus glacialis*, *Morus bassanus*, *Stercorarius pomarinus*, *Larus fuscus*, *Rissa tridactyla*, *Larus hyperboreus*, *Alle alle*, *Fratercula arctica*, *Cephus grylle*, *Uria aalge* and *Uria lomvia*.

List of the observed sea mammals

Whales and dolphins are mostly observed in “warm” water masses, free of ice; in contrast seals and polar bears are mainly seen on ice floes, which serve as physical supports.

WHALES (Balaenopteridae)

- *Balaenoptera acutorostrata*

PERIOD	N	POSITION	PERIOD	N	POSITION
1	1	66° 48' N 06° 27' E	6	1	79° 29' N 10° 13' E
5	1	79° 03' N 04° 25' E	6	3	74° 59' N 02° 03' E
5	1	78° 53' N 05° 18' E	6	1	79° 46' N 00° 14' E

- *Balaenoptera physalus*

PERIOD	N	POSITION	PERIOD	N	POSITION
1	1	68° 46' N 07° 35' E	5	4	79° 07' N 05° 23' E
1	1	68° 51' N 07° 39' E	5	1	78° 58' N 04° 42' E
4	1	77° 07' N 00° 57' E	5	3	78° 54' N 01° 25' E

- *Megaptera novaeangliae*

PERIOD	N	POSITION	PERIOD	N	POSITION
5	1	78° 59' N 04° 40' E	6	1	80° 03' N 02° 47' E

- *Physeter macrocephalus*

PERIOD	N	POSITION	PERIOD	N	POSITION
1	1	65° 50' N 05° 56' E	1	1	73° 10' N 12° 03' E
1	1	69° 03' N 07° 47' E			

- *Orcinus orca*

PERIOD	N	POSITION	PERIOD	N	POSITION
1	11	66° 53' N 06° 30' E	1	5	72° 08' N 10° 05' E
1	3	71° 15' N 09° 22' E			

DOLPHINS

- *Lagenorhynchus albirostris*

Period 1 = 2 dolphins in 1 count at 74° 22' N – 14° 30' E.
 Period 2 = 25 dolphins in 5 counts from 75° 00' N – 14° 46' E to 75° 00' N – 07° 15' E.
 Period 4 = 19 dolphins in 2 counts from 77° 58' N – 04° 21' E to 78° 45' N – 08° 15' E.
 Period 5 = 6 dolphins in 1 count at 78° 58' N – 04° 42' E.

SEALS

- *Pusa hispida* or *Phoca hispida*

Period 2: 9 seals in 4 counts from 75° 00' N – 12° 23' W to 74° 57' N – 14° 12' W.
 Period 3: 322 seals in 32 counts from 75° 50' N – 13° 03' W to 74° 11' N – 12° 35' W
 with concentrations of 16,21,29,21,16,15,27,54,34 and 23 *Pusa hispida*.
 Period 6: 2 seals in 2 counts at 79° 53' N – 00° 46' E and 79° 00' N – 02° 20' W.

- *Erignathus barbatus*

Period 2: 1 seal in 1 count at 74° 58' N – 08° 08' W in a group of *P. groenlandicus*.
 Period 3: 3 seals in 3 counts from 73° 58' N – 13° 56' W to 74° 12' N – 12° 19' W.
 Period 4: probably some 60 bearded seals in concentrations of *Pagophilus groenlandicus* (see *P.gr.*).
 Period 5: 2 seals in 2 counts at 79° 04' N – 03° 37' E and at 78° 58' N – 00° 38' E.
 Period 7: 1 seal in 1 count at 78° 32' N – 00° 01' E.

- *Pagophilus groenlandicus* or *Phoca groenlandica*

Period 2: 293 seals in 8 counts from 74° 49' N – 00° 10' E to 75° 00' N – 14° 00' W
 with concentrations of 83 and 200 *Pagophilus groenlandicus*.

Period 3: 146 seals in 6 counts from 73° 56' N – 14° 45' W to 74° 24' N – 09° 44' W with a concentration of 140 *Pagophilus groenlandicus*.
 Period 4: 4170 seals in 3 counts from 75° 52' N – 03° 21' W to 76° 29' N – 01° 15' W with concentrations of 200, 2400 and 1570 *Pagophilus groenlandicus*. Each time lying on a succession of +/- 10 middle sized ice-floes. The two main groups at respectively 75° 57' N – 03° 11' W and 76° 29' N – 01° 15' W.
 Period 5: 17 seals in 9 counts from 78° 00' N – 07° 00' W to 78° 58' N – 02° 48' E.
 Period 6: 31 seals in 13 counts along the 79° N from 10° 40' E to 01° 55' W and back.
 Period 7: 354 seals in 3 counts with a concentration of 350 probably *Pagophilus groenlandicus* at 77° 42' N – 00° 01' E.

- *Cystophora cristata*

Period 2: some 10 seals in 1 count at 74° 58' N – 08° 08' W in a group of *Pagophilus groenlandicus*.
 Period 3: 5 seals in 4 counts from 74° 06' N – 13° 47' W to 74° 11' N – 12° 19' W.
 Period 4: probably some 60 hooded seals in a concentration of *Pagophilus groenlandicus* (see *P.gr.*).
 Period 5: 1 seal in 1 count at 78° 58' N – 00° 38' E.
 Period 6: 2 seals in 2 counts at 79° 52' N – 00° 38' E and 79° 18' N – 00° 03' W

POLAR BEAR (*Ursus maritimus*)

10 polar bears from 73° 58' N – 14° 10' W to 75° 00' N – 13° 50' W.
 Period 2 3 1 female with 2 young at 75° 00' N – 13° 29' W
 1 second year at 75° 00' N – 13° 50' W
 Period 3 1 eating at carcass at 74° 05' N – 14° 11' W
 1 middle sized one at 73° 58' N – 14° 25' W
 1 - at 74° 11' N – 13° 48' W
 2 1 female with 1 young at 74° 14' N – 13° 41' W
 1 a big one at 73° 58' N – 14° 10' W
 This is an important concentration of 10 polar bears at rather low latitude.
 Period 6 1 bloodily eating at 80° 00' N – 00° 58' E
 1 - at 78° 58' N – 05° 50' W

Preliminary results

- Almost all *Fulmarus glacialis* individuals, at 79° N, belong to the dark form of the *Fulmarus glacialis* species. They are scarcely distributed in the area, being a little bit more numerous above ice floes than at sea.
- As a family, *Laridae* are "southern" birds. *Rissa tridactyla* and sometimes *Larus hyperboreus* are the ones to be seen at 79° N.
- At 79° N, *Rissa tridactyla* is regularly present, most of the birds being adult individuals, probably breeding. Non-adult birds are found more to the south.
- During periods 1 to 4, *Stercorarius pomarinus* was exceptionally frequent, from an ornithological point of view. It could mean that such a continental nesting bird stayed longer in the North Eastern Atlantic waters. Along the coast of Norway, migration normally occurs at the end of April and during May. That land species nests throughout northern Siberian, during May, mostly eating small rodents. Lemmings constitute a major part of their diet. Supposed absence of lemmings this year could have turned pomarine skuas to piracy at sea.
- *Alcidae* is the best represented family in the North Eastern Atlantic and Arctic waters, namely with *Uria lomvia* (3.10⁶ breeding pairs), *Fratercula arctica* (3.10⁶ b.p.) and *Alle alle* (1,5.10⁶ b.p.) For these three species, Spitsbergen, Eastern Greenland, Iceland and Norway are major haunts. Very high numbers

of "crossers" coming from or going to colonies. (POLARSTERN was less than 10 km from Spitsbergen).

The first two are fish eaters. The diet of the third is zooplankton. All of them play an important role in the trophic chains of the North Eastern Atlantic and Arctic seas.

- *Cephus grylle* is known to be a very coastal bird. Presence far at sea has been frequently observed. Nevertheless these observations are mostly involving 1st summer individuals, therefore not in charge of breeding duties.
- As huge sea mammals that play a considerable role in trophic webs, whales were evidently to be involved in the counts. In agreement with literature concerning weight, 1 *Physeter macrocephalus* (sperm whale, Pottwal) (30 tons) is equivalent to 200.000 *Alle alle* (Little Auk, Krabbentaucher) (150 g). To no surprise they were mostly present in the "warm" waters of the West Spitsbergen Current, and were represented by 43 animals belonging to 5 species.
- Living in family pods, *Lagenorhynchus albirostris*, small cetaceans of 200 kg, were observed mainly in West Spitsbergen Current, West of the Barents Sea, with a total of 52 individuals. Dolphins are very active fish eaters. They are easily observed from the vessel and in some way their importance is often overestimated.
- Large concentrations of *Pagophilus groenlandicus* (4170 individuals in 3 groups) were observed between 75° 52' N – 03° 21' W and 76° 29' N – 01° 15' W. With a mean weight of about 100 kg, these fish eaters represent a very important web in the food chain.
- Polar bears are super predators, standing at the top of the trophic chain, like man. The study of the behaviour of the mythic "Micha" is therefore of prime interest. A total of 10 *Ursus maritimus* (polar bears) were encountered in a relatively restricted area (between 75° 00' N – 13° 50' W and 73° 58' N – 14° 25' W), which is unusually south for that species. Reasons for that are to be discussed later (global increasing population? change in environmental conditions? prey occasionally concentrated more to the south? south eastern Greenland population? (See also Polar Bear studies, ARK IX 2 and 3, pp. 116-125).
- Many warm-blooded animals (whales, dolphins, seals, walruses, etc.), just like cold-blooded ones (fish...) do not occupy large areas at random. They are concentrated in clusters where the food is accessible or where they nest (*Alcidae* on ice floes and cliffs) or where they moult (*Anatidae*). To be instantly ready to identify them at sea is a question of good knowledge of systematics and habits, but above all it requires an aggressive determination to perform long-term counting.

Followers

Because followers cause serious problems while counting, we tried to make an estimation of their impact.

Therefore the number of birds of a species during a normal count (N) is compared with the number of followers of that species after the counting (N') and after 1 hour on CTD-station (N''). These data registered with or without ice and with or without fog are entered separately in the table. This has been done during the 75°N and the 79°

N transects. The following tables show the results for *Fulmarus glacialis* and *Rissa tridactyla*, the two most frequent followers.

		<i>Fulmarus glacialis</i> 75° N transect								22 counts	
		NO ICE				ICE				GLOBAL	
		NO FOG		FOG		NO FOG		FOG			
		A	r	A	r	A	r	A	r	A	R
N		2/10	0,20	0/4	0,00	3/7	0,71	0/1 *	0,00 *	5/22	0,32
N'		5/7	4,86	1/1*	4,00*	1/2 *	2,50*	0/1*	0,00*	7/11	3,91
N''		10/10	54,50	4/4	38,00	7/7	24,43	0/1*	0,00*	21/22	39,45

A = X/C = Number of counts where the species is present/ total number of counts

r = N/C = Number of birds counted/ total number of counts

N: number of birds counted during a count

N': flying followers (counted at the end of a count)

N'': sitting followers (during CTD-stations), after +/- 1 hour during which POLARSTERN is on stop position.

*: non significant

		<i>Fulmarus glacialis</i> 79° N transect								16 counts	
		NO ICE				ICE				GLOBAL	
		NO FOG		FOG		NO FOG		FOG			
		A	r	A	r	A	r	A	r	A	r
N		1/5	0,40	0/2*	0,00*	4/9	0,78	0/0*	0,00*	5/16	0,57
N'		4/4	2,25	0/2*	0,00*	6/7	6,29	0/0*	0,00*	10/13	4,08
N''		4/5	7,40	1/2*	2,00*	8/9	11,56	0/0*	0,00*	13/16	9,06

		<i>Rissa tridactyla</i> : 75°N transect:								22 counts	
		NO ICE				ICE				GLOBAL	
		NO FOG		FOG		NO FOG		FOG			
		A	r	A	r	A	r	A	r	A	r
N		1/10	0,10	0/4	0,00	3/6	0,83	1/1*	4,00 *	5/21	0,48
N'		3/7	2,28	1/1*	2,00*	0/2*	0,00*	0/1*	0,00*	4/11	1,64
N''		8/10	6,10	0/3*	0,00*	5/7	2,14	0/1*	0,00*	13/21	3,62

		<i>Rissa tridactyla</i> : 79° N transect								16 counts	
		NO ICE				ICE				GLOBAL	
		NO FOG		FOG		NO FOG		FOG			
		A	r	A	r	A	r	A	r	A	r
N		3/5	2,0	0/2*	0,00*	3/9	0,56	0/0*	0,00 *	6/16	0,94
N'		2/4	0,75	0/2*	0,00*	6/7	13,43	0/0*	0,00*	8/13	7,46
N''		2/5	1,60	0/2*	0,00*	5/9	4,89	0/0*	0,00*	7/16	3,25

For the *Fulmarus glacialis* there are, at 75° N, 10 times more flying followers (N') and 100 times more sitting followers (N'') than on normal counts (N). The data from all species need to be accurately analysed in order to present a protocol involving all followers. In order to better understand the behaviour of the followers, waves and wind are also factors to take into consideration.