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Specifics of Polar Bears Surviving an Ice Free Season on Wrangel Island in 2007.

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During the last 15 years, a continuous decrease of Arctic sea ice has caused significant increases of polar bear (*Ursus maritimus*) seasonal strandings on Arctic islands and the northern coasts (Amstrup, 2003; Ovsyanikov, 2006; Schliebe et al., 2006). Large polar bear on-shore gatherings have been observed on Wrangel Island since 1990 (Ovsyanikov, Kochnev, 1991; Ovsyanikov, 1993, 1995, 2005, 2006 a,b,c; Kochnev, 2002). Research on polar bear activity in the coastal and island ecosystems during periods of stranding is important for understanding the effects of climate change, current population status and trends, adaptive potentials of the species, factors threatening polar bear well being and for developing sound conservation measures.

In 2007, degradation of Arctic pack ice was the greatest observed during the entire history of scientific climate monitoring. By September 16, the general size of the Arctic ice shield had decreased 30% from the average for the period from 1979 to 2000. In the Chukotka sector of the Arctic, by the beginning of September, the edge of the pack ice had receded to 82° N (V.T. Sokolov; S. Frolov, Russia's AAI, personal communication). Data on polar bear numbers, demographic composition, body condition, behavior and mortality on Wrangel Island in 2007 was collected from July 3 through August 23 on route surveys by I. E. Menyushina, and from August 24 through October 30 on stationary and route observations by N.G. Ovsyanikov. Standard observation protocols were used (Ovsyanikov, 2006a,c). Observations covered almost the entire southern coastal area (from Cape Blossom to the mouth of Nasha River) and western coastal area (from Cape Blossom to Cape Thomas and from Cape Ptichyi Bazar to the mouth of Bolshaya Lagoon). The northern coast was not surveyed due to technical limitations, except for one visit of the reserve's staff rangers to Cape Warring on October 05-08. Additional information was collected by A.V. Bezrukov, A.G. Dondua and I.P. Oleinikov.

The total length of survey routes on ATVs (Honda) was 2420 km; 246 hours of on-route observations were done; 693 observations of polar bears were recorded, including 401 lone bears

and 116 family groups. Stationary observations at 3 points (Somnitelnaya Spit, Somnitelnaya Base Camp, and Cape Blossom) comprised a total of 80 days.

The first summer observations of polar bears on the island were recorded on July 5. Mass arrivals of the bears began on 20th of July and continued through the first half of August with the degradation of the Wrangel ice shield. By mid August the aggregation of stranded bears on the island was generally completed. Bears that appeared in the central parts of the island in August remained there until the end of inland observations (September 11). During this period, a total of 31 different bears were recorded in the central areas of the island, 23 of which were adults, including females with family groups.

The estimated general number of bears on the island during the autumn season of 2007 was approximately 500-600. Distribution of the number and demographic composition of bears by surveyed areas is shown in tables 1,2 (all duplicate and probably duplicated bear recordings are excluded from these tables).

There were no large bear congregations at traditional walrus haul out sites during the season. All bears were widely distributed along the shoreline, gathering in relatively small temporary groups of about 10-30 bears at carcasses of dead walruses and whales cast on the beach by the surf. A total of 4 different whale carcass remains were found on the southern coast of the island during this season, 3 of which were partial. After finishing one carcass, bears continued to stay within the same area, shifting to another carcass when it was cast onto the beach. During the summer-autumn season, southern and southeastern winds were prevailing and sectors of the coast with the most carcasses were relatively constant: the mouth of Khistchniki River, Somnitelnaya Spit, Krasin Bay, Spit of Popov Lagoon, Yuzhnyi Bay, and Cape Blossom. On the western coast, remains of walrus carcasses scavenged by bears were found at Cape Ptichyi Bazar and within the sector from Cape Florence to Nanaun Lagoon. Accordingly, temporary polar bear gatherings were forming within these segments. In addition, a gathering of about 30 bears was recorded at Draga Bay (near Cape Warring) by early October (I.P. Oleinikov, personal report).

Small groups of bears that formed on Cape Blossom spit (from 10 to 14 bears) and on Spit Somnitelnaya (up to 17 bears simultaneously at the end of the spit) remained relatively stable during the observation period, when walruses were staying and gradually dying at these points (until the end of October). By their size and behavior, these polar bear groups were similar to gatherings at walrus carcasses at other places, but more stable in composition. At Somnitelnaya

Spit bears were moving along the entire spit (6 km long narrow gravel peninsula), so that numbers of bears at the very end of the spit were changing over time from 0 to 17 animals.

Among animals that were identified by sex-age class, adult males prevailed (table 2). A high proportion of unidentified bears in the inner parts of the island is related to the fact that the majority of those bears were observed at a long distance lying on slopes or walking along the base of mountains. Such behavior in autumn is more characteristic for adult females, thus, it is most probable that in this category adult females prevailed and their total proportion in the population is significantly higher than 9%. Nevertheless, the percentage of adult males on Wrangel Island in the 2007 season was high with a proportionally greater concentration of males along the western coast (table 2).

Body condition was determined for 239 bears (table 3). Underfed bears (categories 1-2; very skinny and skinny) comprised 4.6% of all bears whose body condition was determined at one-time-count surveys. About 70% of all bears were fat and very fat animals (table 3). A few underfed bears were observed mostly among adult males and the only single underfed bear was from other social categories; one female with two yearlings and one sub adult male. The total proportion of underfed bears in 2007 was lower than in previous years (4.6% versus 7-15%, respectively). We did not include in this estimate bears whose body condition was determined at repeated (including multiple records) and possibly repeated observations, because their shape was increasing during the season with consuming more dead walruses.

A total of 63 litters of all ages were recorded (excluding repeated and possibly repeated recordings). The average litter size was: for cubs-of-the-year - 1.39 (litter number - 36, total cub number - 50); for yearlings - 1.23 (litter number - 13, total cub number - 16); for 2.5-year olds - 1.33 (litter number - 6, total cub number - 8). For 8 litters the age and number of cubs was not determined because they were observed only while sleeping and from a long distance. For cubs of all ages, the proportion of litters with only one cub was the highest, figure 1.

Polar bear mortality on Wrangel Island in this season was low; during the entire observation period we found only one dead bear, a 2.5-year old female with severe wounds from walrus tusks, on Somnitelnaya Spit, near a walrus rockery.

The specifics of the 2007 summer-autumn season for polar bears on Wrangel island that make it different from previous years of extreme ice disappearance in the region were:

- (1) The high number of bears in good body condition stranding under better food resources due to high walrus mortality (see Ovsyanikov, *et al.*, 2008, in press) and walrus carcasses continuously cast onto the beach, combined with an unusually high number of beached whale carcasses (4 whale carcasses in 2007 against 2 during the 27-year period from 1980 to 2006);
- (2) the absence of large polar bear congregations at traditional walrus haul out sites, with constant (during September-October) formation of numerous small temporary bear gatherings at walrus and whale carcasses;
- (3) a significant presence of polar bears in central parts of the island.

The 2007 season has shown how, and on what food resources polar bears can successfully survive ice free seasons in coastal and island ecosystems; confirmed the exceptional significance of Wrangel Island as a survival refuge for polar bears during ice free seasons; and confirmed the hypothesis that an ice-free ocean provides alternative food resources for polar bears by transferring large quantities of marine food material into coastal ecosystems.

Table 1. Number of bears by areas of Wrangel Island

Area	Total N	N ad	N subad	Yr/Ty&F	Juv&F	Lit&F	
Cape Blossom*	11	7	4	0	0	0	0
Somnitelnaya Spit*	15	10	1	4	0	0	0
Southern coast	101	63	9	13	15	1	
Western coast	205	166	1	6	26	6	
Central areas of Island	55	46	1	4	3	1	
Ushakovskoe area	4	4	0	0	0	0	
Total	391	296	16	27	44	8	

Notes:

1. * - For Cape Blossom and Somnitelnaya Spit data are given for a period of a one-time count along the entire surveyed coastline. Detailed demographic composition of groups formed at these points during the season is shown in table 2.

2. Yr/Ty&F – number of cubs older than one year (yearlings and 2.5-year olds) with mother in family group; Juv&F – number of cubs-of-the-year with mother in family groups; Lit&F – number of litters with mother in family groups for whom age and number of cubs was not determined.

Table 2. Demographic composition in percent from number of recorded bears - by areas and total.

Area	MM ad	FF ad	FF/juv	FF/yr	FF/ty	F/lit-FG	Од-n	Yr/Ty&F	Juv&F	Lit&F	Subad	
C.Blossom	28.6	21.4	7.1	0	0	0	0	7.1	0	7.1	0	28.6
Somnitelnaya Sp.	19.2	11.5	3.8	11.5	3.8	3.8	11.5	19.2	7.6	3.8	3.8	
Southern coast	11.7	13.6	10.7	5.8	2.9	1.0	17.5	12.6	15.5	1.0	7.8	
Western coast	26.6	5.3	11.1	1.0	0.5	3.4	30.9	1.9	15.5	3.4	0.5	
Inner areas	7.4	7.4	3.7	5.6	0	1.9	57.4	7.4	5.6	1.9	1.9	
Ushakovskoe area	0	0	0	0	0	0	100	0	0	0	0	
Total	19.6	8.6	9.3	3.4	1.2	2.5	29.7	6.4	13.2	2.5	3.7	

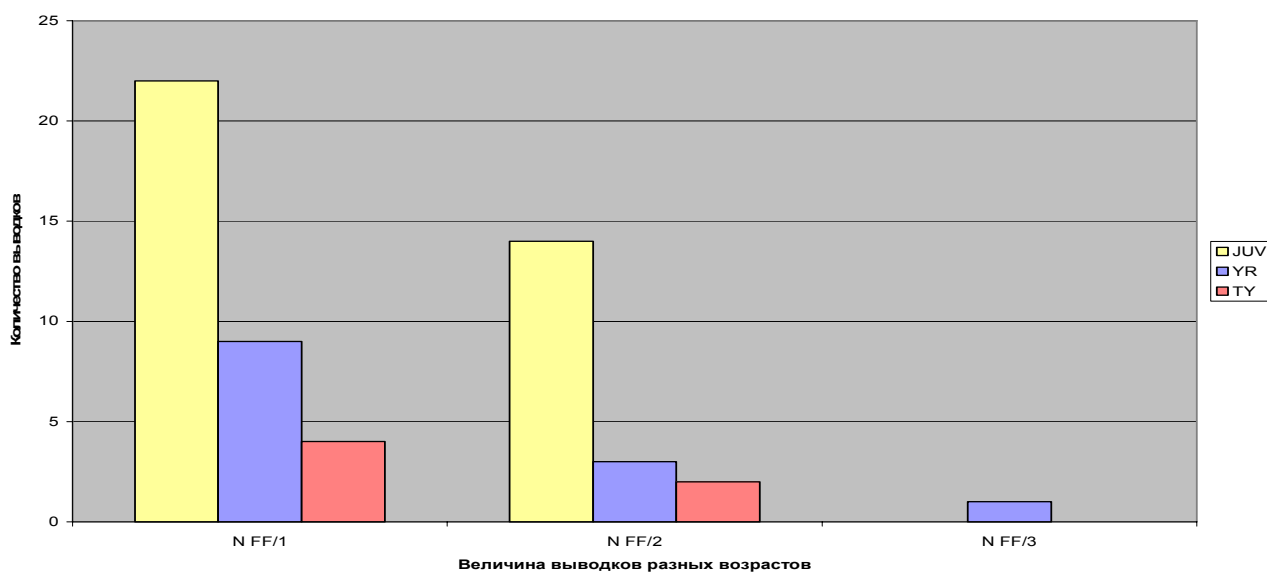
Notice: MM – males; FF – females; juv – cubs-of-the-year; yr – yearlings; ty – 2.5-year olds; F/lit-FG – females with un-identified litter - family groups;; Lb – lone bears un-identified by sex and age category; Yr/Ty&F –cubs older than one year with mother in family group; Juv&F –cubs-of-the-year with mother in family group; Lit&F – litters un-identified by age and number of cubs with mother in family group. Category “Lb” (Lone un-identified bears) contains animals that are observed at long distance, sleeping and young bears, in which sex related features are not well seen for identification.

Table 3. Body condition of bears in percent by categories.

Category	1 point	2 points	3 points	4 points	5 points	N
MM ad	1.4	8.1	16.2	64.9	9.5	74
FF ad	0	0	12.9	64.5	22.6	31
FF/juv	0	0	46.4	46.4	7.1	28
FF/yr	0	8.3	41.6	33.3	16.7	12
FF/ty	0	0	16.7	83.3	0	6
Од-п	0	0	18.2	81.8	0	11
Subad	0	8.3	33.3	41.7	16.7	12
Yr/Ty-СГ	0	8.0	32.0	52.0	8.0	25
Juv-СГ	0	0	50.0	42.5	7.5	40
Total	0.4	4.2	28.9	56.1	10.5	239

Notice: N – number of bears of this category, with which body condition was determined. 1 = very skinny; 2 = skinny; 3 = normal shape, not fat; 4 = fat; 5 = very fat.

Figure 1. Proportion of litters with different cub numbers.



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