

Polar Bear Behavior in Coastal Congregations

© 2005 N. G. Ovsyanikov

Wrangel Island State Nature Preserve, Pevek 686870

Email: nikita_ov@mail.ru

Accepted for publication 14 April 2004

Abstract

Aspects of polar bear behavior within autumn coastal congregations on Wrangel Island are qualitatively described. Congregations are defined as relatively stable temporary groups of bears within a limited area, in which the animals continually meet, interact, and maintain social distance and relations. Coastal congregations formed in years when the surrounding sea ice completely melted and had populations varying from 40—160 members in different years. This study examines the process of congregation formation, spatial distribution of individuals, roles of communicative pathways, social orientation and positional interaction, and the ability to estimate and evaluate occurring events. Social rank within a community (in which large adult males score the highest) is evaluated as the degree of independence from the presence or actions of conspecifics. However, actual individual interactions between animals are a result of the participants' current needs. Incidences of male-male alliances and composite families in polar bears are described, as are indicators of high sociality and the factors responsible for its development in this species. Finally, criteria of high sociality are presented here that are applicable to polar bears specifically, and to the bear family in general.

Introduction

Despite the notable recent successes in studying polar bear population structure and biology during the last two decades with the use of high tech methodology (i.e., satellite telemetry, infrared cameras, videotaping, and DNA identification) many questions remain unanswered. A sufficiently precise estimate of bear populations is lacking, both in general, as well as at individual sites. Several other population dynamics are unknown, such as cub mortality before separation from their mothers, general mortality, juvenile population structure, prey base status in different areas, and population response to local pollution and global climate change. Polar bear behavioral ecology is also inadequately known, especially social behavior in areas with high animal concentrations.

This report presents the general characteristics of interrelationships among polar bears in their autumnal coastal congregations. This is a preliminary report that presents a qualitative description of social processes among polar bears forming seasonal communities on the coast of Wrangel Island during years when the surrounding sea ice completely melted. Quantitative aspects of polar bear social behavior are not treated here, but will be presented in a separate report.

Materials and Methods

Observations of bears on Wrangel Island were conducted from 1990 to 2003 (excluding 1994-1996 and 2001) during the autumn season, from the beginning of September to the end of November. The primary observation site was at Cape Blossom (the island's south-westernmost point), with additional locations at Doubtful Spit (on Krasina Bay, in the southern coast), along the south and west coasts (in all studied years), and the northern coast (during 1991-1993), using Honda all-terrain vehicles and Buran snowmobiles for transportation.

Primary methods for collecting information about bear behavior were visual observation and videotaping from the ground by an observer (the author) located near concentrations of bears, either in the open, or while using a shelter made from an abandoned truck body with the window glass removed, anchored in the footings of a wooden navigational tower. Clothing was camouflaged to match the prevailing weather: grey tones during snow-free periods, and white during snowy times.

Observations of bears occurred from 0.5 m—2.5 km. For short distances, observations were made without equipment; for longer distances 8-15x binoculars, or a 20-60x spotting scope, was used. Videotaping was performed with a Sony VX-1000, Canon XL1 and XL1s cameras. Combined observation methods, such as focusing on one animal or using "scanning surveillance" (Ovsyanikov 1993), were used to track multiple events. This report is based on material gathered from over 1,500 discrete observation sessions of social interactions in polar bear congregations.

Formation of Coastal Congregations

Polar bears usually begin to move to the Wrangel Island coast in the second half of August. However, the exact timing and intensity of bear migration is directly linked to sea ice condition. Bear movement begins when sea ice sufficiently weakens and pack ice retreats north of the island. If sea ice around Wrangel Island remains cohesive enough during the entire summer to autumn period, then bear excursions to the shore are limited and brief. In the year 2000, for example, ice around the island never thinned to less than 4—5 m and only 32 bears were found on the coast during the entire autumn season (September—November). During this time, bears that did venture to the coast were only there for a few hours. In 1992, during similarly ice-bound conditions, only 12 bears per month were seen in the Cape Blossom area. In contrast, during the year of greatest ice melting and highest autumnal bear concentration (1990), when the island's complete bear population was between 350—400, the number of bears in the Cape Blossom region

alone reached 150—160, and those animals stayed on the coast continually for two months (Ovsyanikov and Kochnyev 1991, Ovsyanikov 1993). Historically, coastal congregations of polar bears have ranged from 40—100 individuals.

Bears initially enter the coast by simply moving onto the closest land mass when the ice disappears. In September, bears slowly walk along the coast, usually from the east to the west, until they reach traditional walrus breeding grounds, Doubtful Spit or Cape Blossom Spit. These sites have old accumulations of walrus skins and bones, and are places where new forages can be found, such as beached whale carcasses. Individual walrus or seal carcasses washed onto beaches during storms are usually found by several bears and quickly consumed: 1—2 days for an adult walrus carcass, and mere hours for a seal carcass. Bears usually don't linger for long around these ephemeral food resources, generally just long enough to consume them and rest briefly, normally a few hours to days. True congregations only form at the traditional places described above or around newly discovered, significant sources of food.

Bears from all age and sex groups visit the Wrangel Island coast during autumn, but the composition of bears among them varies considerably. For example, the percentage of females with dependent young ranged from 9.3 to 25 across years, while that of adult males ranged from 11.1 to 80.0.

Bear censuses along southern coastal routes reflect the composition of those migrating toward congregation sites. For instance, bears observed along the stretch of land between Cape Blossom and the mouth of Doubtful River (an 80 km long segment) during the fall of 2003 comprised: 14 September—21 bears, 17 September—35, 18 September—72, and 1 October—4. During this same period, the number of bears on Cape Blossom (determined by counting all the bears in the field of view at the time) was the following: 4 September—3 bears, 8 September—19, 11 September—27, 13 September—22, 17 September—18, 26 September—38, 1 October—32, and 10 October—59. While bears at the beginning of autumn are widely dispersed over the entire coastline, by October the migration's "first wave" is effectively finished and bears gather in congregations at the both capes. Congregation on the coast proceeds from the first appearance of bears at the main gathering points, the spits of Cape Blossom and Doubtful Cape. In recent years approximately 80% of all bears in initial groups were males. When there is an active walrus breeding ground in the area, all bears entering stay to form congregations, but in the absence of such a rookery some bears continue moving toward the north after briefly inspecting the ground (from a few hours to 1—2 days).

I define **congregations** as relatively stable temporary groups of bears within a limited area in which the animals continually meet, interact, and are compelled to maintain social relations and distance. I observed polar bear congregations in four primary situations during the study period:

- At traditional formation sites for walrus breeding grounds, in the absence of an active rookery but with the remnants of old walrus hides which the bears used as supportive forage. These were observed with up to 60 bears at one time.

- At the same places, but with an active rookery—up to 160 bears simultaneously.
- At the same places, without an active rookery, but with a large number of walrus carcasses—up to 77 polar bears observed at one time.
- Around a beached whale corpse—up to 100 bears observed at one time.

Inclusion of newly arriving bears into a congregation always begins with their examination of the area and of the bears already there. A new arrival is easily distinguished by its explorative behavior: the bear walks around the entire cape and checks all the main accumulations of hides, carcasses, or other notable objects on the beach. At the same time, the new individual will sniff other bears, watch them, and often examine their tracks and day beds. During its first inspection of the surrounding area, a bear usually doesn't stay at any one object for long, even if it is a food item. Instead, the bear will continue to inspect other items, and only then begin to feed. When a bear has finished this search, it is effectively included in the congregation.

The initial reaction of bears to a newcomer is largely determined by their age-sex cohort and physical condition. Responses vary from exploratory sniffing to desperate flight. Ongoing relationships among bears are modified according to each individual's particular character traits. It is obvious that the course of action in a given case (whether to stay on the cape or move on) is the result of a conscious decision. Only rarely do bears leave the cape after an intense bear-bear conflict. Usually the choice to abandon the area is a deliberate course of action. The distribution of potential food objects on the cape makes them equally available to all bears, so bears that run away or move to the sea after an intense encounter quickly return and resume normal activities. Since bears in such a temporary community aren't bound by any internal social ties, their ongoing association constitutes what I define as a coastal congregation.

Bears already well acquainted with these congregation sites are clearly distinguishable from newcomers. These bears are calm, unhurried and methodical in their explorations of the area. They exhibit a knowledge of where to go as they travel along the usual routes used by congregation "members". Newcomers to the area are high-strung and cautious, moving hurriedly, abruptly changing direction, and moving from one object to another depending on what has caught their attention. If they stay on the cape, these bears' behavior quickly changes into the usual rhythm of congregation members.

A certain degree of inattentiveness is characteristic in polar bear behavior. If their attention is focused on something they may fail to notice another object or action. For example, while examining a collection of walrus hides and bones, a bear might not pay attention to an observer standing motionless nearby. Alternatively, this intense focus predisposes the bear to being startled when a potentially dangerous situation is suddenly recognized, whereupon the bear becomes frightened and runs away in a panic, occasionally jumping into the ocean and swimming away. However, once the bear calms down it often returns and carefully examines everything connected to the incident, such as objects in the area and tracks on the ground. The need for ongoing interaction with

conspecifics appears important. Even while focused on some aspect of exploring the beach environment, bears are continually aware of the location and activities of others.

Bear Distribution at Sites of Congregation Formation

Walrus hides are unevenly distributed around the shoreline of congregating sites, found mainly in areas historically favored as rookeries. Walrus rookeries typically are found at the ends of the spits. Bears visiting these spits inspect the accumulations of hides, and all congregants go there daily to feed. The only animals that remain at these rookeries for extended stays (e.g., resting or overnight) are adult males and some male juveniles. The largest, most experienced males prefer to establish beds (round depressions) at the very end of spits. Resting adjacent to ocean currents allows bears to observe potential new food floating past, well in advance of the more inland individuals. These locations also allow bears immediate access to the ocean which provides ready escape if danger arises. Typically, day beds are close to each other, sometimes even in a row, touching one another.

Females with cubs forage on carcasses alongside other bears, but return to rest at the widest point of the spit, lying down apart from others. The general distribution of polar bears at the congregation sites is as follows: male beds are closely arranged (~ 0.5 to several meters apart) on the ends of sand spits, while all other bears, such as family groups, lone females, and juveniles, spread their resting sites farther back, towards the middle of the cape. The average distance between beds for these latter groups is generally at least a couple dozen meters. Most beds are situated on the slopes of hollows in the ground, since bears are better protected there from the wind. However, they can also be found on the pebbly ridge tops, since these higher sites offer an unimpeded view of their surroundings. Adult males also use beds in the widening zone of the cape. Bears don't adhere to any absolute rules when establishing themselves on the cape, but some tendencies are apparent. As previously mentioned, preferred resting sites for different sex and age groups, and the clear avoidance of the proximity of adult males by family groups are both readily observed.

Social Tolerance and Maintenance of Social Distance. Means of Communication

Bears respond less intensely to the close proximity of others while in congregations than during encounters on the ice. Social tolerance (i.e., low intensity responses to the presence of conspecifics at relatively short distances), is higher on the coast than on ice, and higher at congregations than during the coastline migrations. While bears are gathering on the capes, they habituate to one another. However, the reaction to each close encounter varies by situation. A slowly moving bear usually does not alarm its neighbors. Females with cubs will feed calmly at walrus carcass accumulations with other family groups, juveniles, and lone adult females but a few meters away. However, when adult males approach, family groups will leave, maintaining a distance of at least 20—30 m or more.

Visual and scent stimuli have the greatest importance for polar bear social behavior. While very responsive to sounds, polar bears rarely use specific vocalizations in social interaction. This is usually only observed within family groups (a mother and her cubs), or in short range antagonistic contacts, such as snarling between two bears attempting to feed from the same walrus carcass. Bears continually sample their visual, olfactory and auditory surroundings as part of one continuous communicative process. That olfactory data are crucial for orientation and communication is evident from how bears' noses are constantly swinging from side to side as they scan their environment. Sped up videography reveals that the nose has a constant yawing motion, almost like a miniature elephant's trunk. "Licking the air" is another very characteristic means for polar bears to obtain chemical information about their surroundings, and is constantly seen during active sniffing—whether in searching for food or within a social context. Bears always smell one another whenever they approach or pass by each other, and they usually try to be downwind of another animal. While living on the coast, bears often defecate directly in their beds, a practice which mats their fur with soil and feces, and obviously becomes a component of each bears' individual olfactory signature. Even humans can detect the strong odor associated with bears if it approaches within several meters.

Visual information is also indispensable for polar bears. Bears are quite capable of recognizing each other and can assess the situation at a fair distance. I have observed how bears at the end of the cape were able to recognize approaching individuals at a distance of 600-700 m, even with a strong wind blowing perpendicular to the direct line between each other. Under these circumstances, the chance of odor (and thereby olfactory information) from one animal reaching the other is not possible. At these distances, humans can see the approaching animal, but determining exact size and sex is only possible with binoculars. In a social context, bears are very responsive to even the smallest and least significant movements or gestures, particularly to the slightest threat gestures. Mimicry among polar bears is fairly expressive and includes movements of the lips, nose, ears and eye appearance. The current thought on the "immovable face" of polar bears is apparently due to a lack of familiarity with their behavior and the difficulty of observation at close quarters, where fear impedes the collection of fine details. In addition, the thick snout fur masks this mimicry.

Movements in a social context (i.e., demonstrations) are expressive, and have the same meanings as those found in canid behavior, except for active tail movements and variations of bared teeth. Positioning of the head, back, and paws, height of stance, alignment of the body, and movement of the paws (including waving, folding, blows, shoves, and others) are all part of an array of poses used to formulate this "morphological form of behavior" (Ovsyanikov 1993). The baring the teeth, a characteristic demonstration of wolves, appears in the polar bears' repertoire as they open their mouths while facing one another. Incidentally, this also serves as an analogue to canine teeth baring which occurs among lesser canids such as polar foxes (Ovsyanikov et al 1988).

A logical analysis of many social situations confirms that rational assessment of contemporary events is a key factor in recognizing, evaluating, and reacting to visible demonstrations from other bears. It fosters flexibility in regulating social interactions and

offers the ability to correctly understand and appraise reactions and intentions of an opponent, even from the smallest expressions of morphological behavior.

It is important to note that while many interactions among polar bears are accompanied with visible demonstrations of a clear and direct character, “positional interactions” (movements from one place to another to regulate social distance based on the changing arrangement of neighbors, what I call manipulation of social distance), play just as important a role, without any explicit demonstrations. This is easily seen, for example, when bears replace each other around a walrus carcass, or when regrouping along the coast after one, or a few bears, moves out. Indeed, this manipulation of social distance is apparent during practically any significant change in arrangement of members of the congregation at a given moment.

Communication between members of the congregation is continuous and uninterrupted even in the absence of visible expressions or direct social interactions. This process is carried out not only through the means of direct face-to-face exchanges, but also by continually following surrounding individuals out of the corner of the eye, without focused attention or for lengths of time. This observation gives bears prompt and operative information about the distribution and current actions of conspecifics, thereby allowing the animals to control the social setting around themselves. Positional interactions show that keeping a mental representation of surrounding space and others’ capabilities plays an important role in determining a place to stay and a course of action. For example, a young bear will return to a walrus carcass as soon as an adult male leaves the site. During the exchange, no movements are directed toward the other individual and no demonstrations are made—bears simply exchange position without looking at one another. In another example, when an adult male begins to slowly approach the cape, mothers with cubs at a walrus carcass will cease feeding. Then, the family will retreat to the edge of the beach and rest there, selecting a place to sit from which all possible approach paths are visible and from which they can depart in any direction if another bear approaches. The family group will remain for as long as the male lingers at the site, then return to the carcass as soon as he leaves.

Does a Social Hierarchy Exist Among Polar Bears?

Reactions of one animal to another depend on sex, age, current actions and motives. The rules of social behavior among polar bears are described as follows. Social ranks in polar bear communities are distinguishable as the degree of independence to the presence and actions of conspecifics. Priority in choosing a location accessible to the beds and food sources is clearly connected to this. A higher ranking bear goes where it wants regardless of other animals present, approaches whomever it chooses, and takes whatever it desires. Large adult males have the highest ranking by these criteria. Other bears fear them and prefer to withdraw when they approach. Among bears of other sex-age cohorts, fully grown females are clearly dominant, except over young males transitioning from juvenile to adult status. Adult female priority in these interactions is equivocal and is decided by each participant’s confidence and motivation. Among subadults, males have clear priority over females, who are more cautious and leave when approached. Among young, cubs in

the presence of their mother have higher rank than cubs of the same age living without a mother (see below for more about this category).

The rules described above constitute a formal foundation for hierarchical behavior. In general, they give priority to individuals that are stronger, more confident, and more experienced in social situations than smaller, weaker and less confident individuals. Reasons for bears' caution toward each other, and especially toward large males, are discussed below. This model can fundamentally change in the context of real episodes of social behavior in a congregation. In the first place, these rules have added to them the animal's degree of actual motivation, and a strongly motivated and more active bear can get priority regardless of its formal standing. In the second place, a bear's experience and choice of a course of action to a large degree determine its priority. Perseverance, for example, especially plays a significant role. If, for instance, a smaller bear approaches the feeding site of an older and larger bear, and holds its place after the retaliatory threatening lunge, the situation will change in his favor. Resistance in a situation of conflict is expressed by standing opposite the opponent with an open mouth and in a protective low stance, often countering with a swipe of the forelimb. A more common variation is the "polite" approach, in which the individual desiring to join the meal approaches slowly and calmly, walking the circumference around feeding animals and showing a humble pose (head lowered and a slightly lowered back). In response to this behavior, a feeding bear will usually either walk away, abandoning food, or allow the newcomer to join. This behavior is nothing other than begging for permission to join the feeding, and it is quite widespread in polar bear social behavior.

A rapid, direct approach is interpreted by all bears as a threat. In these situations, the animal being approached will become agitated as the distance closes, eventually either standing and assuming a pose of readiness for confrontation, or turning to flee. Approach at a run is seen as a severe threat and inspires panic and flight in all bears regardless of their respective sizes. Retreat is understood by all to be a sign of weakness and can provoke pursuit or even attack. Aimless running of one bear is understood by all others as a signal of general danger and will start a chain reaction, where even bears who hadn't noted the initial alarm start running themselves.

It is significant that bears in a congregation will seek to follow one another and form a loose herd when in danger. Their reaction in this situation, gathering together into a more compact group, is identical to that of animals typically in herds, such as northern deer and white geese, the only difference being distance between members. Polar bears do not gather densely enough to physically touch each other's bodies, but stay a few meters apart even in a small movement. As with herd animals, antagonistic interactions immediately flare up when the congregation compacts. For example, females will rush animals to chase them away from their cubs. Ultimately, these gatherings in response to danger do not last for long. Some bears immediately descend to the ocean and swim away as a compact group. Animals remaining on shore begin to disperse as soon as they calm down, which in the longest cases takes only a few minutes.

The need to follow and orient on each other when moving as a close group in panic and danger, is due to the high degree of sociality in polar bears and is motivationally related to the instinct of cubs to follow and depend on their mothers.

Young Bears in the Community

Polar bear cubs normally remain with their mothers for about three years, or until their third autumn. However, some cubs become independent and self sustaining in their second year and some earlier yet. This probably is the result of getting lost in stormy situations on ice or from the death of their mother. Every autumn there are some one-and-a-half year old cubs living independently in the congregation.

These young individuals successfully join the community and live exclusively as scroungers, living on any available food--old walrus skins, marine invertebrates washed on shore, carcasses, and leftovers from adult bears' kills. When they find potential prey (such as seals or walruses) these juveniles will attempt to capture it, but never succeed. In certain situations it is possible for a yearling to make such a kill (such as intercepting a small, greatly weakened seal where it cannot escape to the water), but their only way to successfully survive to adulthood is as a "parasite" of adult males and females, who are the community's best hunters. Existence for orphan cubs as a parasite-scrounger is completely manageable, at least in the food-rich area of Wrangel Island. Many of the yearlings observed in autumn congregations are well fed and in normal physical condition.

Orphan cubs do have lower social status than cubs of the same age with a mother. In competitive situations (for food or bedding sites) cubs from a family have priority over lone youngsters. On the other hand, cubs living on their own are more independent in their actions, better oriented in their social environment, and use any opportunity to obtain food. They attentively watch surrounding bears and reply to any sign of danger, while at the same time, they characteristically are perseverant and resourceful in reaching their goals.

Male Alliances

Large adult males have a special position in polar bear society in general, and particularly in the congregations. Bears of all other age and sex categories behave cautiously toward them and try not to be within a short distance of them. But at the same time, adult males show high social tolerance among themselves. Male day beds accumulate at the cape tips because males walk up to and lay down beside other males, and before laying down sniff all around each other or touch noses. Males often follow one another when walking their circuits along the shoreline, a behavior in which their need for social support and orientation is observable.

The most striking expression of sociality in adult males is male alliances. These are friendly association between two males, who move about together, orient on each other, wait for each other, and lie down together for rest. Males in an alliance even play with

each other. Alliances are founded on mutual attachment, and members of an alliance do not change partners when coming across other males. There are no data permitting us to determine how long alliances last because we were never able to follow one of these pairs for more than a few days. However, some alliances were successfully followed for a few days, and these observations showed that members of an alliance can break up for some time and still come together again in the future.

In some cases alliances were formed between bears of the same age and size, from which we can presume that they were siblings. However, other pairs were encountered in which one animal was notably smaller than the other.

Males' high tolerance for each other and their formation of alliances reflect the higher sociality present within this sex-age group, compared to that with any other demographic category. It is apparent that males' striving for society within their peer group compensates for the deficit of positive social stimulation (even avoidance) shown by family groups, juveniles and lone females.

Complex Families in Polar Bears

While there are few examples of polar bears forming compound families (in which more than one female's litter are together), some have been recorded. For a long time during the fall of 1991 there was a family group observed in the congregation on Doubtful Spit that consisted of a female with two large one-and-a-half year olds and also another female no younger than three and a half years old. This female was in the midst of the family, but held herself more independent than the younger cubs. All four animals slept together in one bed. It can be assumed that this female was the daughter of a female in a previous breeding cycle, and that she joined the family after meeting them in migration or perhaps even after they were on the cape.

I observed another compound family during the autumn of 1998 on Cape Blossom, which consisted of a female with a cub from that year and a one-and-a-half year old cub. Both cubs acted like offspring of that mother, and there was never any antagonism within the family. It was assumed that one of the cubs was adopted by the female, but indiscernible which one. Instances where yearling orphaned cubs attempted to stay close to a family and follow it were observed by me several times. One other compound family, consisting of a mother with a one-and-a-half year old cub and a four to five year old female, was under observation on Doubtful Bay in the autumn of 2002. These observations show that polar bears are capable of maintaining long-term social ties, at least with females and their cubs from previous litters and adopted lost cubs.

The Role of Social Factors in Hunting and Consumption of Prey

Polar bears only hunt alone and quite understandably never try to cooperatively hunt even large prey, such as walrus. Hunting is above all a physical process, and its course and result are determined by the physical parameters of both the hunter and the hunted (speed, weight, strength, tools for holding and killing and their opposition, the instruments for defense) as well as the milieu in which they interact. Unlike wolves, hyenas or lions, polar bears do not need to chase their prey for long periods, use coordinated hunting or corner swift and agile prey. What are important in hunting polar bears' main prey (seals) are individual searching, effective concealment, unnoticeable approach or long ambush, and then a quick lunge and grasp. Weight and strength are most important in hunting walrus, because these large, strong, and slippery prey must be killed on the spot and not allowed to escape to the water. The parameters in all polar bear hunting are such that a second hunter or a group of hunters would prove to be a hindrance and a matter for unease. Therefore, evolution has not led polar bears to develop collective hunting habits.

The lack of collective hunting in polar bear society is countered by their communal consumption of prey. Their high social tolerance is seen in how all animals that find a carcass are allowed to stay and feed. Specific behavioral tricks are used to suppress potential tension and aggression, one of which was the above-mentioned "polite" approach. We observed up to 8 polar bears feeding simultaneously at a single carcass, and up to 14 bears were counted feeding or waiting for a spot around the carcass. It is important that while among wolves, or lions, only members of a family or pack feed together at a single carcass; however, at polar bear feeding sites unrelated animals gather together. Sharing one's kill with other bears is useful because it allows other individuals who cannot effectively hunt for themselves to survive as dependents, while allowing the successful hunters to concentrate on eating their portion and not on guarding their kill from others. During times of abundant prey the effective hunters can kill as much as they need in any case.

Cannibalism Among Polar Bears. Do Adult Males Hunt Young?

The question of how widespread cannibalism is among polar bears remains unresolved at this time. There is the opinion that male polar bears actively hunt cubs, which would explain the fear and caution shown in their presence by young individuals and females with litters. Few documented cases of cannibalism exist, though, and cannot confirm whether these instances are the rule or just rare exceptions.

There were instances that I observed in congregations around active walrus rookeries where a large adult male ate side by side with a family group without any signs of aggression or tension. The usual response when a male approached a family group in congregation interactions not associated with consuming fresh marine mammal carcasses was to group together into a protective stance (shoulders to shoulders facing the opponent with lowered heads). The family group would then either exit or the female would lunge aggressively toward the male, and he would leave.

I saw evidence that males can attempt to catch a cub under certain circumstances when, in the autumns of 2002 and 2003 the congregations were without large food reserves. Two instances were recorded in 2002 when an adult male (two different individuals) attempted to pursue lone yearling-cubs. These attacks differed from the short threatening lunges polar bears use to chase away other animals. In both of these situations, the male first moved to intercept the cub along the beach while the group gathered, then from a distance of 30--40 m threw himself at the cub and chased for at least 50 m. In both cases the cub ran away fast and far, which indicates their unambiguous interpretation of their attacker's intent. In addition, there were two cases in 2003 (both involving the same victim) when lone yearlings chased a female who had a cub for 50--70 m, and also did not appear to be an attempt to only scare her away. In 2002, a few bears--none of them adult males--ate a cub that had recently either died or been killed. The cub was one of a pair that had showed up on the coast without a mother several days before and only an hour before was alive, active and not showing any signs of weakness or illness. The bears that ate him were a family group consisting of a female with two yearling cubs and two young lone females. While I did not observe the actual death of the cub and do not know the exact cause of death, it is likely that he was caught and killed by one of the bears feeding on his corpse (i.e., a female, and not male bear.)

In all cases when polar bears drowned or died from illness other bears ate their corpses, but a few days (2--7) would pass from the time of death before they started to eat. In these cases, young bears usually were the first to begin eating.

These facts lead us to conclude that cannibalism (hunting young) among polar bears takes place when the animals are hungry and cannot find other food. Switching to cannibalism is not characteristic of all bears, however, and rather than being a general rule, it is more likely a tactic of specific individuals. It is well known that in extreme conditions even humans have been cannibalistic.

Conclusion

The study of polar bear behavior in coastal congregations leads us to conclude that the traditional conceptualization of the polar bear as a lone predator that wanders over the ice without no bonds to conspecifics and incapable of sociality is incorrect. Congregations have been found on the ice in areas of prey accumulation, such as near a pod of trapped belugas (A. Smirnov, personal correspondence). Our observations of polar bears on ice show that on the ocean they continue to orient on each other, walk in each others tracks, and move from area to area in synchronized migrations. The very presence of bears signals the appeal of a location to other conspecifics. The distance between individuals in a group changes when moving to life on the ice, but social orientation and communicative processes do not cease.

The depth of communicative processes in a community is not only determined by a species' perceived capabilities and development of a signaling system (the expressiveness of demonstrations of different modalities), but is also distinguished to a notable degree by their capability to remember and assess information received. The environmental

constraints in which an animal is found also promote the development of its mental capability. The polar bear's environment is exceptionally harsh. The icy landscape in which they spend a large part of their lives has a wide variety of relief features, from wide, flat ice fields to mountains of ice jams more than ten meters high. Their landscape is three dimensional and exceptionally dynamic because of ice movement, compression and rupture. The underwater surface of the ice also presents a complicated three dimensional landscape, with different sculpted forms, grottos, cavities, fissures and cracks. Activity in such a space requires good memory and development of deductive capabilities. The continuous change of the ice landscape, extreme variability of weather conditions and uncertain distribution of prey require polar bears to constantly solve complex tasks, of which the easiest is extrapolating the movement of different objects. These factors also cause elements of signaling to change. The polar bear lives in an environment that lacks any components of a permanent nature and he constantly moves from the aboveground to submarine worlds and vice versa. I consider that these factors play an important role in developing the polar bear's psyche and mental capability, which are directly linked to mechanisms and capabilities for social processes. These qualities distinguish the complexity of communicative processes and high sociality in polar bear communities.

Criteria of sociality dependent on a group's composition are clearly not applicable to polar bears because they do not reflect the real conditions of their lives. To understand the particulars of an animal's social life it is absolutely necessary to take into consideration their specific biology. Formal, universally applicable criteria for sociality are useless. For example, the degree of sociality in the ursid family cannot be described and considered by the same criteria used with the Canidae.

The following criteria of high sociality are applicable for polar bears and the ursid family as a whole:

1. High social tolerance as the toleration of the presence of non-related conspecifics at a close distance.
2. A well developed communicative system and plasticity in behavior in different social circumstances.
3. Strongly expressed social orientation between members of a community regardless of distance between them.
4. Need for grouping and social support (proximity of conspecifics) in critical situations
5. Long memory of social ties and the ability to maintain them. The ability to create positive social relations between individuals not bound by maternal--offspring blood relations. (As a separate factor: the ability to adopt.)
6. Inclination toward social games and finding partners for playing.

All these criteria are characteristic of polar bears and well demonstrated in their social behavior.

Literature

Amstrup SC, Garner GW, Cronin MA, Patton JC. 1993. Sex identification of polar bears from blood and tissue samples. *Can. J. Zool.* 71:2174-2177.

Cronin MA, Amstrup SC, Garner GW, Ernest RV. 1991. Interspecific and intraspecific mitochondrial DNA variation in North American bears (*Ursus*). *Can. J. Zool.* 69(12):2985-2992.

Ovsyanikov NG. 1993. Behavior and social organization of the arctic fox. M.: published by TsNIIL Glavokhota RSFSR. 243 pages.

Ovsyanikov, NG. 1993. Magnitude, distribution and demographic composition of autumnal polar bear groups in the Wrangel Island area. Bears of Russia and surrounding countries—population conditions. Ch. 2 M.: Materials of the 6th Conference of Bear Specialists. Central Forest State Preserve, 6-11 September. p.12-41.

Ovsyanikov, NG and Kochnyev AA. 1991. Observations of coastal walrus rookeries and their appearance on Wrangel Island in 1990.

Ovsyanikov, NG. Draft. Populations and communities of animals on Wrangel Island. M.: published by TsNIIL Glavokhota RSFSR. p. 74-91.

Ovsyanikov NG, Rutovskaya MB, Menyushina IE, Neprintseva ES. 1988. Social behavior of the white arctic fox (*Alopex lagopus*): repertoire of moving reactions. *Zoological Journal* 67(2):263-273.