Observing Coastal Walrus Haul-outs and Related Phenomena On Wrangel Island in 1990 (Preliminary Report)*

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The climatic and ice conditions around Wrangel Island were unusual in the autumn of 1990. By July the ice had already largely broken up in the coastal waters. By the end of August, only isolated fields of small pieces of ice remained along the shore, with ice concentrations rated at two on the density scale. In Krasina Bay, the closest ice was 12 to 15 kilometers from the shore, and on August 25 and 26, no ice could be seen from shore, with the exception of a minor field of small pieces, measuring two to three square kilometers in size, in the region of Davydov Lagoon. Data from ice reports show that by the second third of August the southern border of the pack ice was at least 200 to 250 kilometers north of the island. At the same time, only ice fields with concentrations of one to three on the density scale were registered in the coastal waters, along with one small concentration of ice that rated a five on the scale. No ice remained around the island in the last third of August, and the edge of the perennial ice was 250 kilometers to the north. In the first and second thirds of September, it had moved to 500 kilometers north of Wrangel Island, and it began to approach the island again only starting in the last third of September (see Illustration 1).

Consequences of these environmental conditions included the formation of coastal walrus haul-outs on Wrangel Island, the concentration of large numbers of polar bears along the coastline and unusual phenomena relating to the migration of birds. According to data from the Pacific Fisheries Research Center, or TINRO (G.A. Fedoseyev, report to the Ichthyological Commission of the Soviet Fisheries Ministry, Moscow, January 30, 1991), in September 1990 walruses also hauled out on the shore of Gerald Island. Previously, walrus haul-outs formed on Wrangel Island in 1983 (on Kosa Somnitelnaya sandbar) and in 1979 (on Cape Blossom) (*Chronicle of Nature in the Wrangel Island Preserve*, 1981 and 1984).

Materials for this report came from observations of coastal walrus haul-outs on Wrangel Island conducted from August 11 to October 29, 1990, including: in Somnitelnaya Bay, from August 11 to October 20 (from September 14 to October 20, observations were conducted by V.I. Pavlov from the Somnitelnaya Bay cordon, located eight to ten kilometers from the haul-outs); and on Cape Blossom, from September 11 through October 29. Besides the authors' observations, this report also includes data collected by staff members of the preserve security office: D.N. Kovalyov, I.P. Oleinikov and P.V. Maryukhnich. We would like to take this opportunity to thank them.

The methodology included visual observations of the activities of the walruses and of the other animals concentrated near the haul-outs, as well as counts of walruses, polar bears and snowy owls from certain observation points and along routes of movement. Hauled-out walruses were counted in Somnitelnaya Bay from a 12-meter-high tower situated at the end of the sandbar where the

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walruses were located; and on Cape Blossom, from a 12-meter-high tower, the roof of a field station (four meters in height) or a coastal escarpment (1.5 meters in height), depending on where the walruses were hauled-out. The number of walruses was determined using two methods: 1) by counting the walruses in a selected area and the subsequent extrapolation to obtain a figure for the entire haul-out, based on its approximate size; and 2) based on the size of the haul-out, using a coefficient of 1.13385 square meters per individual, as calculated by A. I. Grachev for the Arakamchechen haul-out (Smirnov, 1988). Subsequently, the data collected using the different methods were correlated. The area of the haul-out on Kosa Somnitelnaya sandbar was estimated only once, on September 2, immediately after the walruses went into the water during a storm. The visual count of walruses was found to be 37 percent smaller than the count calculated based on area. Subsequently, this correction was included in all visual observations, and as a result in all instances the walrus counts produced two figures: a minimum (visual count) and maximum (with correction for the reduction). An estimate of the number based on the corrected figure will be indicated in parenthesis after the estimate based on a visual count.

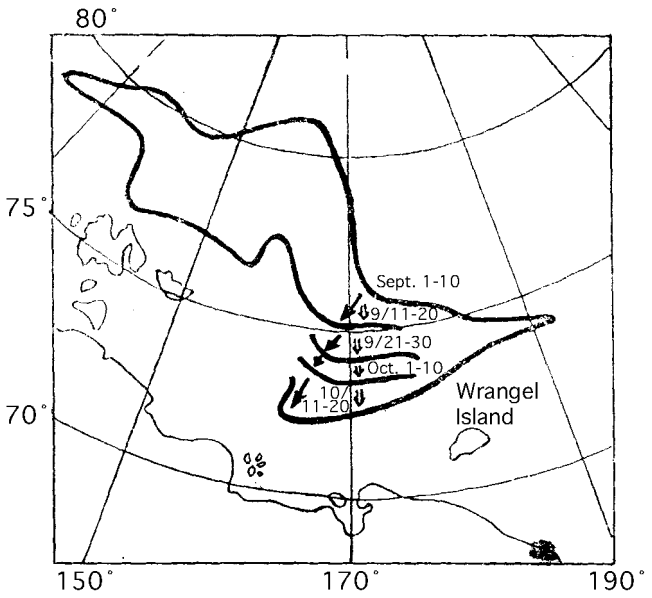

Illustration 1. Displacement of southern border of the pack ice near Wrangel Island in the autumn of 1990 (based on ice surveys). Illustration shows border of ice for thirds of months.

At the Cape Blossom haul-out, the walruses occupied different areas of the shore on different days. The sizes of the haul-outs were not measured. At the haul-out on the Davydov Lagoon sandbar, counts were conducted visually three times from the opposing shore of Kosa Somnitelnaya sandbar (from the nearest and highest point).

An estimate of walrus numbers in the coastal waters was made at Cape Blossom daily in the morning and, so long as daylight permitted, in the evening. In certain cases, the estimates were made during the day. The number of walruses was determined visually from the roof of a residential building and sometimes from a tower on the tip of the Cape. All the counts and observations were made using a 12x set of binoculars.

The age and sex compositions of the haul-outs were determined visually using the methods of TINRO and the All-Union Research Institute of Fisheries and Oceanography (VNIRO): comparing body features of an animal with a standard table of the bodies of the different age and sex groups.

Observers twice went out on whaleboats with hunting teams in the area of Somnitelnaya Bay (on August 26 and 29).

During the entire time when the walruses were around the haul-outs, observations were conducted of their behavior and their interrelations with predators (polar bears). Weather conditions, visibility and ice conditions were recorded daily.

RESULTS

Duration of activity at the haul-outs: The haul-out at Kosa Somnitelnaya sandbar was active from August 28 through October 15. During this entire period the walruses were on shore 35 days.

The haul-out on Kosa Davydov sandbar was active from September 7 through the first third of October. Regular observations were not made at this haul-out. In all during this period, walruses were reliably confirmed to have been at the haul-out on eight days.

The initial phase of the formation of the haul-out on Cape Blossom was not determined by ground observations. Apparently, this takes place in the first third of September. The last time the walruses attempted to come onto the shore was on October 3. In all during the period of observation starting September 11, the walruses came on to the beach on 12 days.

By the middle of October, initial ice formations began to form on the surface of the water along the coast, including slush, frazil ice and pancake ice. The last walruses were observed around Cape Blossom on October 17.

Division of haul-outs: The haul-out at Kosa Somnitelnaya consisted of three sections: the main section (on the western end of the sandbar), north section (600 to 700 meters from the main section, on the northern jutting end of the sandbar) and the eastern section (five kilometers east of the main haul-out, on the shore of Somnitelnaya Bay) (see Illustration 2). Usually the walruses occupied the main section of the haul-out. They used the north and especially the eastern haul-outs only during storms, when the currents carried them away from the main section. Of the 35 days during which the haul-out was active, the northern section was reliably observed to have been occupied for only three days, and the eastern section only for nine days (of which on seven days this section was occupied at the same time as the main section, although on these days the number of walruses in the main section either substantially declined or shrank to zero by the end of the day, while the number of animals at the eastern haul-out increased).

At Kosa Davydov sandbar, during all the observations the walruses came ashore in only one section of the sandbar, on its western end.

Around Cape Blossom, the observations showed that the walruses usually came ashore from the southern side of the cape (see Illustration 3). The total length of the coastline on the various sections of which the walruses formed haul-outs was nine kilometers. However, usually the walruses preferred sections 1, 2 and 3, centered on southern Blossom Kosa sandbar, opposite a residential building and up to 1.5 kilometers to the east of it (see Illustration 3). In addition, on three occasions the walruses were seen to haul-out at sections 4 and 5 on the southern shoreline, three to 3.5 kilometers east of the building and five to six kilometers east of the building at the tip of Kosa Burunnaya sandbar. It must be noted that through September 11, judging by the tracks on the beach, walruses hauled out

along the entire length of the southern coast, from the residential building to the east. The length of the haul-out was at least four kilometers. However, after an overflight by an airplane on September 11, the haul-out withdrew into the water and subsequently never formed in such volume.

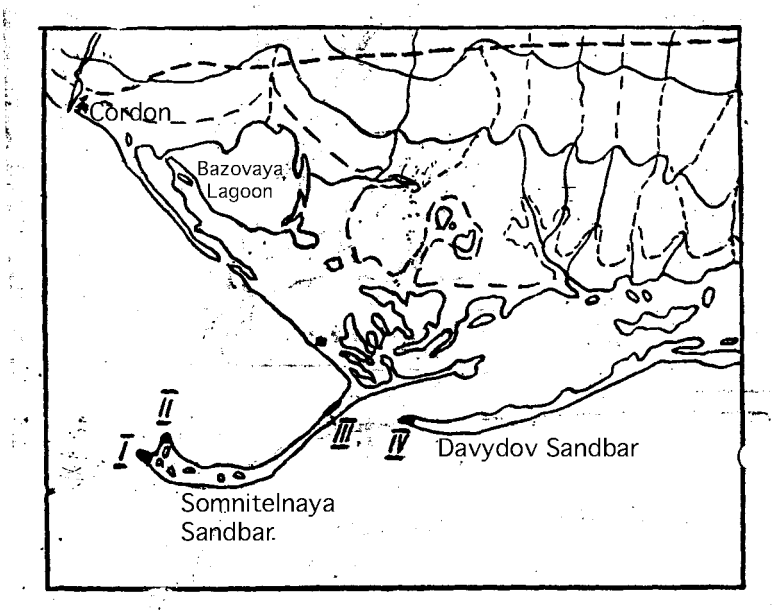

Illustration 2. Distribution of walruses at haul-outs on Somnitelnaya and Davydov sandbars (September - October 1990). Somnitelnaya haul-out: I - main section; II - northern section; III - eastern section; IV - Davydov Sandbar section.

In all, during the 12 days of observations when the walruses were seen on the shore, walruses hauled-out on the southern side of the cape on eight days, including: one day, along the entire southern shoreline to the east of the residential building; six days at section 2; three days at section 3 (concurrently with section 2); one day at section 4; and one day at section 5 (concurrently with section 2).

Constant attempts by the walruses to haul out on the shoreline were also noted at the very end of Cape Blossom, at a site where a haul-out was active in the 1970s (section 6) and on the western sandbar, Vaigach, 1.5 kilometers to the north of the cape (see Illustration 3). However, all the haul-outs on these sections were short-lived due to large numbers of polar bears, which frightened the walruses off the beach. At the tip of the cape, walruses were observed attempting to haul out on five days, on one of which the walruses simultaneously hauled out on the southern shoreline (section 2). At Kosa Vaigach sandbar (section 7), walruses were seen attempting to haul out on just one day.

It must be noted that the formation of haul-outs on the southern shoreline was usually accompanied by a northwest wind, when the current in the south was weak. Attempts by walruses to haul out in the west and on the end of the cape were observed when there was a shift to an eastern and northeastern wind and the force of the breakers increased in the south and decreased in the west.

Walrus Numbers

Haul-out at Kosa Somnitelnaya sandbar. The greatest number of walruses at the main section was observed on September 10: 45,000 (71,000). After September 10, counts were not taken.

The greatest number at the northern section was observed on September 14: 2,500 (4,000). This was the only count here.

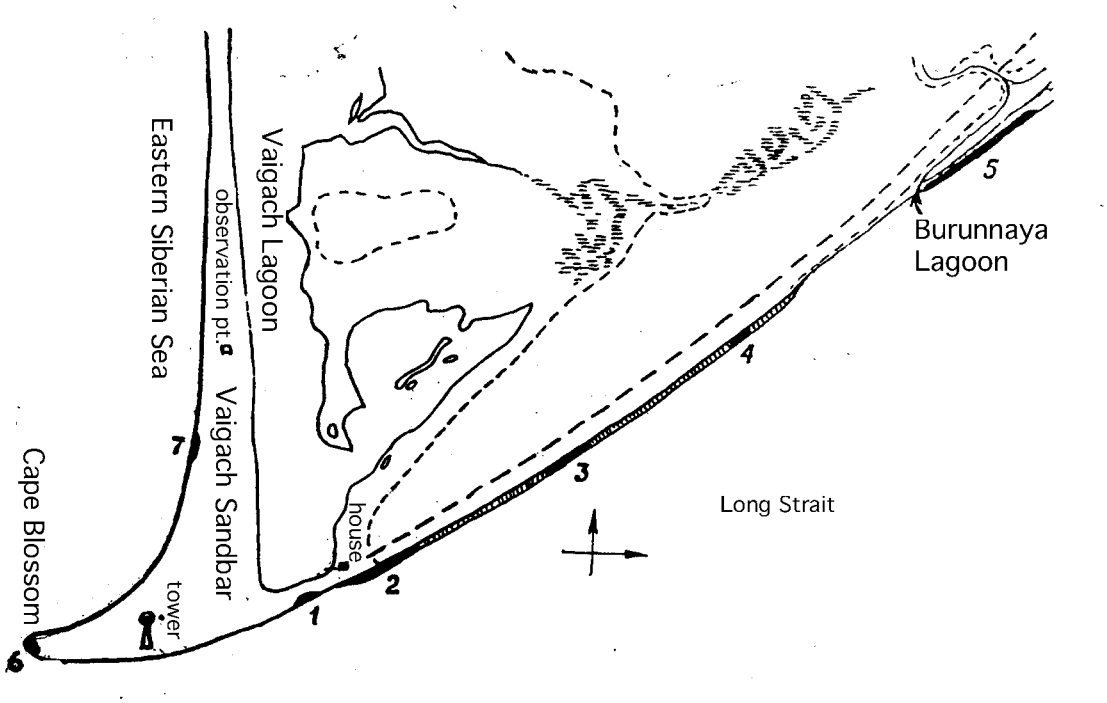

Illustration 3. Distribution of walruses at haul-outs on Cape Blossom (September 1990).
1-5 - haul-outs on southern shore; 6 - haul-out at end of cape; 7 - haul-out on Vaigach Sandbar.

The greatest number at the eastern section was observed on September 30. However, no count was conducted. Estimates of the numbers were made from the Somnitelnaya Bay cordon 8.5 kilometers from the haul-out.

Haul-out at Kosa Davydov. Greatest number observed on September 7: 7,000. Regular counts were not made subsequently.

Haul-out at Cape Blossom. Apparently, the greatest number here was on September 11. Based on an approximation of the area occupied by the walruses (based on tracks they left on the beach), there were at least 50,000 to 60,000 walruses here.

Subsequently, the greatest numbers of walruses at the different sections were:

- at section 1: 1,500 (2,400), September 16;
- at section 2: 4,500 (6,300), September 24;
- at section 3: 2,500 (4,000), September 22;
- at section 4: 2,500 (4,000), September 13;
- at section 5: about 2,000 on September 24 (a count was not made; this estimate was based on the number of walruses that went into the water, apparently as a result of bears on the hunt);
- at section 6: 150, September 28;
- at section 7: count not made, although judging by indirect indicators, probably no more than 100 to 150 walruses on September 30

Table 1. Age and sex composition of walruses at coastal haul-outs on Wrangel Island in 1990.

	Age Groups (years)										
						6-9		10-15		>15	
Haul-out	<1	1	2	3	4-5	F	M	F	M	F	M
Somnitelnaya Bay (n=58)	5.17	5.17	6.9	6.9	12.07	15.52	-	24.14	1.72	18.97	3.45
Cape Blossom (n=154)	7.79	6.49	5.84	5.19	3.25	21.43	0.65	30.52	2.6	14.29	1.95
Total (n=212)	7.08	6.13	6.13	5.66	5.66	19.81	0.47	28.77	2.36	15.57	2.36

In the coastal waters around Cape Blossom, the greatest number of walruses counted from one point was observed on September 16: 35,000 to 40,000.

The sex and age compositions of the haul-outs are cited in Table 1.

Disturbance factors: At the haul-out on Kosa Somnitelnaya, the main reason for the walruses leaving the shore and changing the section in which they were hauling out was stormy weather (67 percent of total incidents in which the walruses left the haul-out or in which there was a substantial reduction in their numbers). A polar bear attack was the reason in one case here. In two instances, people caused the disturbance: on September 16, at least two-thirds of the hauled-out walruses went into the water due to an overflying airplane; and on October 5, a raiding boat came to within two or three kilometers of the haul-out and lowered a smaller boat into the water with a team that conducted an unsanctioned visit to the haul-out and the illegal collection of tusks from dead animals. In the latter case, all the walruses went into the water.

At the Davydov haul-out, on September 7, walruses were observed to leave the haul-out due to an overflying airplane. At the same time, there was a polar bear near the haul-out. About 30 minutes after the airplane's overflight, this bear was eating the fresh carcass of a young walrus. It is possible that the bear was an additional factor in the disturbance of the walruses.

At the Cape Blossom haul-out, as has been noted already, a large number of walruses (at least 50,000 to 60,000) were hauled-out through September 11. However, on September 11, an airplane overflew the walruses at least twice (the observers were located eight to nine kilometers from the haul-out at the time and clearly heard the drone of the airplane). At 8:00 p.m., a visit to the haul-out showed a large number of walruses in the waters close to the beach, the beach was interspersed with walruses hauled up on the shore, and a strong smell was coming from the beach. The observers concluded that the walruses had gone into the water no more than a few hours beforehand. On that evening at Cape Blossom, a large number of polar bears were observed, along with the fresh remains of walrus pups of nursing age (up to two years old, inclusively). Seven skulls were found.

From September 12 through the end of the observations, the main reason for the walruses going into the water was hunting by polar bears. There constantly were 60 to 70 bears (not including cubs) in the area of the Blossom haul-out while it was occupied. The greatest number of polar bears in the Cape Blossom area was observed on September 19: 122 bears.

Subsequent observations of the interactions between polar bears and walruses showed that smaller haul-outs of walruses at the early stages of forming quite easily went into the water when bears appeared and tried hunting. For example, on September 16 there were seven hunting attempts by polar bears during the course of the day (including two attempts that met with success), as a result of which walruses that were starting to haul out onto the beach rushed back into the water in a panic. Attempts to form new haul-outs were constantly interrupted by bears. On average, on September 16 the walruses completely withdrew from the beach due to polar bears every 1.4 hours. At the same time, at large haul-outs, with animals packed around each other, it was not as easy for the walruses to withdraw into the water, and hunting polar bears could scare away a relatively small portion of the walruses from the outlying areas of the haul-out.

On this basis, we concluded that the most likely cause of the walruses' withdrawal from the beach on Cape Blossom on September 11 was the airplane overflight, after which polar bear activity did not allow the haul-out to reform in such great numbers as on September 11. This was confirmed by observations that we made on September 16, when about one-third of the haul-out withdrew due to an airplane overflight.

Thus, after September 11 there was no full-fledged haul-out on Cape Blossom. The number of walruses on the beach never reached the maximum possible level, that is, the number of walruses in the water and in the surf was always greater than the number of walruses hauled out on the beach. During the subsequent month most of the animals were unable to get onto solid ground to rest and slept in the water, with groups of 70 to 100 animals frequently forming. Exhausted individuals were regularly seen coming onto the beach on their own. At the beginning of October, in the areas around Cape Blossom, the carcasses of both nursing-age pups and adults frequently washed ashore. From the appearance of the carcasses that washed ashore, we can conclude that the cause of death was a complete loss of strength and extreme exhaustion.

Concentration of polar bears near the walrus haul-out at Cape Blossom. A high number of polar bears were observed around Cape Blossom throughout the entire period during which walruses were forming haul-outs here. This was observed for the first time in the evening of September 10. On this day, as was noted above, the main walrus haul-out withdrew into the water, most likely due to two overflights by an airplane conducting aerial counts of walruses using aerial photography and videotaping under a Soviet-American research program (TINRO was the Soviet participant). At about 10:00 p.m., when two observers approached Cape Blossom, five or six adult bears (including two females with two cubs each from that year's litter) were found to be among the buildings of a field station (a former polar station, two buildings and a storage shed). The bears were below an escarpment about 25 meters from one of the homes, feeding on the carcass of a walrus that they had killed (or that had been crushed during a withdrawal from the haul-out). Due to the fading light, it was not possible to count the bears around the area, but in approaching the station, observers saw a high concentration of bears in a radius of two to three kilometers around the station on the shore of the lagoon.

From September 11 through October 27 (a period when Cape Blossom was under constant observation), counts were made of polar bears in the area around the cape on a daily basis, except for days when the visibility was very poor. The number of animals in a radius of two to three

kilometers around the station was estimated by sectors based on the following divisions (see Illustration 3): Cape Blossom sandbar (the area where the tower was located); the northern sandbar (bordered to the west by Vaigach Lagoon); inner shore of Vaigach Lagoon; and the tundra between the shore of Vaigach Lagoon and the southern shore of the cape on the side of Long Strait (including the shore of the strait up to the entrance to Burunnaya Lagoon). Groups of between 30 to 50 and 90 to 100 adult bears were seen, with the greatest number counted at one time having been 122. During the entire period up to October 25, the number of bears on Cape Blossom did not decrease. Smaller numbers of bears were counted only on days with poor visibility and when snow fell and formed drifts and snow covered many of the bears at the haul-outs. The highest numbers of bears counted together on the following dates were: September 18, 60 adults; September 19, 122; October 2, 88; October 6, 79; October 8, 96; October 9, 84; October 10, 77; October 12 through October 18, between 64 and 92 bears daily; October 21, 102. The last times significant numbers of bears (33 and 29) were observed occurred on October 23 and 24. After October 25, the number of bears on Cape Blossom fell sharply: 11 bears were counted on October 25; 12 on October 26; 13 on October 27. At this time, in the last third of October, fresh ice began to form on the sea. Fresh and pancake ice was first observed on October 22 (a four- to five-degree storm occurred on October 18). Perennial drift ice appeared on the horizon on October 26.

From the first day that the fresh ice appeared, the bears began to go out onto it, even though they were still falling through it, and they began trying to hunt seals on the ice. The sharp decline in the number of bears on dry land at Cape Blossom was clearly related to the start of the freeze on the ocean and the approach of perennial drift ice to the shores of the island (see Illustration 1).

Among the polar bears concentrated on Cape Blossom, there were individuals of all age and sex groups: mature males, females with 1.5-year-old cubs, pregnant females, and young (2.5- to 3.5-year-old) males and females that were alone or, rarely, in pairs. On the day when the highest number (122) was recorded, the share of females with cubs or yearlings was 10.6 percent, including 6.6 percent that were females with one cub and 4.0 percent, females with two cubs.

The greatest concentration of bears was observed at the tip of the sandbar in the area around the tower, where there was a “walrus graveyard” — a multi-year accumulation of old carcasses (bones and skins) of animals that had died from various causes and in various years. Throughout September, between 25 and 54 bears usually gathered here in an area of five to six hectares [12.35 to 14.82 acres], with their average density being from 4.2 to nine bears per hectare [1.7 to 3.6 bears per acre]. However, as a result of being spooked by humans when the observers went to the tower, most of the bears ran to the end of the sandbar, where 50 to 60 of the animals collected in an area of two to three hectares [4.94 to 7.91 acres], with the density reaching a substantially higher level: 20 to 30 bears per hectare [8.1 to 12.1 bears per acre].

On the sandbar, the bears made themselves at home in the pebbles, where they slept for hours, rarely getting up, or they visited other bears or chewed on the remains of walrus skins. Another area of concentration of the bears (but significantly lower in density) was the south shore near the station on the side of Burunnaya Lagoon, where from four to eight and up to 14 bears might be found over a space of one to two kilometers. Here the bears primarily rested or ate young walruses that they had killed.

In October, when the beach on the cape had largely frozen and the "walrus graveyard" became covered with snow, the bears did not come together in such high concentrations at the tip of the sandbar but were spread out more broadly. The greatest numbers continued to gather at the tip of the sandbar (from several bears to between 24 and 34), along the shore of the lagoon (as many as 23 to 25) and on the northern sandbar (as many as 17 to 34).

During the entire period when the walruses hauled out on the shore, observers regularly saw successful and unsuccessful attempts by the polar bears to hunt the walruses at the haul-outs and in the breeding grounds. Qualitative and quantitative information on the hunting and social behavior of the polar bears is being prepared, and therefore in this report we will cite only the most general, preliminary conclusions based on the results of these observations:

1. The only successful hunts were those for walruses of nursing age: newborns, one- and two-year-olds.

2. Only a few of the bears gathered in the area of Cape Blossom were successful in their hunts for walruses: mature males and large mature females. The rest of the bears fed on the leftovers of these hunters or the remains of the walruses in the "graveyard." Not even mature male bears were able to kill an adult walrus, although attempts to do so were observed.

3. There is a certain element of risk for the polar bears in hunting walruses. Female walruses vigorously defend their young, trying to strike the bears with their tusks. At least four bears were observed with wounds received from blows by walrus tusks.

4. When feeding on walruses, certain bears dominated the others, but at the same time groups of four, eight or 15 bears would feed side-by-side on the carcass of a single young walrus, with the groups including various categories of bears: females, females with newborns, young bears and mature males.

During the entire time of the observations, there were four confirmed deaths of bears on Cape Blossom for reasons that were not established but presumably from starvation (or, in any case, at least with signs of starvation). The carcasses of two of them (apparently a newborn and a 1.5-year-old) were eaten by other bears, while the body of an adult female found on September 15 on the shore of the lagoon remained untouched as of September 26 (after that date, the carcass was not checked). Several of the living bears under observation also were clearly emaciated.

Unusual gathering of snowy owls on Cape Blossom. Snowy owls were seen at Cape Blossom from the very first day of observations. On the first days, no more than 10 owls were observed in the vicinity of the station. A large number of the owls arrived at Cape Blossom on September 15 (see Menyushina and Ovsyanikov in this book). From this day through September 27, within a radius of two kilometers around the station the number of owls counted in the field of vision, based on a one-time count, was 90 (September 17). After September 27, the number of owls sharply fell. Apparently at this time they flew across the strait, despite the absence of ice. In this report we would highlight the connection between snowy owls and walrus haul-outs and polar bear activity. In anticipation of their flight across the strait, the owls fed solely on the bears' leftovers. Owls were

observed feeding on the remains of walruses that had been killed and fed upon by bears as early as September 11 (at least three different birds). On subsequent days, this reoccurred regularly after every successful walrus hunt by the bears, when fresh remains appeared on the beach. The owls sat a certain distance from the carcasses (from several dozens of meters to 300 or 400 meters away) and flew up to the carcasses only when no bears were nearby. Besides owls, a large number of glaucous gulls also gathered near the carcasses, but the owls always were dominant.

It is interesting to note that during the entire time of the observations in the area of Cape Blossom, not a single polar fox appeared, even though fox tracks and the foxes themselves were seen just eight kilometers to the north in the area around the Neozhidannaya River estuary when an observer investigated in mid-September. The tundra in the area of Cape Blossom has almost no lemming colonies, but they can be found along Neozhidannaya River.

DISCUSSION

The environmental situation on Wrangel Island in the autumn of 1990 was unusual even compared with the other seasons when the drift ice receded so far from the island and the walruses were forced to haul-out on the shoreline. Never before had such a large number of polar bears been seen on the island as were observed in the area of Cape Blossom.

The particular nature of the ecology and behavior of each species in this situation deserves special discussion. Here we will offer only the most general conclusions.

First, this situation is unfavorable for both polar bears and walruses, and the large numbers of emaciated individuals of both species that were observed confirm this conclusion. For walruses, more favorable ice conditions would likely be when there were numerous and broad fields of low-density perennial ice. In such cases, the walruses form numerous small haul-outs on the ice, dispersing over a broad area. We can assume that given this type of more dispersed distribution, the impact on the feeding areas is lower and they are used more evenly than when thousands of walruses concentrate in a relatively smaller area of water when they form onshore haul-outs.

The presence of large concentrations of perennial ice in the waters around the island is beneficial for the polar bears since they can hunt seals, their main prey, only from the ice. In this case, bears of all sex and age classes can feed normally. When they are forced to gather on the shore, the bears have no other choice but to hunt walruses at the haul-outs in order to eat. But in these cases, only certain individuals eat normally, while the remaining animals have access only to leftovers. In this situation, many bears start the winter too emaciated. We assume that if such an ice situation were to repeat frequently, as is probable due to a warming of the Arctic climate, the polar bears, as a species, would be in a difficult situation.

Second, although the walrus haul-outs form in several locations on the island's coast, the environmental situations in these locations vary. For example, in Somnitelnaya Bay, the bears began to gather near the haul-out much later than at Cape Blossom. At the same time, the formation of the haul-outs resulted in activity among, and produced food for, snowy owls and glaucous gulls, which became commensals of the polar bears.

The formation of the haul-outs is associated with strictly defined sections of the coast characterized by a particular combination of environmental factors. In normal years these sections, to all appearances, do not play a significant role in the lives of the animals and the large birds on Wrangel Island (with the exception of Cape Blossom, which apparently is a key area on the migration routes of birds and for polar foxes and polar bears). In a situation such as is addressed in this report, they take on particular significance. We can say that in a season such as occurred in 1990, given a significant and unusual change in conditions, there was a shift in environmental importance from certain areas to others.

Finally, the formation of numerous coastal walrus haul-outs observed in the autumn of 1990 on Wrangel Island should be viewed not only as a distinct, interesting biological event but also in terms of the prospects for the survival of, and need to protect, this species in the near future.

Current state of the Pacific walrus and necessary measures for protecting and studying the walrus. Currently there are apparently two populations of Pacific walrus. One group, limited to the waters of the Gulf of Anadyr, numbers more than 60,000 (Mymrin et al, 1990). The second, a larger group (numbering about 200,000 animals) is distributed from the southeastern section of the Bering Sea (in winter) to the eastern section of the Eastern Siberian Sea (in summer).

The Anadyr population does not make long migrations and remains in the same waters during the summer-autumn feeding period as in the winter, given the absence of ice blocking the permanent haul-outs on the sandbars of Russkaya Koshka, Arakamchechen Island and northern Kamchatka (Mymrin et al, 1990).

Walruses of the Chukotka-Alaska population spend much of the winter in the southeastern waters of the Bering Sea, from St. Lawrence Island to Nunivak Island in Bristol Bay. Here, mating and birthing takes place from January through March, after which the population divides into two groups. One group, consisting of males, remains for the summer and autumn in the ice-free waters of the Bering Strait and the southern part of the Chukchii Sea, spreading out on the coastal haul-outs. The second group — consisting of females, their children of different ages, young animals and a small number of sexually mature males — migrates with the ice to the northern section of the Chukchii Sea (Fedoseyev, 1984). As much as 40 percent of the migrating animals go east of the Soviet-American border in the Chukchii Sea and spread out with the ice to the Beaufort Sea (Fedoseyev, 1984). A larger number of them migrate to the western waters of the Chukchii Sea, reaching Wrangel and Gerald islands by the end of July. The walruses remain here during the entire feeding period until mid-October, when they start to migrate to their wintering locations.

Usually the walruses in the area of Wrangel Island stay on drift ice, setting up their haul-outs on the ice. However, in years when less ice forms (every three or four years over the past 20 years), the walruses also use coastal haul-outs on sandbars at Somnitelnaya, Davydov, Blossom and Korvin. Apparently, nearly the entire western Chukotka group of migrating walruses concentrates at the temporary coastal haul-outs on Wrangel Island.

The principal members of this group are females with pups, while adult males are relatively few in numbers (5.19 percent of the total number of animals). The remaining sexually mature males remain

in the ice-free waters of the Bering Strait and are dispersed among Chukotka's coastal haul-outs. The proportion of females with pups under three years old in the western Chukotka group is 30.15 percent of the total number of adult females. Thus, the Wrangel Island area is one of the primary feeding areas for the reproductive members of the Chukotka-Alaskan population of Pacific walruses and is therefore particularly important for the conservation of the walruses.

By the beginning of the 1980s, Pacific walruses numbered 270,000 to 280,000, reaching their optimal population size (Fedoseyev, 1984; Kibalchich, 1988).

In 1978, as an "experiment," government harvesting of walruses was revived, and by 1985 the quota allocated to the Sakhalin Fishing Company (Sakhalinrybprom) rose from 1,000 to 1,500 walruses. While males make up the bulk of coastal harvesting, with the exception of the harvesting done around the coast of the Gulf of Anadyr (where females comprise between 60 percent and 80 percent of the population [Grachev, 1988]), harvesting from boats regularly results in takes that are at least 35 percent female, that is, the impact of the harvesting falls on the mothers in the herd. Already by 1987 and 1988 a decline was observed in the take of walruses from coastal harvesting in the Gulf of Anadyr. Currently the trend is toward a decline in this population of Pacific walruses (Grachev, 1988). The impact of the government's ship-based harvesting is clear.

A further increase in the size of the take by boats, and moving the government industry toward operating under market economics on a commercial basis, could have an unfavorable impact on the Pacific walrus population. The commercialization of coastal harvests is also impermissible. Onshore harvests should remain in their traditional form and should go no further than satisfying the needs of the Native peoples of Chukotka. The allocation of limits on walrus harvesting should be done very carefully, with consideration of the large numbers of nonproductive losses (at least 40 percent, according to data from Arsenyev, 1976). Our observations indicate that during hunts for "floating" walruses, the percentage of drowned and injured animals can be 100 percent to 150 percent.

Until recently walruses around Wrangel Island during the feeding period were practically inaccessible for hunting vessels due to the ice conditions, which did not allow for harvesting in these waters. However, ship-based harvesting was occasionally conducted rather close to the coast of the preserve. The forecast for the coming years is for the climate to warm and the ice to break up, which could lead to the expansion of harvesting in this region. Clear signs of the impact of this process on the animals of Wrangel Island have already been observed in the past two years. They will start to harvest the reproductive segment of the Pacific walrus herd feeding near the shores of Wrangel and Gerald islands. The 1990 season, when the pack ice had retreated to between 200 and 500 kilometers north of the islands, showed that the current equipment levels at the preserve permit the security service neither to quickly react to violations of the preserve regulations in the coastal waters nor to counter such violations effectively. For example, in the course of just one-and-a-half weeks in September, passing ships violated four provisions of the Rules for Protecting and Harvesting Sea Mammals: ships in the area of the coastal haul-outs on Kosa Somnitelnaya sandbar and Cape Blossom coming closer than the established 12 miles (the ships passed within three or four kilometers of the shore); the unsanctioned visit to the haul-out at Kosa Somnitelnaya by a sloop, causing the walruses to retreat into the water in a panic; the illegal collection of tusks from dead animals; and the cleaning of bilge and dumping of garbage and emissions into the protected preserve zone near the Blossom

haul-out. Security staff members from the preserve were unable to stop the violators due to a lack of marine transportation and outboard motors.

The Pacific walrus population's reproduction rate is very low since a sexually mature female produces, on average, one pup every three years. In the 1960s, the survival of the Pacific walrus was under threat, and the entire subspecies numbered just 50,000. Currently its numbers have reached an optimal level, but any careless impact on the environment or change in the commercial harvesting policy could alter the situation for the worse. A decline in the general environmental situation in the Arctic and an increase in the negative impact of human activities on the Pacific walrus necessitate increased attention for this species in terms of protecting and studying it. The following measures could be considered as first steps:

1. It is necessary to expand the protected zone of the preserve to between 40 and 60 kilometers around Wrangel and Gerald islands. A portion of the coastal waters should be declared completely protected. Boats that must cross through the protected zone should stay strictly to established routes and waterways. All harvesting or other activities should be banned within the protected zone of the preserve, with the exception of traditional onshore harvesting to satisfy the needs of the Native population of the island. Such harvesting is conducted annually and is monitored by preserve staff, and the requirements of the island's residents do not exceed two or three walruses per year, which does not damage the population's reproductive capacity.

2. To perform the necessary work to protect and study the marine animals in the waters around Wrangel and Gerald islands, it is necessary to significantly improve the equipment levels at the preserve, providing a modern boat and outboard motor suitable for use in the polar sea. This is a serious problem, and resolving it would allow for an increase in the effectiveness of the protection of the walruses at the coastal haul-outs and on the ice haul-outs, as well as help provide answers to many questions regarding the biology and ecology of the walrus that have been little studied to date. It is urgently necessary to also provide the preserve with small aircraft: a light helicopter and a seaplane.

3. The sandbars at Somnitelnaya, Davydov, Bruch and Cape Korvin on Wrangel Island, as well as the entire coastline of Gerald Island, should be noted (with indication of their exact coordinates) in point 11.14 of the Rules for Protecting and Harvesting Sea Mammals, with all the resultant limitations on sea and air transport. Coastal haul-out locations must be indicated in the navigational directions for the Chukchii and Eastern Siberian seas and marked in navigational charts on boats, planes and helicopters. Currently the Rules for Protecting and Harvesting Sea Mammals mention only the haul-out on the Cape Blossom sandbar.

4. It is necessary to study and protect the food supply of the walruses in their summer and autumn feeding areas, in particular around Wrangel Island. Effective methods must be developed for tagging walruses for a detailed study of their migration, movements and inter-population ties. In connection with the tagging issue, it would be preferable to prepare a joint Soviet-American program to study the ecology of the Pacific walrus with the help of telemetry.

5. The government's ship-based harvesting must be put under the strict control of environmental protection agencies, limited through the delineation of harvesting areas and the allocation of limits for different areas, or perhaps halted altogether until the little-studied aspects of walrus biology can be explored. The current use of the raw materials received from the walrus harvest has not been given due consideration and is ineffective. It is possible that the harvesting of Pacific walruses should be entirely limited to traditional resource usage, which would meet the needs of the Native peoples of Chukotka and Kamchatka.

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