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Unusual Pacific Walrus Mortality at Wrangel Island in 2007.

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The walrus (*Odobenus rosmarus divergens*) life cycle is strongly linked with drifting sea ice within a marine shelf zone (Nikulin, 1940; Arseniev, 1976; Fay, 1982; Pavlov, Bichkov, 2001). Seasonal disappearance of ice from the main walrus habitats (marine shelf) may critically impact walrus populations. Since 1990 observations on walrus at Wrangel Island have been carried out annually (Kochnev, 1991, 1999; Ovsyanikov, Kochnev, 1991; Ovsyanikov et al, 1994; Ovsyanikov, 2006). Large coastal walrus rookeries are formed on the island only during seasons of ice disappearance in the surrounding sea. In 2007 walrus staying near Wrangel Island and the formation of rookeries was accompanied by the appearance of significant number of exhausted, weak animals that were gradually dying during the autumn season (August-October). This resulted in generally high walrus mortality at the island. Such situations were never observed during previous years. This article describes this event and discusses its probable causes.

Observations on walrus and other marine mammals on Wrangel Island during the summer-autumn season of 2007 were carried out from July 3 to August 23 periodically by route surveys done by I.E. Menyushina, and from August 24 to October 30 systematically (daily) combining stationary and route observations done by N.G. Ovsyanikov, A.V. Bezrukov and I.E. Menyushina. Route surveys (total length - 2420 km) covered almost the entire southern and western coasts of the island. Stationary observations were carried out at Cape Blossom, Somnitelnaya Spit and Somnitelnaya base camp, for a total of 80 days. Additional information was collected by A.G. Dondua and I.P. Oleinikov.

Two waves of walrus hauling out at coastal rookeries of the island were recorded during the season. The first mass appearance of walrus in coastal waters was recorded during the period from mid July through the first week of August. The maximum number of walrus observed at one place simultaneously during this period was up to 500. Before the disappearance of drifting ice near the island, walrus were forming rookeries on ice floes. Hauling out on Somnitelnaya Spit was recorded

on August 6 (from a distance of 7 km). During investigations on the spit on August 8-9, a herd of approximately 200 walrus was found in the water near the shore; on the beach were found signs of a rookery and remains of 4 adult walrus (all females) and 1 calf-of-the-year, all scavenged by polar bears. The main mass arrival of walrus to the island and the formation of large coastal rookeries at traditional haul out sites on Somnitelnaya Spit and Cape Blossom were recorded at the end of August. The maximum estimated number of walrus in this herd was 15000. On Somnitelnaya Spit up to 10000-11000 walrus were recorded at the rookery at any one time. This main herd remained at the island for about 10 days, then the majority of walrus left. After the disappearance of the main herd, approximately 1000-2000 walrus remained at the island, many of which were obviously weak, kept to small groups spread along the southern and western coasts of the island, and were gradually dying.

A total of 98 dead walrus were recorded; carcasses were cast on the beach by the surf or dragged out of the water by polar bears, and all were scavenged by bears. Of this number, 92 walrus (94%) were found on the southern coast and only 6 (6%) on the western. Of all the dead walrus, adults older than 4 years comprised 46%, young from 2 to 4 years - 10.2%, and calves-of-the-year - 43.9%.

These results do not reflect full mortality, as surveys at the western coast were done only one time on September 1-2. Data for the southern coast, where activity and walrus deaths were monitored during the entire September-October period (most thoroughly at Somnitelnaya Spit and along the whole coast of Krasin Bay) showed that 66% of all walrus deaths at this segment occurred in September-October. Moreover, even on the southern coast some areas (all of the shoreline east of Somnitelnaya Spit) were surveyed only once at the end of August-early September. Thus, walrus carcasses that may have appeared there in September-October would not have been counted. Taking into account that significant number of weak walrus (in September in Krasin Bay we registered hundreds, in October - tens) were observed at the southern coast during September and October, while the northern, eastern and southeastern coasts were not surveyed at all, the real number of walrus that died at Wrangel Island most likely reached a few hundred. The last dying walrus in Krasin Bay were recorded at the end of observations - October 30.

Behavior of dying walrus and their encounters with polar bears were recorded with still photo and video cameras. The extreme weakness of the walrus was evident -- they were unusually slow while hauling out, stayed in the surf or hauled out to just the upper edge of the surf, remained motionless for hours while lying on the beach, pressed their bodies against one another, and hardly reacted to

each other or even to bears in the vicinity (until bears approached within a few meters or came in contact). Some walrus were rolled by weak waves in the surf, appearing as dead although remaining alive for several days. We did not observe typical polar bear attacks on walrus, as occur with healthy animals (Ovsyanikov, 1995). When walrus were incapable of defending themselves, the polar bears simply approached the dying walrus on shore or dragged them out of the water and killed them. If the walrus could confront an approaching bear, the bear would back off and wait because there were many opportunities throughout the season. If walrus escaped from an approaching bear into the water, they did so slowly and hauled back out as soon as possible. Some dying walrus calves were without mothers. We observed 11 cases when bears dragged away a calf that was alone and not protected by any adult walrus. In one walrus family group we observed in Krasin Bay, the female was in much poorer condition than her calf, which was more active hauling out on the beach. We recorded 3 dying adult walrus with rear flippers seriously wounded by bear bites. Many weak walrus had less serious bloody wounds on their bodies. All the weak walrus were thin, their skin hung on their bodies, and in most the ribs and backbones were visible under the skin. Necropsy of 5 calf carcasses revealed that their subcutaneous fat layer did not exceed 3-4 cm. In 3 calves-of-the-year necropsied after being dragged to the beach by bears, extensive internal hematomas were found. Observations on walrus behavior at sea revealed that they were not feeding near the island.

Thus, in 2007 in the coastal waters of Wrangel Island, increased pacific walrus mortality was recorded. We hypothesize that the probable cause may be the combined impact of two major factors:

1 - Retreat of the pack ice northward far beyond the extent of the continental shelf zone. As a result, walrus that were staying on the ice were carried to a deep zone of the ocean where they could not feed and from where they had to swim long distances back to the coast without feeding. This hypothesis may explain why so many weak walrus arrived at Wrangel Island with the second (main) herd.

2 - Walrus that returned to the island, being already exhausted, could not find enough food nearby to recover. As noted, we did not observe them feeding near the island. It may also be due to unknown changes in sea bottom ecosystems caused by changes in the temperature regime or other conditions of ecosystem functioning. The complete absence of grey whales (which are bottom feeders) near Wrangel Island during this season supports such an assumption. Research on the sea bottom ecosystem in the Wrangel Island region is needed to investigate this hypothesis.

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