SEA OF OKHOTSK BELUGA WHALES:
SEASONAL MOVEMENTS AND HABITAT USE

By
Olga Shpak and Dimitri Glazov

The current abundance of white whales occupying Russian seas is unknown. In the past twenty to thirty years, beluga research has become occasional and of a limited geographical and methodological scale in Russia, due to the termination of whaling and the collapse of the Soviet Union. A lot of places in the Russian Arctic and the Far East are extremely difficult – if not impossible – to access due to logistics; aerial abundance surveys are expensive and also cannot cover the entire beluga range. However, a combination of satellite telemetry, aerial surveys and radar imagery can be very helpful in understanding the seasonal migrations of beluga and their adaptation to climate change, as Dr. Olga Shpak and Dimitri Glazov, of the A.N. Severtsov Institute of Ecology and Evolution of Russian Academy of Sciences (IPEE RAS), explain.

The beluga, or white whale, is a small, toothed whale. This gregarious marine mammal can form groups of thousands of individuals and has a circumpolar distribution occupying the Arctic and subarctic Seas, and is also found as far south as the Gulf of St Lawrence in Canada. In the Sea of Okhotsk (Russia), the southernmost population of belugas in Asia is found. Beluga whales have a very diverse diet: their main food is fish of different species, but they also feed on a wide range of invertebrates. In summer, belugas occupy shallow estuarine waters and in winter their life is tightly connected to ice. As other Arctic marine mammals, belugas are sensitive to changes in high-latitude marine ecosystems, especially ones resulting from man-caused pollution and physical environment destruction, and climate change. Attractive, playful and easy to train, this whale species is often featured in aquarium shows.

STUDYING BELUGAS FROM SAKHALIN-AMUR

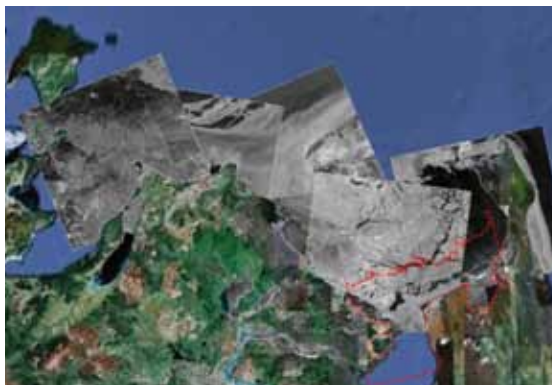Since 2005, A.N. Severtsov Institute of Ecology and Evolution of Russian Academy of Sciences (IPEE RAS) and Utrish Dolphinarium, Ltd. have been conducting a collaborative research on the beluga whale abundance, distribution, and population structure in the Russian waters. Part of this research is the study of seasonal migrations of belugas from Sakhalin-Amur region in the Sea of Okhotsk with the use of satellite telemetry, aerial surveys and radar imagery.

It is known that Okhotsk Sea belugas form three major summer stocks; but where the boundaries between them lie and whether their habitats overlap was not known. Very little information existed on wintering grounds of the Okhotsk Sea beluga population and none – on the winter migration behavior and routes of the separate stocks.

A VAST TAGGING PROGRAM

In 2007-2010, 22 adults and subadults were tagged with ARGOS satellite transmitters in Sakhalinsky Bay, 9 males and 13 females (1 SPOT3, 2 SPOT 5, and 10 SPLASH tags by Wildlife Computers, Inc., USA, and 9 Pulsar tags by closed joint-stock company ES-PAS, Russia). In 2010, 2 males and 1 female from the third – Northern, or Shelikhov – stock, were also tagged with Pulsar transmitters on the Western Coast of Kamchatka Peninsula.

The results obtained from the analysis of the treks of tagged belugas showed that movement pattern varied with season. On their summer grounds, in warmer shallow bays and river estuaries, belugas were highly residential and performed only small-scale daily

A photo of a group of Sakhalin-Amur belugas taken from a motorized paraglider during age-structure and Photo ID study. Photo courtesy of Olga Shpak.

Five of the ten RADARSAT images taken in December 2010 showing the sea-ice cover in the Sea of Okhotsk.
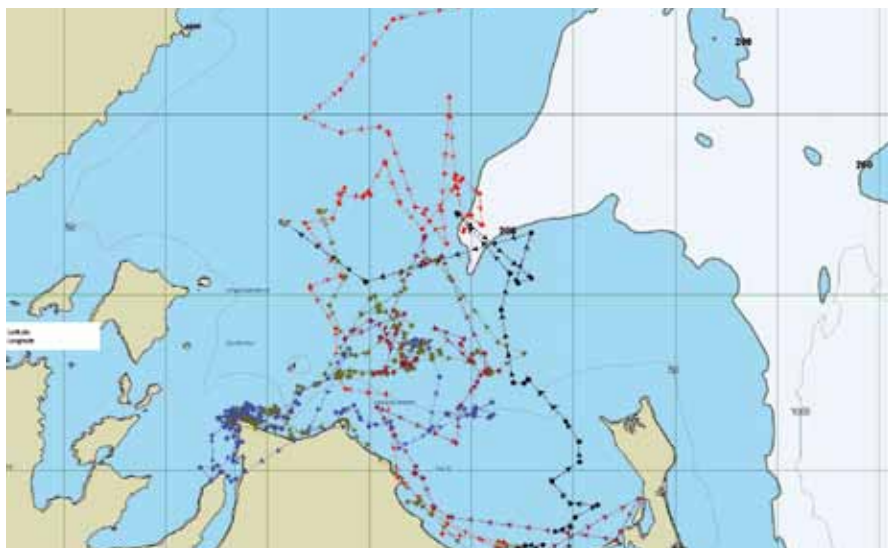
A map of the trajectories of five beluga whales in Sea of Okhotsk in December 2010.

movements likely associated with feeding and tidal cycle. In winter, all tracked animals migrated offshore and fed in deeper water. The data obtained from beluga tracking in autumn months showed that two of the summer stocks (Shantar and Sakhalin-Amur) share some habitat and thus are not isolated from each other throughout the year. Autumn (pre-migration) habitat overlap suggests that both stocks may follow the same winter migration paths and share winter grounds. The wintering grounds of Sakhalin-Amur belugas lie in the northern Okhotsk Sea far from their summering areas; their winter behavior is very "nomad" and is closely related to ice-edge distribution. Shelikhov stock belugas were only tracked trough the autumn months, and their winter movements wait to be defined in the following years of the project.

UNDERSTANDING THE IMPACT OF ICE ON WHALES' TRAJECTORIES

To broaden the knowledge of physical factors influencing the beluga movements, a project funded by the French Space Agency, CNES, was established,

and a set of 10 high resolution radar images taken in December 2010 was processed and analyzed in relation to whales' trajectories. The purpose was to follow the ice movement, define sea ice edge and qualify the ice features in order to assess the belugas' behavior in this specific environment.

Furthermore, the White Whale Program has obtained an environmental database (Themis) including satellite sea surface temperature, sea surface currents and satellite chlorophyll concentration from 2007 to 2010 from CLS. Superposition of beluga tracks with these data and the radar images combined all together provides a comprehensive view of the beluga whale habitat use throughout different seasons. The ongoing analysis must help in understanding the factors determining beluga whale seasonal movements and distribution. This knowledge is extremely important for prediction of beluga movements in the areas where tracking is impossible and for prognosis of its adaptive distribution shifts in changing climate conditions.

Sea surface currents (vectors) are superimposed on a sea surface temperature map via the environmental database Themis. Beluga whale positions are superimposed over the corresponding processed radar image. Belugas are still close to the coast (early December). The radar image clearly shows ice forming along the coastline.

Olga Shpak

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Dr. Olga Shpak obtained her PhD in biology in 2008 from Moscow State University, focusing on behavioral signs of sleep in cetaceans. At Utrish Dolphinarium scientific department, she also performed abundance, distribution and population structure studies on Black Sea dolphins. Since 2007, Olga has been leading a project on the status and sustainability of the Sakhalin-Amur beluga stock in the Sea of Okhotsk, which includes satellite tracking, aerial surveys as well as health assessment and genetic studies of beluga whales. She joined the IPEE RAS in 2009 to participate in the White Whale Program. She lives and works in Moscow and has published numerous publications in peer-reviewed journals and participated in many conferences.
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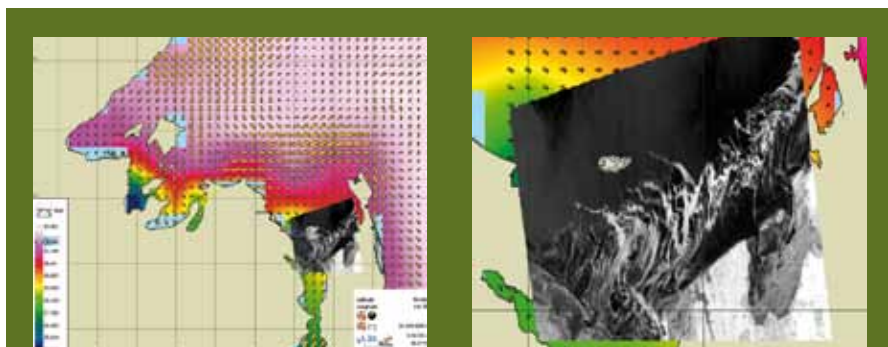

Dmitri Glazov

Principal engineer, co-director of the White Whale Program, IPEE RAS

Dimitri Glazov studied Biology at Moscow State University, where he obtained his Master's degree in 1996. After working as a researcher for the Russian Federal Research Institute of Fishery and Oceanography (VNIRO), he joined the Russian Academy of Sciences, where he has investigated the distribution, behavior, day activity, and impact of pollution in dolphin populations in the Black Sea.
Dmitri also participated in abundance and distribution studies of ice seals. As co-director of the White Whale Program, his current work primarily focuses on beluga abundance, distribution, and migrations in Russian Arctic. He lives and works in Moscow and has published numerous publications in peer-reviewed journals and participated in many conferences.