Satellite Tracking and the Importance of International Collaboration

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For nearly 20 years we have collaborated on tracking bird migration with Russian, Mongolian, Chinese, Korean, Indian and American scientists. Satellite tracking is especially well suited to Asian-based research because of the extremely large land area, sensitive political situations, and the many urgent conservation problems in the region. We have satellite tracked the migration of about 20 species of cranes, storks, swans, geese, ducks and hawks. We are interested in migration routes, migration patterns through time, and habitat use of threatened birds in East Asia.

Our research results have led to conservation outcomes in many East Asian countries, including the establishment of national nature reserves (about 3,000 ha in Mundok and 2,000 ha in Kumya) for migrating cranes in North Korea and of a 5,200 ha nature park for breeding cranes and storks in Muraviovka, southeastern Russia. Based on the results of the crane satellite tracking data, aerial surveys and satellite images, we recommended massive changes to the existing development plans in Three Rivers Plain in northeastern China, and some of the recommendations have actually been implemented. All these contributions are due to active international collaboration among scientists and conservationists.

Photo by Ken-ichi Tokita

USGS and Japanese scientists are removing pintails captured by a clap net in northern Honshu, Japan.

Recently, we have collaborated with the USGS Alaska Science Center and the U.S. Fish and Wildlife Service (USFWS) to track the migration of Northern Pintails (*Anas acuta*) from their wintering areas in Japan. This research will help us understand whether migratory birds could carry avian influenza viruses such as the highly pathogenic H5N1 virus from Asia to North America. We deployed Microwave Telemetry PTTs to 129 pintails in northern Japan in February 2007, 2008 and 2009 and found that many pintails migrated to breeding areas in northeastern Russia that were also used by pintails from North American wintering areas. Some Japanese pintails even migrated to Alaska (Fig. 1). Virus exchange likely occurs between populations where North American and Asian pintails come into contact, a finding supported through genetic studies of low pathogenic influenza viruses from pintails in Alaska. This research will contribute to our understanding of how avian influenza viruses spread and will help identify important migration habitats of Northern Pintails in East Asia.

In spring of 2008 there was an outbreak of the H5N1 virus among Whooper Swans *(Cygnus cygnus)* at three locations in Japan. We had a unique opportunity to monitor Northern Pintails that we had marked with PTTs earlier in the winter and to observe their use and subsequent migration from the H5N1 outbreak sites.

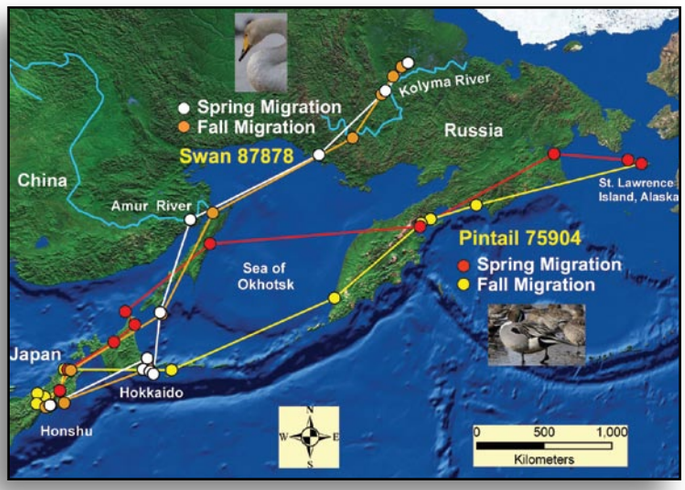

Figure 1. Spring and fall migration routes and stopover sites of a Whooper Swan and Northern Pintail marked with satellite transmitters on wintering areas in Japan.

This is the first study in which birds marked with satellite transmitters were tracked during an occurrence of the H5N1 virus (Yamaguchi et al. 2010. Ibis 152:262-271). This information has been very helpful in understanding the potential for migratory birds to carry a highly pathogenic avian influenza virus to new regions during migration. As a result of those observations we collaborated with USGS and the USFWS to deploy satellite transmitters to 17 Whooper Swans in 2009 in order to better understand the migratory connections between swans and Northern Pintails. Microwave designed a reinforced solar powered PTT that we attached to swans via plastic neck collars. These allowed us to track all 17 swans to their nesting areas in Siberia between the Indigirka and Kolyma rivers, identify migration stopovers used along the way, and to track swans on their return migration to Japan (Fig. 1).

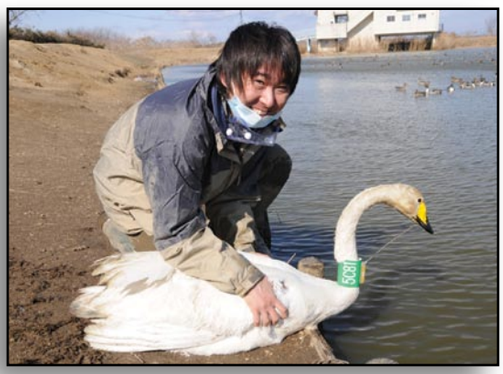

Photo by USGS

Dr. Noriyuki Yamaguchi of the University of Tokyo prepares to release a Whooper Swan in northern Japan following attachment of a neck collar mounted satellite transmitter.

Even though satellite tracking is costly, requiring expensive PTTs and high satellite tariffs, it is however more cost-effective than many other methods of tracking. For example, 229 Red-crowned Cranes were banded in Russia and China between 1981 and 1996, but only 11 have been re-sighted or recovered outside the ringing areas. The time, energy and money expended during this project were considerable. In contrast, only 1 or 2 years were needed to show the whole migration routes of the species through satellite tracking. Moreover, as mentioned above, the great contribution to conservation can be accomplished through satellite tracking work, which is much more cost-effective than expected from the cost itself.

The combination of advanced technology, field work, and international cooperation will help make great progress to promote the conservation and management of biodiversity.