

# InfoNorth

## The Status of Biological Research in the Russian Arctic

By Stephen R. Johnson, Sergei B. Yazvenko, Yuriy Yu. Dgebuadze and Evgeny A. Kriksunov

THE "opening" of Russia and the former Soviet Union (FSU) to foreign scientists earlier this decade brought a surge of international interest and new scientific activity. This was especially true for biological and environmental scientists, most of whom had never visited this part of the world and had read only the few English-language accounts of Soviet scientific activities and environmental problems. Relaxed travel restrictions for both foreign scientists visiting Russia and the FSU and Russian scientists visiting the West provided many new opportunities for collaboration. Numerous scientific and research alliances were forged, and valuable long-term cooperative relationships were established between foreign institutions and scientists and their Russian counterparts.

Unfortunately, the early enthusiasm has waned in recent years, mainly because of political and economic instability in Russia. Internally, the economic and political turmoil caused money to be redirected away from research, education, and science. The result has been a slowdown in environmental and biological research conducted in the Russian Arctic and Subarctic by both foreign and Russian scientists.

For Russian scientists the situation is especially difficult. Nearly a decade of economic inflation and the changing priorities of the central government in Moscow have reduced financial support for science in general and for biological and environmental science in particular. Despite existing alliances and funding from western academic institutions and businesses, the current situation for most Russian scientists is considered worse than during the Soviet era. Salaries average about US\$50 per month, buildings are in disrepair, laboratories are without supplies, and halls are darkened to conserve electricity. In addition, the quagmire of political and bureaucratic obstacles at all levels of government continues to be a major barrier to new scientific initiatives.

Fierce competition between local authorities and the Russian central government for the control of natural resources and for information relating to those resources has become a serious problem throughout Russia. During the Soviet era, virtually all information was centralized in Moscow. Scientists interested in a particular resource issue could obtain all available information from one of several central repositories. Today, much information is

closely held by local authorities and can be obtained only through local contacts. In present-day Russia, as in many other parts of the world, scientific information, especially accurate data about natural resources and the environment, has become a very valuable commodity.

Many Russian ecologists argue that in reality little new environmental information is being collected in Russia, because state interest and financial support for environmental research and monitoring have declined by 90% over the past seven to eight years. This decline is significant because, despite the recent decrease in industrial activity and agriculture in Russia, threats to the environment remain, both in the Arctic and elsewhere. For example, during 1991-94 the annual industrial output of Russia declined by 44%, but air and water pollution decreased by only 22% and 18%, respectively. Numerous environmental accidents have been caused by old technology, old equipment, old pipelines, and declines in training and self-discipline. In many cases, local authorities have begun to exploit natural resources in protected areas and nature reserves. State support of nature reserves and national parks has declined by over 80% during the past eight years. Since Perestroika, the state of the natural environment in Russia has declined. Even though about 40% of Russia is still unexploited wilderness, 14% is considered to be in ecological crisis.

Despite the problems and challenges facing Russia today, the situation is far from hopeless. Russian and Western scientists continue to find support for important biological, ecological, and environmental research in Russia and the FSU. The current broad scope and high quality of basic and applied biological research in the Russian Arctic reflect the importance of this area to the Russian State and the traditional interest of Russian biologists in issues concerning the North. Contemporary biological research in the Russian Arctic reflects current trends in the development of post-Soviet science, and has the following primary focus:

- Integrated, multidisciplinary research into natural biological systems;
- Historical research emphasizing the importance of the past in explaining the present;

- Cooperation between different research groups, laboratories, institutions and countries in addressing common scientific issues.

Basic biological research in the Russian Arctic is coordinated by the Russian Academy of Sciences, mainly through the Russian Fund for Fundamental Research. However, some of the most significant research projects conducted during the past 10 years have been in cooperation with scientists from other countries.

The following is a partial list of research institutions in Russia that have active projects in the Arctic. Their affiliation with the Russian Academy of Sciences (RAN) is noted in parentheses.

- The A.N. Severtsov Institute of Ecology and Evolution, Moscow (RAN)
- Murmansk Marine Biological Institute, Murmansk (RAN)
- The Institute of Biological Issues of the North, Magadan (RAN, Far East Division)
- The Institute of Marine Biology, Vladivostok (RAN, Far East Division)
- The Institute of Biology and Soil Science, Vladivostok (RAN, Far East Division)
- The Institute of the Ecological Issues of the North, Apatity (RAN)
- The Institute of Plant and Animal Ecology, Ekaterinburg (RAN, Ural Division)
- The Institute of Biology, Syktyvkar (RAN, Komi Science Centre)
- The Institute of Biology, Petrozavodsk (RAN, Karelian Science Centre)
- The Institute of Botany, Saint Petersburg (RAN)
- The Institute of Zoology, Saint Petersburg (RAN)
- Yakutian Institute of Biology, Yakutsk (RAN, Siberian Division)
- The Polar Botanical Garden, Murmansk (RAN)
- The Institute of Environmental Protection, Moscow (State Committee on Environmental Protection)
- Moscow State University, Moscow
- Saint Petersburg State University, Saint Petersburg
- Petrozavodsk State University, Petrozavodsk
- Novosibirsk State University, Novosibirsk
- Vladivostok State University, Vladivostok

The work conducted by these institutions falls into two major geographical regions of the Russian Arctic: the Western-Central Region, with the Taimyr Peninsula as the tentative eastern boundary, and the Pacific Region. The scope of research activities includes the following: interactions within and between biological populations in local and regional ecosystems; population dynamics; biogeochemical cycles and energy flow; biodiversity and taxonomy of various groups of organisms; biological productivity; resource management and sustainable development in the Arctic; biology, conservation, and restoration

of populations of rare, threatened, and endangered species; biology of economically important species; and habitat restoration in areas degraded by past human activities.

Among the most important studies are those on the status of the biota and the impacts of human activities on marine ecosystems, particularly in the Barents Sea. Marine and freshwater fish are both critical components of this ecosystem and important food sources for indigenous people living in the area. The present status of this resource is precarious because of commercial overfishing and the poorly understood ocean dynamics that affect carrying capacity. Industrial pollution is an added threat to marine and freshwater organisms in the Arctic seas. Recent oil spills in the Pechora and Ob river basins have attracted considerable international attention and have been intensively studied. Many other applied research projects related to arctic and subarctic marine environments are currently being carried out by Russian institutions. The most notable of these institutions include:

- VNIRO, Moscow (State Committee on Fisheries)
- TINRO-Centre, Vladivostok (State Committee on Fisheries)
- Sakhalin-NIRO, Yuzhno-Sakhalinsk (State Committee on Fisheries)
- TINRO, Chukotka Division, Anadyr (State Committee on Fisheries)
- KamchatNIRO, Petropavlovsk (State Committee on Fisheries)
- PINRO, Murmansk (State Committee on Fisheries)
- SibRybNIIProjekt, Tyumen (State Committee on Fisheries)
- Salekhard Division, SibRybNIIProjekt, Salekhard (State Committee on Fisheries)
- East Siberian NIIProjekt, Yakutsk

The main goals and objectives of biological scientists working in the Russian Arctic today can be summarized as follows:

- The creation and expansion of databases on biodiversity for various taxonomic groups;
- More intensive and systematic research on the biological resource potential of Arctic regions, both terrestrial and aquatic;
- Development of a theoretical basis for assessing the stability and dynamics of Arctic populations and ecosystems;
- Development of scientifically defensible criteria of optimum land-use patterns and sustainable development;
- Development of an ecological typology of the Arctic, ecological maps of the Arctic, and maps of land-use patterns and human impacts;

- Development of experimental ecology in the Arctic and its application to bio-indication, bio-testing and ecological assessments of the status of populations and ecosystems;
- Wider application of remote sensing approaches to the assessment of Arctic ecosystems;
- Development of theory and methodology for predictive ecological assessment, risk analysis, and crisis prediction;
- Development of new types of protected territories and methods for conserving biodiversity in the new socioeconomic conditions of post-Soviet Russia;
- Development and application of land restoration technologies adapted to different regions.

Research and the protection of nature in the Russian Arctic traditionally were carried out in the system of state nature reserves (Zapovedniks) and biological stations. As mentioned earlier, Russian state support of nature reserves and national parks has declined dramatically in recent years. Nevertheless, 11 Nature reserves currently exist in the Russian Arctic. Some of these reserves were recently established with financial support from the German and Dutch governments and international organisms such as the World Wildlife Fund (WWF). Through these and other cooperative ventures over the past six years, protected areas in the Russian Arctic have doubled in size to over 350 000 km<sup>2</sup>.

In spite of the recent economic and political difficulties in Russia, there are many examples of successful international cooperative and collaborative scientific ventures in the Russian Arctic.

- The Willem Barents Biological Station was established in 1995. This project was funded by the Dutch Ministry of Agriculture, Nature Management, and Fisheries to support Russian and international field studies in the Arctic. The station is located within the boundaries of the Great Arctic Reserve on the Taimyr Peninsula.
- The Lena-Nordenskjold International Biological Station, situated in the Lena River delta in eastern Siberia, was also inaugurated in 1995. This project was funded by WWF-Sweden and the Yakutian Government.
- The Integrated Marine Arctic Expedition, conducted by the Russian Research Institute for Cultural and Natural Heritage, has carried out investigations on Novaya Zemlya and on Vaygach and Kolguyev islands since 1986. Research includes the climatology and geology of the coast and continental shelf, arctic soils, terrestrial fauna and flora, and littoral zone



*Ob River in full spring flood, late May 1996. Near Khanty Mansyisk, Northwest Siberia, Russia. Photograph by Stephen R. Johnson.*

ecosystems. This research was supported primarily by the Russian government and by the Dutch Ministry of Agriculture, Nature Management, and Fisheries.

- The Russian-Swedish Tundra Expedition was conducted in 1994. The Russian research vessel Academician Fedorov spent more than 100 days traveling across the Russian Arctic, conducting a wide array of ecological studies in coastal and tundra environments.
- The International Arctic Expeditions to the Taimyr Peninsula during 1989-96 to study arctic birds, mainly the ecology of brent geese, were coordinated by the Russian Academy of Sciences. However, the expeditions were financially supported primarily by Dutch, German, French, and Polish organizations and institutions.
- The joint Russian-German Laptev Sea System-2000 project was conducted mainly in the Lena River delta. The project focused primarily on the seasonal variability of modern fluxes in permafrost; variability in the terrestrial-marine environment of the Siberian Arctic during the past 100 years; terrestrial-marine interactions and their influence on the sediment budget of the Lena Delta; short- and medium-term climatic trends in terrestrial environments in the Siberian Arctic; and long-term climatic trends in the marine environment in the Siberian Arctic.
- Small expeditions to the Russian Arctic to study avian ecology have been organized under the auspices of the Study of the Status and Trends of Migratory Bird Populations in Russia, financially supported through the collaborative efforts of the multinational Migratory Birds of the Western Palearctic program.

Various other Arctic and Subarctic biological research projects and expeditions have been conducted over the past several years. The National Geographic Society sponsored studies of waterfowl in the Vaygach Island area, and various Japanese businesses and research institutions have sponsored expeditions to the Russian Far East. Western petroleum and mining companies have sponsored a wide array of biological research projects in the Arctic and elsewhere in Russia and the FSU. Numerous other public and private institutions have supported projects that focused efforts on individual species and their habitat, such as the Amur Tiger (Alaska Department of Fish and Game, Hornocker Wildlife Research Foundation) and the Siberian Crane (International Crane Foundation, Amoco Eurasia Petroleum Company).

Since the signing of the U.S.-U.S.S.R. Environmental Agreement (Area V. Protection of nature and establishment of reserves) in 1972, which was renegotiated in 1994 as the U.S.-Russian Environmental Agreement, conservation agencies and other organizations in both countries have sponsored several hundred exchanges of specialists in rare and endangered species of fauna and flora, refuges and reserves, migratory birds, marine mammals, and fisheries management. The Environmental Agreement and other joint projects relating to terrestrial/marine ecosystem biodiversity outlined under Area V have contributed significantly to the protection and management of shared or unique resources.

Some notable Area V joint projects and activities carried out in the Arctic include the following:

- Determining the nesting areas, migratory routes, wintering grounds, productivity and adaptations to environmental changes of geese, ducks, swans and other waterbirds, with particular emphasis on areas currently or potentially subject to human disturbance;
- Monitoring the Asian nesting population of Snow Geese on Wrangel Island, Russia;
- Studying the systematics and zoogeography of mammals of the Holarctic, including the problem of gene pool conservation for certain species and the evaluation of genetic variability in certain populations.

Since 1990, the Alaska Science Center of the National Biological Survey, U.S. Department of the Interior and the Laboratory for Space Monitoring and Eco-information Systems of the Russian Academy of Sciences have collaborated on a program to evaluate and exchange contemporary technologies that have applications to biological research in Arctic regions. The goals of the program (Applications of Contemporary Technology in Ecological Studies of Large Mammals) are to develop joint methods to collect, process, and integrate remotely sensed data and to create geographic information system (GIS) database

structures and models for ecological studies of large mammals in arctic environments. Both laboratories have established compatible capabilities for analyzing and exchanging satellite imagery and GIS databases.

Other areas of collaboration between the National Biological Survey and the Russian Academy of Sciences (A.N. Severtsov Institute of Ecology and Evolution) include the following: collecting concurrent optical and imaging radar satellite data for sea-ice habitats and developing databases for investigating large mammal (polar bear, walrus) ecology in arctic environments; incorporating Canadian RADARSAT synthetic aperture radar (SAR) data with the completed ERS-1, JERS-1, and Landsat database for Prudhoe Bay, Alaska; continuing to analyze the capability of SAR to discriminate landscape characteristics; and expanding a multitemporal SAR database to aid in developing techniques for monitoring changes in emergent wetland tundra ecosystems.

Multidisciplinary projects conducted in the Russian Arctic over the past 10 years have shown that humans have traditionally played a far greater role in shaping the natural environment in the Arctic than was previously understood. There is a growing realization that the Arctic is a distinct natural and cultural entity that should be studied and preserved as such, and that traditional knowledge is an invaluable source of information about the Arctic environment and human adaptations. There is a renewed commitment in Russia today to study and preserve these fast-disappearing cultures before they are overcome by modern industrial civilization. One major step in this direction is the proposed creation of protected natural-cultural areas that would preserve traditional ways of life and land-use patterns.

In summary, the levels of cooperation and collaboration between Russian and foreign scientists specializing in Arctic research over the past decade have been impressive. However, as Russia struggles with internal political and economic issues over the coming years, we need to maintain existing avenues of communication and continue to offer international support. The Arctic is an important region that offers a unique opportunity for cooperative and comparative research, in part because it is subdivided among different countries (i.e., study areas) in the eastern and western hemispheres, each supporting some similar and some unique natural biological and cultural systems. The Arctic, and especially the Russian Arctic, deserves our best efforts in understanding and conserving it.

*Stephen R. Johnson and Sergei B. Yazvenko, LGL Limited, Environmental Research Associates, 9768 Second Street, Sidney, British Columbia, Canada V8L 3Y8*

*Yurij Yu. Dgebuadze, Deputy Director, A.N. Severtsov Institute of Ecology and Evolution, Russian Academy of Sciences, Leninsky Prospekt 33, Moscow 117071, Russia*

*Evgeny A. Kriksunov, Professor of Ichthyology, Moscow State University, Vorobiev Hills 119899, Moscow, Russia*