

Kazan (Volga region) Federal University, Kazan, Russia  
Institute of Fundamental Medicine and Biology

*Master's program*

## **Natural Resources and Biodiversity**

### ACTUALITY.

Problems of biological resources conservation and biodiversity in conditions of local and global environmental changes are extremely relevant nowadays. In 1992, the UN adopted a global strategy of biodiversity, where the problem of biodiversity conservation was considered as a necessary condition for preventing the destabilization of the biosphere and the loss of its ability to maintain the required quality of the environment, as well as an important component of sustainable development and the preservation of life on Earth. Also it is important to study the molecular genetic, cellular, tissue, organic, organismal, population, species, coenotic and biosphere levels of biological diversity. All these determines the relevance of the master's program «Bioresources and Biodiversity», which lays within the direction 06.04.01 - Biology.

Main department of the Institute, where the master's program «Natural Resources and Biodiversity» realizes is the Department of Zoology and General Biology.

The first lectures in zoology and comparative anatomy at Kazan Imperial University were read in 1823, by Professor E. I. Eichwald, corresponding member of St. Petersburg Academy of Sciences. The department as a separate unit originates from the cabinet of comparative anatomy of animals, organized by the University in March 1843 by Professor P. I. Vagner. In 1865 the zootomic and zoological cabinets were created; during the reorganization of university in the beginning of the XX century they have been reorganized into the Department of Invertebrate Zoology and Department of Vertebrate Zoology, respectively. In 2012, the departments were renamed as the Department of Invertebrate Zoology and Functional Histology and the Department of Biological Resources and Aquaculture, respectively. Finally, on September 1, 2014 as a result of merger of both departments the Department of Zoology and General Biology was formed.

The history of the two departments is connected with the whole amount of eminent scientists: N. P. Vagner (1829-1907) - an entomologist, corresponding member of St. Petersburg Academy of Sciences; A. O. Kovalevsky (1840-1901) - a prominent zoologist, author of the phylogenetic theory of germ layers, academician of the St. Petersburg Academy of Sciences; M. M. Usov (1845-1902) - the founder of the Kazan school of evolutionary morphology; V. V. Zalensky (1847-1918) - embryologist, academician of the St. Petersburg Academy of Sciences; E. A. Meyer (1859-1928) - a prominent evolutionary morphologist; A. A. Ostroumov (1858-1925) - an outstanding ichthyologist, organizer of systematic studies of fishes in Volga-Kama region; N. V. Shmelev (1889-1949) - the founder of applied (agricultural and forestry) fields in entomology; N. A. Livanov (1876-1974) - the founder of the doctrine of the laws of the animal kingdom evolution; V. L. Vagin (1907-1984) - an outstanding marine zoologist, Arctic explorer, parasitologist; V. A. Popov (1910-1980) - founder of the environment and environmental protection research in Volga region; H. M. Kurbangalieva (1910-2004) - an outstanding

hydrobiologist, founder of multifaceted studies of aquatic ecosystems of lowland water reservoirs; A. B. Halidov (1935-2010) - founder of mycetobiotic entomology, and many other scientists.

#### THE MAIN SCIENTIFIC DIRECTIONS OF THE PROGRAM.

Scientific investigations are developing in different areas of biological resources and biodiversity: hydrobiology, ichthyology, theriology, malacology, entomology, arachnology, herpetology, ornithology, ecology, as well as cell and tissue levels of animal research.

Direct supervision of the second year master students of higher professional education is carried out by professors and associate professors of the Department. Topics of scientific research conducted by the Department staff correspond to the Master's program content and cover a wide range of tasks in the field of zoological bioresources, biodiversity and bioinvasions, morpho-functional and ecological adaptations of animals at the cellular, tissue, organism and population levels.

#### INTELLECTUAL AND SCIENTIFIC RESOURCES.

Institute of Fundamental Medicine and Biology of Kazan Federal University has all the necessary conditions for the Master program «Bioresources and Biodiversity» within the direction 06.04.01 - Biology:

- preparing of bachelors and specialists in biology is carried out;
- preparing of master students in a wide range of programs («Biochemistry and Molecular Biology», «Microbiology and Virology», «Biotechnology», «Bioinformatics», «Bio-ecology and environmental protection» and others);
- preparing of postgraduate students and doctoral candidates, the council for the doctoral and PhD theses is successfully functioning.

For the implement of the stated Master's program «Bioresources and Biodiversity» within the direction 06.04.01 – Biology, the Department of Zoology and General Biology of Institute of Fundamental Medicine and Biology has highly qualified personnel.

For the last five years (2009-2014) the Department staff published more than 500 scientific papers, including 13 monographs, 40 papers in journals from Scopus / Web of Science citation bases, more than 80 papers in in journals from Russian citation bases (RISC / HAC), and more than 200 papers in various other journals, within the thematic of disciplines stated in the master's program.

The staff of the Department of Zoology and General Biology in the last 5-year period have 30 research grants, including 11 – the foreign ones, for the last five years (2009-2014):

- BINARC Grant (Norway-Russia) «Biological invasions in Sub-Arctic marine ecosystems under the climate change: causes, impacts and projections», 2009-2010. Application Number: ES442443 Project Number: 194277;
- JSPS Grant (Japan) «Globalization of Education System of BioScience based on Biodiversity». Joint grant with Woodland Laboratory of Okayama University, 2009-2013;
- PINRO/IMR Research Program (Norwegian-Russian) «Joint Norwegian-Russian environmental status 2013, Barents Sea Ecosystem», 2009-2015;
- Swedish Institute Grant PN 00919/2011 «International training course on soil animals identification», Uppsala, Sweden 21-25.01.2013;

- Special JSPS program «Complex Adaptive Traits», RN 60414900. Joint grant with National Institute of Agrobiological Sciences, Tsukuba, 2013;
- Okayama University Grant «Support of Research Excellence, 2011-2015». Joint grant with Institute of Bioresources, Japan, 2013;
- Monbukagakusho: Mext Grant (Japan) «Japanese Government Scholarship Program for International Student», 2013-2015;
- Grant «Palaeoenvironmental Investigations And Reconstructions In Northern Russia Using Sub-fossil Cladocera (Branchiopoda, Crustacea)», 2011;
- Grant «A Sub-fossil Cladocera-based Regional Assessment Of Environmental And Climate Change In Lakes And Ponds Of Arctic Russia», 2013;
- Grant «Biodiversity-Exploratories» (SPP 1374), Project Number: WO670/7-2. 2013-2014;
- Visby Programme, Project Number: 00919/2011. 2013-2014.

The staff of the Department read general and specific lecture courses. The lecturers from the Department participate in writing and editing of scientific-educational materials. Laboratory practicums, independent and individual educational work of students are provided with sufficient number and quality of scientific-educational materials. The aforementioned materials are published in Kazan University Press. There are electronic versions of educational materials, lecture courses, educational and testing programs at the Department. Students have an opportunity to use it all for independent educational work.

The Department receives only positive feedback and remarks on its graduates. The high professional level of specialists, wide erudition and valuable practical skills are often mentioned in them. The graduates of the Department continue their education in post-graduate course, and successfully defend a PhD thesis within the speciality in scientific organizations of Kazan, Moscow, St. Petersburg, and other, sometimes even in foreign countries (Japan, Germany). There are 7 successfully defended PhD theses for the last 5 years.

#### CONDITIONS OF IMPLEMENTATION OF THE MASTER'S PROGRAMME.

The staff of the Department includes 4 professors, 10 associate professors, 6 assistants. The structure of the department consists of: scientific research laboratory (SRL) of Ultrastructural Organization of Tissues, SIL of Hydrobiology and Molecular Systematics, SIL of Biodiversity of Invertebrates and Bioindication, SIL of Ecology of Aquatic Organisms and Aquaculture, SIL of Biodiversity and Ecology of Vertebrates, SIL of Embryology and Functional Histology, Zoological Museum named after E.A. Eversman, White Sea Biological Station (Karelia). Laboratories are equipped with modern scientific equipment: transmission (translucent) electron microscope JEM-100 CX; raster (scanning) electron microscope Hitachi TM-1000 with system of energy dispersive analysis Qantax 50; research microscopes Hirox KH-7700, Axio Imager A2 etc.; rotary microtomes HM 325; equipment for molecular studies (PCR amplifier MJ Mini, transilluminator Vilber Lourmat - 254 nm), etc. Kazan branch of the Parasitological Society of Russian Academy of Sciences (RAS), Kazan branch of the Entomological Society of RAS, Kazan branch of the Hydrobiological Society of RAS, Kazan Marine Aquarium Society and Aqua design are based at the Department.

The total square of the Department is 607,4 m<sup>2</sup>, including 456,5 m<sup>2</sup> for educational laboratories. There are 2 computer mini-classes, where the students can access the resources of University's inner computer network. Also, there are 16 terminals with Internet access for students. In total, there are 20 units of computer techniques to use. Scientific-educational equipment is also equipped with the modern computers with special programs, allowing students

to provide experimental work and processing of obtained results on high quality level. Students' access to the basic and special literature, to scientific journals is enough, and lies within the requirements of FSES. The staff of the Department develops its own educational materials. At the department there is an access to Internet and to the electronic manuals and special programs for education.

#### SCIENTIFIC COLLABORATION WITH FOREIGN AND RUSSIAN PARTNERS.

The department collaborates with more than 70 Russian scientific organizations - Institutes of RAS (Murmansk Marine Biological Institute, Murmansk; Zoological Institute, St. Petersburg; Institute of Ecology and Evolution, Moscow, and others.); Departmental Research Institute (Polar Research Institute of Marine Fisheries and Oceanography, Murmansk; Atlantic Research Institute of Fisheries and Oceanography, Kaliningrad; Sakhalin Research Institute of Marine Fisheries and Oceanography, Yuzhno-Sakhalinsk; Russian Institute of Helminthology, Moscow; Magadan Research Institute of Marine Fisheries and Oceanography, Magadan; Chukotka Research Institute of Marine Fisheries and Oceanography, Anadyr; Tatar branch of National Research Institute of Lake and River Fisheries, Kazan, and others); Institute of Ecology and subsoil, Tatarstan Academy of Sciences (Kazan); classical universities (Saint Petersburg State University, Moscow State University, Nizhny Novgorod State University, and others); Republican Clinical Hospital of Tatarstan Republic (Pathology Department, cytological laboratory); Federal Service for Supervision of Natural Resource Usage, Federal Service for Veterinary and Phytosanitary Surveillance; Federal Service for Supervision of Consumer Rights Protection and Human Welfare; Federal Agency for Fisheries; Ministry of Ecology and Natural Resources of the Tatarstan Republic; Ministry of Agriculture of the of Tatarstan Republic and the Ministry of Forestry of the Tatarstan Republic; plant protection stations; nature reserves (the Volga-Kama State Nature Biosphere Reserve, National Park "Lower Kama", etc.). Among the foreign partner organizations are Okayama University (Japan), Hiroshima University (Japan), National Institute of Agrobiolology (Tsukuba, Japan), National University of Puebla (Mexico city, Mexico), The Institute of Coastal Research of the University of Klaipeda (Lithuania), The Alfred Wegener Institute of Polar and Marine Research (Potsdam, Germany), University of Münster named Wilhelm II (Germany), Justus Liebig University (Giessen, Germany), Xinjiang University College of Life Sciences and Technology (Urumqi, China), and others.

#### HEAD OF THE MASTER'S PROGRAM «NATURAL RESOURCES AND BIODIVERSITY»:

Professor Anatoly I. Golubev – doctor of biology, academician of International Pedagogic Academy, Honoured Science Worker of Tatarstan Republic, Honoured Professor of Kazan University.