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Editorial



Ecological genetics. What is it? 20 years later

Sergei G. Inge-Vechtomov, Larisa V. Barabanova

Saint Petersburg State University, Saint Petersburg, Russia

ABSTRACT

This article deals with the 20th anniversary of the publication of the first issue of the Journal "Ecological Genetics". The authors list the main prerequisites that determined the creation of the Journal with the aim of combining scientific research conducted in different areas of ecological genetics. The modern vision of ecological genetics within the framework of general biology is emphasized.

Keywords: Journal of Ecological Genetics; content of ecological genetics; genetic education; organism interactions.

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Редакторская заметка

Что такое экологическая генетика? 20 лет спустя

С.Г. Инге-Вечтомов, Л.В. Барабанова

Санкт-Петербургский государственный университет, Санкт-Петербург, Россия

АННОТАЦИЯ

Статья посвящена 20-летию выхода в свет первого номера журнала «Экологическая генетика». Перечислены основные предпосылки, определившие создание журнала с целью объединения научных исследований, ведущихся в разных направлениях экологической генетики. Подчеркнуто современное видение экологической генетики в рамках общей биологии.

Ключевые слова: журнал «Экологическая генетика»; содержание экологической генетики; генетическое образование; межорганизменные взаимодействия.

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The journal *Ecological Genetics* is celebrating anniversary this year. Its creation was determined by several factors, with the most significant being the urgent need, at that time, to document the content of the actively developing field of ecological genetics and to coordinate scientific research in the field. In 1989, we proposed a solution to this challenging problem in the *Soros journal* with the article "Ecological genetics. What is it?" (S.G. Inge-Vechtomo) (Fig. 1). The article mainly focused on the scientific research conducted at the Department of Genetics and Selection (Department of Genetics and Biotechnology since 2012) of St. Petersburg State University in recent years, and the formation of educational programs within a unified plan for training geneticists.

The original content of *Ecological Genetics*, as proposed in the aforementioned article, centered on the methodology and methods of ecology and genetics, aiming to establish ecological genetics as an independent science. This emphasis guided scientific research at the Department of Genetics for many years. An attempt to isolate elementary traits in the system of interorganismal relationships was successfully performed using the ecological-genetic model "yeast–drosophila." This model revealed a key stage in the metabolism of yeast sterols, crucial for the normal life of the consumer species

(drosophila). The regulation of genetic processes in consumers is possible due to simple mutational events affecting the biosynthesis of yeast metabolites essential for drosophila. The expansion of research related to the study of interorganismal interactions continues on the model of microbial–plant interactions. The use of modern molecular genetic methods in this subject has opened prospects for managing the nitrogen fixation process, with significant economic implications in agriculture.

Another aspect of interorganismal relationships is the many years of research on pheromonal topics using a model genetic object, the house mouse. The findings of these studies enabled us to demonstrate the mutagenic effect of biotic factors on genetic processes occurring in both somatic and germ cells of animals. It is now established that many anthropogenic environmental factors have mutagenic and carcinogenic activities. Testing their genetic activity requires creation of specialized test systems. Test systems that can quickly identify primary (pre-mutation) genetic disorders are particularly important. The development and improvement of one of these test systems (alpha test) began at the Department of Genetics and Selection involving another model microbiological object, the yeast *Saccharomyces cerevisiae*. This test has been added to the list of several test systems used in genetic toxicology.

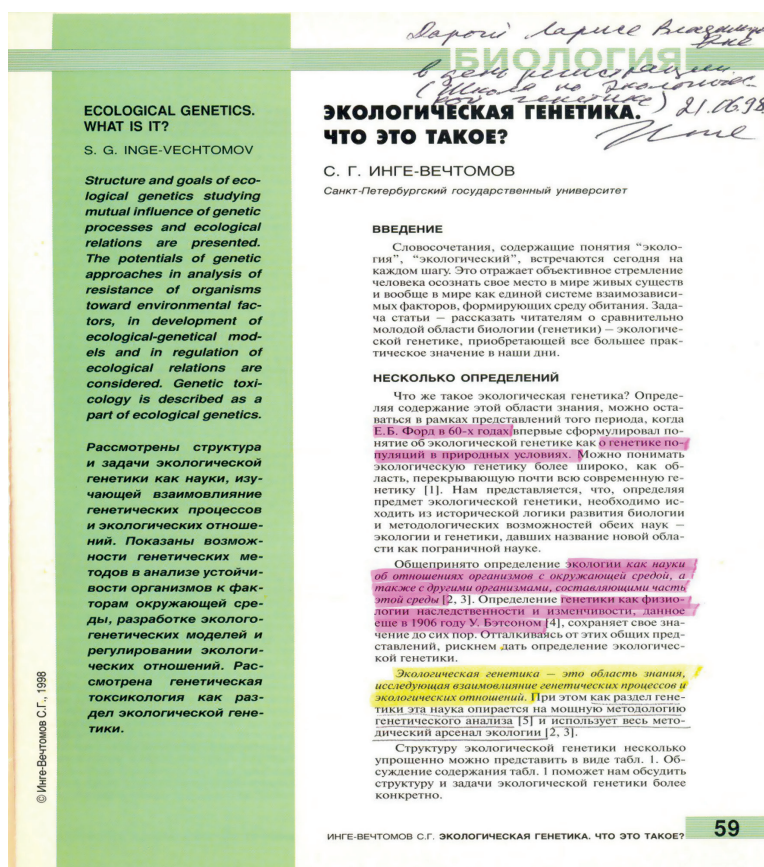


Fig. 1. Title page of the S.G. Inge-Vechtomo article published in *Soros Educational Journal* (1998)

Рис. 1. Титульная страница статьи С.Г. Инге-Вечтомова, опубликованная в *Соросовском образовательном журнале* (1998 г.)

In addition to genetic testing of environmental factors for their mutagenic activity, employees of the Department performed genetic monitoring of various territories and water areas using natural indicator species. This type of research enables the identification of areas of ecological tension in the environment and the formulation of recommendations for reducing genetic hazards.

Based on many years of scientific research by the staff of the Department of Genetics and Selection and global trends in the development of science, under the guidance of Professor M.M. Tikhomirova, a master's program in "Ecological Genetics" was developed. This program included lectures and practical classes in current areas of ecological genetics. These areas encompass, alongside compulsory master's courses, special courses such as "Ecological Genetics," "Genetics of Higher Forms of Interorganismal Relations," "Environmental Factors and Human Heredity," "Genetic Toxicology," "Ecological Mechanisms of Adaptation and Evolution," a special seminar on "Methods for testing the genetic activity of environmental factors," a special seminar "Applied aspects of ecological genetics," a special laboratory on "Methods of molecular genetics," and a special laboratory on "Methods for testing the genetic activity of environmental factors." Leading scientists in the field of population genetics, interorganismal relationships, differential sensitivity to environmental factors, and many others were involved in delivering lectures and conducting practical classes.

During the time when the master's program "Ecological Genetics" at the Department of Genetics and Selection of St. Petersburg State University was offered, students prepared and successfully defended master's theses, which would be completed within the scientific topics of the department and many scientific institutions in St. Petersburg. The topics of master's theses included "Estimation of the frequency of heteroploidy in human spermatozoa with abnormalities of reproductive function of various etiologies" (I.D. Fedorova) and "The influence of the pheromone 2,5-dimethylpyrazine on the stability of the genetic apparatus of dividing somatic and germ cells of males of different lines of house mouse *Mus musculus* L." (T.M. Marysheva), "Analysis of chromosomal aberrations and polymorphism of the *GSTM1* and *GSTT1* genes in individuals exposed to extreme environmental factors" (M.N. Timofeeva), "Study of the relationship between chromosome fragility and the development of cancerous diseases" (O.V. Mikhailovskaya), "Genetic analysis of thermal resistance of flies of the *Drosophila melanogaster* T line" (O.E. Tsaponina), "Evaluation of the genetic activity of epithalon in tests for micronuclei and abnormal sperm cells in mice (*Mus musculus* L.)" (N.V. Pavlova), "Anomalies of the 17th chromosome in female patients with bilateral breast

carcinomas" (M.B. Karpova), and many others. It is gratifying to emphasize that the results of these studies were, at least partially, published in the journal *Ecological Genetics*.

Schools for young scientists in ecological genetics were organized as an effective way of providing supplementary education and advanced training for young scientists. The scientific themes of the schools attracted the attention of many young researchers from various institutions in Russia and enabled, not only familiarization with various areas of research in the field of ecological genetics but also finding common ground of interests between individual scientific teams. The scientific material accumulated over the years of holding schools for young scientists and the need for an accessible introduction to the newly obtained results of ongoing research on ecological genetics created an urgent need to organize a scientific publication in the form of a periodical journal called *Ecological Genetics*.

Twenty years have elapsed since the creation of the journal *Ecological Genetics*, which is largely characterized by the evolution of views on the modern content of the science of the same name. There is still considerable debate about the subject of ecological genetics. In many ways, the reason for such a debate is the rapid development of molecular genetic research methods, which are used to solve traditional problems of ecological genetics and reveal the subtle mechanisms of processes occurring at the level of populations and complex natural ecosystems. This area of research promises to provide new knowledge on traits because of the interaction of various (often taxonomically distant) organisms that make up an ecosystem. This opens up new perspectives in understanding the evolutionary process and in realizing that the phenomenon of macroevolution cannot be reduced to microevolutionary patterns studied by population genetics, which represents intraspecific genetics.

We believe that the 20th anniversary of the journal *Ecological Genetics* is only the first 20 years.

ADDITIONAL INFORMATION

Authors' contributions. Thereby, all authors made a substantial contribution to the conception of the study, acquisition, analysis, interpretation of data for the work, drafting and revising the article, final approval of the version to be published, and agree to be accountable for all aspects of the study. The contributions of each author: S.G. Inge-Vechtomov, L.V. Barabanova — concept and formulation of the main provisions, design of the article, editing; L.V. Barabanova — writing the text.

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AUTHORS' INFO

Sergei G. Inge-Vechtomov, MD, Dr. Sci. (Biology), Professor, Academician of the Russian Academy of Sciences; ORCID: 0000-0002-2832-6825; Scopus Author ID: 23473232500; eLibrary SPIN: 3743-7626; e-mail: ingevechtomov@gmail.com

***Larisa V. Barabanova**, Cand. Sci. (Biology), Assistant Professor; address: 7/9 Universitetskaya emb., Saint Petersburg, 199034, Russia; ORCID: 0000-0001-9790-031X; Scopus Author ID: 6603645339; eLibrary SPIN: 3251-2823; e-mail: l.barabanova@spbu.ru

* Corresponding author / Автор, ответственный за переписку

ОБ АВТОРАХ

Сергей Георгиевич Инге-Вечтомов, д-р биол. наук, профессор, академик РАН; ORCID: 0000-0002-2832-6825; Scopus Author ID: 23473232500; eLibrary SPIN: 3743-7626; e-mail: ingevechtomov@gmail.com

***Лариса Владимировна Барабанова**, канд. биол. наук, доцент; адрес: Россия, 199034, Санкт-Петербург, Университетская наб., д. 7/9; ORCID: 0000-0001-9790-031X; Scopus Author ID: 6603645339; eLibrary SPIN: 3251-2823; e-mail: l.barabanova@spbu.ru