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**КОНЦЕПТУАЛЬНЫЕ
И ПРИКЛАДНЫЕ АСПЕКТЫ
НАУЧНЫХ ИССЛЕДОВАНИЙ
И ОБРАЗОВАНИЯ
В ОБЛАСТИ ЗООЛОГИИ БЕСПОЗВОНОЧНЫХ**

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**EDUCATIONAL AND SCIENTIFIC PERSPECTIVES
OF NATURAL HISTORY MUSEUMS IN GENERATION
OF NATURAL HERITAGE KNOWLEDGE AND
PRESERVATION OF BIOLOGICAL DIVERSITY VOUCHERS**

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Abstract. Natural History Museums continue to play a significant role as centres for educational and scientific activity of society; as new types of research potentially evolve in the future, the importance of such Museums does not diminish but only increases. The educational and scientific perspectives of natural history museums in generating knowledge of natural heritage and preserving biological diversity vouchers, have great importance and will be in increasing demand at the nearest future. All scientists working on natural profiles and environmental change are strongly recommended to pay special attention to Museum collections, visit them and help their progress to any extent possible.

Keywords. Natural history museum, educational, scientific, collection, voucher.

**ПРОСВЕТИТЕЛЬСКИЕ И НАУЧНЫЕ ПЕРСПЕКТИВЫ
ЕСТЕСТВЕННО-ИСТОРИЧЕСКИХ МУЗЕЕВ В ПОЗНАНИИ
ПРИРОДНОГО НАСЛЕДИЯ И СОХРАНЕНИИ ЭТАЛОНОВ
БИОЛОГИЧЕСКОГО РАЗНООБРАЗИЯ**

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Аннотация. Музеи естественно-исторической направленности играют значительную роль в качестве центров образовательной и научной деятельности

и не теряют своего общественного значения в рамках новых видов исследований, имеющих тенденцию активного развития в будущем, определяя при этом появление новых разработок на основе исследования фондовых материалов музеев. Нет сомнений, что образовательные и научные перспективы естественно-исторических музеев будут иметь большое значение в познании природного наследия и сохранении эталонов биологического разнообразия в ближайшем будущем. Сознвая высокую значимость сохраняемых в этих музеях материалов, хотелось бы настоятельно рекомендовать ученым, работающим по биологическим, экологическим, природоохранным и другим направлениям наук о жизни, уделять особое внимание музейным коллекциям, посещать музеи и предлагать посильную помощь и содействие для обеспечения их развития и сохранения.

Ключевые слова: естественно-исторический музей, образовательный, научный, коллекции, эталон.

Natural History museums provide society with a wide range of educational and scientific services and play one of the most important roles in the formation of national cultural standards. All knowledge on the development and function of the biosphere are based on the study of animal, plant and microorganism material, safely deposited in Museums, where they are available for exposition and examination. Nowadays, "the digital world" is characterized by a tendency to develop digital products, and in Museums, an aim to substitute physical specimens by their digital proxies, made available globally via the internet. The time has come to review the future role of Natural History museums in our lives and for the prosperity of society.

Seven essential aspects could be named for each of the two areas of Museum Activity mentioned above:

Education:

1. Open exposition of local or world nature, providing knowledge of specifics of the environment.

2. Seasonal exhibitions and meetings, reflecting phenology in local nature.

3. Popular science lectures regarding environmental problems.

4. Art and design displays and gallery activity.

5. Environmental education for children through the excursions in Museums.

6. Aesthetic and ethical approaches to natural heritage.

7. Face to face acquaintance with biological objects demonstrated in museums.

Scientific:

1. Presentation of the wide range of diversity of biological forms.

2. Natural database of distribution and change of biota over a long-time period of collecting.

3. Long-term scientific study of local regions.

4. Essential deposition of type and voucher species (in UK uses the term “voucher specimens” – these are examples of any taxon from any area; they serve as proof of the taxon’s occurrence and as an actual specimen of that species).

5. Source for molecular-genetic research of different taxa, e.g. from distant, vanished or past populations.

6. Conservation of different samples as a resource for future research in different fields, namely: modeling, engineering, medicine, food security, medical purposes etc.

7. Expeditions to survey defined areas and collect and preserve examples of the flora and fauna.

Giving credit to the importance of the Educational sphere will draw attention to the Scientific one, defining practical activity in different fields. Material preserved in Museums represents large-scale and long-term data, is obtainable at present time, and could have value for future research in the course of developing new techniques. Thus, specimens collected many years ago are available for molecular study, but these are limited now and will be more informative in future when research methods have been improved. Each museum specimen is provided with detail geographic and biotopic labels which provide valuable data for analysis of species distribution and ecosystem conditions. After mounting, each specimen is identified and given a scientific name. Sometimes species identification is done by expert-specialists living far from the museum in different countries. After preparation and identification, the specimen will be provided with necessary labels (geographic, biotopic, identification and an inventory number), at which point they become scientific samples and can be named as voucher specimens. The main purpose of scientific Museums is carefully store such vouchers and make them accessible for study by scientists.

The understanding of a wide range of diversity of biological forms is only possible when vouchers of biota are carefully studied, together and in the context of other vouchers. Such data are available only from museum collections. Usually taxonomic revisions loan material from different museums to study vouchers of all known species. Only museum collections can provide this valuable resource for taxonomic research, to define essential baseline knowledge on biological diversity, and this role will be the main task of Museums in the future. In Europe and elsewhere there are many amateur entomologists with private collections some of which contain Type material as well as masses of specimens collected on private expeditions. Usually when the owner of such collections dies, the collection will be bequeathed to a museum. We hope the dead person’s relatives select a museum that understands the value of “a lot of old dead insects” and are capable of

preserving such collections. Global climate changes have an impact on fauna and flora, precipitating movement of biological species to new regions. Active penetration of non-indigenous faunistic elements to local biocenoses causes changes in taxonomic structure and upset the balance of ecosystems. This process of biological movement is especially dangerous in cases of pest or weed species invasions, that could strongly damage human economic activity. Modern methods of environmental monitoring are helpful to forecast or prevent pest invasions - collection of data on regional ecosystems, and their species composition provide baselines for monitoring, and are only available from Natural History Museums. Long-term databases with local distributions of species are typical products of museum work, and a significant source for monitoring purposes. Such practice is facilitated in Museums due to the activity of volunteers, who perform a lot of different museum work free of charge and with a great enthusiasm. Thus, in UK “regional biological record centres” can be in a museum, council planning department, county wildlife trust headquarters etc. Usually one or two paid staff but many volunteers. Naturalists send field records to these Centres and the data are then entered on a powerful database and eventually each Centre sends its accumulated data to a National Data base (as well as maintaining a local data set).

New research methods of molecular-genetic studies appeared in the last decades and allow us to use numerous specimens collected in different localities to obtain information about population differences in different species, reveal the times of origin of species, and describe trends in ecosystem formation of the past. On the basis of rare specimens deposited in Museums, it is possible to study evolution, and the genesis of faunas and floras within a comparative analysis of the molecular-genetic character of each taxon, and technical control on molecular level could be used to reveal the time of divergence of taxa. Thus, Natural History Museums collections provide valuable material for genetic research, which could, probably, also be used for genetic engineering in the future.

Organisation of expeditions to poorly studied and distant regions is one of the most important areas of Natural History Museums activity, aimed to develop and enrich the ‘fund’ of collections and to found cooperation and build capacity with counterpart institutes in other countries. As a rule, expeditions are undertaken on a basis of long-term studies to the reveal biological diversity of the studied region. The results of material studied are analysed and published in serial publications and special catalogues. As a good example, we should mention the Himalayan expeditions realised and organised for the past 25 years by Erfurt (Natural History Museum and Entomological Society [1]). Seventeen expeditions to Nepal took place from 1992 to 2017, accumulating valuable materials on the fauna and flora of the Himalayas and

the geological history of the region. Multiple articles with analysis of ecosystems were presented afterwards. A large number of new taxa were described as the result of these expeditions, clarifying our knowledge on the biological diversity of this diverse and poorly known region. Six Symposia “Biodiversität und Naturlausstattung im Himalaya” (Biodiversity and Natural Heritage of Himalaya) have been held and six volumes setting out the results of studied material published, and a new Symposium is planned for 2021.

Of course, such great work is impossible without great enthusiasm and personal support of the Museum community, and united work of people from different regions and countries. This is a characteristic feature of Natural History Museums, as centres of scientific collaboration.

The Siberian branch of the Russian Academy of sciences is rich in Natural History Museums of different aspects of study, 14 museums with a natural sciences profile are mentioned in the monograph “MUSEUMS OF SCIENTIFIC CENTERS AND INSTITUTES OF THE SIBERIAN BRANCH OF RUSSIAN ACADEMY OF SCIENCE” published in 2009. Amongst them, the fields of study of Geological, Zoological, Botanical, Soil and Ecosystem are presented, with rich collections. Siberia is rich in Natural History Museums, presenting material covering a wide range of disciplines and having required especial attention to their development, and enthusiastic support.

Natural History Museums continue to play a significant role as centres for educational and scientific activity of society; as new types of research potentially evolve in the future, the importance of such Museums does not diminish but only increases. Positively, the educational and scientific perspectives of natural history museums in generating knowledge of natural heritage and preserving biological diversity vouchers, have great importance and will be in increasing demand at the nearest future. All scientists working on natural profiles and environmental change are strongly recommended to pay special attention to Museum collections, visit them and help their progress to any extent possible.

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