Memoirs of the Scientific Sections of the Romanian Academy
Tome XLVIII, 2025

BIOLOGY

THE DEPARTMENT OF TAXONOMY, ECOLOGY AND NATURE CONSERVATION (TEON) OF THE INSTITUTE OF BIOLOGY – BUCHAREST (IBB)

ONETE MARILENA[1], MANU MINODORA[1], NICOARĂ ROXANA-GEORGIANA[1], MOLDOVEANU MIRELA[1], CONSTANȚA-MIHAELA ION[1] AND SORIN ȘTEFĂNUȚ[1]

[1]The Institute of Biology Bucharest, Romanian Academy, Bucharest, Romania
Corresponding author: sorinstefanut@gmail.com

The paper offers a comprehensive historical and current overview of the Department of Taxonomy, Ecology, and Nature Conservation (TEON) within the Institute of Biology Bucharest (IBB), which operates under the Romanian Academy. It details the institution's eventful history of reorganizations since 1949, highlighting its transition from dispersed research groups focused on basic taxonomy to an integrated center for ecological research and biodiversity conservation. The source emphasizes the department's core activities, which are structured around three pillars: taxonomy and biodiversity systematics, ecology and ecosystem monitoring, and nature protection and conservation, including extensive involvement in implementing EU biodiversity policies like the Habitats Directive and the Nagoya Protocol. Furthermore, the text outlines the department's strategic objectives, commitment to international collaboration, and reliance on specialized infrastructure such as research stations, extensive laboratories, and crucial scientific collections like the BUCA and BUCM Herbaria. Overall, the source positions TEON as a leading scientific authority in Romania, dedicated to both fundamental research and providing evidence-based solutions for sustainable environmental management.

Keywords: Taxonomy, Ecology, Biodiversity Conservation, Monitoring, Ecosystems

HISTORICAL OVERVIEW AND DEVELOPMENT

The Institute of Biology – Bucharest, part of the structure of the Romanian Academy, has a complex and eventful history, marked by numerous reorganizations and changes in name.

Beginning in 1949, research groups and later departments were established to study the invertebrate and vertebrate fauna, as well as the flora and vegetation of various regions across the country. The initial studies focused on taxonomy,

forming the foundation for floristic and faunistic works of national importance, addressing both terrestrial and aquatic environments. Before 1960, biological research in these fields developed gradually, with several research groups (laboratories) dispersed throughout Bucharest. In 1964, all these research units were brought together under one roof, at 296 Splaiul Independenței (the current headquarters). That same year, the greenhouse was inaugurated, and in 1965, the vivarium building was constructed. From the 1970s onward, laboratories and centers specializing in biosystematics, plant and animal taxonomy, terrestrial ecology, and nature conservation were established. In 1973, the Central Institute of Biology (ICeBiol) was founded as a national structure for coordinating biological research. At that time, the organizational structure already included several research groups within the Terrestrial Ecology Laboratory and the Aquatic Ecology Laboratory. In 1990, the laboratories of ICeBiol separated, leading to the establishment of the Institute of Biology Bucharest as part of the Romanian Academy (pursuant to Government Decision No. 1220/1990). The Biochemistry and Speleology Laboratories became independent research units within the Academy, forming the Institute of Biochemistry and the "Emil Racoviță" Institute of Speleology. Additionally, two laboratories with an applied research profile branched off to form the National Institute for Research and Development in Biological Sciences and the Research Center for Ecological Technologies.

Despite its "turbulent" history, marked by various shifts in focus and restructurings–especially during the communist period–the Institute of Biology Bucharest (IBB) of the Romanian Academy has succeeded in preserving strong research cores in traditional fields of Romanian biology while also developing new research directions.

From its very beginnings, ecological research represented a priority area, during a time when the concept of ecology was beginning to gain scientific and practical significance in Romania. In the decades that followed, the Department of Ecology, Taxonomy and Nature Conservation became a reference platform for the study of both natural and human-modified ecosystems, contributing to the definition of key ecological concepts such as biocoenosis, ecological succession, and dynamic equilibrium within Romanian natural environments.

Beginning in the 1970s and continuing to the present day, laboratories and/or centers specializing in biosystematics, plant and animal taxonomy and physiology, as well as terrestrial ecology and nature conservation, were established. Between 1974 and 2000, the studied invertebrate groups can be classified as follows: surface-dwelling species (Coleoptera–Chrysomelidae, Thysanoptera, Araneae) and soil-dwelling fauna (edaphic fauna) (Coleoptera–Carabidae, Acari–Oribatida, Mesostigmata, Nematoda, Enchytraeida, Collembola, Oligochaeta, Chilopoda). Faunistic and floristic studies (focused on taxonomy and biogeography) of national importance were carried out, aiming at the identification of species characteristic to Romania, the description of new species for science, the development of

distribution maps for certain species of fungi, lichens, invertebrates, and vertebrates, the evaluation of uncertain taxa, and the analysis of their spatial distribution in correlation with environmental factors and the type of ecosystem investigated. During the same period (the 1970s), the first ecological research projects also took shape, focusing on plant and invertebrate populations within terrestrial and aquatic ecosystems, in natural, semi-natural, and anthropogenic areas throughout the country. These studies resulted in valuable scientific contributions, as well as in conservation measures and actions aimed at protecting and enhancing areas of unique scientific significance in Romania. At the same time, the first scientific foundation studies for future protected areas were developed, particularly in the counties of Prahova, Dâmbovița, and Brașov (for example: Bucegi Natural Park and Piatra Craiului National Park). In the initial phase, research focused on the structural changes within plant and invertebrate populations and on the different types of ecosystems–both natural and anthropogenic–such as coniferous and deciduous forests, mixed stands, dwarf pine thickets, shrublands, grasslands, agroecosystems, urban ecosystems, wetlands, mining areas, spoil heaps, and tailing ponds.

From a geographical perspective, these studies were carried out predominantly in terrestrial ecosystems located in the Bucegi, Gârbova, Baiului, and Piatra Mare Mountains, as well as in the Prahova Valley, Doftana Valley, Teleleajăn Valley, and in other counties of southern Romania. The research projects conducted between 1970 and 1990 addressed the following topics: population studies of faunal and floral components in different types of terrestrial ecosystems; systemic analysis of forest ecosystems; structural organization of the main biocoenotic components; ecological bases for the optimal utilization of mountain and subalpine grasslands; study of differential ecological indices in forest ecosystems from different geographical regions; structural and dynamic changes in soil invertebrate communities in pesticide-treated crops; as well as pedo-climatic characterization of the studied areas. All these studies were made possible thanks to the large number of specialists dedicated to each taxonomic group, interdisciplinary collaborations with experts in soil science, forestry, geology, and meteorology, as well as due to the availability of national funding and the existence of two research stations–one in Sinaia (currently Posada) and one in Sulinawhich provided the basic organizational structure for these types of studies.

As the number of specialists began to decline starting in 2000, the research themes addressing flora and the fauna of invertebrates and vertebrates within the Department became more diversified, with an increasing focus on complex ecological studies. These projects aimed not only at structural and quantitative analyses but also at exploring functional aspects at the level of terrestrial ecosystems. Thus, new research directions emerged, addressing topics such as: the study of structural and functional diversity in areas subjected to varying degrees of anthropogenic impact; trophic structure and food resources for edaphic fauna; ecological studies

of grassland ecosystems in alpine and subalpine zones; and investigations on the relationship between biodiversity and ecosystem functions in certain Romanian Carpathian ecosystems.

Another research direction developed from 2008 to the present, with foundations laid as early as the 1970s, has focused on the management and conservation of biodiversity in Romania. Research has continued to provide the scientific basis for new protected areas (the future Făgăraș National Park, Natura 2000 sites such as Mestecănașul de la Coșna, Bahnele Bancului Nord, and Mlaștina Pilugani, all located in Suceava County, as well as Crâng-Buzău Forest). In addition, efforts have been made to inventory and delineate existing natural habitats in Romania to establish the Natura 2000 network of protected areas. This work has involved identifying and documenting natural habitats (Doniţă *et al*., 2005; Sanda *et al*., 2008a, 2008b) and endemic, rare, and/or nationally threatened species of Romania (Ştefănuţ, 2008; Ștefănuț and Sanda, 2008; Dihoru and Negrean, 2009; Murariu and Maican, 2021).

For nearly ten years, the Department, through its experts, has been involved in the study and monitoring of Natura 2000 species of lichens, plants, invertebrates, and vertebrates, in accordance with Habitat Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora. Regarding invertebrate species, the research focused primarily on two taxonomic groups: Coleoptera and Lepidoptera (Manu *et al*., 2018), enabling the identification and quantification of threats and pressures affecting invertebrate species of conservation interest, as well as the design of conservation measures and monitoring plans. All this work has resulted in national scientific reports for protected areas (in accordance with Article 17 of Habitat Directive 92/43/EEC) and for their management plans, in national scientific guidelines for monitoring these species, participation in national and international conferences, and publications in scientific journals.

Within the Department of Ecology, Taxonomy, and Nature Conservation, biogeographical studies have continued over the years, highlighting various biodiversity hotspots for soil-dwelling invertebrate fauna, particularly Collembola and Acari. These studies have provided the basis for the discovery of many species new to science and for the development of a red list of Collembola species from the Carpathian Mountains (Winkler *et al*., 2021). These investigations have also served as a springboard for molecular-level studies, including DNA sequencing of various Collembola species.

Another research direction within the Department has been the use of fungi, lichens, bryophytes, higher plants, invertebrates, and vertebrates as bioindicators, a theme that became particularly prominent in research from the 1980s onwards. This work aimed to assess the impact of, and monitor, anthropogenic activities on the biocoenotic components of affected ecosystems and to quantify the success of ecological restoration projects at various spatial scales (local, regional, national). This research direction expanded significantly starting in 2005, when, thanks to the

initiation of projects funded by European and national programs, the use of sensitive species as bioindicators of air pollution, soil contamination by heavy metals, and pesticides became a valuable tool for assessing risks in contaminated areas and for evaluating the biological conservation status of soils. These studies were published in multiple national and international scientific journals (Onete, 2008; Onete and Paucă-Comănescu, 2011; Oromulu *et al*., 2012; Manu *et al*., 2015). The results of these projects also led, during the same period, to the emergence of the first urban ecology studies.

Subsequently, research in this field was strengthened through the implementation, at the national level, of the project "National Long-Term Monitoring System of Airborne Heavy Metal Bioaccumulation **(BIOMONRO)"**, funded by a grant from Iceland, Liechtenstein, and Norway under Program RO04 – "Reduction of Hazardous Substances". The project aimed to establish protocols for the use of plant species and other biological groups in the biomonitoring of airborne heavy metals and to develop an integrated national system for data collection and analysis (Ştefănuţ *et al*., 2017).

As a result of the interdisciplinary collaboration of specialists within the department, for more than 20 years, studies have been conducted to evaluate the species-specific diversity of plants and invertebrates present in the study areas (grasslands, urban zones, spoil heaps, tailing ponds) and the impact of natural and anthropogenic environmental factors on the diversity of soil plants and invertebrates. These collaborations have led to the development of more complex, innovative, interface studies that address the direct and indirect interactions between subterranean and aboveground biota (the plant–soil invertebrate relationship), both in situ and ex situ, in the context of biodiversity loss as a result of global climate change and its negative effect on ecosystem sustainability and human well-being (ecosystem services). These studies are a precursor to the development of long-term research aimed at demonstrating the dynamic process of these interactions, depending on plant species diversity and growth stages, soil invertebrate species diversity, their trophic status, and life cycles. They provide the knowledge base necessary for long-term research and the development of integrated, adaptive, and sustainable management actions of ecological systems to mitigate the negative impact of climate change, land-use practices, the introduction of new species, habitat fragmentation, etc.

Starting in 2015, the Department of Ecology, Taxonomy, and Nature Conservation, through its specialists, has been part of a comprehensive process of evaluation and mapping of ecosystem services at the national level, using biological indicators characterized by quantitative and qualitative parameters (NEPA *et al*., 2017). Research on the integration of soil biodiversity into ecosystem services (assessing soil biodiversity composition, its dynamics, connections with aboveground biodiversity, network structure according to different land-use types; identifying factors influencing changes in soil biodiversity; evaluating cost-

effective indicators for EU soils to capture sensitivity, resilience, and adaptation to land-use changes in different regions) continues to the present day, through the participation of specialists in soil invertebrates in complex European projects. Participation in these projects over the years has also enabled the development of valuable collections of invertebrates (Collembola and Acari–Mesostigmata) from the soils of twelve European countries, including Romania, as well as the contribution to a European-level database, the European Soil-Biology Data Warehouse for Soil Protection (EUdaphobase) (Fiera *et al.*, 2021; Russell *et al*., 2024).

All these studies would not have been possible without over 50 years of national and international, interdisciplinary collaborations with specialists from Romania and abroad (Poland, Sweden, Germany, Hungary, Czech Republic, Slovakia, United Kingdom, Republic of Moldova, etc.), without continuous training and documentation in the studied field, and without sustained and consistent contributions of financial and human resources.

Over the past decades, several projects carried out by IBB have contributed to the development of a solid scientific knowledge base on the dynamics of aquatic ecosystems. These studies have also provided concrete solutions for the sustainable management and restoration of affected ecosystems. Three major directions stand out for their scientific and applied relevance: biodiversity conservation in the Danube Delta (Fontana *et al*., 2018; Enache *et al*., 2019; Moza *et al*., 2021; Florescu *et al*., 2022b; Catană *et al*., 2025), assessment of anthropogenic impact on urban ecosystems (Florescu *et al.,* 2022a; Catană *et al*., 2023; Popa *et al*., 2023; Florescu *et al.,* 2024), and ecological restoration of the Romanian Black Sea coast.

Developing ecological restoration activities, IBB implemented the project "Strategies for the Restoration of Degraded Peatland Ecosystems in Romania (PeatRO)," funded through a grant from Iceland, Liechtenstein, and Norway under Program RO02 – "Biodiversity and Ecosystem Services," through the EEA Grants 2009–2014. Peatlands, being wetlands and important carbon reservoirs, are capable of sequestering atmospheric carbon dioxide over the long term, playing an essential role in moderating climate change. The drainage and degradation of these habitats lead to the massive release of CO_2 and methane, amplifying global warming. In this context, the **PeatRO** project aimed to develop national strategies to stop biodiversity loss and restore the ecological functions of degraded peatlands by identifying and evaluating affected areas, restoring the hydrological regime, controlling invasive species, restoring habitat connectivity, and elaborating the guide and national program for the restoration of degraded peatlands in Romania. Interventions carried out in the Mlaca Tătarilor protected area (ROSCI0112) in Sibiu County represented a pilot ecological restoration project, serving as a model for future peatland ecosystem restoration actions in Romania. The success of the PeatRO project formed the basis for the Ministry of Environment, Waters, and Forests to formulate a new call for proposals, "Restoration of Wetlands and Peatlands," funded through the RO-Environment Program under the EEA Grants

2014–2021, which aimed to continue and expand restoration actions for degraded wetlands and peatlands. Within this call, five regional restoration projects were funded, three of which were implemented by IBB: **PeatRO2, PeatRO3, and PeatRO4**. All five projects drew media and online attention to the issue of peatland habitat conservation and included intensive activities dedicated to awareness-raising and ecological education among local communities and schoolchildren in the targeted regions

In addition to research and nature conservation activities, IBB has maintained a constant channel of communication with decision-makers in ministries and national and local administrations, engaging not only in the scientific foundation and proposal of protected areas but also in the development and implementation of public policies in the field of biodiversity and sustainable use of natural resources. Between 2019 and 2023, the institute participated, as a partner, in the project "Strengthening the Institutional Capacity of the Ministry of Environment and Its Subordinate Units for Improving Biodiversity Policies" (SIPOCA code 594, SMIS code 127465), co-financed by the European Social Fund through the Administrative Capacity Operational Program (POCA) 2014–2020. Within this project, coordinated by the Ministry of Environment, Waters, and Forests, IBB played an important role in the implementation of the **Nagoya Protocol** into national legislation, contributing to the preparation of studies and guides regarding access to genetic resources and the fair and equitable sharing of benefits arising from their use (ABS), as well as to the development of the **Nagoya Platform** (https://nagoya.anpm.ro/), intended for the exchange of information and monitoring the use of genetic resources at the national level. Some of the results of this initiative were published in the Order of the Minister of Environment, Waters, and Forests no. 828/23.03.2023, regarding the approval of the General Guide and the Practical Guide on the Nagoya Protocol, published in the Official Gazette of Romania, Part I, no. 353/26.04.2023. Through its involvement in this initiative, IBB has strengthened its role as a strategic scientific partner in supporting the decision-making process, contributing, among other things, to the interpretation and clarification of the national framework for implementing the Nagoya Protocol, including the clear distinction between applied research leading to the commercial use of genetic resources and fundamental research.

Since 2007, TEON researchers at IBB have played an essential role in the national implementation of monitoring activities for species and habitats of community interest, in accordance with Article 17 of the Habitats Directive (92/43/EEC), within projects from the 2007–2013 Sectoral Operational Program Environment (POS no. 130537/10.01.2011) and the 2014–2020 Large Infrastructure Operational Program (POIM no. 238/11.03.2019), Sustainable Development Project (PDD) for the implementation of the monitoring system for the conservation status of species and habitats of community interest (SMIS code 2021 – 336936) (title: "Completing the level of biodiversity knowledge through the implementation of the monitoring system for the conservation status of species and

habitats of community interest in Romania and reporting under Article 17 of the Habitats Directive 92/43/EEC"), funded by the Ministry of Investments and European Projects and co-financed by the European Union. Among the results, it is noteworthy that nine monitoring guides for species and habitats of community interest were developed, adopted through Order no. 3.351/28 December 2023 and Order no. 3.352/28 December 2023 (Official Gazette of Romania, Part I, no. 31 and no. 32 of 15 January 2024), including the Monitoring Guide for Plant Species of Community Interest in Romania (Mihăilescu *et al*., 2015a), to whose development TEON experts made a significant contribution.

Within projects coordinated by the Ministry of Environment, Waters, and Forests and the National Agency for Protected Natural Areas (ANANP), IBB was involved in the collection, analysis, and interpretation of data regarding the conservation status of priority species and habitats listed in the Annexes of the Directive, in order to achieve sustainable development objectives, namely balancing environmental protection, economic development, and social inclusion. Monitoring activities focused on evaluating the distribution, abundance, population trends, and anthropogenic pressures on plant and animal species of European interest, as well as characterizing the structure and functionality of natural habitats. The results obtained by IBB contributed to the national reporting to the European Commission, providing the scientific basis for updating conservation strategies and establishing adaptive management measures within the Natura 2000 network, and the data from the first reporting were published in the **Synthesis Report on the Conservation Status of Species and Habitats of Community Interest in Romania** (Mihăilescu *et al*., 2015b).

Through its taxonomic, ecological, and methodological expertise, IBB has strengthened Romania's institutional capacity in implementing European biodiversity policies, ensuring rigorous and continentally comparable monitoring.

These research directions reflect an integrated vision of protecting, conserving, and restoring biodiversity in Romania and demonstrate the continuity of scientific effort from the study of natural processes to the development of innovative solutions for the restoration of degraded ecosystems.

By employing modern methods, integrating ecological data, and fostering international collaboration, these projects contribute not only to the advancement of scientific knowledge but also to the foundation of sustainable public policies, evidence-based and adapted to local realities.

Thus, Romanian research in the field of aquatic ecology today stands out as a model of applied excellence, combining science, innovation, and social responsibility in the service of protecting Romania's natural heritage.

In conclusion, after 1990, the department experienced accelerated development, benefiting from openness to international collaborations and integration into European research networks in ecology and environmental protection.

After 2024, the department's name was changed to the Department of Taxonomy, Ecology, and Nature Conservation (TEON) to highlight the

fundamental pillars of its research, since, in the current context, its activities focus on: in-depth knowledge of fungi, lichens, bryophytes, plants, invertebrates, and vertebrates; understanding fundamental ecological processes; biodiversity conservation; and promoting a sustainable relationship between humans and the natural environment. In the context of the global ecological crisis, the TEON department stands out as a center of scientific excellence, academic training, and interdisciplinary collaboration.

Currently, although the department's research is directed toward modern, topical subjects with societal impact, financial and human resources are increasingly limited, which may jeopardize the future of research.

RESEARCH DIRECTIONS

Currently, the department's activities are structured around three major interconnected directions:

1. Taxonomy and Biodiversity Systematics

This direction focuses on the identification, classification, and study of the diversity of living organisms, serving as an essential pillar for all other ecological and conservation activities.

- Taxonomy and Chorology: Research on the classification, description, and geographic distribution (chorology) of species across various groups.
  - Flora of Romania: Studies on macrofungi, lichens, bryophytes, and higher plants.
  - Fauna of Romania: Studies on invertebrate and vertebrate species.
- Scientific Collections: Hosting and managing reference collections, such as:
  - BUCA Herbarium (plant collection) and BUCM Herbarium (fungi and lichens collection).
  - Romanian Ornithological Center (for the study and monitoring of birds).
- Molecular Biology: Use of modern molecular biology methods for taxonomic and phylogenetic research (evolutionary relationships).

Thus, by integrating classical taxonomy (species nomenclature and classification) with modern molecular phylogeny and bioinformatics methods, this research direction analyzes patterns of biological diversity at hierarchical levels (from genes to ecosystems) to understand processes of speciation, adaptation, and evolutionary radiation. It provides the scientific basis for biodiversity conservation by identifying distinct taxonomic units and areas of high evolutionary value; contributes to the inventory of natural heritage, offering essential data for environmental policies, ecological planning, and sustainable management of biological resources.

2. Ecology and Ecosystem Monitoring

This component focuses on the study of interactions between organisms and their environment, as well as the structure and functioning of ecosystems.

- Biodiversity Assessment and Monitoring:
  - Complex research in natural (terrestrial and aquatic), semi-natural, and cultivated ecosystems.
  - Study of the structure and composition of plant and animal communities.
- Ecosystem dynamics: understanding the evolutionary trends and changes undergone by ecosystems under the impact of:
  - Anthropogenic factors (pollution, habitat fragmentation).
  - Climate change (identification of ecological indicators and vulnerable species).

3. Nature Protection and Biodiversity Conservation

Conservation activities ensure the translation of taxonomic and ecological knowledge into practical protection measures:

- Identification of protected areas: scientific documentation necessary for the identification and proposal of endangered and vulnerable species, as well as threatened habitats, for inclusion in the national and European Natura 2000 network.
- Conservation management: research providing the scientific basis for the development of:
  - Management plans for protected areas.
  - National biodiversity conservation policies.
- Research projects: participation in numerous national and international projects (*e.g.*, PNCDI programs, European projects such as Life, INTERREG, EEA Grants) focused on monitoring of conservation status, ecological restoration, and environmental impact (*e.g.*, study of peatlands, air pollution monitoring).

Essentially, the TEON Department covers the entire cycle of biological research, from inventorying (Taxonomy) and understanding ecosystem functioning (Ecology) to implementing protection measures (Nature Protection).

RELEVANT STRATEGIC OBJECTIVES

The TEON Department is involved, directly or indirectly, in several strategic directions defined at the institute level. Among these directions:

- Biodiversity studies, taxonomy, and assessment of species and habitats
  - The strategy aims to strengthen taxonomic knowledge and species distribution.
  - Improving reference data for species and habitats to enable the assessment of long-term changes.
  - Synergies between ecology, taxonomy, and conservation for application in environmental policies and habitat protection.

- Anthropic impact and climate change
  - The strategy requires the inclusion of "new" research topics by the beginning of 2025, which implies adaptation to emerging challenges (*e.g.*, climate change, urbanization, pollution) affecting ecosystems.
  - Current projects confirm this orientation (*e.g.*, assessment of ecosystem services in anthropized contexts; study of tertiary-impacted aquatic ecosystems; monitoring of mountain and alpine habitats).
- High-performance research with international visibility
  - A key objective is to increase the number of WoS (Web of Science) indexed publications for budget projects, with clear targets of at least 4 articles per year per project.
  - It is also aimed to publish in top journals (Top 1 in WoS), including possible journals such as Science or Nature, for each budget project by 2030.
- Innovation, interdisciplinarity, and adaptability
  - the strategy promotes the introduction of new research topics, adapted to internal and global developments.
  - closer collaborations, integration of modern and technological methods (*e.g.*, biometrics, molecular techniques, predictive models, environmental sensors, GIS).
- Monitoring, reference, and assessment
  - there are clear indicators for evaluating the strategy over time – for example, the number of WoS articles, annual review, inclusion of new topics by the established deadline.
  - the strategy provides for assessing the achievement of objectives through annual reports and periodic checks.

CONCRET ACTIVITIES

1. Fundamental and applied scientific research
   - Taxonomy: description and classification of species of plants, animals, fungi, lichens, etc.
   - Chorology: the study of the geographical distribution of species.
   - Ecology: assessment of natural aquatic and terrestrial ecosystems, including the effects of human activities (anthropic) and environmental changes on ecosystems.
2. Monitoring and evaluation
   - Identification of threatened habitats and assessment of their conservation status.
   - Specific projects on biodiversity in alpine/subalpine areas, monitoring species and habitats of community interest.

3. Contribution to the network of protected areas
   – The institute works to include identified habitats in the network of protected natural areas, both national and European ("Natura 2000").
4. Relevant research projects
   – Projects funded by the Romanian Academy on biodiversity, climate change, ecosystem services, environmental quality, etc.
   – Projects studying ecosystems affected by anthropization (for example, urban aquatic ecosystems) and classification/bioindicators.
5. Role in education and policy development
   – The data and studies produced by the Institute can be used by authorities and decision-makers for environmental policies, legislation, conservation strategies, and protected area management.
   – Additionally, IBB, through TEON, participates in public education and raising awareness about the importance of biodiversity and nature conservation.

FIELD ACTIVITIES AND INFRASTRUCTURE

The Posada Research Station, as an integral part of the TEON research structure at the Bucharest Institute of Biology of the Romanian Academy, represents one of its fundamental facilities, strictly necessary, without which–especially given the challenging financial conditions for research activities–the institute could not have fully fulfilled its thematic tasks and, at the same time, its obligations to foreign partners, as assumed through scientific collaboration agreements. This station serves as a national reference center for studies in acarology and the ecology of soil fauna.

The Sulina Ecological Research Station today represents a model of continuity and innovation in Romanian ecological research. From the first hydrobiological studies in the 1950s to modern molecular biology research, the institution has successfully integrated scientific tradition with the demands of contemporary European research. Through its historical legacy, remarkable scientific contributions, and openness to international collaborations, the Sulina Station stands not only as a center of scientific excellence but also as a hub of influence in the sustainable management of the Danube Delta–a space where science, nature, and social responsibility converge in a common mission: protecting and sustainably valorizing one of Europe's most precious ecosystems.

The Romanian Ornithological Center (C.O.R.) represents a scientific structure of national importance, established in 1939. The main mission of C.O.R. is the coordination, regulation, and development of ornithological studies based on bird ringing, being the first official state ornithological institution to address, in addition to migration, issues of protection and conservation of bird species. From

its founding until 2019, C.O.R. operated within the Research and Development Institute for Plant Protection (I.C.D.P.P.) under the Academy of Agricultural and Forestry Sciences "Gheorghe Ionescu Șișești," and subsequently, its transfer to the Bucharest Institute of Biology (IBB) of the Romanian Academy was proposed and implemented to ensure the continuity and proper functioning of this structure.

Specialized laboratories enable detailed laboratory analyses (biological structure, biochemistry, taxonomy, etc.): the "Nicolae Botnariuc" Laboratory of Terrestrial Ecology, the "Ludovic Iosif Urban Rudescu" Laboratory of Aquatic Ecology, the Laboratory of Urban Ecology, the Laboratory of Bio-Geochemistry of Elements, the Laboratory of Microorganism Ecology, the Laboratory of Ethology, the "Nicolae Boșcaiu" Laboratory of Nature Conservation, the "Ionescu Mihai Andrei" Laboratory of Invertebrate Zoology, the Laboratory of Acarology, the Laboratory of Entomology, the "Petre Bănărescu" Laboratory of Ichthyology, the "Ion Eduard Fuhn" Laboratory of Herpetology, the "Maria Paspaleva" Laboratory of Ornithology, the Laboratory of Mammalogy, the "Olga Săvulescu" Laboratory of Mycology, the Laboratory of Lichenology, the "Ion D. Cărăușu" Laboratory of Algology, the "Traian Ștefureac" Laboratory of Bryology, the Laboratory of Plant Systematics, the "Traian Săvulescu" Laboratory of Plant Taxonomy, and the "Vasile Sanda" Laboratory of Phytosociology.

The greenhouse is part of the institute's research infrastructure, providing a controlled space for plant experiments and studies in the fields of plant ecology, taxonomy, and other botanical research, as well as for experiments highlighting the bidirectional relationships between plants and soil invertebrates.

The vivarium is another component of IBB's experimental biological research infrastructure and serves as a facility for rearing and maintaining living organisms (especially invertebrates) under controlled conditions, for studies in zoology, ethology, and experimental ecology.

The herbarium of higher plants at the Bucharest Institute of Biology (BUCA) (registered in *Index Herbariorum*) contains unique specimens (types) and materials of exceptional heritage value, including endemic species, rare plants, historic sheets over 100 years old, and collections belonging to distinguished botanists. It encompasses both vascular plants and a valuable collection of bryophytes. Currently, the BUCA Herbarium incorporates approximately 400,000 specimens and is part of the international scientific circuit. Its primary use is scientific research, through the study of individual species, genera, or various botanical groupings, with materials serving as references in taxonomic, floristic, and ecological studies. These collections support revision, identification, and documentation work on biodiversity, contributing to the strengthening of national and international floristic databases. In recent years, the BUCA Herbarium has also been included in interdisciplinary *art & science* projects and in educational activities aimed at the general public. The BUCA collection is continuously growing, thanks to the sustained efforts of botanists who deposit study materials

from field research. In parallel, a comprehensive digitization process is underway, involving the transcription of label data and photographing of herbarium sheets. This complex and long-term initiative aims to make the botanical heritage of the BUCA Herbarium accessible online, thereby facilitating consultation and scientific utilization of its collections.

The Mycological Herbarium of the Bucharest Institute of Biology (BUCM) (registered in *Index Herbariorum*) was established in 1928 at the initiative of Traian Săvulescu. By 1975, it held approximately 42,000 fungal specimens, considered "assets potentially forming part of the national cultural heritage." The collection has since expanded through national and international exchanges, as well as through in-house research, reaching around 137,211 specimens today. Among these, the herbarium houses type specimens (holotypus, isotypus, etc.), plant-pathogenic fungi, rare specimens, and fungi listed on the Red List of Macrofungi. From a taxonomic and biodiversity perspective, the herbarium serves as a reference for studies in mycology, phytopathology, biodiversity archiving, and the history of mycoflora in Romania and the European region. For academic research, the herbarium allows: verification and revision of fungal nomenclature; studies on the geographical distribution of fungi; conservation studies (rare and vulnerable species); specimen exchanges with other herbaria and research centers; and support for doctoral research, students, taxonomists, and mycologists.

CONCLUSIONS

The TEON department of the bucharest institute of biology represents a division within a reference institution in ecological research in romania, with a solid tradition, a team of highly skilled specialists, and a remarkable contribution to promoting environmental science. through the continuous activity of the department's researchers, the role of the romanian academy as a guarantor of scientific progress and the protection of national natural heritage is strengthened.

The researchers in the teon department aim to contribute to a deep understanding of ecosystem functioning and to the development of innovative solutions for nature conservation. their vision is that of an integrated ecology, combining rigorous scientific analysis with social responsibility and community involvement.

The teon department research team carries out complex fundamental and applied research activities in the following fields:

- General and theoretical ecology, focused on the structure and dynamics of populations and biological communities;
- Biodiversity and conservation, centered on the inventory and monitoring of rare and endemic species in natural and semi-natural ecosystems;

- Aquatic and terrestrial ecology, with studies on biotic and abiotic processes in freshwater and forest ecosystems;
- Ecotoxicology and pollution, analyzing the impact of contaminants on organisms and ecosystems;
- Urban ecosystems, addressing species adaptation to anthropized environments and the effects of human pressures on the environment.

Thus, the researchers make a substantial contribution to the development of concepts for the assessment of ecosystem services and their integration into sustainable natural resource management strategies. The researchers of the TEON Department are actively involved in national and international projects, carried out through research programs such as PNCDI, EU Horizon Europe, COST, and EEA Grants. Among the most representative initiatives are:

- Projects on biodiversity monitoring in protected natural areas of the Carpathians and the Danube Delta, as well as monitoring of species and habitats of community interest, in accordance with Article 17 of the Habitats Directive.
- Projects that established protocols for the use of plant species and other biological groups in biomonitoring of airborne heavy metals and the creation of an integrated national system for data collection and analysis.
- Interdisciplinary research on the impact of heavy metal and microplastic pollution on aquatic and terrestrial ecosystems.
- Projects dedicated to the assessment of ecosystem services in the context of climate change.
- Projects aimed at developing strategies for the restoration of degraded peatland ecosystems in Romania and the continuation and expansion of restoration actions for wetlands and degraded peatlands in multiple regions of the country.
- Collaborations with foreign institutes in the fields of taxonomy, ecology, and habitat conservation.

Researchers in the TEON department aim to contribute to a deep understanding of ecosystem functioning and to the development of innovative solutions for biodiversity conservation. Their vision is that of an integrated ecology, combining rigorous scientific analysis with social responsibility and community engagement.

Through the TEON department (and the other constituent departments), the Institute of Biology Bucharest (IBB) represents a reference institution in the field of ecological research in Romania, with a solid tradition, a team of high-level specialists, and a remarkable contribution to the promotion of environmental science. Through its continuous activity, the research team strengthens the role of the Romanian Academy as a guarantor of scientific progress and the protection of the national natural heritage, in the following ways:

- Allows for an integrated vision: terrestrial ecosystems are not studied in isolation from aquatic ones; ecological exchanges, transitions (riparian zones, riverbanks), and the impacts of pollution or climate change make sense only if studied together.
- Contributes to environmental and conservation policies: identifying habitats of interest, designating protected areas, collaborating with authorities for impact assessments, and evaluating ecosystem services.
- Strong facilities and infrastructure for scientific research (stations, laboratories, collections, and expert personnel).
- Educational components: students, doctoral theses, master's programs, involvement in training, volunteer work, and international collaborations.

The TEON department represents one of the fundamental scientific structures of the Romanian Academy, playing an essential role in coordinating, promoting, and integrating research in biological and ecological sciences within the broader framework of national academic activity. Through their mission, the department's researchers contribute to:

1. Development of taxonomic knowledge – through the inventory, classification, and systematization of national and regional biodiversity, providing a solid scientific foundation for applied research in biology, agriculture, forestry, and environmental protection.
2. Promotion of fundamental and applied ecological research – focusing on the study of interactions between organisms and their environment, ecosystem dynamics, processes of adaptation and ecological resilience, as well as the impact of human activities on the environment.
3. Support for nature and biodiversity conservation policies – through scientific expertise, consultancy, and recommendations to governmental institutions, thereby contributing to the development of national environmental protection strategies and the implementation of relevant international conventions.
4. Integration of Romanian research into international scientific networks – through interdisciplinary collaborations with academic institutes and universities both nationally and abroad, participation in European programs and projects, and dissemination of results in prestigious scientific journals.
5. Training and support of human resources in the life sciences – through the promotion of young researchers, organization of scientific sessions, conferences, training internships, and complementary educational activities.

Overall, the Bucharest Institute of Biology, through the TEON department, serves a strategic function within the Romanian Academy, contributing to strengthening the institution's role as the supreme scientific authority in biological

and ecological knowledge, protecting Romania's natural heritage, and harmonizing socio-economic development with the principles of ecological sustainability.

The Department of Taxonomy, Ecology, and Nature Conservation (TEON) within the Bucharest Institute of Biology (IBB), under the aegis of the Romanian Academy, represents one of the institute's fundamental structures, with its primary mission being fundamental and applied scientific research in fields vital for understanding and conserving the national natural heritage. In this way, the Bucharest Institute of Biology of the Romanian Academy, through the TEON Department, stands as a reference institution in ecological research in Romania, with a solid tradition, a team of high-level specialists, and a remarkable contribution to the promotion of environmental science. Through their ongoing activity, the department's researchers reinforce the Romanian Academy's role as a guarantor of scientific progress and the protection of the national natural heritage.

REFERENCES

*** https://www.ibiol.ro/
***https://nagoya.anpm.ro/
***https://www.eudaphobase.eu/
***https://www.sob4es.eu/who-we-are/partners/ibb

(Catană *et al.,* 2025) CATANĂ, R. D., MIHAI, R. A., MOROŞANU, A.-M., DOBRE, L., MOLDOVEANU, M. M., FLORESCU, L. I., *The initiation of in vitro culture* in **Gongolaria barbata species–A key species in the coastal marine areas. Aquatic Conservation: Marine and Freshwater Ecosystems**, 35(9).

(Catană *et al.,* 2023) CATANĂ, R. D., PODOSU, A., FLORESCU, L. I., MIHAI, R. A., ENACHE, M., COJOC, R., MOLDOVEANU, M., *Quantitative Analyses of Chemical Elements* in **Phragmites australis as Bioindication of Anthropization in Urban Lakes. Sustainability**, 15(1), 553.

(Dihoru, Negrean 2009) DIHORU G., NEGREAN G., *Cartea roşie a plantelor vasculare din România*, Bucureşti, Editura Academiei Române, 630 p., ISBN 978-973-27-1705-9.

(Doniță *et al.*, 2005) DONIȚĂ, N., POPESCU, A., PAUCĂ-COMĂNESCU, M., MIHĂILESCU, S., BIRIŞ, I. A., *Habitatele din România*. Editura Tehnică-Silvică, Bucureşti.

(Enache *et al.,* 2019) ENACHE, I., FLORESCU, L. I., MOLDOVEANU, M., *Diversity and distribution of Daphnia across space and time in Danube Delta lakes explained by food quality and abundance* in **Hydrobiologia**, 842(1), 39–54.

(Fiera *et al.,* 2021) FIERA C., ARBEA J. I., VARGOVITSH R. S., BARJADZE S., *A synthesis on troglobitic springtails in Europe* in **J. Zool. System. Evolution. Res.** 59, 1874–1890. doi: 10.1111/jzs.12560

(Florescu *et al.* 2024) FLORESCU, L. I., CATANA, R. D., MIHAI, R. A., DUMITRACHE, A. C., MOLDOVEANU, M. M., *Macrophyte Community Distribution in Relation to Anthropization Influences and Phytoplankton Development in an Urban Lake Chain* in **Water**, *16*(23), 3467.

(Florescu *et al.* 2022a) FLORESCU, L. I., MOLDOVEANU, M. M., CATANĂ, R. D., PĂCEŞILĂ, I., DUMITRACHE, A., GAVRILIDIS, A. A., IOJĂ, C. I., *Assessing the Effects of Phytoplankton Structure on Zooplankton Communities in Different Types of Urban Lakes* in **Diversity**, *14*(3), 231.

(Florescu *et al.* 2022b) FLORESCU, L.I., MOLDOVEANU, M., PARPALĂ, L., PACIOGLU, O., *The plankton assemblages as potential bioindicators in the environmental conditions of Danube Delta* in **Biologia**, 77, 105–114.

(Fontana *et al.* 2018) FONTANA, S., KANIANTHARA, M.T., MOLDOVEANU, M., SPAAK, P., POMATI, F., *Individual-level trait diversity predicts phytoplankton community properties better than species richness or evenness* in **The ISME Journal**, 12(2), 356–366.

(Manu *et al.* 2015) MANU M., SZEKELY L., VASILIU OROMULU L., BĂRBUCEANU D., HONCIUC V., MAICAN S., FIERA C., PURICE D., ION M., Bucharest. In Kelcey J.G. (Eds.) *Vertebrates and Invertebrates of European Cities: Selected Non-Avian Fauna* in *Springer Science+Business Media LLC New York*: 700 pp., ISBN: 978-1-4939-1697-9., pp. 257–322

(Manu *et al.* 2018) Manu M., Lotrean N., Onete M., Nicoară R., Bodescu F., *Monitoring of the Callimorpha (Euplagia) quadripunctaria (Poda, 1761) (Insecta: Lepidoptera) in the Măcin Mountains National Park (Romania)* in Enache M. (eds.). "The novel results of the Institute of Biology Bucharest into fields of Ecology, Microbiology and Citobiology". Pp 73–98. Editura Ars Docendi, ISBN 978-606-998-044-6.

(Mihăilescu *et al.* 2015a) MIHĂILESCU, S., ANASTASIU, P., POPESCU, A., ALEXIU, V.-F., NEGREAN, G. A., BODESCU, F., MANOLE, A. A., ION, R. G., GOIA, G. I., HOLOBIUC, I., VICOL, I., NEBLEA, M. A., DOBRESCU, C., MOGÎLDEA, D. E., SANDALĂ, V., BIȚĂ-NICOLAE, C. D., COMĂNESCU, P., *Ghidul de monitorizare a speciilor de plante de interes comunitar din România*, Editura Dobrogea, Constanța, 122 pp., ISBN: 978-606-565-079-4 https://www.researchgate.net/publication/316646796_Ghidul_de_monitorizare_a_speciilor_de_plante_de_interes_comunitar_din_Romania

(Mihăilescu *et. al.* 2015b) MIHĂILESCU, S., STRAT, D., CRISTEA, I., & HONCIUC, V., *Raportul sintetic privind starea de conservare a speciilor și habitatelor de interes comunitar din România*, Editura Dobrogea, Constanța, 280 pp., ISBN 978-606-565-088-6. https://www.ibiol.ro/posmediu/pdf/Ghiduri

(Moza *et al.* 2021) MOZA, M.I., POSTOLACHE, C., BENEDEK, A.M., MOLDOVEANU M., SPAAK P., *Geographical and temporal patterns of cyanobacterial assemblages in the Danube Delta Lake complexes* in **Hydrobiologia**, 848, 753–771.

(Murariu, Maican 2021) MURARIU D., MAICAN S., *Cartea Roşie a Nevertebratelor din Romania*, Editura Academiei Române, 451 pp. ISBN 978-973-27-3357-8.

(NEPA *et al*. 2012) NEPA, ROSA, WWF România, NINA, ABAZA V., BĂLTEANU D., DIACONU D., DUMITRAȘCU M., GANCZ V., GÂȘTESCU P., GHEORGHE I.F., IOJA C., MANU M., MARUȘCA T., MATEESCU R., MIHALACHE M., MOLDOVEANU M.M., ONETE M., POP O.G., RADNEA C., SILAGHI D., VÂNĂU G.O., VINTILĂ R., VÎRSTA A., *Assessment of Ecosystems and Ecosystem Services in Romania*, 197 pag. ISBN 978-606-8038-23-0.

(Onete, Paucă-Comănescu 2011) ONETE M., PAUCĂ-COMĂNESCU M., *Bucharest* in Muller N., Kelcey J.G. (Eds.) **Plants and Habitats in European Cities**, Springer Verlag, 171-206 (ISBN 978-0-387-89683-0)

(Onete 2008) Onete M. (Eds.), *Species monitoring in the central parks of Bucharest*, Editura Ars Docendi, Univ. Bucureşti, 122 pp., ISBN: 978-973-558-392-7.

(Oromulu *et al.* 2012) OROMULU L., BARBUCEANU D., MANU M., *Principalele componente ale unui catalog cu specii indicatoare, rezistente, sensibile şi tolerante la diferiţi factori de stres* in **Nevertebrate**, pp. 19-21, in: **Catalogul speciilor tolerante, rezistente, sensibile şi indicator din bazinul mijlociu al Jiului**, coord.: Corneanu M., Gămăneci G., Corneanu G., Editura Academica Brâncuşi, Tîrgu Jiu, 100 pp., ISBN: 978-973-144-497-0.

(Popa *et al.* 2023) POPA, C. L., DONȚU, S. I., CARȘTEA, E. M., IOJA, I.-C., FLORESCU, L. I., DUMITRACHE, A. C., VANĂU, G., POPA, A.-M., MOLDOVEANU, M., *Land use impact on the levels of fluorescent dissolved organic matter, phytoplankton and zooplankton in urban lakes* in **Limnologica**, 99, Article 126062.

(Russel *et al.* 2024) RUSSELL D.J., NAUDTS E., SOUDZILOVSKAIA N.A., BRIONES M.J.I., ÇAKIr M., CONTI E., CORTET J., FIERA C., HACKENBERGER KUTUZOVIC D., HEDDE M., HOHBERG K., INDJIC D., KROGH P.H., LEHMITZ R., LESCH S.,

MARJANOVIC Z., MULDER, C. MUMLADZE L., MURVANIDZE M., RICK S., ROß-NICKOLL M., SCHLAGHAMERSKÝ J., SCHMIDT O., SHELEF O., SUHADOLC M., TSIAFOULI M., WINDING A., ZAYTSEV A., POTAPOV A., *Edaphobase 2.0: Advanced international data warehouse for collating and using soil biodiversity datasets* in **Applied Soil Ecology**, 204: 105710. DOI: 10.1016/j.apsoil.2024.105710.

(Sanda *et al.* 2008a) SANDA V., ÖLLERER K., BURESCU P., *Fitocenozele din România. Sintaxonomie, structură, dinamică şi evoluţie*, Ars Docenti, Universitatea din Bucureşti, 570 p., ISBN 978-973-588-341-5.

(Sanda *et al.* 2008b) SANDA V., VICOL I., STEFANUT S., *Biodiversitatea ceno-structurala a invelisului vegetal din Romania*. Ars Docenti, Universitatea din Bucuresti, 569 p., ISBN 978-973-588-378-1.

(Stefănuț *et al.* 2017) STEFĂNUȚ S., MANOLE A., ION C.M., OLLERER K.A., ONETE M., MANU M., VICOL I., MOLDOVEANU M., MAICAN S., BANCIU C., COBZARU I., NICOARA R.G., FLORESCu L.I., MOGÂLDEA E.D., PURICE D.M., NICOLAE C.D., CATANĂ R.D., VĂLEANU V.F., CONSTANTIN M., *Ghid de utilizare a speciilor în programele de biomonitorizare*, Editura Ars Docendi, Universitatea Bucureşti, 105 pp; ISBN: 978-973-558-978-3.

(Ştefănuţ 2008) ŞTEFĂNUŢ S., *The Hornwort and Liverwort Atlas of Romania,* Editura Ars Docendi – Universitatea din Bucureşti, Bucureşti, 510 p., ISBN 978-973-558-387-3.

(Ştefănuţ, Sanda 2008) ŞTEFĂNUŢ S., SANDA V., *Atlas Florae Romaniae* V. *Fabaceae*: *Genistella, Genista, Laburnum, Cytisus, Chamaecytisus şi Sarothamnus,* Editura Ars Docendi, Universitatea din Bucureşti, Bucureşti, 164 p., ISBN 978-973-558-367-5.

(Winkler *et al.* 2021) WINKLER D., NÉMETH M.T., FIERA C., *A new species of* Pseudosinella *Schäffer*, 1897 (Collembola, Entomobryidae) from Hungary and Romania, with redescription of related species *Pseudosinella huetheri* Stomp, 1971. Zookeys, 1063: 121–137. DOI: 10.3897/zookeys.1063.73094

Ordinul nr. 828 din 23 martie 2023 pentru aprobarea Ghidului general și a Ghidului practic privind Protocolul de la Nagoya. Monitorul Oficial al României, Partea I, nr. 353 din 26 aprilie 2023. https://legislatie.just.ro/Public/DetaliiDocument/267392

Ordinul nr. 3.351 din 28 decembrie 2023 pentru aprobarea Ghidului privind protocoalele și metodologiile unitare de monitorizare a stării de conservare a speciilor de interes comunitar, din cadrul proiectului „Completarea nivelului de cunoaștere a biodiversității prin implementarea sistemului de monitorizare a stării de conservare a speciilor și habitatelor de interes comunitar din România și raportarea în baza articolului 17 al Directivei Habitate 92/43/CEE", finanțat prin Programul Operațional Infrastructura Mare 2014–2020. Monitorul Oficial al României, Partea I, nr. 31 din 15 ianuarie 2024. https://legislatie.just.ro/public/DetaliiDocument/278140

Ordinul nr. 3.352 din 28 decembrie 2023 pentru aprobarea Ghidului privind protocoalele de monitorizare și metodologiile unitare de monitorizare a stării de conservare a habitatelor de interes comunitar din România, din cadrul proiectului „Completarea nivelului de cunoaștere a biodiversității prin implementarea sistemului de monitorizare a stării de conservare a speciilor și habitatelor de interes comunitar din România și raportarea în baza articolului 17 al Directivei Habitate 92/43/CEE", Cod MYSMIS 2014+ 120009, finanțat prin Programul Operațional Infrastructura Mare 2014–2020. Monitorul Oficial al României, Partea I, nr. 32 din 15 ianuarie 2024. https://legislatie.just.ro/public/DetaliiDocument/278170