



The Institute of Botany of the ASCR, v. v. i. is one of the research institutes of the Academy of Science of the Czech Republic. The Institute carries out basic botanical research at the level of species, populations and plant communities. The following fields are represented: taxonomy, biosystematics and evolutionary biology of higher and lower plant species (including algology, mycology and lichenology), ecotoxicology, plant ecology (including population biology, comparative and production ecology and ecophysiology), mycorrhizal symbioses, phytogeography and geobotany concentrating on investigating large vegetation complexes, including vegetation mapping and paleoecology. Currently, it is especially concerned with biodiversity and evolutionary trends among plants, the invasive behavior of species, responses of plants and vegetation to environmental changes and the coexistence of various species in the ecosystems.

A walk through the Průhonice Park

The institute also maintains the Průhonice Park with extensive collections of native and introduced plants.



Scientific activities of the Institute

Department of Genetic Ecology

The department hosts diverse working groups dealing with the ecological and evolutionary processes that underlie patterns of plant life. The research interests include population genetics, molecular evolution, hybridization, plant ecology and invasions, evolutionary theory, and related subjects. Researchers apply empirical to theoretical approaches across a wide variety of plant species. While some research is focused on plant hybridization, polyploidization and evolution of diverse taxa, other researchers make use field experiments in combination with molecular techniques to understand species invasiveness.

Department of Geobotany

Researches investigate vegetation diversity and dynamics at various temporal and spatial scales using several approaches:

- Basic synchronous concepts - phytosociology and vegetation mapping
- Concepts functional at large spatial scales represented by vegetation surveys from three continents (European area, Korea, Brazil).
- Concepts functional at small temporal scale (prediction of vegetation dynamics) profiting from long-term monitoring.
- Correlation concepts linking concepts functional at large temporal scale (Holocene's vegetation dynamics using palaeobotany data) with historical sciences and conservation biology.

Department of Invasion Ecology

Department of Invasion Ecology has been involved in pan-European projects dealing with alien and invasive species (e.g., ALARM, DAISIE) and cooperated on the European database of alien species, established by the latter project. Long term research interests include theoretical aspects of invasion process and classification of alien species, macroecological patterns of biological invasions, determinants of habitat/region/ecosystem invasibility and the role of species traits in invasions. Special attention is paid to determining the relative roles of factors affecting invasions.

Department of Mycorrhizal Symbiosis

The research focuses on the symbiosis between specific soil fungi and plant roots. Attention is paid to various types of this association: ecto-, arbuscular and ericoid mycorrhiza.

- The study of diversity of mycorrhizal fungi in natural communities using molecular methods.
- Interactions between ecto- and ericoid mycorrhizal fungi.
- Interaction between ericoid mycorrhizal fungi and testate amoebae and its importance for ecophysiology of ericoid mycorrhizal plants.
- Importance of mycorrhizal symbiosis for growth of host plants in substrates with unfavourable edaphic conditions.
- Potential use of mycorrhizal fungi in re-vegetation of degraded areas (spoil banks, fly ash deposits).

Centre for Bioindication and Revitalization

The research activities at the Centre CBR are aimed on research on cyanobacteria, algae and symbiotic soil microorganisms (bacteria and algae) use for bio-indication and revitalization of toxic anthropogenic substrates and water resources. The targeted outcomes are methodic for prediction of cyanobacteria in drinking water and water resources, technology of biogas production from algal biomass, use of algal biomass for pharmaceutical industry and biotechnology of microbial inoculations for more effective recultivation of brown-coal spoil banks.

The results have potential to be used in practice as new biotechnologies in several application fields. Particularly, it is a case of bioindication of toxins in drinking water, pharmaceutical use of algae, their use for production of biogas and application of symbiotic soil microorganisms for revitalization of degraded ecosystems of spoil banks established after brown coal mining.

Department of Plant Population Ecology

The research focuses on ecology of plant populations, their interactions with other organisms (plants, herbivores, pathogens) and community ecology of plant communities.

- Population biology of rare and invasive plant species, conservation ecology
- Landscape-level ecology of plant populations, seed dispersal, dynamic modeling of plant populations in the landscape, metapopulation biology of plants
- population dynamics effects of plant-herbivore and plant-pathogen interactions
- Ecology and dynamics of communities of clonal plants (primarily in grasslands)
- ecology of woody species, dendroclimatology

Department of Taxonomy

The research covers a broad spectrum of tasks from phylogeny and evolution, genetic variability and microevolution, and protection of genetic resources.

- Systematics and taxonomy of vascular plants: The main tasks are sorting, naming and cataloguing plant diversity; collaboration within the framework of major synthetic Floras and in projects aimed at inventory of plant diversity; monographic studies (*Juncaceae*, *Myosotis*, *Hieracium*, *Potamogeton* and *Taraxacum*).
- Systematics, taxonomy a ecology of lichens and fungi: Taxonomy, ecology and bio-monitoring of lichens. Comprehensive taxonomy and phylogenetic studies of Ascomycetes.

GIS & RS Laboratory

Laboratory deals with Geographical Information System (GIS) and Remote Sensing (RS) applications in botany. It focuses on processing and analyses of spatial data field-collected or derived from maps, aerial photos, and satellite images. These data are used for example in: i) mapping of vegetation and individual species; ii) deriving of relationships between flora, vegetation and environmental factors as a background for predicting species or habitats distribution; iii) analyses of spatial pattern and spatial relationships of monitored individuals, populations, and whole plant communities; and iv) analyses of spatio-temporal changes on local and landscape scale. Results of spatial and spatio-temporal analyses are employed in spatially-explicit models.

Laboratory of Flow Cytometry

The mission of the Laboratory is to provide accurate and timely estimates of genome size to meet demands of different research groups. The gained data are widely used in plant population and evolutionary biology, ecology, and biosystematics to address questions of phenotypic manifestation, spatial distribution, and evolutionary significance of genome duplication (polyploidy) and chromosomal variation (aneuploidy). The high speed and reliability of flow cytometry paves the way for large-scale surveys at the landscape, population, individual, and tissue levels. A combination with other, namely molecular, techniques is emphasised and this approach promises qualitative advances in our understanding of genome multiplication in the population biology of vascular plants.

Department of Experimental Phycology and Toxicology

Research activities are focused on studies on photoautotrophic planktonic organisms in the aquatic environment. From ecotoxicological point of view the greatest attention has been devoted to cyanobacteria. The research is mainly aimed at finding of new methods usable for mass cyanobacterial development restriction, including chemical, physical and biological methods. Ecotoxicological characteristics of potential algalicides as well as methods for reduction of nutrient concentrations in surface water have been studied. Another research interest is cyanobacterial autecology, especially cyanobacterial overwintering and the role of cyanotoxins in living strategy of cyanobacteria.

Department of Vegetation Ecology

Our research topics are vegetation diversity and dynamics at various spatial and temporal scales.

- Vegetation ecology (geobotany): We are interested in factors driving the distribution, diversity and dynamics of plant communities.
- Palaeoecology: We focus on the reconstruction of vegetation in the Quaternary. The main methods are palynology and the analysis of macrorests in peat bogs and wetlands and the polar regions of Eurasia.
- Historical ecology: This research concerns historical human impact on ecosystems.
- Ecosystem ecology: We mainly investigate the functioning of grassland ecosystems, regarding biomass production and nutrient allocation.

Centre for Algology

Research of cyanobacteria and algae is focused on three areas of interest:

- Taxonomy
- Ecology and ecophysiology in extreme environments
- Physiology and biochemistry

Methods are developed for studies in molecular taxonomy, for estimations of the influences of abiotic and biotic environmental conditions on morphology, for physiological and biochemical characterization of extremophilic phototrophic microorganisms and for observations of the life cycles of cyanobacteria and algae. We work at the J. G. Mendel Czech Antarctic Station (James Ross Island) and at the station at Billefjorden bay (Isfjorden, central Svalbard).

Department of Functional Ecology

Research is focused on morphological and physiological adaptations of plants in communities subjected to stress, disturbance and competition. The following topics are studied in details:

- Ecophysiology of aquatic carnivorous plants and sphagnum mosses.
- Biology of selected plant species.
- Plant functional traits (species-rich meadows, role of bud bank in regeneration of disturbed vegetation).
- Ecology of plants on their altitudinal and latitudinal limits (West Himalaya, Equador, Svalbard)
- Ecology of pollination by insects and birds (Cameroon).

Centre for Biodiversity

The Biodiversity Research Centre belongs to the Network of Excellence consisting of eight institutions in the Czech Republic. One of their key research topics of the centre studied in the Institute is testing the hypotheses on plant invasions. The research centre is focused on:

- Taxonomical revision of plant names in distribution databases**
- Sharing and accessibility of data on distribution and biological traits of selected groups and organisms**
- Patterns of plants invasions**

Research is aimed at case studies of individual species as well as at synthesis of available knowledge on biological invasions and naturalization processes.

Herbarium PRA

The Herbarium is part of a worldwide network of collections. The Herbarium concentrates on Monocot angiosperms and taxa with specific modes of reproduction (e.g., apomixis), especially from regions from which it is otherwise difficult to obtain material (Central Asia, the Caucasus, North Africa, India New Caledonia, Australia, North and South America etc.). At present the herbarium collections hold a total of over 250.000 herbarium sheets.

Other important collections

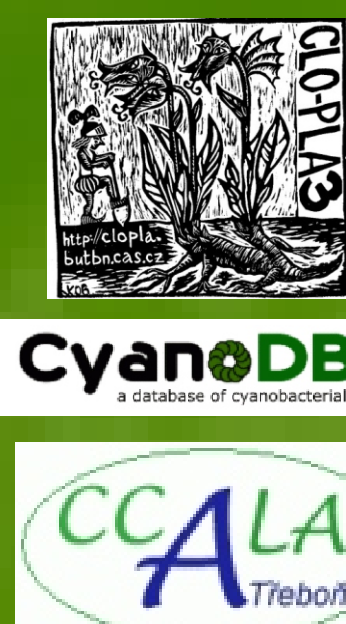
- The comparative herbarium of the Central European synanthropic flora
- The dendrological collection (including cones, bark, wood and twigs)
- It is among the world's most significant collections of conifers.
- The collections of diaspores of the families *Fabaceae* and *Umbelliferae*
- The collection of plants of Ladakh (West Himalaya, India)
- The collection of A. Vězda, a leading lichenologist, (35,000 sheets).

Research Facilities, Collections and Databases



- Isozyme Laboratory
- DNA Laboratory
- Experimental Gardens
- Optical Laboratory
- Analytical Laboratories
- Paleoecology Laboratory

- Wood Collection (Xyloteka) and Seed Index
- CCALA: Collection of autotrophic microorganisms
- Collection of water and wetland plants
- Arboretum of the Botanical Park
- Collections of the Chotobuz Botanical Garden
- Collection of arbuscular mycorrhizae
- Collection of cyanobacteria and algae



- Database of Ladakh Flora (West Himalaya, India)
- List of vascular plants of Flora of the CR
- CLO-PLA: Database of clonal growth in plants
- HERBMAN: Database of herbarium collections
- CYANODB: Database of cyanobacterial genera
- DAISIE: The European alien species database
- DAWIS: Database of Alien Woody species in the CR