

**POLICY BRIEF**

# Strengthening Taxonomic Capacity through Education and Training in Europe

## Executive summary

Taxonomy underpins biodiversity monitoring, environmental protection, and biosecurity. Yet, Europe faces a critical shortage of taxonomic expertise and declining infrastructure. Without urgent action, this gap will weaken EU conservation efforts, delay environmental assessments, and increase vulnerability to biodiversity loss and emerging risks. **Strengthening taxonomic training and capacity building is essential for effective EU policy implementation, scientific innovation, and environmental resilience.**

## Why It Matters

### Taxonomy provides the foundation for:

- Conservation biology, through the identification of endangered as well as invasive species and pathogen vectors, thus setting protection and control priorities.
- Environmental monitoring, by enabling the tracking of biodiversity changes and ecosystem health.
- Ecology, by providing the knowledge necessary for understanding species interactions and ecosystems.
- Agriculture and forestry: through identification of pests, crops, and “beneficial” organisms, thereby improving management and biosecurity.
- Medicine and Veterinary Medicine, by recognising disease-causing organisms and vectors.
- Biotechnology and Innovation, for specific applications and development of supporting tools.



Source: Image from Natural History Museum of Crete

## The Challenge

Without reliable species identification, EU policy ambitions such as the Green Deal and Biodiversity Strategy 2030 cannot be delivered. Accurate taxonomy underpins the implementation and enforcement of a wide range of biodiversity-related legislation both in Europe - such as Birds, Habitats, Water Framework and Marine Strategy Framework Directives - and globally, to meet international commitments such as the Convention on Biological Diversity (CBD).

While the responsibility towards biodiversity conservation is broadly acknowledged through all these instruments, monitoring, reporting, conservation planning, and policy enforcement can significantly be compromised without a robust taxonomic foundation. Among other numerous studies, the landscape analysis on taxonomic expertise needs and the gap analysis on academic taxonomic training in TETTRIs has provided evidence of the critical shortage of trained experts and funding needed to support taxonomic work (the so-called “taxonomic impediment”) that is mainly due to the combined effect of:

- an ageing workforce with limited replacement;
- few and unstable career opportunities;
- decreased attraction to invest on applied technology in the discipline;
- decreased capacity to address biodiversity knowledge gaps;
- underfunded natural science collections and training infrastructure.

These barriers restrict the ability to conserve, manage, and sustainably use biological resources, and to provide a consistent and comprehensive scientific base for policy making.

## Validated responses from TETTRIs

In TETTRIs, several methodological approaches for strengthening Europe’s taxonomic capacity have been tested, including courses provided in different formats and for different target groups (based on the level of expertise and their focus activities), surveys for identification of existing capacities to meet expected needs for reporting and monitoring, and extended consultations run across numerous categories of actors, from academia to policy-makers, educators and practitioners in the field. Collaboration with the private sector has been explored in TETTRIs *Stakeholders Labs* (stakeholder roundtables connecting researchers, policymakers and industry stakeholders seeking joint pathways towards addressing pressing biodiversity challenges) leading to emergence of new opportunities and formats such as *Taxonomists4Future* and *Taxonomist in Residence* programs, for fostering the matchmaking and collaboration between science and industrial actors. The development of key digital infrastructures in TETTRIs, such as the TETTRIs e-learning platform CETAF-DEST, and the Marketplace for Experts and e-services, showcases the urgent need for advanced tools required for tooling up taxonomists and facilitating an integrative approach to taxonomy for the combination of traditional taxonomic, molecular, and ecological evidence in the delimitation and description of species.

Additionally, the TETTRIs Satellite Projects (funded through the cascade grant mechanism) have been instrumental in capturing some of the challenges to tackle the lack of an optimal taxonomic capacity in Europe. Some of them (e.g. TrailsID, CRYPTERS, TEOSS) illustrate how taxonomists can co-develop and apply emerging technologies to enhance data quality, standardize validated methodologies and increase the reliability of biodiversity monitoring actions at large. Others (e.g. SOILMATS, TEOSS, LUCE) demonstrate that without taxonomic

## Strengthening Taxonomic Capacity through Education and Training in Europe

expertise reliable species identification and biodiversity assessments, including soil ecosystems, are extremely weakened. Finally, some (e.g. LUCE, FOOTPRINTS) prove that joint training of professionals, citizens, and amateur experts enhances both scientific output and continued public engagement.

Altogether, the TETTRIs' combined results showcase the critical need for building taxonomic capacity across Europe and designing an integrated training ecosystem that anchors on:

- a coordinated **multi-pathway training approach**, including formal education (degrees and accredited courses), non-formal training (workshops and field-based programmes), and informal learning (mentorship and self-directed pathways);
- **a robust and combined enabling infrastructure** that supports both training and access to reference collections, tools and services; and
- a **stable funding framework** for consolidating resources and capacities.

## Expected Benefits

Investing in taxonomic training and capacity building will ensure the continuity of knowledge and maintenance of expertise in species identification, collections, and reference systems that will ensure:

- More precise and fully reliable knowledge of biodiversity status and environmental assessments for modelling strategies and supporting scientific-base decisions making.
- Faster identification of rare, endemic, and threatened species that support quicker and more effective protection measures.
- Earlier detection of invasive species and faster response to biosecurity threats, with the substantial reduction of ecological damage and economic costs.
- Accurate identification of pests, pathogens, and “beneficial” organisms that improves crop protection and sustainable production in agriculture, forestry, stock raising and fisheries.
- Efficiently address the knowledge gaps to address biodiversity health and resilience.
- Stronger innovation in green and blue economies and improved responses to nature-positive actions from sectors such as pharmaceuticals, biomaterials, and ecosystem services.
- Improved public health preparedness (One Health).
- Reinforced EU scientific leadership across countries and disciplines.

## Policy Recommendations

- 1 Create a stable and well-supported investment roadmap for education and training in taxonomy**, to produce the next generation of experts, by embedding taxonomy within EU programmes and providing sustained funding mechanisms to training agents (universities, natural history and natural science museums, herbaria and scientific collections) and for diverse taxonomic degrees.

## POLICY BRIEF

# Strengthening Taxonomic Capacity through Education and Training in Europe

- 2 Generate sustainable career pathways** to ensure availability of taxonomic positions across career stages and promote cross-sector opportunities beyond academia and traditional taxonomic facilities (such as natural history and natural science museums and botanical gardens).
- 3 Support the integration of a multi-pathway training approach in the training ecosystem** that ensures a flexible, inclusive, and skills-driven system capable of sustaining a strong and future-ready taxonomic workforce across Europe.
- 4 Strengthen an open and ready-to-use training infrastructure** that will optimize the use of resources and maximize impact, by expanding digital platforms and e-learning tools for wider access and by accelerating digitisation of collections to enable open, expert-validated data.
- 5 Support innovation and new technologies** through expanding the collaboration between taxonomists and technology developers and promoting specialized training in AI and DNA-based monitoring methods.
- 6 Foster collaboration** between universities, research institutions, and key networks, such as CETAF, to upgrade taxonomic skills and competences, and to mobilise taxonomic capacity and knowledge exchange.
- 7 Embed taxonomy in policy implementation** to strengthen EU biodiversity monitoring capacity, by placing taxonomic expertise and knowledge at the core of biodiversity monitoring schemes and developing accredited training for national and regional capacity needs.
- 8 Engage citizens and amateur experts in the co-creation of taxonomic knowledge in the field** through initiatives that combine citizens-based activities with professional guidance, by delivering adequate tools and supervised protocols and enhancing recognition of joint outcomes.



Transforming European Taxonomy through training, research and innovations



TETTRIs Grant Agreement 101081903

**Duration:** December 2022 - May 2026

**Budget:** € 5.997.636

**Type:** HORIZON IA - Innovation Action



Catalogue of Life

ecsa

