

Grant Proposal

BioDATA - Biodiversity Data for Internationalisation in Higher Education

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Abstract

BioDATA is an international project on developing skills in biodiversity data management and data publishing. Between 2018 and 2021, undergraduate and postgraduate students from Armenia, Belarus, Tajikistan, and Ukraine, have an opportunity to take part in the intensive courses to become certified professionals in biodiversity data management. They will gain practical skills and obtain appropriate knowledge on: international data standards (Darwin Core); data cleaning software, data publishing software such as the Integrated Publishing Toolkit (IPT), and preparation of data papers. Working with databases, creating datasets, managing data for statistical analyses and publishing research papers are essential for the everyday tasks of a modern biologist. At the same time, these skills are rarely taught in higher education. Most of the contemporary professionals in biodiversity have to gain these skills independently, through colleagues, or through supervision. In addition, all the participants familiarize themselves with one of the important international research data infrastructures such as the Global Biodiversity Information Facility (GBIF). The project is coordinated by the University of Oslo (Norway) and supported by the Global Biodiversity Information Facility (GBIF). The project is funded by the Norwegian Agency for International Cooperation and Quality Enhancement in Higher Education (DIKU).

Keywords

Armenia, Belarus, Darwin Core, data management, data mobilization, DIKU, ForBio, GBIF, Norway, Tajikistan, training courses, Ukraine

Dates and places for BioDATA training events

September 24-26th, 2018, kick-off and coordination event, Oslo, Norway

February 18-22th, 2019, train-the-mentors event, Minsk, Belarus (Fig. 1)

June 3-7th, 2019, intensive data course in Dushanbe, Tajikistan

November 11-15th, 2019, intensive course in Minsk, Belarus

March 30th-April 3th, 2020, intensive course in Yerevan, Armenia

October 5-9th, 2020, intensive course in Kiev, Ukraine

March 1-5th, 2021, closing event and final coordination meeting in Oslo, Norway



Figure 1. [doi](#)

Group photo from the train-the-mentors event in Minsk, February 18, 2019

Project background

The project main partners have collaborated for 7 years on research in biodiversity and run a joint DIKU funded project in higher education. Dr. de Boer first visited the National Herbarium, Institute of Botany, Plant Physiology and Genetics of the Academy of Sciences of the Republic of Tajikistan (IBPPG) and the NGO Zan ve Zamin in 2012 during a scoping mission for research collaboration in biodiversity, ethnobotany and DNA barcoding. The curator Dr. Kurbonali Partoev, showed the group around in the herbarium that was heavily damaged during the civil war and subsequently neglected. The alarming decay of this biodiversity collection of national and international importance was the motivation to work for change. During the next few years, we advocated the plight of the collections and deteriorating state with several donors, and in 2015 IBPPG and NGO Zan ve Zamin obtained funds from the [Christensen Fund](#) to renovate and reinvigorate activities at the herbarium. As a part of this process, the Natural History Museum, University of Oslo (NHM-O) was consulted regarding collection management and herbarium collection digitization. This culminated in a joint workshop on museum collection digitization taught in Dushanbe and joint fieldwork on biodiversity collection in the Zeravshan mountains supported by NGO Zan ve Zamin and NGO Zeravshan Tourism Development Association in the summer of 2016 (taught by Dr. Jan Wieringa, Dr. Abdolbaset Ghorbani, Dr. Anneleen Kool and Dr. Hugo de Boer). In Dushanbe, meetings to discuss the current proposal and specifically to identify needs among all network partners were initiated to ensure that future work continues to reflect our interests. In the summer of 2017, the IBPPG and NHM-O together organized an intensive Pamir Biodiversity Field Course around Khorog in the Gorno-Badakhshan Autonomous Region of Tajikistan with national and international experts including Anneleen Kool, Abdolbaset Ghorbani, Mukhabbat Mamadalieva, Mirzorahimov

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The Norwegian GBIF Node Manager, Dag Endresen, a key trainer in the proposed project, has extensive experience with data training in Norway, Europe, and other regions. ForBio and the GBIF Secretariat brought more Former Soviet Union Republics (FSU) connections to this established cooperation – Belarus through iBOL7 conference and CBD connections, Armenia through European Conservation Biology Congress 2015, Ukraine through first data publications through GBIF.

By teaching young people relevant knowledge and skills, this project will directly contribute to achieving the UN Sustainable Development Goal number 15 (Life on land) and 4 (quality education). It will also address goal number 5 (gender equality), 13 (climate action) and 9 (industry innovation and infrastructure) (United Nations 2015). The project will also contribute to achieving the goals under the Convention on Biological Diversity, as expressed in the updated and revised Strategic Plan for Biodiversity 2011-2020.

The project is also relevant to the vision of the University of Oslo, Norway (UiO), which, as a globally engaged university aims to meet global challenges in areas such as climate, energy, health, poverty and human rights, regardless of disciplinary and geographic boundaries. In UiO, Life Science is the largest priority area in the history of the University (University of Oslo 2014). UiO aims at increasing the international profile in education and research. The Natural History Museum in Oslo (NHM-O) strategic plan (2010 – 2020) stresses the need to provide society with high level knowledge on biological diversity and conduct high quality research on biodiversity and related topics; as well as raise the quality of education in natural sciences. NHM-O has been in charge of a new UiO master specialization in biodiversity and systematics since 2018.

The Institute of Plant Physiology and Genetics of the Academy of Sciences of the Republic of Tajikistan was founded in 1964. The Institute is a part of the Department of Biological and Medical Sciences of the Academy of Sciences of the Republic of Tajikistan. The principal directions of scientific research of the Institute are: the development of theory and methods of plant physiology and biochemistry, genetics and molecular biology, photosynthesis, creation high-yield crop varieties resistant to environmental stresses, and to improve cultivation technologies; ecological physiology and plant biochemistry. The Society of Plant Physiologists of Tajikistan operates at the Institute, uniting scientists working in the educational and research institutions of the republic in the field of plant physiology and biochemistry.

GBIF has developed a set of training material for the European Council funded BID program with a 3,9M Euro budget to capacitate data activities in sub-Saharan Africa, Caribbean and Pacific countries. Based on these materials, the project will develop specific data skills course for the target countries. The training materials in English will be made openly available for reuse in English and Russian for and beyond project duration via ForBio and GBIF sites.

Links to research

The project's support and drive of ongoing research activities and research cooperation between the partner institutions is excellently summarized in an article in Science Nordic 'Making Biodiversity Accessible in Tajikistan' (Kool et al. 2016). The authors state that former Soviet Union countries are an important biodiversity area and global data source. Mobilisation and liberation of these data from non-digital archives and building modern data skills for the next generation of biologists are the primary focus of this project. As of March 2019, there are 1,084,046,082 records of species occurrences shared freely and openly through GBIF by 1362 organizations worldwide for research, education, and policy uses. Central Asia, Caucasus, and Eastern Europe are largely a biodiversity data gap. By offering a novel training program on data skills we aim to bring the skills needed to overcome the data delays in biodiversity education and research. At NHM-O, we have organized fieldwork and expeditions to Uzbekistan, Kyrgyzstan, and Tajikistan, the former two funded by the National Geographic Foundation. GBIF has over 15 years of experience in promoting data activities across the globe (Telenius 2011).

Main objective, expected outcomes and outputs

Current situation

The Former Soviet Republics (FSU) of Armenia, Belarus, Tajikistan, and Ukraine, have more than 25 years of independence, but in terms of biodiversity research, and data openness, the countries are still very isolated from cutting edge biodiversity informatics. FSU countries turn to the open data in science, but early career researchers lack data management capacities. In the same time, collections from FSU countries serve as extremely important sources of biogeographic and taxonomic information relevant for researchers around the world (Hurdu et al. 2018). Digitization of such collections and continuous online distribution of open data from FSU countries seem to be crucial tasks that could finally cover the blind zones on biodiversity maps.

Leading partners in this project are the University of Oslo, GBIF Norway ForBio, and the GBIF Secretariat. These entities have collaborated for years on research in biodiversity, and have made a number of significant improvements to biodiversity research in target countries, including a joint workshop on museum collection digitization taught in Dushanbe in the summer of 2016. The current proposal seeks to build on these experiences and take our collaboration to a new level by organizing shared activities within the framework of the DIKU Eurasia program. The six activities will be in the form of intensive courses and workshops, and a symposium. The activities will be organized in collaboration with the Nordic Research School in Biosystematics – ForBio, a unique platform of expertise in biosystematics in the Nordic countries, and the Norwegian Node of GBIF.

Target group

The project's primary audience are graduate (MSc) and postgraduate (PhD) students, as well as postdocs; museum curators, collection managers and researchers are the second priority. The target group are students from the collaborating partner countries, and include the broader Eurasian partners in Tajikistan, Belarus, Armenia, and Ukraine, as well as other FSU countries and Norway.

Main objective

The main objective of the project is to offer professional training in higher education for future biodiversity professionals and researchers. In addition, the project aims to promote open data and open science culture in the post-soviet space, and to provide, through data openness, new avenues for academic collaboration across borders. Thirdly, training a number of professionals in the target countries is expected to involve target countries more closely in international biodiversity work through GBIF, CBD and other global initiatives.

Activities

The main concept of the project is training of teachers and training of MSc and PhD students from Norway and Eurasian partner countries to a database and digitize biological collections using internationally accepted standards and procedures. The project builds on and expands strong and lasting institutional partnerships through academic collaboration between Norway and Tajikistan and partners in Ukraine, Belarus, and Armenia.

The project provides for a number of activities that will take place in the territory of participating countries. A train-the-mentors week in Minsk, Belarus (February 2019) followed the 2-day kick-off meeting in Oslo, Norway (September 2018). Building on those, there are planned trainings for MSc and PhD students in Dushanbe (June 2019), in Minsk (October 2019), in Yerevan (April 2020) and in Kiev (October 2020). Each training will involve from 16 to 20 students from the respective country. The final meeting will take place in Oslo in March 2021.

Data training activities are positioned in the first and middle parts of the project timeline. This will allow participating students to apply the gained skills to prepare dataset and data paper publications in time for the closing activities, where examples of those publications and educational experiences will be presented and discussed.

Expected outcomes and outputs

In the short term, the target audience will obtain required capacities and skills on international data management and publication tools which is currently not provided at their

home institutions. They will be granted with relevant certificates that give them a competitive edge in national and international higher education, and increase their employability.

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In the long-term the target audience will gain an international network of collaborators to tap into for support and projects and proposals. This will provide additional international mobility both academically and professionally, enhanced opportunities for continued learning in third cycle education, and international collaboration between partners in Eurasian countries and with Norway. It is expected that professionally trained young professionals will establish careers in their countries and continue to contribute to the process of the opening biodiversity data using modern solutions in biodiversity informatics.

We also anticipate that project activities will clarify the value of the open data approach in the target region and will encourage governments or participating countries to become GBIF participants. As Meyer et al. (2015) note, 'GBIF participation emerges as a consistently strong factor determining completeness in DAI' (digitally accessible information) on biodiversity. Numerous examples from among current GBIF participants support this finding, highlighting the effectiveness of national participation in supporting data-intensive research and evidence-based policy about any country's biological resources.

1. Successful implementation of the project will have the following outcomes for the defined target groups:
2. Common international training will provide the target groups with internationalization at home and abroad.
3. Shared intensive learning will provide meeting places for initiation of collaborative projects between the FSU partners and NHM-O.
4. The selective nature of the project will provide international exposure and opportunities for international collaboration to a group of young and aspiring students who will be given a framework for the further pursuit of academic training at home and abroad.
5. The interaction between the project coordinator, academic staff at FSU partners and NHM-O, GBIF specialists and the students will help identify new knowledge gaps and enable collaborative international funding proposals.
6. The target group will be able to benefit from the strategic, university-wide and centralized internationalization policy of UiO.

Contribution from partners

The coordinating Norwegian partner (the Natural History Museum at the University of Oslo) will plan the student registration and academic certification for the training events through the ForBio research school. They will also take the lead on updating and presenting GBIF biodiversity training material for the particular need of the project partner countries in Central Asia through the Norwegian GBIF Node. ForBio and GBIF Norway will also be

responsible for the local organization and logistics for the kick-off meeting and training events organized in Oslo.

The main partner outside Norway - Tajikistan, two partners in Belarus, two in Ukraine and two in Armenia will coordinate all local activities, organise venue, local logistics, registration and take part in the teaching activities, by i) delegating four advanced students from each country to join the train-the-mentors course and ii) by selecting the best student candidates for the data skills courses in their country, and iii) by presenting the education experiences and dataset / data papers as research products and the academic results of the data training.

The Tajik partner Institute of Botany (IBPPG) will be responsible for the local organization of the training event in Dushanbe and the selection of representatives from Central Asia for the initial train-the-trainers event and kick-off meeting. The Belarus, Armenian and Ukrainian partners will be responsible for the local organization of the training event in Minsk, Yerevan and Kiev respectively, and nominate students for the training events and follow up on further dissemination of knowledge from the training events.

GBIF Norway, with the support from GBIF Secretariat, as a non-academic partner, will contribute with expert knowledge and training materials from the biodiversity informatics curriculum developed for its BID projects and the extensive GBIF data publishing e-infrastructure including data publishing software.

First outcomes

Currently we have completed the pre-planned activities which include a 2-day coordinating (kick-off) meeting in Oslo (September 2018) and mentors training (train-the-mentors) in Minsk (February 2019). During train-the-mentors event 17 students were trained, and in total 22 people joined the [GBIF Volunteer Mentor](#) team.

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BioDATA - Biodiversity Data for Internationalisation in Higher Education

Hosting institution

Natural History Museum, University of Oslo (NHM-O) and Plant Physiology and Genetics of the Academy of Sciences of the Republic of Tajikistan (IBPPG)

Conflicts of interest

None

References

- Hurdu B, Barina Z, Mráz P, Novikov A, Puşcaş M, Ronikier M, Šibík J (2018) Endemic flora of the Carpathians: the importance of digitally integrating scientific information of major Carpathian region herbaria. *Visnyk of the Lviv University. Series Biology* 78: 56-59.
- Kool A, de Boer H, Wieringa J, Ghorbani A (2016) Making Biodiversity Accessible in Tajikistan. <http://scienordic.com/content/making-biodiversity-accessible-tajikistan>. Accessed on: 2019-3-15.
- Meyer C, Kreft H, Guralnick R, Jetz W (2015) Global priorities for an effective information basis of biodiversity distributions. *Nature Communications* 6: 8221-8221. <https://doi.org/10.1038/ncomms9221>
- Telenius A (2011) Biodiversity information goes public: GBIF at your service. *Nordic Journal of Botany* 29 (3): 378-381. <https://doi.org/10.1111/j.1756-1051.2011.01167.x>
- United Nations (2015) SDGs: Sustainable Development Knowledge Platform. <https://sustainabledevelopment.un.org/sdgs>. Accessed on: 2019-3-15.
- University of Oslo (2014) UiO strategy for the life sciences. https://www.uio.no/english/research/strategic-research-areas/life-science/documents/2016/uo_strategy_life_sciences_2014_160704.pdf. Accessed on: 2019-3-15.