

## Dear Workshop Participants,

Thank you for your application for the **CenTrain500 workshop**. We apologize for the late feedback and hope that you did not get discouraged by our long silence. Now we have summarized the applications, discussed the possibilities for location and timing and also designed a preliminary program and tasks document that already allocates the applicants to proxy groups.

If anyone has a suggestion for other participants, please send us their contact information. Further details will be provided by the team leaders. We will hold the conference in person if the epidemic situation intensifies we will hold the conference in an online meeting.

As a remainder, the aim of the workshop is to bring together early-career and experienced scientists in the field of late quaternary paleoecology from Central Eastern and Northern Europe (according to EuroVoc) who work with biotic proxies and use training sets.

Our primary aim is *to initiate the formation of a scientific network* with a principal aim of developing regional biotic training sets for limnological and terrestrial proxies that then can be used for more precise quantitative environmental and climate reconstructions.

In order to raise funding for this initiative, to allow us organising workshops, conferences and training schools, *we would like to submit a COST Action Proposal* either this year or next year for which we had to define a catchy topic and title that overlaps with our aims, but also responds to actual societal challenges. For this reason we decided to focus on the last 500 years, and as you will see in the proposal summary below, the COST Action proposal largely builds on the elaboration of early Warning Signals, demonstration for the public the ongoing rapid ecosystem reorganizations in our lakes and in our terrestrial environments and the workout of policy recommendations.

Title: **Defining early warning signals for Environmental change in ECE Europe**

Acronym: **CenTrain500**

Terrestrial and aquatic habitats have experienced unprecedented tempo of change in their biotic communities over the last 30 years that threaten with irreversible changes leading to local extinctions and invasions. Several studies demonstrated the move out of these ecosystems from their safe operational states and argued for the synergic role of climate change and anthropogenic disturbance. In order to advise decision makers in habitat regulation, and to raise awareness of the ongoing processes in our society, it is essential to place the ongoing biotic changes into a longer time perspective. This is offered by paleocological time series data extending back to centuries or even millennia. In the CenTrain500 action we bring together scientists who specialize in the study of sediment archives and reconstruct aquatic and terrestrial habitat change using biological proxies (pollen, diatom, non-biting-midges, crustaceans, testate amoebae and environmental DNA) in order to improve estimates for rate of ecosystem change, to define reference conditions, and calculate how much the aquatic habitats of ECE moved out from their safe operational state. We publish 500 yr time series data, and designate areas that are threatened by irreversible

ecosystem transformation. We publicize our data using online maps, develop action plans to revert habitats to safe operational states. We produce land cover change maps to demonstrate the connectivity of terrestrial and aquatic habitat changes and develop regional training sets to increase the accuracy of quantitative reconstructions. We also train researchers to use novel eDNA techniques and demonstrate the usefulness of the method.

***The proposed time of the workshop is 11-13 November (Thursday to Saturday)***

Group breakdown:

- 1 Pollen group
- 2 Chironomidae group
3. Cladocera group
4. Diatom Group
5. Peatland group – testate amoebae, plant macrofossils

**Conference location:**

Centre for Ecological Research, Institute of Aquatic Ecology  
Hungary 1113 Budapest, Karolina street 29.

**Proposed PROGRAM:**

*11 November - Thursday*

11.00-12.00 am – Opening talks

Magyari et al: Short introduction to the aims, proposed workshop structure, state of the art with the Cost Action proposal

Miklós Bálint: How to integrate eDNA research with classical taxonomy-based paleoecological research?

12.00 - 13.00 Lunch break

13.00-15.00 Group breakdown with talks

15.00-15.30 Coffeee break

15.30-18.00 Group task 1

*12 November - Friday*

9.00-11.00 Group task 2

11.00-11.30 Coffeee break

11.30-13.30 Group task 3

13.30-14.30 Lunch break

14.30-16.30 Presentation of group task results and general discussion

16.30-17.00 Coffee break

17.00-18.00 Presentation of group task results and general discussion

*13 November*

9.00-17.00 Taxonomic identifications – harmonizing the identification of fossils in groups

+ COST Action project application discussion

### **Pollen section – group leader: Enikő Magyari**

Dear Pollen Specialists,

Dear Pollen Analysts,

Thank you for your interest in the CenTrain500 workshop, and apologies for our late response to your applications

As we described in our mission letter, the aim of the CenTrain500 workshop is to bring together paleoecologists who work in EC Europe and initiate the launch of a regional project that focuses both on aquatic and terrestrial ecosystem changes in this region over the last 500 years. One principal aim of the initiative is to build regional training sets for biotic proxy based quantitative environmental and climate reconstructions that is much needed for several limnological proxies (particularly diatom, chironomids, cladocera, testateae amoebae). In this context the pollen based quantitative reconstructions use a much larger scale training set for climate reconstruction, so our group would have a different job.

The way we can help this project most is to collect existing and currently analysed short sediment core pollen records that were dated by  $^{210}\text{Pb}$  –  $^{137}\text{Cs}$  and have thus a secure chronology for the last 150-200 years and less secure, but extrapolated timescale down to about 500 years.

The countries we would like to focus on are all characterised by similar political histories: socialist countries with strong centralised agriculture (collective farming) mostly using artificial fertilizers intensively which was then abandoned for a short period after the collapse of socialism and intensified again with the emergence of private economies. Our job is to examine the existing pollen productivity estimates from our region and using these estimates use these sequences for regional land cover reconstruction for the last 500 yr.

A secondary aim or possibility is to join the biotic limnological proxy initiatives by collecting and amending the European Modern Pollen Database (EMPD) with additional samples from EC Europe focusing on both agricultural land and near-natural habitats. This dataset could then be used for full Holocene pollen based climate reconstruction (only near-natural habitat surface samples) that have generally several biases, but a regionally focused study with careful selection of the training set samples might be a useful addition to the existing studies.

Before we decide on the suggested contributions, I would like to ask you opinion on these questions.

If you agree in these two aims than I have the following suggestion for the workshop.

Group tasks:

1. **start collecting georeferenced surface pollen samples from EC Europe** in a database, start the procedure at the workshop, design database metadata and sample input format, draft letter to invite submission of data, mention in the letter the COST Action proposal, possibility to join
2. **start collecting high resolution existing pollen records covering the last 500 yr in EC Europe**, discuss and consider the involvement of non 210Pb dates (14C dated) records, design database metadata and sample input format, draft letter to invite submission of data, mention in the letter the COST Action proposal, possibility to join
3. **discuss available pollen productivity estimates** to be used in the land cover reconstructions, chose and feed PPEs and other necessary data to a database available for project participants
4. **Describe** in 1-2 pages what are **the expected results**, what the 500 yr land cover reconstruction can add to the limnological bitoc proxy bases reconstructions on rapid ecosystem reorganisation, early Warning signals (move out from the safe operational state, stable state)

We also encourage you to **deliver a talk** related to the above mentioned topics. Please, indicate in your response if you are willing to give a talk, and send a provisional title.

### **Chironomid section – group leader: Ladislav Hamerlik**

Dear Chironomid Specialists,

Thank you very much for the positive answers to the workshop. **The workshop will be held from November 11-13.** The aim of the workshop is to bring together early-career and experienced scientists in the field of long-term paleoecology from Central Eastern and Northern Europe (according to EuroVoc) who work with sub-fossils chironomids proxies and use training sets. Our aim is to initiate the development of regional training sets and quantitative reconstructions for climate (temperature) and environmental change reconstruction using chironomids proxies.

The aim of the workshop is to discuss available datasets and prepare for the submission of a Cost Action (European Cooperation in Science and Technology) project proposal. Cost Actions are dedicated to networking activities for European researchers across all scientific disciplines and involve 38 (+1) COST Countries. In scope of the cost action project we would like to focus on last 500 year quantitative July air temperature reconstructions in alpine and lowland lakes from the study region. During the workshop our task will be to discuss the proposal and receive your suggestions for its finalization.

**The program of the section**

## **11 November - Thursday**

13.00-15.00 Group breakdown with talks

15.00-15.30 Coffee break

15.30-18.00 Group task 1

### **Presentations**

The aim of the lectures is primarily to look at what databases are available from your region. Highlight how you took the surface samples, what tools you used for it. How many samples were taken, from which lakes, from what altitudes (maps). To these samples, you assign temperature values (grid cell (resolution), measured meteorological data, how many years you average, e.g., 1990-2020). In addition to the surface samples, please give details on the hydrochemical measurements made and the method/equipment used. Please, show on your slides how many short cores are available in your country /region in addition to the surface samples (for the last 200-500 years). What proxy analyses were performed on these core, and what quantitative reconstructions were made, if any. The primary goal of the workshop is to show the present days warming by quantitative temperature reconstruction, so it is very important to gather what calibration databases are available on a regional scale along the north-south extent of the Carpathians and how uniformly they are built. After the lectures, we discuss the methodology homogenization.

### **Group task 1**

Developing a uniform methodology for meteorological data acquisition for the surface samples (time period for averaging, meteorological stations, surface sample minimum count)

## **12 November - Friday**

9.00-11.00 Group task 2

11.00-11.30 Coffeese break

11.30-13.30 Group task 3

13.30-14.30 Lunch break

### **Group task 2**

Start collecting georeferenced surface chiro samples from EC Europe in a database, start the procedure, design database metadata and sample input format, draft letter to invite submission of data, mention in the letter the COST Action proposal, possibility to join

### **Group task 3**

Start collecting high resolution existing chironomid records covering the last 500 yr in EC Europe, discuss and consider the involvement of non 210Pb dates (14C dated) records, design database metadata and sample input format, draft letter to invite submission of data, mention in the letter the COST Action proposal, possibility to join

14.30-16.30 Presentation of group task results and general discussion

16.30-17.00 Coffee break

17.00-18.00 Presentation of group task results and general discussion

### **13 November - Saturday**

9.00-17.00 Taxonomic identifications – harmonizing the identification of fossils in groups, COST Action project application

Taxonomic study

Due to the completion of the unified calibration database, we consider it very important to discuss the methodology of taxonomic determination. Please, describe what keys you use for the identification, tell us your opinions about the general problems and difficulties of the identification. Please, bring slides with you to look at and discuss these together. If you have a species that you cannot identify or find it difficult to classify in one of the species types, please bring it with you. This day would be largely devoted to homogenizing the decision-making methodology and solving problems.

### **November 13.**

COST Action project

After discussing the main problems, we consider it important to discuss and assign the tasks related to the application. We need to discuss the timing and structure of the application. We need to designate a coordinator and who will take on what role. We also consider it important to involve PhD students and young researchers in the project, as everyone needs to be involved in standardizing the database and making decisions. Discuss the organization of further workshops as a continuation of the cooperation.

## **Diatom section – group leader: Krisztina Buczkó – Zlato Levkov**

Dear Diatom Specialists,

Siliceous algae (diatoms and Chrysophyceae cysts) are excellent biotic proxies in quantitative climate reconstruction – old tool/new challenge.

Evidence for the effects of climatic change and anthropogenic disturbances on biodiversity at global scale is now unequivocal. Among the affected ecosystems, freshwater habitats proved to be particularly vulnerable to current climatic patterns. Habitat destruction, over-exploitation, water pollution, hydromorphological modifications, biological invasion and climate change are the main drivers of declining biota diversity. Many studies have proved, that diatoms are useful indicators for several environmental modifications, such as acidification, nutrient enrichment, variance in water temperature, conductivity (Rimet and Bouchez, 2012). As it, diatoms are one of the most valuable biotic proxy in quantitative climate reconstruction.

The main aims of our 3-days long meeting are to get closer the approaches in paleoecological reconstructions. The most often used methods apply the species richness and diversity metrics based on taxa as taxonomic units. However, this species diversity-centred approach has limitations since it requires a high level of taxonomic expertise and misidentifications are common. In diatom research two new lines are drawing out: (i) studies focusing on trait-based,

functional approaches and studies using DNA-based community analyses (calculating true-phylogenetic diversity).

During the workshop we offer some taxonomical training for harmonising the identification, for improving the taxonomical tools of participants. We suggest to take pictures about your unknown diatoms, and let's discuss them together. Please, do not forget to take the slides with you, sometimes the pictures are not enough.

Use trait-based approaches in R environment are also the part the meeting (with help and supervising by János Korponai).

One of the main aims is to estimate the number of high-resolution diatom record available in our region (EC Europe, former socialist countries). The mountain lakes received more attention, but not exclusively. We ask the participants to make a compilation about the published data about the cores on which diatom analyses made from their own country. Searching the general trends in diatom responses in our lakes are the focus of the meeting.

Miklós Bálint with Kálmán Tapolczai will introduce us DNA-based community analyses. The new method revolutionizes biodiversity surveys and becoming an essential tool in paleolimnology.

## **The program of the section**

### **11 November - Thursday**

13.00-15.00 Group breakdown with talks

15.00-15.30 Coffee break

15.30-18.00 Group task 1

### **Presentations**

For the operative function of our group, we ask the participants to prepare an overview about the published diatom records focusing on the last 500 years from own countries. The best solution if you make a presentation or a review about these cores, including info about the other proxies. Please, do not get discouraged! If you have no time/or possibility for this, we will do it together! After the introductory summaries, using these available data, we are going to survey the species pool, with special consideration of the rare, oligotraphentic taxa that are underrepresented in the common identification books (Lange-Bertalot et al. 2017) and tools (OMNIDIA) and database (Rimet et Bouchez 2012). Harmonising the taxonomy of taxa is the first essential step for improving the diatom-based quantitative reconstructions.

The next step we are going to discuss, is about the usable (recent) local databases. In the case of diatoms, the countries usually have large databases of "surface samples" as a consequences of Water Framework Directives demands, but these samples can be only restrictedly used for reconstruction because of the different species tools. The conceptional database building for the forthcoming 3-4 years is the aim of our section meeting.

The primary goal of the workshop is to show the present days trophic changes in lake stratigraphies and maybe the saprobic status of lakes by quantitative reconstruction.

### **Group task 1**

Developing a uniform methodology for chemical and meteorological data acquisition for the surface samples (time period for averaging, meteorological stations, surface sample minimum count), pH, dissolved oxygen, water temperature profiles, nutrient concentration measurements

### **12 November - Friday**

9.00-11.00 Group task 2

11.00-11.30 Coffeee break

11.30-13.30 Group task 3

13.30-14.30 Lunch break

### **Group task 2**

**Start collecting georeferenced surface diatom samples from EC Europe** in a database, start the procedure at the workshop, design database metadata and sample input format, draft letter to invite submission of data, mention in the letter the COST Action proposal, possibility to join

### **Group task 3**

**Start collecting high resolution existing diatom records covering the last 500 yr in EC Europe**, discuss and consider the involvement of non <sup>210</sup>Pb dates (<sup>14</sup>C dated) records, design database metadata and sample input format, draft letter to invite submission of data, mention in the letter the COST Action proposal, possibility to join

14.30-16.30 Presentation of group task results and general discussion

16.30-17.00 Coffee break

17.00-18.00 Presentation of group task results and general discussion

### **13 November - Saturday**

9.00-17.00 Taxonomic identifications – harmonizing the identification of diatom fossils in groups, COST Action project application

## **Cladocera section - – group leader: János Korponai or Magdalena Suchora**

Dear Fossil Cladocera Specialists,

In agreement with the aim of the meeting, “Cladoceran group” will formulate how “central-european cladoceran” training set is used for the aquatic ecosystem changes for the last 200-500 years in this region. Since cladocerans occupy the central position of trophic structures of ecosystems thus changes in their taxonomic and functional compositions reflect the changes in trophic structure of the lakes (climate changes, changes in top-down and/or bottom-up control).

During the workshop we would discuss the focuses of action plan, and tools:

- Where we put the focus of the action plan:

- o How we can decouple the climate and human impacts
  - o Tracking the effect of climate on the cladocerans: cold/high mountain lakes
  - o Tracking changes in trophic structures: top-down control needs fish data, while bottom-up control require phytoplankton data
- available cladoceran sets
  - available cores for reconstructions
  - expected results for presentation effect of the great acceleration.

## **The program of the section**

### **11 November - Thursday**

13.00-15.00 Group breakdown with talks

15.00-15.30 Coffee break

15.30-18.00 Group task 1

#### **Presentations**

The participants should present what they can contribute to the regional training set: present their cladoceran training sets, and cores on which quantitative reconstruction will be done; and brief summary of their environmental reconstruction works.

#### **Group task 1**

Developing a uniform methodology for chemical and meteorological data acquisition for the surface samples (time period for averaging, meteorological stations, surface sample minimum count), pH, dissolved oxygen, water temperature profiles, nutrient concentration measurements

### **12 November - Friday**

9.00-11.00 Group task 2

11.00-11.30 Coffeee break

11.30-13.30 Group task 3

13.30-14.30 Lunch break

#### **Group task 2**

**Start collecting georeferenced surface cladocera samples from EC Europe** in a database, start the procedure at the workshop, design database metadata and sample input format, draft letter to invite submission of data, mention in the letter the COST Action proposal, possibility to join

#### **Group task 3**

**Start collecting high resolution existing cladocera records covering the last 500 yr in EC Europe**, discuss and consider the involvement of non 210Pb dates (14C dated) records,

design database metadata and sample input format, draft letter to invite submission of data, mention in the letter the COST Action proposal, possibility to join

14.30-16.30 Presentation of group task results and general discussion

16.30-17.00 Coffee break

17.00-18.00 Presentation of group task results and general discussion

### **13 November - Saturday**

9.00-17.00 Taxonomic identifications – harmonizing the identification of cladocera fossils in groups, COST Action project application

### **Some details about the Cost Actions**

<https://www.cost.eu/funding/how-to-get-funding/documents-guidelines/>

Proposals for new COST Actions shall be prepared by a network of proposers, represented by a Main Proposer, from at least seven (7) COST Full or Cooperating Members amongst which a minimum number shall be from COST Inclusiveness Target Countries as detailed in Annex I.

### **MANAGEMENT OF A COST ACTION**

The COST Action shall be governed by legal, ethical, contractual and administrative rules and principles in compliance with best scientific stewardship and the set of COST Rules. For each new COST Action a multilateral agreement, the Action MoU, shall be prepared on the basis of the approved proposal describing the Action's scientific and technological objectives and the added value of networking. The Action MoU shall be accepted by at least seven (7) different COST Full or Cooperating Members within the six months following the CSO approval of the Action. By accepting the MoU, a COST Member confirms that activities to be covered by the Action shall rely on research funding provided by national authorities or other sources. Accepting the MoU implies acceptance of the set of COST Implementation Rules. An **Action Management Committee** (Action MC) shall be responsible for the coordination and management of the Action activities. The Action MC shall be composed of representatives of **COST Members (maximum two MC Members per COST Full or Cooperating Member)**. The Action MC shall elect an **Action Chair** at its first meeting, who shall be responsible for coordinating the Action MC activities as well as an Action Vice-Chair. Other key leadership positions required for achievement of the Actions' objectives and the implementation of the networking tools shall be elected at the first possible opportunity. One of the key leadership positions in the Action management (e.g. **Action Chair, Vice-Chair, Working Group Leader, Grant Holder Scientific Representative, STSM Coordinator, Science Communication Manager**) shall be

reserved for a representative of a COST Inclusiveness Target Country. The present paragraph shall apply for COST Actions deriving from open calls starting at the open call 2017-1. COST Actions shall be implemented through a set of networking tools such as **meetings (Action MC meetings, Working Groups, workshops, conferences), Short-Term Scientific Missions (STSMs), Training Schools and Dissemination activities**. The reimbursement of expenses incurred by Action Participants, other than those incurred by the Action MC Members, depends on the fulfilment of the COST eligibility criteria for reimbursement<sup>9</sup> and shall be always subject to the availability of COST funds.

## PERFORMANCE MEASURES

The performance of COST will be measured in relation to each of the objectives by a set of indicators aiming to monitor the progress. The stated specific objectives of the COST Framework are: - Joining research efforts and developing common S&T programmes through coordination of nationally or otherwise funded research activities led by pan-European, high quality, collaborative S&T networks. - Building capacity by providing networking and leadership opportunities for emerging talents and thereby strengthening and building up excellent S&T communities. - Addressing Societal Questions by promoting trans-disciplinary, new approaches and topics and identifying early warning signals of unforeseen societal problems aiming at contributing to Societal Challenges. - Strengthening COST Inclusiveness Policy by fostering better access and integration of less research intensive countries' researchers to the knowledge hubs of the European Research Area aiming at contributing to the Widening Pillar of Horizon 2020.