

12TH CENTRAL EUROPEAN DIATOM MEETING

PROGRAMME AND ABSTRACT BOOK



LUC ECTOR, CARLOS E. WETZEL AND BART VAN DE VIJVER (EDS)

BELVAUX, LUXEMBOURG / 26-27 MARCH 2019

LUXEMBOURG
INSTITUTE OF SCIENCE
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WELCOME

Dear Participants,

We would like to welcome you to the 12th Central European Diatomist Symposium to be held this year in Belvaux, Grand Duchy of Luxembourg. After a sabbatical year in 2018, we are proud to continue the tradition of meeting each other to discuss a broad array of topics on diatom science. We are happy to announce for 2019 the presence of more than 45 delegates from 18 countries, giving 3 keynote lectures, 16 oral presentations and 26 poster presentations.

The meeting will be followed by a one-day Workshop on diatom taxonomy entitled "*Planothidium* species complex: *Planothidium frequentissimum-rostratum*, *P. lanceolatum*, *P. delicatulum*", organised by Bart Van de Vijver, Carlos E. Wetzel and Luc Ector.

Despite being one of the smallest members of the European Union, Luxembourg is nevertheless the birthplace of the concept of a unified Europe. Together with Brussels and Strasbourg, Luxembourg City is the official headquarters of many of the European Union's major institutions. A multicultural city by tradition, Luxembourg continues to enhance its cosmopolitan nature. The city of Luxembourg, the thousand-year-old capital of the Grand Duchy, was founded in 963. Over the course of its history, Luxembourg has been occupied by Burgundians, Spaniards, French, Austrians and Prussians, all of whom contributed to making it one of the best-fortified cities in the world, the "Gibraltar of the North". Today, the fortress, along with the Old Town, have gained international recognition. In 1994, UNESCO recognized the city's historical importance by naming it a World Heritage Site.

Belvaux is a neighbourhood in the west of Esch-sur-Alzette, situated in south-western Luxembourg at a few kilometers from the border with France. It was the site of the large steelworks that dominated the city. Due to the dominance of the steelworks, the area suffered from the abandonment of steel production in Luxembourg, and is currently undergoing an extensive regeneration programme to help diversify beyond steel production. This redevelopment plan will turn the brownfield site into a large scientific and cultural centre, including the science faculty of the University of Luxembourg. It is also the location of the Rockhal, Luxembourg's largest music venue, which opened in 2005.

The Luxembourg Institute of Science and Technology (LIST) is a mission-driven Research and Technology Organization that develops technology-intensive solutions focussed on environmental innovation, digitization and advanced materials. We transfer technologies to industrial partners from sectors such as manufacturing, automobile, logistics, biotech, energy, space, construction, water, agriculture, viticulture and more.

On behalf of the organizing committee, we wish you a pleasant time and fruitful meeting!

Luc Ector, Carlos E. Wetzel & Bart Van de Vijver

GENERAL INFORMATION

VENUE

The oral presentations, poster sessions, and all related activities (apart from the Gala Dinner) will take place at the **Luxembourg Institute of Science and Technology (LIST), Environmental Research and Innovation Department (ERIN), 41 rue du Brill, L-4422 Belvaux, Luxembourg** (49°30'20.5"N 5°56'37.6"E).

IT IS STRICTLY FORBIDDEN TO SMOKE INSIDE AND IN FRONT OF THE BUILDING!

SECRETARIAT AND STAFF CONTACT

During the meeting, the secretariat can be found at the registration desk to answer all your questions and provide help if any problems arise.

Alexandra Dobrowolski - (+352) 275 888 - alexandra.dobrowolski@list.lu - ced2019@list.lu
Chrystel Petiteville - (+352) 275 2364 - chrystel.petiteville@list.lu - ced2019@list.lu

BADGE IDENTIFICATION

The meeting badge is required for admission to all meeting activities.

Registration fee for the meeting includes free access to all sessions, coffee breaks and lunches, the book of abstracts, the guided tour of Luxembourg City as well as the Gala Dinner on Wednesday 27th of March 2019.

Registration fee for the workshop includes the workshop book, coffee breaks and lunch.

ORAL PRESENTATIONS

Oral presentations are scheduled throughout the conference. Please check the programme for the time allotted to your presentation, including a few minutes for discussion.

Presentations should be uploaded at the registration desk at the latest the day before (if your talk is scheduled for the morning sessions) or in the morning before lunch (if your talk is scheduled for the afternoon session). Presentations should be named: Surname_Date_PresentationTitle.ppt)

All presentations must be compatible with Microsoft PowerPoint on the Windows PC platform.

If your presentation includes videos, they will not work unless they are copied onto the presentation laptop computer as well. Therefore, please ensure to submit copies of the videos when submitting your presentation.

POSTER PRESENTATION

Posters will be presented on Tuesday afternoon but will remain exposed for the entire duration of the conference. Presenters of the posters are kindly asked to stay next to their posters providing the possibility for discussion. Pins for pinning up the posters will be provided. Please remove your poster during the last coffee break on Wednesday afternoon.

WORKSHOP *PLANOTHIDIUM*

On Thursday 28th of March 2019, a workshop will be organised for registered participants. Topic of the workshop will be the group of species around *Planothidium lanceolatum*, *P. frequentissimum* and *P. delicatulum*. The workshop will consist of two parts. During the morning session, an extensive presentation will be given highlighting all species from this group. In the afternoon, selected species will be illustrated using material from type slides and other larger populations from Europe. Participants are welcomed to bring their own slides with problematic species that will be discussed during the workshop.

BOOK SALE

Koeltz Botanical Books and Schweizerbart Science Publisher will exhibit the most recent and interesting books on diatoms during the CED Meeting.

INTERNET FACILITIES

Wireless internet is available in the building.

CONFERENCE PROCEEDINGS

CED Meeting 2019 articles may be submitted for publication in a special volume of Botany Letters: Manuscripts must be sent for submission by end of June 2019 at the latest.

Botany Letters is an international scientific journal, published by the French Botanical Society (Société botanique de France) in partnership with Taylor & Francis.

Botany Letters (Impact Factor: 1.342) welcomes all manuscripts dealing with plants and plant science in a broad sense, especially interdisciplinary studies. The scope covers Embryophyta, algae and fungi or any taxa described in their interactions with photosynthetic organisms. All organisation levels are considered. Botany Letters aims at allowing fast dissemination of quality research, for a large audience of readers interested in plant sciences. Articles on methodologies and tools, short communications, including from PhD thesis, and reviews are encouraged.

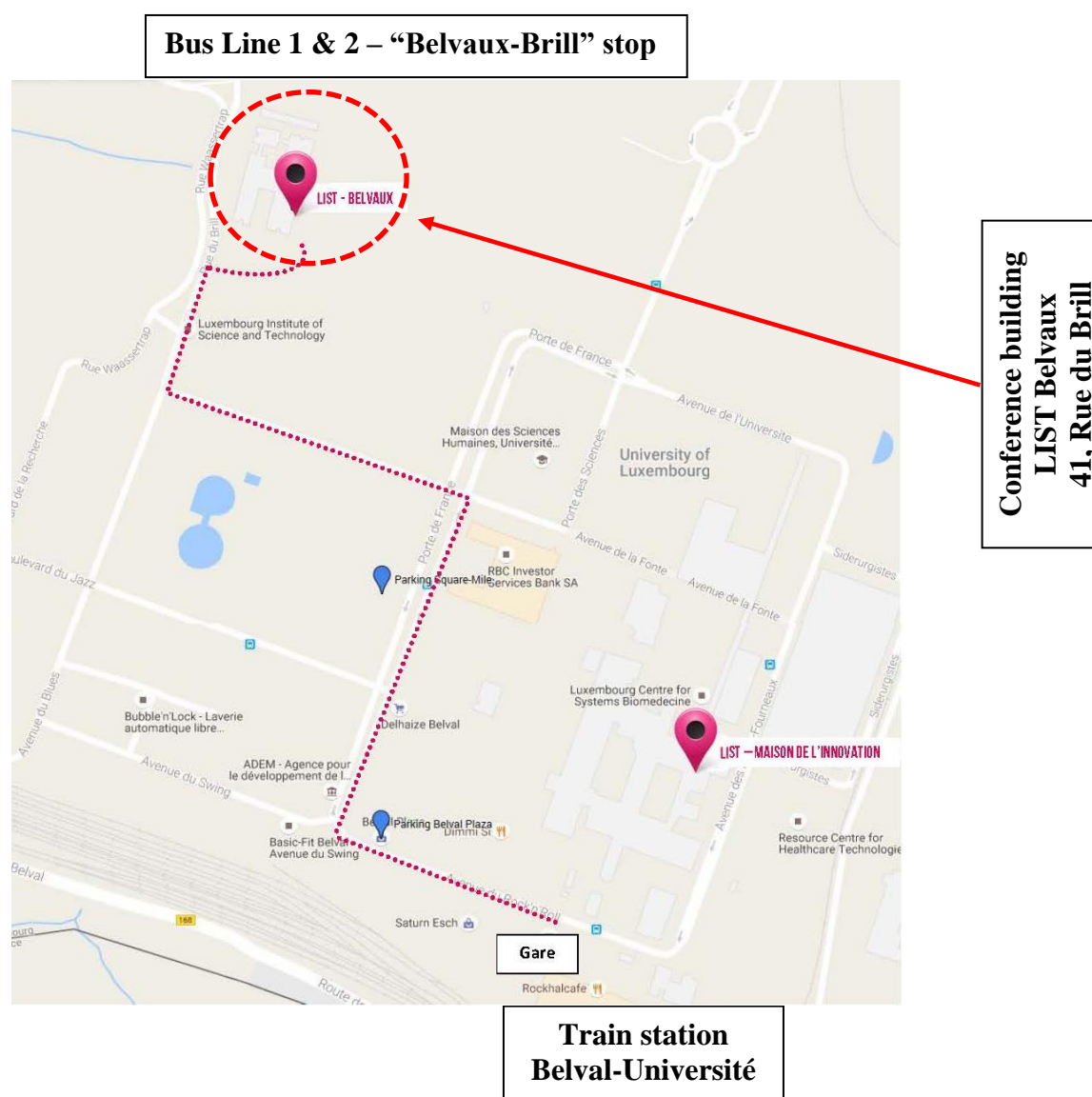
INSURANCE

The Organizing Committee cannot assume responsibility for injuries or losses occurring to persons or personal belongings during the meeting. Participants are therefore advised to take care of their belongings.

STUDENT PRIZES

Awards for the best student oral and poster presentations will be evaluated and rewarded. Evaluation criteria will include: communication skills, quality of scientific content, overall quality of the presentation and the visual layout. The results of the competition will be announced during the Conference dinner on 27th of March.

Student presentations are marked with (S) behind their name in the Conference Program.



PROGRAMME

TUESDAY, 26th of MARCH 2019

Luxembourg Institute of Science and Technology (LIST)
41 rue du Brill, L-4422 Belvaux

8:30 – 9:30 **Registration**
(Mounting of posters)

9:30 – 10:00 **Opening ceremony**
(Welcome address by the conference organizers)

10:00 – 10:50 **KEYNOTE LECTURE 1**
David G. Mann
*DO WE NEED THE BOURGEOISIE? THE DEFICIENCIES OF A MARXIST APPROACH
TO DIATOM CLASSIFICATION ABOVE THE SPECIES LEVEL*

*Session 1: Morphology and taxonomy
(Chairs: René Le Cohu & Horst Lange-Bertalot)*

10:50– 11:10 **Coffee break**

11:10 – 11:30 **Livia F. Costa (S)**
ACHNANTHIDIUM (BACILLARIOPHYCEAE) FROM SOUTHEASTERN BRAZIL

11:30 – 11:50 **Carlos E. Wetzel**
*UNMASKING THE SMALLEST ONES: A SHORT REVISION OF SMALL CELLED
'SELLAPHOROID' DIATOMS FROM EUROPE*

11:50 – 12:10 **Bart Van de Vijver**
THE PLANOTHIDIUM PERICAVUM/ENGELBRECHTII COMPLEX

12:10 – 12:30 **René Le Cohu**
*A FEW REMARKS ON THE « ANATOMICAL » PARTICULARITIES IN FOUR
CYMBELLACEAE OF NEW CALEDONIA*

12:30 – 14:00 **Lunch**

14:00 – 14:50 **KEYNOTE LECTURE 2**
Wiebe Kooistra
*SPECIES DIVERSITY AND SEASONALITY IN THE MARINE PLANKTONIC DIATOM
CHAETOCEROS ASSESSED BY MEANS OF METABARCODING*

*Session 2: Morphology and taxonomy
& forensic science
(Chairs: David G. Mann & Nelida Abarca)*

14:50 – 15:10 **Luc Bourguignon**

FORENSIC DIATOMOLOGY IN BELGIUM

15:10 – 15:30 **Jordan Bishop (S)**

*A UNIQUE NEW NAVICULOID DIATOM GENUS FROM CONTINENTAL
ANTARCTICA*

15:30 – 15:50 **David M. Williams**

*WHAT EXACTLY IS ULNARIA ACUS (SYNEDRA ACUS) KÜTZING? THE TYPE
SPECIMENS OF SYNEDRA ACUS KÜTZING, SYNEDRA ARCUS KÜTZING, SYNEDRA
VITREA KÜTZING AND A FEW MORE...*

15:50 – 16:10 **Bart Van de Vijver**

*FOUR NEW MELOSIROID DIATOM TAXA RECENTLY DESCRIBED FROM THE
SOUTHERN HEMISPHERE*

16:10 – 16:30 **Coffee break**

16:30 – 18:00 **Poster session**

WEDNESDAY, 27th of MARCH 2019

Luxembourg Institute of Science and Technology (LIST)
41 rue du Brill, L-4422 Belvaux

9:30 – 10:20 **KEYNOTE LECTURE 3**

Benoît Schoefs

DIATOMS: FROM PHYSIOLOGY TO APPLICATIONS

10:20 – 11:00 **Coffee break & Posters**

Session 3: Phylogeny

(Chairs: Wiebe Kooistra & Zlatko Levkov)

11:00 – 11:20 **Nelida Abarca**

THE MOST COMMON GOMPHONEMA IN CENTRAL EUROPE IS NOT A GOMPHONEMA!

11:20 – 11:40 **Maxim Kulikovskiy**

MOLECULAR AND MORPHOLOGICAL INVESTIGATION OF SPECIES FROM THE GENUS GOMPHONEMA EHRENBERG IN SOME WATER ECOSYSTEMS OF RUSSIA

Session 4: Paleo-ecology

(Chairs: Kim Krahn & Aude Beauger)

11:40 – 12:00 **Hannah Hartung (S)**

HOLOCENE ENVIRONMENTAL AND CLIMATE CHANGE IN THE SOUTHERN LEVANT: DIATOM-BASED PALAEO LIMNOLOGY OF LAKE KINNERET (ISRAEL)

12:00 – 12:20 **Agata Z. Wojtal**

RESPONSE OF CURRENT AND SUBFOSSIL DIATOMS TO METAL-CONTAMINATED ENVIRONMENTS (SOUTH POLAND)

12:20 – 14:00 **Lunch**

Session 5: Ecology & Biodiversity

(Chairs: Benoît Schoefs & Sunčica Bosak)

14:00 – 14:20 **Aude Beauger**

INFLUENCE OF THE NATURAL RADIOACTIVITY ON THE DIATOM COMMUNITIES LIVING IN MINERAL SPRINGS

- 14:20 – 14:40 **Jasper Foets (S)**
THE INFLUENCE OF ENVIRONMENTAL FACTORS ON THE STRUCTURE AND DIVERSITY OF TERRESTRIAL DIATOM COMMUNITIES
- 14:40 – 15:00 **Zlatko Levkov**
DIATOM DIVERSITY IN THE R. NORTH MACEDONIA – CHALLENGES AND PERSPECTIVES
- 15:00 – 15:20 **Bart Van de Vijver**
THE EPIBIOTIC DIATOMS ASSOCIATED WITH LOGGERHEAD SEA TURTLES IN THE ADRIATIC SEA
- 15:20 – 16:00 **Coffee break**
(posters taken down)
- 16:00 – 16:15 **Closing ceremony**
- 16:30 – 18:30 **Excursion to Luxembourg city**
- 19:00 – 22:00 **Gala Dinner in Luxembourg city**

THURSDAY, 28th of MARCH 2019

Luxembourg Institute of Science and Technology (LIST)
41 rue du Brill, L-4422 Belvaux

Bart Van de Vijver, Carlos E. Wetzel & Luc Ector
TAXONOMIC WORKSHOP

- 9:30 – 12:30 **Plenary lecture highlighting all *Planothidium* species**
- 12:40 – 14:00 **Lunch**
- 14:00 – 17:00 **LM microscopy observations of *Planothidium* species including type material and slides of the participants**

POSTERS

Presenting author in bold (first author if different in brackets)

Student presentations are marked with (S) behind their name

Morphology, taxonomy and phylogeny

Centrics, Araphids and Brachyraphids

- P1** **Levkov Z.** (Zaova D.)
INTRASPECIFIC MORPHOLOGICAL VARIATION IN CYCLOTELLA CAVITATA FROM LAKE OHRID
- P2** **Usoltseva M.**
AULACOSEIRA SPECIES FROM PALEO-LAKES OF THE BAIKAL RIFT ZONE, RUSSIA
- P3** **Wetzel C.E.**
TWO NEW PUNCTASTRIATA (BACILLARIOPHYTA) SPECIES FROM ALPINE FRENCH LAKES
- P4** **Heudre D.**
A SHORT APPRAISAL OF SOME FRENCH POPULATIONS OF TABELLARIA IN WATER BODIES IN FRANCE
- P5** **Taylor J.C.**
TROPICAL AFRICAN DIATOMS FROM THE EUNOTIA ASTERIONELLOIDES SPECIES COMPLEX
- P6** **Jüttner I.**
MORPHOLOGICAL INVESTIGATIONS OF EUNOTIA BIDENTULA W.SMITH AND EUNOTIA PACHYCEPHALA KÜTZING
- P7** **Casa V.** (S)
THE GENUS EUNOTIA IN TIERRA DEL FUEGO PEATBOGS (ARGENTINA)

Morphology, taxonomy and phylogeny

Monoraphids and Biraphids

- P8** **Wetzel C.E.**
COCCONEIS ROUXII HÉRIBAUD & BRUN A FORGOTTEN COMMON BENTHIC DIATOM SPECIES FROM THE MASSIF CENTRAL, FRANCE
- P9** **Costa L.F.** (S)
FRESHWATER COCCONEIS SPECIES (BACILLARIOPHYCEAE) FROM SOUTHEASTERN BRAZIL

- P10 Van de Vijver B.**
PSAMMOTHIDIUM MANGUINII: FROM ONE TO SIX...
- P11 Jüttner I.**
INVESTIGATIONS OF THE TYPE MATERIALS OF ACHNANTHES PARALLELA J.R.CARTER AND ACHNANTHES PETERSENII HUSTEDT
- P12 Heudre D.**
TWO DIATOM SPECIES WITH AN UNUSUAL BIOGEOGRAPHICAL DISTRIBUTION OBSERVED IN A MIDDLE-MOUNTAIN LAKE IN FRANCE
- P13 Bosak S.**
NEW OBSERVATIONS ON SOME SEA TURTLE ASSOCIATED CRASPEDOSTAUROS SPECIES
- P14 Vidaković D. (S)**
MORPHOLOGICAL VARIATION WITHIN THE PLACONEIS ELGINENSIS (W.GREGORY) E.J.COX SPECIES COMPLEX
- P15 Jüttner I. (Carter C.)**
MORPHOLOGICAL INVESTIGATION OF ENTOMONEIS PALUDOSA (W.SMITH) REIMER (BACILLARIOPHYTA) INCLUDING ANALYSIS OF THE TYPE MATERIAL OF AMPHIPRORA PALUDOSA W.SMITH

Physiology

- P16 Schoefs B. (Scarsini M.)**
INVOLVEMENT OF TRANSCRIPTION FACTORS IN THE METABOLIC SHIFT IN THE DIATOM PHAEODACTYLUM TRICORNUTUM

Ecology & Paleo-ecology

- P17 Kulaš A. (S)**
DIATOMS OF KRKA RIVER, CROATIA
- P18 Zidarova R.**
COLONIZERS OF NEW SUBSTRATES IN ANTARCTIC MARINE WATERS - RESULTS FROM A SHORT-TERM EXPERIMENT AT THE SOUTH BAY, LIVINGSTON ISLAND

- P19 Gómez-Leyva Y. (S)**
BENTHIC DIATOM COMMUNITIES AS INDICATORS OF EUTROPHICATION IN COASTAL LAGOONS
- P20 Ben Khelifa L.**
DIATOM FROM MAJERDA-RIVER AND TUNIS LAGOON, NORTHERN TUNISIA
- P21 Abarca N. (Zimmermann J.)**
GERMAN BARCODE OF LIFE ² (GBOL²) – DIATOM EDNA METABARCODING IN THE CONTEXT OF THE EU WATER FRAMEWORK DIRECTIVE (EU WFD)
- P22 Huang S. (S)**
RELATIONSHIP BETWEEN DIATOMS IN SURFACE SEDIMENTARY DNA AND LAKE WATER CHARACTERISTICS IN NORTH EASTERN SIBERIA
- P23 Verweij G.L.**
RECONSTRUCTING PALEO-LANDSCAPES FOR ARCHAEOLOGICAL INVESTIGATION USING DIATOMS
- P24 Zeleke K.T. (S)**
PHD PROJECT: APPLICATION OF DIATOMS (BACILLARIOPHYTA) AS PALEO-LIMNOLOGICAL PROXIES FOR ESTIMATION OF PAST SALINITY CHANGES IN SELECTED LAKES IN ETHIOPIA
- P25 Krahn K.J. (S)**
DIATOM RESPONSE TO HOLOCENE ENVIRONMENTAL CHANGE IN NW MADAGASCAR: FIRST RESULTS FROM LAKE AMPARIHIBE
- P26 Schwarz A.**
EFFECTS OF GLOBAL WARMING ON DIATOM SUCCESSION IN SENSITIVE KEY REGIONS: EVIDENCE FROM THE TIBETAN PLATEAU (LAKE NAM CO)

Keynotes

Species diversity and seasonality in the marine planktonic diatom *Chaetoceros* assessed by means of metabarcoding

Wiebe H.C.F. Kooistra¹, Chetan C. Gaonkar², Marina Montresor¹, Roberta Piredda¹, Diana Sarno¹ & Adriana Zingone¹

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Environmental DNA metabarcoding is proving to be a powerful approach to assess planktonic diatom diversity next to -or instead of- cell counting by means of light microscopy (LM). In the present study we examine the performance of 18S rDNA V4-metabarcoding in revealing the diversity in the diatom family Chaetocerotaceae at the LTER-MC station in the Gulf of Naples. To this aim, we analysed a metabarcode dataset collected on 48 sampling dates over 3 years, and assigned them to distinct species based on a phylogenetic analysis including named reference sequences from a database of taxonomically validated strains. The LTER-MC was chosen because its plankton diversity has been monitored regularly since 1984. So, contextual information is available. Chaetocerotaceans resolved into a series of solitary haplotypes, each containing a modest number of metabarcodes, as well as a series of terminal polytomies composed of multiple haplotypes, each with usually one haplotype containing the vast majority of the metabarcodes. Both the solitary haplotypes as well as the dominant haplotypes with their retinues of peripheral haplotypes were considered molecular operational taxonomic units (MOTUs). A total of 53 out of the 73 MOTUs included a reference, usually matching its solitary or dominant haplotype, and could thus be identified. Distribution of the metabarcodes over the sampling dates revealed clear seasonal patterning. The various species in cryptic species complexes generally were found in different or offset periods. Comparison of the phylogenetic results with those on commonly applied clustering revealed the following: the number of MOTUs depends on the similarity cut-off threshold. Too close to 100% and numerous fringe haplotypes within phylogenetically delineated MOTUs drop over the threshold into their own MOTUs, generating "Lots of Rare Biodiversity". Set it lower and phylogenetically closely related MOTUs collapse into single MOTUs. Unfortunately, there is no magic cut-off for clustering haplotypes into MOTUs at which results are anywhere near OK. A comparison with contextual LM data showed that the species commonly recognized in the LM data were also present in the contemporary metabarcode data.

Do we need the bourgeoisie? The deficiencies of a Marxist approach to diatom classification above the species level

David G. Mann

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I discuss aspects of formal diatom taxonomy above the species level: the classifications we have, how they were produced, and whether we should bother with them. From time to time, comprehensive hierarchical classifications of diatoms appear. Examples are Schütt and Karsten's classifications produced for early editions of Engler & Prantl's *Die natürlichen Pflanzenfamilien* and Simonsen's system of 1979; other older classifications are reviewed by Williams & Kociolek (in J. Seckbach & J.P. Kociolek (eds) *The Diatom World*. Springer, 2011). A new classification was outlined by Round et al. in *The diatoms* (Cambridge, 1990) and a variant of this has been adopted by NCBI for the GenBank database. A further modified version was constructed by Cox for the latest edition of the *Syllabus of Plant Families* (Part 2/1, ed. W. Frey, 2015). Lastly, a revised system of subdivisions, classes and subclasses has been included in the latest protist classification (S. Adl et al. 2019, J. Euk. Microbiol. 66:4–119). Putting to one side the question of whether any of these classifications actually reflect biological reality, we might ask what prompted them to be made? The answer in several cases seems to be mainly a desire for order, completeness and consistency. For Round et al, the classification was partly an afterthought, providing an overall framework in which similar diatoms were grouped together, rather than the alphabetical system that might have been better for the simple atlas originally envisaged; but it was also obligatory for the chapter that Round & Crawford contributed to the contemporaneous *Handbook of Protoctista* (ed. L. Margulis *et al.*: Jones & Bartlett, 1990). Likewise, the detailed classifications of diatoms in editions of the *Pflanzenfamilien* were required to complete a consistent treatment of all plant groups. I doubt that most of the orders, families, etc have served for much. The groupings most used are the highest – an aristocracy of 'centrics', 'pennates', 'raphids', etc – and the lowest – a proletariat of binomials. However, a 'bourgeoisie' of intermediate taxonomic levels seems increasingly necessary, e.g. to provide a framework for exploration of diversity and taxonomic revision at lower levels, and meaningful categories for metabarcoding. How can these be developed? Older classifications were produced by one or a few authors – (self-)appointed 'authorities' – working independently; there was no communal activity leading to consensus. Though this is perhaps why the classifications ever got done, a bourgeoisie of taxonomists (cf. The Legume Phylogeny Working Group) might do better.

Diatoms: from physiology to applications

Matteo Scarsini¹, Adrien Thurotte¹, Brigitte Moreau¹, Virginie Mimouni¹, Lionel Ulmann¹, Vandana Vinayak², Richard Gordon³, Hanhua Hu⁴, Justine Marchand¹ & Benoît Schoefs¹

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The increase in the world's population, as well as the reduction in agricultural lands and natural resources, have made the search for new types of resources mandatory. Among the different possibilities, the potential of photosynthetic microorganisms is one of the most promising because photosynthetic organisms are able to produce their own matter using photon energy and simple molecules, i.e. carbon dioxide and water. In this context, diatoms occupy a particular place because of their ability to synthesize unique compounds such as fucoxanthin and polyunsaturated fatty acids. All theoretical studies suggest that microalgae will be the next platform for the production of biomass and commercially interesting molecules such as carotenoids, lipids, bio(nano)materials, etc. However, most essays on industrial scaling have shown algae to be non-competitive when compared to traditional methods of production. This is mostly due to the biotechnological biomass processes that are destructive for the biomass leaving biological and organic wastes. An alternative to these destructive processes is to develop biocompatible extraction methods such as milking. In a milking process only a portion of molecules are extracted, leaving the cells alive. After the pool of extracted molecules has been regenerated, they can be extracted again after a replenishment period. Thus a milking process consists of repetitive extraction of compounds, each extraction being separated from the next one by a regeneration period. The research and development of milking processes is rather slow because of the lack of data concerning the regulation of the functioning of diatoms, especially carbon metabolism and its connexion with the other biochemical pathways generating compounds of interest. Another field in which much information is lacking is the management of the stress response. The presentation will start with a brief presentation of the interest in diatoms for biotechnology. Then milking alternatives will be presented. The presentation will end with the physiological challenges that could make diatom milking biotechnology successful.

This presentation will explain the steps to the creation of the IDEC, its evolution over the years, and will also expose our reflections on 10 years of diatom-based development, persuasion, and ongoing challenges.

Lectures

The most common *Gomphonema* in Central Europe is not a *Gomphonema*!

Nélida Abarca¹, Wolf-Henning Kusber¹, Oliver Skibbe¹, Jonas Zimmermann¹, Lina Anh Tu Van¹, Krisztina Buczkó^{2,3} & Regine Jahn¹

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By reinstating the genus name *Gomphonella* established by Rabenhorst in 1853, the nomenclatural and taxonomic enigma of the taxon known currently either under the name *Gomphonema olivaceum* in Europe or *Gomphoneis olivacea* in America is solved. In addition, the authorship of the epithet is clarified with the presentation of the type by Hornemann in 1810. Morphometric studies on eight populations from seven different water bodies and 21 unialgal strains support the establishment of two new species. Molecular data of unialgal strains and several environmental clones show that there is more diversity in the “*Gomphonella olivacea* clade” than can be identified morphologically. The molecular data place *Gomphonella* species into the Cymbellales but not into the Gomphonemataceae. Molecular data also reveal that *Gomphoneis tegelensis* R.Jahn & N.Abarca (Skibbe et al. 2018) has to be transferred into the genus *Gomphonella* (Jahn et al. in press).

References

- Hornemann, J.W. (1806-1810) Icones plantarum sponte nascentium in Regnis Daniae Norvegiae, et in Ducatibus Slesvici et Holsatiae ad illustrandum opus de iisdem plantis, Regio jussu exarandum, Florae Danicae nomine inscriptum. Hauniae, Typis E.A.H. Mölleri. 1810. vol. 8 (fasc. 22, 23, 24): pls. 1261-1440.
- Jahn, R. et al. (in press) Plant Ecology and Evolution.
- Rabenhorst, L. (1953) Die Süßwasser-Diatomaceen (Bacillarien) für Freunde der Mikroskopie. Eduard Kummer, Leipzig. 72 pp., 9 pls.
- Skibbe, O. et al. (2018) Diatom Research 32(2): 251-262.

Influence of the natural radioactivity on the diatom communities living in mineral springs

Aude Beauger¹, Fanny Millan¹, Elisabeth Allain¹, Olivier Voldoire¹, Carlos E. Wetzel², Luc Ector², Didier Miallier³ & Vincent Breton³

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Radioactivity is present all-around Earth and could have contributed to the development of life. Indeed, near the natural reactor of Oklo (Gabon), multicellular fossils were observed dating from 2.1 billions of years. Over the millennia, living organisms have evolved to manage the stress induced by ionizing radiation, but the evolutionary consequences of chronic exposure to natural radioactivity are not fully characterized.

Due to its geology, the Auvergne region is particularly famous for its numerous mineral springs. Because of Auvergne granitic substrate, some of these springs are significantly radioactive like for instance La Montagne spring, the second most radioactive in Europe after Jachymov spring in Czech Republic. Besides their medical or touristic interest, the radioactive mineral springs have received little attention regarding their biodiversity and particularly the diatom communities. To date, no study was done to evaluate how radioactivity influences these communities.

The emergence of La Montagne spring is located in a former bottling factory that is presently ruined. As a consequence, a large part of the emergence is drained outside the building. A first survey was conducted in 2018 in order to evaluate the physical and chemical parameters (ionic concentrations and radioactivity) and to investigate the diatom communities. SEM observations were also done on the diatom population of July to characterize the deformities.

Water physical and chemical parameters are very stable, displaying high level of radioactivity both in the water and in the sediments: around 4500 Bq of radon per liter of water were measured using a Germanium gamma spectrometer while 800 nSv/h of ambient gamma radiation was measured using a COLIBRI portable device in the building. There is one notable exception for the samples collected in May 2018 after heavy rains caused water dilution coming from the catchment that resulted in high nitrates concentrations.

Observed diatom diversity was low and dominated by *Planothidium frequentissimum* with *Humidophila perpusilla* inside the ruined building and by *Crenotia angustior* outside the building. An important part of the observed individuals presented teratological forms (inside: 79% in May, 25% in July and 29% in October; outside: 33% in May, 24% in July and 32% in October).

It seems that the natural radioactivity induced a restrictive environment on diatoms. In May, the inputs from the catchment induced higher nutrients concentrations and could explained the highest percentage of teratological forms. However, the percentage of phenotypic abnormalities seems to be around 25% during dry period.

A unique new naviculoid diatom genus from continental Antarctica

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The stepwise re-investigation of the diatom flora from the Antarctic region has challenged long held notions of cosmopolitanism, endemism and species distribution as they pertain to microorganisms. Specifically, the Maritime and sub-Antarctic regions possess both endemic and cosmopolitan taxa across a number of ecologies. These advances led to the combined effort to re-examine the non-marine diatom flora of the Antarctic Continent.

Using a fine-grained taxonomic approach, historic materials from the Vestfold Hills (East Antarctica) are currently being re-analyzed. This area features numerous lakes, ranging from freshwater holomictic to marine meromictic habitats. Using original materials from Roberts & McMinn (1999), it is clear that the Vestfold Hills harbor a unique diatom flora that is much more diverse than originally thought, featuring both cosmopolitan taxa and those endemic to the Antarctic region.

One of these taxa, *Navicula adminensis* D.Roberts & McMinn, was first described in 1999 from the Vestfold Hills, East Antarctica (Roberts & McMinn 1999). Detailed light and scanning electron microscopy observations have shown that based on its morphological features, the species does not belong to the genus *Navicula sensu stricto*. A morphological and taxonomical analysis, comparing the species to several genera such as *Adlafia*, *Kobayasiella*, *Envekadea*, *Stenoneis*, *Berkeleya*, *Climaconeis*, and *Parlibellus*, showed that the combination of morphological features was not met by any of the known genera. The species is characterized in having uniseriate, very fine striae composed of small, rounded areolae occluded externally by individual hymenes, a rather simple raphe structure with straight, short central endings and short terminal raphe fissures, a very shallow mantle and open girdle bands with double perforation. Based on the comparison analysis, the species will have to be placed in a new genus that is currently submitted for publication.

The present lecture discusses the unique morphology of the species, its taxonomic history, ecology and distribution in the Antarctic Region.

References

Roberts, D. & McMinn, A. (1999) *Bibliotheca Diatomologica* 44: 83 pp., 9 pls.

Forensic diatomology in Belgium

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The juxtaposition of the words “forensic” and “diatoms” usually evokes drowning studies, bone marrow extraction and lengthy time spend on a compound microscope. On this in particular, not much really changed. Really?

The work follows scientific and technical innovations though. Today, diatoms are still mostly used to support the legal doctors’ findings in death investigations, but other applications are finding their place, among other soil diatoms or studies about diatom retention in immersed textiles.

In our laboratory, the use of strong acids or hydrogen peroxide in glass labware is being replaced by microwave digestion systems, which will seriously decrease the risks for the operator. Scanning electron microscopes (SEM) is now in use for several years, allowing for the detection and identification of the smallest species or tiny fragments that were virtually invisible with light microscopes.

The laboratory is a founding member of *the Animal, Plant and Soil Traces* workgroup (APST), which federates numerous European forensic scientist and researchers in a wide range of disciplines, including diatomology. This platform allows widespread exchanges of knowledge and techniques among forensic laboratories, where before there was virtually nothing.

***Achnantheidium* (Bacillariophyceae) from southeastern Brazil**

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Achnantheidium Kützing presents the largest number of taxa in Achnanthidiaceae D.G.Mann, including more than 200 species, varieties and taxonomic forms. It is considered a monoraphid diatom genus due its heterovalvar frustule presenting one raphid and other araphid valve. It is also characterized by small cells with linear, lanceolate or elliptical valves, and a lateral view forming a deep V. In Brazil, the specific study of *Achnantheidium* is almost absent, however some species (14 taxa) are cited in diatoms surveys. Through the documentation of the taxa found in LM and SEM, taxonomic, quantitative and ecological analysis, this study aims to expand the knowledge about freshwater *Achnantheidium* species occurring in Brazilian waters. For that, a total of 222 samples, including phytoplanktonic, periphytic, and surface sediment materials from São Paulo state, southeastern Brazil, was investigated. The raw material was digested with concentrated H₂O₂ and HCl. The cleaned material was diluted with deionized water and mounted on permanent slides for LM analysis. For SEM, part of the oxidized material was filtered and washed with deionized water through a polycarbonate membrane filter (3µm). Filters were mounted on aluminium stubs, subsequently metallized with platinum. The optimum ecological analysis was performed in the R program for each taxa and habitat. It was based on the counting (relative abundance of each taxa) and the dataset of the ecological variables of each site. Currently, only twelve taxa of *Achnantheidium* were cited with some taxonomic information for the state of São Paulo. In our study, eight of them were observed again, but five different taxa were also found. From all, six are already known (*A. catenatum*, *A. minutissimum*, *A. saprophilum*, *A. sehuencoensis*, *A. sieminskae* and *A. tropicocatenatum*), five are probably new species, and two could not be identified. Regarding the occurrence of the taxa, *A. tropicocatenatum*, *A. minutissimum* and *Achnantheidium* sp. 1 were the species with wider distribution. Ten taxa had their ecological optimum analysed by occurring in more than 10% of the samples. *Achnantheidium catenatum* and other four species showed preferences for moderate enriched (TN optimum > 1000 µg L⁻¹ and TP optimum > 40 µg L⁻¹) and neutral to slightly alkaline (pH 6.9-7.9) waters. On the other hand, *A. sehuencoensis*, *A. sieminskae*, *A. tropicocatenatum* and *Achnantheidium* sp. 1 had preference for low availability of nutrients (TN optimum < 550 µg L⁻¹ and TP optimum < 27 µg L⁻¹) and slightly acidic to neutral (pH 6.6-6.9) waters.

The influence of environmental factors on the structure and diversity of terrestrial diatom communities

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Several studies have previously explored the use of soil diatoms as environmental markers in different applications, such as a soil bioindicator, a hydrological tracer or even a tool in forensic sciences. The first results of these applications showed real potential. However, the lack of knowledge on the ecology of soil diatoms stymied the exploitation of their full potential. Therefore, the aim of our research was to investigate which environmental variables play a key role in structuring soil diatom communities and how these communities change through time. We collected diatom and soil samples across the Attert River Basin (Luxembourg) every month for a period of 14 months, at 16 sites characterized by different combinations of geological, soil and land use features. In total, we identified around 300 different taxa comprising of 42 genera of which *Sellaphora*, *Pinnularia*, *Mayamaea*, *Nitzschia* and *Hantzschia* were the most important both in species richness (except *Hantzschia*, which included only five species) as in relative abundances. We identified habitat (land use), site and sampling month as significant factors in shaping the soil diatom communities – meaning that the changes in the diatom communities, due to seasonal effects, are small. However, we noticed a seasonal synchronism among sampling sites for some species. In addition, the less disturbed the sites are, the higher the species diversity is and thus the more unique the community is; each forested site could be distinguished based on the diatom community. We also derived indicator species for the different habitats such as *Chamaepinnularia obsoleta* (Hustedt) C.E.Wetzel & Ector, *Humidophila brekkaensis* (J.B.Petersen) R.L.Lowe et al. and *Nitzschia harderi* Hustedt exclusively occurring in undisturbed areas, while *Hantzschia abundans* Lange-Bertalot, *Hantzschia amphioxys* (Ehrenberg) Grunow and *Mayamaea atomus* (Kützing) Lange-Bertalot tend to dominate in disturbed areas. Furthermore, we identified pH, total organic carbon, aluminium, magnesium and iron as the most important chemical variables for structuring the diatom assemblages. To conclude, land use was identified as the main explanatory factor behind the differences in the diatom communities, which otherwise remain rather unchanged through time.

Holocene environmental and climate change in the southern Levant: diatom-based palaeolimnology of Lake Kinneret (Israel)

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The Eastern Mediterranean and especially the southern Levant are key regions for palaeoclimatological and palaeoenvironmental research due to their highly complex topography and climatic variability. Nevertheless, our knowledge and understanding of Holocene environmental variability and its possible drivers is still limited. To date, there has been surprisingly little Quaternary diatom research across the circum-Mediterranean and the southern Levant in particular.

This study aims to investigate and understand the potential of diatoms as palaeoenvironmental and palaeoclimate indicators in Eastern Mediterranean Quaternary research. Diatom death assemblages were analysed from modern sediment surface samples and, for palaeoenvironmental reconstruction, from an 18 m long sediment sequence recovered from Lake Kinneret (Israel) in 2010, covering the last 9,000 cal yrs BP. The resultant high-resolution diatom dataset, with a robust Holocene chronology, is unique in the southern Levant region. Two different methods for lake-level reconstruction are compared here. One was based on the simple calculation of a subfossil Plankton/Benthos-ratio (P/B-ratio) derived from habitat preferences; the other was based on a linear regression model derived from analysis of the modern dataset, which was applied in a second step to the subfossil dataset.

The palaeolimnological results confirm that diatoms provide a powerful tool for Holocene palaeoenvironmental and climatological reconstruction as part of multi-proxy analyses. The diatom data revealed changes in the lake level of Lake Kinneret for the past 9,000 cal yrs BP associated with regional climate variability. Both lake-level reconstructions draw similar conclusions for possible palaeoclimate variation during the Holocene. Nevertheless, the modelled lake-level curve appears to be more sensitive to minor fluctuations and fits most closely to the pattern inferred from palaeo-shoreline measurements around Lake Kinneret. Major changes in diatom-inferred lake level from Lake Kinneret correspond closely with hydro-climate records from the Dead Sea indicating that these were broadly regional but abrupt responses to climate throughout the Holocene. During the late Holocene, a pattern of increasing anthropogenic impact on the lake's ecosystem can be inferred from multi-proxy analysis, changing its trophic state from oligotrophic to meso-eutrophic at ca. 2,200 cal yrs BP.

Molecular and morphological investigation of species from the genus *Gomphonema* Ehrenberg in some water ecosystems of Russia

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The *Gomphonema* Ehrenberg species from freshwater ecosystems of Russia are poorly known. New data about *Gomphonema* species using molecular and morphological investigation will be shown. The aim of this study is taxonomical revision and documentation of species diversity of *Gomphonema* taxa from water ecosystems of Central Russia (Moscow region), Siberian waterbodies and Lake Baikal. During this investigation, 7 species are new for the science were found. We will discuss morphology and distribution of *Gomphonema makarovae* Lange-Bertalot, *G. distans* (Cleve-Euler) Lange-Bertalot & E.Reichardt, *G. subarcticum* Lange-Bertalot & E.Reichardt, *G. parvulus* (Lange-Bertalot & E.Reichardt) Lange-Bertalot & E.Reichardt, *G. duplipunctatum* Lange-Bertalot & E.Reichardt, *G. sphenovortex* Lange-Bertalot & E.Reichardt, *G. jergackianum* E.Reichardt 2009, *G. popovae* Levadnaja, *G. medioasiae* Metzeltin, Lange-Bertalot & Nergui 2009 and *G. demersum* E.Reichardt 2009. Molecular data received allow to us discuss phylogeny of some species.

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Diatom diversity in the R. North Macedonia – challenges and perspectives

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Republic of North Macedonia is a relatively small country with an area of 25,713 km². Despite the small size, the country is characterized by presence of high diversity of water or wet habitats such as springs (more than 1,100 large springs, including thermo-mineral springs), streams, rivers, natural lakes from glacial and tectonic origin (lakes Ohrid, Prespa, Dojran), as well as halomorphic soils, various types of bogs, fens, wetlands and reservoirs on altitude from 50 m to 2700 m above sea level. Such habitat variety supports high diatom diversity. Based on published and personal observations, currently the Diatom checklist of the R. of North Macedonia includes 1636 taxa that belong to 92 genera. From those, 152 taxa are considered as uncertain or unverified records, which might represent misidentifications or synonyms. To date, 1216 taxa has been recorded and illustrated, while 268 taxa remain to be confirmed. During recent observations (2016-2019), about 200 taxa have been observed but are not yet identified. Challenges in identification occur on generic level, especially species that shares morphological characters of two genera such as *Cyclotella* (Kützing) Brébisson vs *Pantocsekiella* K.T.Kiss & Ács, *Tertiarius* Håkansson & Khursevich vs *Lindavia* (F.Schütt) De Toni & Forti, and various *Navicula* sensu lato. Further, challenges are present for species level identifications, mostly within the genera: *Navicula* Bory sensu stricto (23 unidentified taxa), *Pinnularia* Ehrenberg (22 unidentified taxa), *Caloneis* Cleve (15 taxa), *Neidium* Pfitzer (14 taxa), including for identification of species from the small-sized genera such as *Fragilaria* Lyngbye (7 taxa) *Muelleria* (Frenguelli) Frenguelli (3 taxa) and *Odontidium* Kützing (3 taxa). Two additional challenges were encountered during the observations: (i) presence of fossil taxa in the modern samples such as *Cyclotella iris* Brun & Héribaud and various *Tertiarius* and *Stephanodiscus* Ehrenberg and (ii) treatment of extinct taxa from ecosystems with highly variable ecology. For instance, Lake Dojran during the late Glacial and 30 years ago was brackish lake, inhabited with many halophilous species, while recently the lake become freshwater and most of the previously recorded species disappear and are replaced by typical freshwater species.

A few remarks on the « anatomical » particularities in four Cymbellaceae of New Caledonia

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Delicata costei (R.Maillard) Krammer & Lange-Bertalot, *Cymbella bourrellyi* R.Maillard, *Cymbella latarea* R.Maillard and *Cymbella pernodensis* R.Maillard are endemic and show morphological originalities compared to the « *sensu stricto* » definition of their respective genus. *Delicata costei* has been described from LM internal view, and SEM observations have confirmed the generic LM diagnosis. However, the external view is singular. The valve face and the mantle are covered by longitudinal silicified ribs which obscure the striae whose the morphology is the predominant generic feature. The three species of *Cymbella* have apical pore fields and “stigmata”. However, they show some specificities compared to the classical species of *Cymbella*. *Cymbella bourrellyi* has marrow hyaline area on the valve face and the areolae are internally bordered by the small outgrowths. *Cymbella pernodensis* is distinguished by internal biseriate striae. *Cymbella latarea* is singular by internal biseriate apical pore fields. In the three *Cymbella* species, externally, the stigmata are in the strict continuity of the striae and appear as simple and poorly widening at the ends of the striae without changing structure. The three species are also characterized by a different number of areolae or pairs of pores externally and internally.

The epibiotic diatoms associated with loggerhead sea turtles in the Adriatic Sea

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In recent years, there is a growing scientific interest in epibiotic communities on sea turtles. A broad array of animals such as crustaceans, annelids, molluscs and macroalgae are known to thrive successfully as macro-epibionts on the sea turtle body surfaces. Together with these macroscopic organisms, sea turtles also host unique and diverse micro-epibiotic diatom communities composed of a large number of genera, several of which have been described as new to science in the past five years. Typical examples include the genera *Chelonicola*, *Medlinella* and *Poulinea*, known exclusively from the carapaces and skin of different marine turtle species (Majewska et al. 2015, Frankovich et al. 2016).

During a survey of the diatom flora associated with the carapaces of loggerhead sea turtles (*Caretta caretta*) from the Adriatic Sea, a fairly diverse diatom assemblage was observed composed of several *Diploneis*, *Fallacia* and *Amphora* taxa together with three unknown diatom taxa that initially could not be identified even on genus level. For at least two of them, further analysis revealed that they most likely represent new genera whereas a third one could be assigned to the genus *Catenula*.

A first unknown taxon belongs to the monoraphid diatoms based on the presence of both a raphe and rapheless valve. The rapheless valve is characterized by the presence of a large silica crest surrounding the entire valve and covering part of the valve margin. The striae consist of two large areolae, separated by a broad hyaline plate and covered externally by porous hymenes. The raphe is rather simple with bent terminal fissures and straight, simple central endings. Comparison with acnathoid genera such as *Scalariella*, *Kolbesia* and *Madinithidium* yielded both clear similarities but also distinct differences (Desrosiers et al. 2014, Riaux-Gobin et al. 2012). The second unknown taxon shows similarities to the members of the genera *Nitzschia*, *Rhopalodia* and *Psammodictyon* based on the presence of an eccentric raphe, distinct fibulae and a dorsiventral valve outline. Finally, the third taxon is most likely a new *Catenula* species, a small amphoroid genus with only marginal striae, a very simple raphe structure and non-perforated, narrow girdle bands.

These observations show the special nature of the epibiotic flora found on loggerheads and confirm our lack of taxonomic knowledge increasing the importance of the currently ongoing research investigating microepibiotic assemblages associated with sea turtles.

References

- Desrosiers, C. et al. (2014) Phycologia 53(6): 583-592.
- Frankovich, T. et al. (2016) Phytotaxa 272(2): 101-114.
- Majewska, R. et al. (2015) Phytotaxa 233(3): 236-250.

The *Planothidium pericavum/engelbrechtii* complex

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In 1966 John Carter described and illustrated *Achnanthes pericava* from the Tristan da Cunha Archipelago, a small island group located in the southern Atlantic Ocean. This species, transferred in 1999 by Lange-Bertalot to the genus *Planothidium*, is characterized by a rapheless valve lacking the typical spot of *P. lanceolatum* (sinus) or *P. frequentissimum* (cavum). The valves are elliptical-lanceolate with slightly protracted, broadly rounded apices. *Planothidium pericavum* forms important populations on several islands in the southern hemisphere but it also seems present in the northern hemisphere. Lange-Bertalot & Krammer (1989) illustrated the type of *A. pericava* and added several dubious conspecific populations from the Canary Islands, Chile and Catalonia. The ultrastructure of this species is unfortunately not known to date, which prevents to have a correct idea of the identity of *Planothidium pericavum*.

In order to disentangle the exact taxonomy of this species, populations of *P. pericavum* from Tristan da Cunha and Ile Amsterdam (southern Indian Ocean) as well as several European populations (Sicily, Flanders), identified as *P. pericavum*, were analyzed to determine their conspecificity with the typical population from Tristan da Cunha. As the species shows a clear resemblance to *Planothidium (Achnanthes) engelbrechtii*, described by Cholnoky in 1955 from South Africa, the type material of the latter was also investigated to compare it with the type of *P. pericavum*.

The poster presents the ultrastructure of the *P. pericavum* populations of the Tristan da Cunha Islands, Ile Amsterdam Island, Sicily and Flanders and the type of *P. engelbrechtii*. Each population is illustrated using light and detailed scanning electron microscopy. The similarities and differences between the different populations are highlighted.

Four new melosiroid diatom taxa recently described from the southern hemisphere

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During a survey of the limno-terrestrial diatom flora on several islands in the southern hemisphere, at least four unknown melosiroid diatom taxa were observed in several shaded, damp cave (moss and soil) samples. Three taxa were found in the sub-Antarctic region in the southern Indian Ocean (Heard Island, Iles Kerguelen, Iles Crozet) whereas a fourth taxon was recently described from Ascension Island in the Atlantic Ocean. Comparison with already known species from the genus *Melosira* and the recently described genera *Arcanodiscus*, *Angusticopula* and *Ferocia*, resulted in the description of three new taxa based on detailed light and scanning electron microscopy (Van de Vijver et al. 2019, Van de Vijver & Houk 2019). The analysis of the fourth taxon is still ongoing.

A first species was described as *Angusticopula rowlingiana* from Ascension Island. The species is characterized by a large number of narrow copulae in the girdle, a marginal ring of small granules, very small pores covering the entire valve face and the occasional presence of internal valves. The new species is compared with all *Angusticopula* species known worldwide and with several *Melosira* species showing a similar combination of characters.

Secondly, *Ferocia subantarctica* can be distinguished based on its numerous, narrow girdle bands, relatively weakly domed valves, a limited number of well-developed spines and a rather large, hyaline central area. The third species, *Arcanodiscus desmetianus* can be recognized based on its solitary frustules, a series of parallel ridges surrounding the mantle and a hyaline central area that is only less than 50% of the total valve diameter.

Finally, the fourth species shows more affinity with the genus *Melosira*. The girdle is composed of large, perforated copulae, a considerable number of rimoportulae, scattered on the valve face, short, acute spines, irregularly placed on the domed valve face and very small areolae. At present no similar *Melosira* taxa could be found making the description of this unknown *Melosira* as a new species highly likely.

References

Van de Vijver, B. et al. (2019) Phytotaxa 388(2): 155-160.

Van de Vijver, B. & Houk, V. (2019) Phytotaxa 394(1): 50-58.

Unmasking the smallest ones: a short revision of small celled 'sellaphoroid' diatoms from Europe

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A further step towards a taxonomic revision of very small-celled 'sellaphoroid' diatoms is presented. A detailed survey using light and scanning electron microscopy of 54 epilithic diatom samples from rivers, lakes, ponds and also soils from Europe (Bulgaria, France, Germany, Italy, Luxembourg and Switzerland), restricting our analysis to those specimens that would be classified in *Sellaphora saugerresii* (Desm.) C.E.Wetzel & D.G.Mann and *Sellaphora nigri* (De Not.) C.E.Wetzel & Ector (Wetzel et al. 2015) is shown. The identity and nomenclatural history of "well-known" established taxa as well as some recently described and/or rare species are discussed. All species showed to be important from an ecological point of view, since they were often dominant in the observed samples. About twenty well differentiated species are shown including six potentially new taxa. The limitations of conventional diatom taxonomy by light microscopy means via visual light microscopy comparison are demonstrated. This work should help standardize routine identifications and refine published DNA sequences assigned to some of these names as 'molecular barcode'.

References

Wetzel, C.E. et al. (2015) Fottea 15(2): 203-234.

What exactly is *Ulnaria acus* (*Synedra acus*) Kützing? The type specimens of *Synedra acus* Kützing, *Synedra arcus* Kützing, *Synedra vitrea* Kützing and a few more...

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Synedra acus Kützing usually refers to a ubiquitous freshwater species that, if all of its records are to be believed, is found almost everywhere given appropriate conditions. Now known as *Ulnaria acus* (Kützing) Aboal, in spite of its apparent ubiquity, it was only recently noted that a general understanding of the species was “largely inconsistent and actually too broad” (Lange-Bertalot & Ulrich 2014, p. 59). Lange-Bertalot & Ulrich proposed a narrower definition for *Synedra acus* based on their neotypification but crucial aspects of both its description and typification were not then available. In addition, to typifying Kützing’s *Synedra acus* it is necessary to take into consideration the similarly named species *Synedra arcus* as well as a number of other species in the genus *Synedra* that Kützing described and named: *Synedra vitrea*, *Synedra tenuis*, *Synedra splendens*, *Synedra mesocampa* and so on. These will all be examined here with LM and SEM using the type material found in BM.

Response of current and subfossil diatoms to metal-contaminated environments (South Poland)

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We studied the effects of over 40 years of Chechło River water pollution caused by discharge from a lead-zinc ore mine. The examined aquatic system (A.S.) included the river and a group of subsidence ponds. Some water contamination occurred during the period of metal mining, and some appeared after cessation of mining. Currently the river is slowly recovering to its natural conditions, and many channel and floodplain locations still preserve the sediments that accumulated before, during, and after the mining period. The aim of our investigations was to model the response of the A.S. to the reduction of mine water discharge into the river. The model predictions are based on reconstructed changes of diatom assemblages and on physical characteristics and chemistry of sediment stored in subsidence ponds. The diatom materials consist of present planktonic samples and eighteen subfossil cores. The CCA analysis and Monte Carlo permutation test were performed using multivariate statistics in CANOCO software. In the CCA analysis of the species-locality relationship, the first two principal components accounted for 44.5% (axis 1) and 16.4% (axis 2). The most important diatoms in the samples most polluted by copper were *Fragilaria rumpens*, *Planothidium lanceolatum*, and *P. frequentissimum*. The sediments heavily polluted by zinc and cadmium were rich in *Aulacoseira ambigua*, *Craticula buderi*, and *Pinnularia frequentis* valves. The examined aquatic system is characterized by high species richness (ca. 70 taxa per one sample). The material collected from the deepest part of the cores (representing the pre-mining period) show many taxa which were lost during the time of mining, when diatoms resistant to heavy metals appeared. Currently all the waters are inhabited by widespread diatoms which have broad tolerance ranges for heavy metals and other pollutants.

Our results contribute to efforts for identifying remediation in degraded areas where exploitation of metallic ores took place. In our conclusion we add a perspective on the potential use of diatoms to understand the mechanisms of past and future changes in aquatic environments.

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Posters

P20: Diatom from Majerda-River and Tunis Lagoon, Northern Tunisia

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Majerda-River is the only permanent river in Tunisia. It flows a long 350 Km from the west to the Mediterranean Sea at the gulf of Tunis. It provides either the drinking water for the major city as well as the freshwater for agriculture. In the gulf of Tunis, the sediment input is of mixed origin; continental-fluvial and marine (Khsiba et al. 2018). Tunis Lagoon is one of the wet eutrophic costal ecosystem and was an open bay since 190 kyr BP (Ben Mosbah et al. 2017) and now, it is separated from the Mediterranean Sea by a littoral sandy channel fed essentially by the Majerda-River (Ben Mosbah et al. 2017). In this eutrophic metasaline biotope, both marine and continental diatom are observed¹.

Our first work on Tunisian diatom, focus was only on quantitative analyses to define the autecology of living species and to use them as a tool for paleoenvironmental reconstructions. Here, we try to focus on qualitative aspect of both autochthonous and allochthonous species as well as the other microfossils to understand the relation between the two ecosystems and to distinguish the tolerance and the distribution of typical endemic species.

In particular, two diatom species kept our attention; *Cyclotella* sp. *ocellata* (diameter from 8 µm and 30 µm), was widely distributed in the Majerda-River but do not tolerate eutrophic environment and never been observed within the allochthonous assemblage in Tunis Lagoon.

Nitzschia longissima (Bréb.) Grunow, a typical marine species from lagoon of Tunis has a similitude with a rare big *Nitzschia* sp. (around L=280 µm, B=8 µm), observed in the Majerda-River but has lost its elongate apices. In prospective, a metabarcoding aspect would be useful to state the comparison between the two species and thus, the relation of the two ecosystems in the past.

References

Ben Mosbah, C.Z. et al. (2017) Quaternaire 28(4): 491-503.

Khsiba, S. et al. (2018) In: Kallel, A. et al. (eds) Recent Advances in Environmental Science from the Euro-Mediterranean and Surrounding Regions, 1685-1686.

P13: New observations on some sea turtle associated *Craspedostauros* species

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The diatom genus *Craspedostauros* E.J.Cox (Cox 1999) currently comprises eleven, predominantly marine species. *Craspedostauros* taxa have been recorded from various habitats including Antarctic saline lakes, Red Sea plankton and diverse marine benthic environments worldwide. Morphological characteristics of the genus include a stauros narrower than the fascia, cells constricted at the center in girdle view, multiple narrow double-perforated girdle bands, cribrate areolae with four to many pores, and two H-shaped chloroplasts. Recently, a new species *C. alatus* Majewska & Ashworth (Majewska et al. 2018) was described from carapace samples of carcasses of Kemp's ridley and green turtle, and a morphologically similar strain CCMP1120 was found in the UTEX culture collection isolated back in 1967 from the equatorial Pacific. During the survey of the diatom assemblages found on carapaces of sea turtles from the Adriatic Sea and Kosi Bay (eastern coast of South Africa) we observed several populations of four distinct *Craspedostauros* taxa. Specimens from the first population found on Adriatic loggerheads morphologically correspond to epizoic *C. alatus* in having the external wing-like structures near the valve apices and an elongated, weakly constricted rectelevatum. In addition, based on detailed SEM and LM observations of wild populations and cultivated strains we distinguish three new species, two of them from loggerhead carapaces and one found on leatherback-associated barnacles, *Platylepas coriacea*. The first unknown taxon has centrally constricted valves, irregularly shaped areolae with 2-6 cribrate pores, a rectelevatum with a central distinct silica knob and multiple rows of pores around the valve apex. The second loggerhead-associated taxon also possesses a central silica knob on a rectelevatum, but has square areolae with four cribrate pores and lip-like silica flaps covering the central raphe endings. The third taxon was found on epibiotic barnacles on leatherback turtles and possesses narrow linear valves and lacks the stauros resembling *C. paradoxa* Ashworth & Lobban – the first *Craspedostauros* with strongly reduced stauros. Our findings confirm that *Craspedostauros* taxa are not uncommon component of the sea turtle diatom flora. Currently, however, it is still uncertain whether these taxa prefer animal substrate or attach to the sea turtle carapace and barnacles opportunistically.

References

- Cox, E.J. (1999) European Journal of Phycology 34(2): 131-147.
 Majewska, R. et al. (2018) Diatom Research 33(2): 229-240.
 Ashworth, M.P. et al. (2016) Protist 168(1): 48-70.

P7: The genus *Eunotia* in Tierra del Fuego peatbogs (Argentina)

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Peatlands are worldwide considered being very vulnerable ecosystems and most studies in detail are restricted to the northern hemisphere. Their good functioning is crucial for the biotic communities that are often exclusively confined to these environments. Data on southern hemisphere peatlands are however scarce and apart from published data on the sub-Antarctic islands, Tasmania and New Zealand, almost nothing is known from the diatom flora in other southern hemisphere localities such as Patagonia, African mountain peatlands and the Falkland Islands/Islas Malvinas. Recently, a survey has started on the diatom flora from two peatbogs (Rancho Hambre and Andorra Valley) in Tierra del Fuego, Patagonia, Argentina. Tierra del Fuego is an archipelago off the southernmost tip of the South American mainland, across the Strait of Magellan. It encompasses a vast area of pristine peatlands, making up almost 95% of all peatbogs in Argentina. The pools and peatbogs in the sampled peatlands are characterized by low conductivity, low pH and low nutrient values. The vegetation is mainly dominated by *Sphagnum magellanicum*.

During the survey of the freshwater diatom flora of these Tierra del Fuego peatbogs, a diverse diatom flora was observed, composed of several *Eunotia*, *Brachysira* and *Pinnularia* taxa. A large number of *Eunotia* taxa was observed in the samples. Only eleven taxa could be assigned to previously described species whereas twelve others could not be identified using the currently available literature. Based on extensive analysis of light and scanning electron microscopy observations, and after comparison with *Eunotia* taxa worldwide, it is clear that these twelve taxa are new and will need to be properly described. Some of the taxa were also observed (and even described) from the nearby Falkland Islands/Islas Malvinas although almost no similarities were found with the sub-Antarctic region despite the presence of peatbogs and *Eunotia* in the region.

The poster illustrates and discusses several, probably new, *Eunotia* taxa using light and scanning electron microscopy observations and compares them to previously described taxa. The results confirm the high biodiversity of the Tierra del Fuego peatbogs.

P15: Morphological investigation of *Entomoneis paludosa* (W.Smith) Reimer (Bacillariophyta) including analysis of the type material of *Amphiprora paludosa* W.Smith

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Entomoneis paludosa (W.Smith) Reimer was originally described as *Amphiprora paludosa* W.Smith from fresh and slightly brackish waters near Lewes, Sussex, England. Fresh material of the species was collected from a ditch with high conductivity water at Pondersbridge, Cambridgeshire, England. Materials were studied in light and electron microscopy. Additionally alcohol/water mounted specimens were investigated in light microscopy to provide detailed images of the twisted frustules and the girdle bands which are difficult to study in specimens mounted in Naphrax. The valves are lanceolate, convex along the apical axis, with protracted, acute poles, and bear highly arched bilobate, flattened keels with a deep, central constriction. The striae are uniseriate on the valve and lower part of the keel and form a distinct undulate relief that sometimes bears many small warts. In the upper section of the keel, bearing the raphe canal, the relief is almost flat, striae are often biseriate and warts are few or absent. The areola openings are occluded. A distinct bulge is present at the transition between the valve and keel. Several twisted girdle bands are present with transapically elongate, occluded pore openings.

P9: Freshwater *Cocconeis* species (Bacillariophyceae) from southeastern Brazil

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Cocconeis Ehrenberg is a monoraphid genus included in the Family Cocconeidaceae. It is predominantly found in marine waters, receiving great attention nowadays with the description of several new taxa, and the re-examination of some type materials. Moreover, the genus is also common in freshwater, living attached to a substrate by the raphid valve. In Brazil, *Cocconeis* is mentioned in several diatom surveys and some ecologic studies, being usually represented by one or two taxa, but never receiving special attention. In this way, this study aims to increase the knowledge about freshwater *Cocconeis* species occurring in Brazil, specifically in the southeastern. In addition, we also illustrated *Cocconeis schroederi*, an old taxon described by Foged in Ghana, used here for comparison with one of the taxa found in Brazil. For that, seven samples were chosen from a total of 349 investigated for monoraphid diatoms in São Paulo state, Brazil, due their representativeness for *Cocconeis* biodiversity. These samples included periphytic, metaphytic and surface sediments materials. One sample from the Agnėby River, Ivory Coast, was also analysed. Plates were prepared illustrating the species in light (LM) and scanning electron microscopy (SEM), whenever possible. Permanent slides were observed in LM, and micrographs were taken in 1000X magnification. For SEM, filters with some oxidized material were mounted on aluminium stubs, and subsequently metallized with platinum. Scanning electron microscopy analysis was performed with a Hitachi SU–70, and micrographs were taken at 5 kV and 10 mm working distance. Ten taxa belonging to *Cocconeis* were observed in São Paulo environments. Four of them were illustrated in SEM, and six could not be found in this analysis due their low occurrence in the samples. Eight taxa were named (*Cocconeis euglypta*, *C. feuerbornii*, *C. fluvialis*, *C. lineata*, *C. neothumensis*, *C. neodiminuta*, *C. pseudothumensis* and *C. placentula* var. *acuta*), and two could not be identified, however *Cocconeis* sp. 1 is probably a new species. Furthermore, *Cocconeis schroederi* from Ivory Coast was illustrated here, and its morphology can be compared with the similar species *C. fluvialis*. In LM analysis, the species can be confounded, despite the latter presenting higher areolae density; however, in SEM they can be easily distinguished by the complex structure of the areolae. Therefore, LM and SEM analysis showed great importance in their combined use to better understand the variability of each species and to separate similar taxa.

P19: Benthic diatom communities as indicators of eutrophication in coastal lagoons

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Responses of microalgae to eutrophication have been investigated mainly in phytoplankton communities in lakes and marine waters, but changes in benthic diatom communities from shallow coastal lagoons have scarcely been investigated. This study was conducted in one of the biggest coastal lagoons in the Mediterranean Sea (Mar Menor lagoon, SE Spain) that has drastically changed to a eutrophic status from 2015 to 2017. Despite water subsequently becoming clear, benthic macrophytes have markedly disappeared, and effects on the microphytobenthic communities and their suitability as indicators of eutrophication are yet to be studied. The main aims of this study were to assess the responses of coastal benthic diatom communities to the eutrophication episode, test if their responses depend on seasonality (winter and summer) and search for potential indicator species. The benthic communities growing on artificial substrata for 20 days were collected in winter (February) and summer (July), before and after the eutrophic episode (2008 and 2018). Significant community differences were investigated using the PERMANOVA, SIMPER and biological indices. The IndVal analysis was used to detect characteristic indicator species. Our results indicated that eutrophication was related with significant community structure changes and increased species richness, and shifts were more pronounced in winter than in summer. Significant seasonal variation in community structure and greater species richness were found in summer. After the eutrophication episode, these seasonal patterns were less evident in structural terms, and species richness between both seasons was similar.

The structural shifts linked to the eutrophication episode were reflected in the communities dominated by species with high nutrient preference. The relative abundance of the species characteristic of natural communities declined (i.e. *Ardissonaea crystallina*, *Toxarium undulatum*, in winter or *Licmophora colosalis* and *Opephora krumbeinii*, in summer) after eutrophic conditions, while the presence of some new species of *Cyclotella* and *Halamphora*, and the proliferation of *Navicula* spp, resulted in increased species richness. The Indval analysis selected *Cyclotella* spp, *Halamphora* spp (in winter and summer) and *Navicula salinicola* and *N. abunda* (in summer) as indicator species of eutrophic conditions.

We conclude that benthic diatom communities may represent a suitable tool for biomonitoring eutrophication effects on shallow coastal systems, and seasonality should be considered in monitoring strategy designs.

P12: Two diatom species with an unusual biogeographical distribution observed in a middle-mountain lake in France

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During a survey of the diatom flora of Longemer Lake (Xonrupt-Longemer, Vosges, France), two species with an unusual biogeographical distribution were observed. *Psammothidium abundans* (Manguin) Bukhtiyarova & Round, previously considered being a sub-Antarctic endemic but nowadays also found in rivers in Sweden, Ireland and the UK was observed, along with *Achnantheidium sublineare* Van de Vijver, Jarlman & Ector, up to now confined to northern Europe. These are the first records of these rare diatom species in France (*A. sublineare*) and in a European lake (*P. abundans*). Since there are only a few illustrations of these rare species in the literature, both populations are illustrated using light and scanning electron microscopy. Details on their actual biogeographical distribution, characteristics of the lake, and other dominant diatom species observed are added.

P4: A short appraisal of some French populations of *Tabellaria* in water bodies in France

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The diatom genus *Tabellaria* Ehrenberg is one of the most widely distributed genera in freshwaters, both in benthos and phytoplankton. It is rather frequent in unpolluted, circumneutral to slightly acidic and poorly mineralized lakes, streams and peatbogs. Despite being studied intensively in the last decades, the taxonomy of this genus is still unsatisfactory as some authors recently proposed to consider most species as synonyms of *Tabellaria flocculosa* (Roth) Kützing. Populations from France of several *Tabellaria* species were studied and illustrated in LM and SEM, such as *T. flocculosa*, *T. fenestrata* (Lyngbye) Kützing and *T. ventricosa* Kützing. Additionally, the type material of *T. ventricosa* has been investigated and illustrated. Differentiation features for those species are also proposed.

P22: Relationship between diatoms in surface sedimentary DNA and lake water characteristics in North Eastern Siberia

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High Arctic lakes are particularly sensitive to climate change and variations in the ecosystems. Yet freshwater systems in the high Arctic are poorly investigated and understood. In this study, we performed a preliminary study on diatoms DNA preserved in lake surface sediment from thermokarst and glacial lakes of North Eastern Siberia. The samples were collected along with the treeline and follow the tundra-forest transect. We applied a short RuBisCO large subunit (*rbcL*) barcoding marker that targeted specifically on diatom DNA to investigate the diversity and their relationship with physical and chemical variables of the investigated lakes. After strict filtering of the raw sequences (15,092,046 reads), we obtained a final dataset that contained 10,681,274 reads and 163 verified diatom sequence types, where of 81% were identified at least to genus or lower taxonomic levels. The top two sequence types that occupied the highest read counts of total reads were assigned to the species *Staurosira elliptica* (15.12%) and *Aulacoseira subarctica* (10.11%). Glacial lakes such Illerney had a greater diatom dominance by Fraglariaceae (*Fragilaria construens* and *Staurosira elliptica*) over Aulacoseiraceae. Thermokarst derived lakes were dominant by both Fraglariaceae and Aulacoseiraceae. The ordination analysis suggested that dissolved organic carbon and hydrogen carbonate had the most significant influence on the diatom assemblages of all sampling locations. Hydrogen carbonate was the most significant variance to the diatom assemblages in thermokarst lakes; Conductivity was the most significant variable to the diatom assemblages in glacial lakes. Our study provides a preliminary investigation of modern diatom composition and their different driven environmental factors in North Eastern Siberia, which makes this area promising for further environmental monitoring and surveys on ancient sedimentary records.

P11: Investigations of the type materials of *Achnanthes parallela* J.R.Carter and *Achnanthes petersenii* Hustedt

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Achnanthes parallela J.R.Carter 1963 was described from Lindean, Scotland, a species widely distributed in lochs of the southern Scottish uplands. It is currently regarded as a synonym of *Achnanthes petersenii* Hustedt 1937, described from and abundant in a glacier outflow in Svalbard. Investigation of the type materials of both taxa in light and scanning electron microscopy revealed that they are distinct species, and that they can be distinguished in light microscopy. Both species differ most in the shape of the central area on the raphe valve. *Achnanthes parallela* has an elliptical, transapically elongate, somewhat irregular central area, bordered by 3-4 shortened striae of different length and made up of 1-4 areolae, sometimes some of the shortened striae are absent. In contrast *Achnanthes petersenii* has a wide rectangular fascia. There is also a difference in the shape of the axial and central areas on the rapheless valve. In *A. parallela* the axial area is narrow, linear and hardly widens towards a small round central area, while in *A. petersenii* the axial area is wider and widens towards a broad rhombic-lanceolate central area.

P6: Morphological investigations of *Eunotia bidentula* W.Smith and *Eunotia pachycephala* Kützing

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Eunotia bidentula W.Smith was described from Braemar, Scotland, and reported by him from other locations in Scotland, northern England and Ireland. Fresh material collected from upland areas in North Wales and Scotland was investigated in light and scanning electron microscopy. These populations and published images of specimens from the type slide suggest that *Eunotia bidentuloides* Foged is conspecific and represents smaller valves of *E. bidentula*. The dorsal margin has two prominent undulations which are broad in larger specimens, become narrower as valve size declines, and are acute in the smallest valves. In SEM the striae are interrupted by a small ridge at the dorsal and ventral margin, and the valve face drops of gradually towards the mantle, forming a small step with 2-4 areolae.

Eunotia pachycephala Kützing was investigated in light microscopy using a slide from the Kützing collection (BM) with specimens from Falaise, Normandy (France), from where the species was described, and compared to *Eunotia gallica* Lange-Bertalot & Witkowski.

P25: Diatom response to Holocene environmental change in NW Madagascar: first results from Lake Amparihibe

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Madagascar, the fourth-largest island in the world, is well known for its diverse, unique and regionally highly variable flora and fauna. However, high-resolution studies of environmental changes linked to Holocene climatic and anthropogenic impacts are still rare. The aim of this study is to evaluate the potential of Lake Amparihibe (NW Madagascar) for future paleoenvironmental studies using diatoms, combined with geochemical and physical parameters. Amparihibe is a small ~46.5 m deep maar lake situated on the off-shore island Nosy Be. Dissolved oxygen values at the water surface are about 7.9 mg/L (103%), while vertical water parameter measurements confirm anoxic bottom conditions. The lake is slightly alkaline (pH ~8.7), and temperature decreases with depth from 29.3 °C to 27.2 °C. Electrical conductivity is around 245 µS/cm and water transparency about 2.5 m. The sequence analyzed (167 cm) covers approx. the last 1450 years cal BP. Sediments consist of dark brownish to blackish, clayey to silty and partly laminated material. Overall, planktonic diatoms clearly dominate the low diversity assemblages. Concentration is highly variable with most samples having high concentrations (up to $60 \cdot 10^8$ valves g⁻¹ dry weight) and some others almost barren. In the lowermost part (~1400 cal BP) *Discostella* cf. *stelligera* is the most abundant taxon suggesting a lake system with a stable stratification. The section is followed by a period of very low diatom concentrations and poor preservation (~1400 to 1200 cal BP) which coincides with higher magnetic susceptibilities and high and very variable values of detrital elements such as Titanium identified by XRF scanning. This hints at high terrestrial input. Poor diatom preservation might have been promoted by higher pH. The uppermost part of the sequence (~1200 to 0 cal BP) is overall dominated by *Aulacoseira granulata* agg., which replaced *Discostella* cf. *stelligera*. This change suggests development from less stratified to more turbulent conditions. The arrival of humans on Nosy Be and their impact on lake systems by, for example, burning, may have played an additional role in causing pronounced changes. First results underline the high potential for paleoenvironmental investigations of Lake Amparihibe.

P17: Diatoms of Krka River, Croatia

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Krka River is a unique freshwater ecosystem situated in Dinaric karstic area of Croatia. Knowledge concerning diatom diversity, ecology and community associations especially of karstic environments in Croatia is still very scarce. Diversity of benthic diatom species from various habitats, both lotic and lentic, from springhead to the Krka River estuary was studied in September 2017. A total of 44 samples were collected and examined for taxonomic analyses using light and scanning electron microscopy. Altogether, 276 taxa (species, varieties and forms) from 69 genera were identified by traditional morphology analyses. Flora dominated by genera *Navicula* Bory *sensu stricto*, *Nitzschia* Hassall and *Gomphonema* Ehrenberg was observed. The most frequent species were *Navicula cryptotenella* Lange-Bertalot, *N. radiosa* Kützing, *Pantocsekiella ocellata* (Pantocsek) K.T.Kiss & Ács, *Encyonopsis minuta* Krammer & E.Reichardt, and *Achnantheidium minutissimum* (Kützing) Kützing. Species with unclear taxonomic status (*Reimeria* sp. aff. *uniseriata*, *Aneumastus* aff. *tusculus*, *Aneumastus* aff. *stroesei*, *Diploneis submarginestriata*) were also recorded together with *Gomphosphaenia plenkoviciae* Gligora Udovič & Žutinić, a newly described diatom species from Crveno jezero, Croatia. For molecular analyses, 38 samples were exposed using the universal eukaryotic primer pair for the hypervariable V9-region. When comparing morphological and genetic results of represented Operational Taxonomic Units (OTUs), the most frequent species were *Aulacoseira ambigua* (Grunow) Simonsen, *Cocconeis placentula* Ehrenberg, *Cymatopleura elliptica* (Brébisson) W.Smith, *Aulacoseira granulata* var. *angustissima* (O.Müller) Simonsen, *Staurosirella pinnata* (Ehrenberg) D.M.Williams & Round, and *Achnantheidium minutissimum* (Kützing) Kützing. These preliminary results of V9 region performed high number of OTUs for diatom species, but OTUs didn't show high resolution of overlap with traditional morphological-based identification. In order to obtain a better resolution, further research will include primers for the highly conserved *rbcl* gene.

P16: Involvement of transcription factors in the metabolic shift in the diatom *Phaeodactylum tricornutum*

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Since the industrial revolution of the 19th century, we observed a drastic increase of the wellness and a consequent increase in the population. This led to a growth in the commodities request, i.e. fuels and food supplements, with a consequent increase in resource exploitation, that in turn, resulted in a gradual depletion of natural resources, an increase in the prices in commercial market and a search for alternative sources. Among the different possibilities, microalgae are the most promising ones because, like green plants, they are photosynthetic. Thus, in the presence of light and nutrients they use the dissolved CO₂ to produce cellular components. Some of these organic molecules are of great interest to the active industries in the sector of energy, nutrition, cosmetics, health and well-being. The production methods nowadays employed highlights the high costs and destructive biomass processes. This is due to inadequate scientific knowledge of biological processes in microalgae. The diatom *Phaeodactylum tricornutum*, whose fully sequenced genome is available since 2008, has become one of the key organisms to study diatom biology thanks to its ability to grow easily under axenic conditions, the lack of size reduction after mitotic division, the high division rate allowing fast biomass accumulation, the known morphology and the feasibility of cryogenic preservation. Among all the molecules produced by diatoms, lipids, in particular triacylglycerols, are of a great industrial interest. Lipid accumulation in constitutes a default mechanism of carbon reorientation in diatoms facing stressing conditions for example nitrogen or carbon limitation that impact negatively biomass production. This metabolic reorientation involves cellular, biochemical and molecular components, including transcription factors. The aim of this work is to identify the transcription factors involved in the metabolic reorientation in order to create new microalgal strains in which the metabolism would be oriented toward the production of lipid without loss in cell replication. In order to identify the key transcription factors an interdisciplinary approach including bioinformatics, molecular biology and physiology was adopted:

- 1- The transcription factors of interest were selected *in silico* using the gene sequences already recognized as implicated in the lipid metabolism in certain land plants and microalgae and compared with the genome of *P. tricornutum*.

- 2- The change in the expression levels of the identified transcription factors were verified *in vivo* using *P. tricornutum* cultivated in highly controlled photobioreactor conditions. The diatom has been grown in nitrogen starvation condition monitoring environmental, physiological and biochemical parameters. RNAseq analysis has been carried on in order to analyse the relative abundance on the TFs messenger RNA.
- 3- The genes coding the identified transcription factors will be edited to create overexpressing, downregulating and knock out mutants. A large-scale screening of the transformants will be performed exploiting different techniques including Fourier Transform Infra-Red (FTIR) to select the interesting phenotypes.

P26: Effects of global warming on diatom succession in sensitive key regions: evidence from the Tibetan Plateau (Lake Nam Co)

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Paleoclimate and paleoecological studies from Lake Nam Co (4718 m a.s.l., ~2030 km²), located on the southern Tibetan Plateau (TP), hint at a continuous change in the diatom assemblage during the last five decades. In 2012 and 2013, sequential and integral sediment traps were installed in the lake to investigate the seasonal diatom succession. *Stephanodiscus medius* and planktonic *Fragilaria* cf. *tenuissima* dominated the diatom plankton in all trap samples. *Pantocsekiella ocellata*, the most abundant species during the last 4000 years, was detected with a maximum abundance of only 10.9%. The seasonal succession shows *Stephanodiscus medius* dominance in spring and autumn during thermal mixing phases, whereas planktonic *Fragilaria*-species were frequently found during the summer stagnation. Compared to the paleorecords, the development of diatoms differed considerably in 2012/2013. For this reason, the diatom development was analyzed in a multidisciplinary approach using a sediment short core, obtained in 2012.

Our results clearly document a gradual replacement in species dominance from *Pantocsekiella ocellata* to *Stephanodiscus medius* since the beginning of the 1960's. Simultaneously, the abundance of benthic diatoms decreased and planktonic *Fragilaria* cf. *tenuissima* became more frequent since the mid-1990's. Recent studies clearly demonstrate the impact of global warming on the TP, which is reflected in Lake Nam Co by rising lake levels and increasing water temperatures over the last decades. Higher water temperatures triggered earlier and longer summer stratification as well as a shortening of lake ice cover, which is in good agreement with higher occurrences of *Stephanodiscus medius* und planktonic *Fragilaria*-species. Additionally, despite the very low population density on the TP, increasing P and N contents in sediments already indicate signs of anthropogenic influence on Nam Co, possibly caused by atmospheric input originating from South Asia.

P5: Tropical African diatoms from the *Eunotia asterionelloides* species complex

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Given the geographic scale and diversity of the African continent, very little is known of the diatom flora. Tropical Africa in particular remains under investigated for a variety of reasons including difficulty of access and personal safety. Samples were collected in the Democratic Republic of the Congo (fish ponds in the vicinity of Kisangani) and in the Republic of the Congo (= Congo-Brazzaville) (forest lakes), and the diatom species present documented. During these investigations two taxa belonging to the *Eunotia asterionelloides* Hustedt complex were observed. The first taxon from artificial fish ponds in the Democratic Republic of the Congo is probably morphologically most closely related to *Eunotia tukanorum* C.E.Wetzel & D.C.Bicudo, described from Brazil. The structure of the valve outline and raphe appear similar, particularly the raphe position and length (short, mostly on the mantle, rarely extending onto the valve face). A second species was found in forest pools in the Republic of the Congo. This taxon bears a resemblance to *Eunotia zasuminensis* (Cabejszekówna) Körner, described from Eastern-Europe. Although similar in valve outline, the taxon from the Republic of the Congo differs morphologically in several ways. The shape of apex is indented to a larger degree than *E. zasuminensis*, and the raphe differs in its structure, in particular the shape of the terminal endings. The structure and position of the rimoportula also differ. Perhaps the most striking difference compared to all other taxa in this group is that the species from the Republic of Congo is strongly flexed or twisted around the apical axis, this twisting of the cell is easily observed and, in most cases, very pronounced reaching almost 90° in some cells. We thus conclude, based on these morphological characteristics, that this taxon may be as yet undescribed and not known to science.

P2: *Aulacoseira* species from paleo-lakes of the Baikal Rift Zone, RussiaMarina Usoltseva¹ & Lubov Titova¹

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The Miocene diatom flora of the Baikal Rift Zone is known from deposits in the Tunka hollow (Tscheremissinova 1973, Popova et al. 1989, Lupikina & Khursevich 1991, Khursevich 1994, Likhoshway et al. 1997), the Vitim Plateau (Endrikhinsky & Tscheremissinova 1970, Khursevich & Chernyaeva 1994, Khursevich et al. 2004, Chernyaeva et al. 2007, Rasskazov et al. 2007, Usoltseva et al. 2008, 2010) and from the bottom sediments of ancient Lake Baikal (Khursevich et al. 2006, Kuzmin et al. 2009). Diatoms from Barguzin rift valley were not studied early. The aim of this study was to study *Aulacoseira* species from paleo-waterbodies of the Baikal Rift Zone and describe new species.

Cores № 532 and № 531 were obtained in 2012 from Barguzin rift valley. The cores are 222.5 and 124.3 m in long, respectively. It was two paleo-lakes. The first lake is characterized by the development of Middle – Late Miocene planktonic species. The second lake is identified due to Early Pliocene species.

Eight *Aulacoseira* species were in the cores. These were the species currently existing – *A. distans* (Ehrenberg) Simonsen, *A. italica* (Ehrenberg) Simonsen, *A. islandica* (O.Müller) Simonsen, extinct species - *A. canadensis* (Hustedt) Simonsen, *A. spiralis* (Ehrenberg) Houk & Klee, species with an undefined taxonomic status of *Aulacoseira* sp. 3 and *Aulacoseira* sp. 4, and two new species. Below we offer a brief description of two new species.

Aulacoseira parva Usoltseva & L.Titova was detected in amount of up to 25.9 million valves per gram in the depth interval 112.5-110 m. Frustules form straight filamentous chains. Valves are cylindrical, 4.4-11 µm in diameter and 2-3.7 µm height. Areolae absent on the entire valve face, on the mantle rounded, situated in straight rows, 24-25 in 10 µm. Connecting spines are triangular with a notch in the middle. The collar is narrow, thin-ribbed at the edge.

Aulacoseira capitata Usoltseva & L.Titova was detected in 95-94 m in amount of up to 85.7 million valves per gram, which was 98 % of the total number of valves in the sample.

Frustules form straight and curved filamentous chains. Valves have elliptical valve face, 13-20 µm in diameter and 7-6.5 µm height. Areolae absent on the entire valve face. Areolae on the mantle are circle, situated in straight rows, 10 in 10 µm. All valves are connected by wide rectangular spines. The collar is narrow, thin-ribbed at the edge. Valve walls are very thick. Ringleiste is deep. 6-10 rimoportulae are located near the ringleiste. Elliptic valves of *A. capitata* are similar by valve form to *A. elliptica* Tsoy emend. Usoltseva & Tsoy found in the Early Miocene sediments of Russian Far East, Japan and in the Miocene – Pliocene sediments of Oregon, USA (Usoltseva & Tsoy 2010), but differ by rimoportulae and connecting spines. Probably, these two new species are older all presently known species from sediments of the Baikal Rift Zone.

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P10: *Psammothidium manguinii*: from one to six...

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Psammothidium manguinii is a common constituent of the limno-terrestrial diatom flora of the Antarctic Region with records ranging from the Maritime Antarctic region in the southern Atlantic Ocean to the belt of sub-Antarctic islands in the entire Southern Ocean. The species shows a broad variability in several morphological and morphometrical features such as valve outline, valve width, striation pattern and length/width ratio.

Psammothidium manguinii was originally described as *Achnanthes manguinii* in 1952 by Hustedt from several samples collected on Iles Kerguelen, the largest sub-Antarctic archipelago in the southern Indian Ocean. Two years later, Manguin (in Bourrelly & Manguin 1954) separated the more elliptical forms as *A. manguinii* var. *elliptica*. The material of the latter taxon, however, contained two morphologically distinct taxa with only one being similar to the original drawings.

The present poster shows the morphological analysis of the type material of both *A. manguinii* (Hustedt material) and *A. manguinii* var. *elliptica* (Manguin material) together with an analysis of a large number of *P. manguinii* populations from the sub-Antarctic Region (with samples from all major islands in the southern Atlantic, Indian and Pacific Ocean).

The results led to a clear morphological revision of the species. The original variety *elliptica* was split off the nominate form as *P. ellipticomanguinii*. Four new species are described, *P. acutomanguinii*, *P. antarcticum*, *P. mannensianum* and *P. hodgsonii* Van de Vijver & Verleyen. The morphology, ecology and distribution of all species are discussed.

Psammothidium antarcticum is the most widespread of all six in the *manguinii*-group and found in both the Maritime Antarctic and sub-Antarctic region. On the other hand, *P. mannensianum* (Campbell island) and *P. hodgsonii* (Macquarie Island) are restricted to only one island in the southern Pacific Ocean.

P23: Reconstructing paleo-landscapes for archaeological investigation using diatoms

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Diatoms are sensitive to many environmental variables such as salinity, pH, moisture conditions, organic and inorganic nutrients (e.g. carbon, phosphorus, and nitrogen). Although the degree of fossilization of the siliceous cell wall of diatoms is affected by a number of biochemical and physical factors, in general the valves of diatoms are well preserved in older soil layers. The species composition of the diatom flora in those layers can give a detailed image of paleo-landscapes, and is therefore a valuable tool in reconstructing paleoecological changes in wetland areas.

In recent years in the Netherlands, diatoms are more frequently used in archaeological investigation in order to reconstruct former landscapes. Insight of landscapes and its changes provide valuable keys in understanding the use of former landscapes by man and the anthropogenic influences on the environment. Knowledge of land use can also be helpful for the estimation of potentially valuable archaeological sites.

This poster explains how the analysis of the species composition of diatoms are combined with the results of other archaeological proxies in order to reconstruct former landscapes.

P14: Morphological variation within the *Placoneis elginensis* (W.Gregory) E.J.Cox species complex

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Freshwater diatom species *Placoneis elginensis* (W.Gregory) E.J.Cox was originally described in 1856 as *Pinnularia elginensis* W.Gregory. Because it is often confused with other species, its distribution requires closer investigation. The *Placoneis elginensis* species complex includes taxa with elliptic-lanceolate to linear-lanceolate valve shapes and capitate to rostrate apices. At present, six taxa are known from this complex: *P. elginensis*, *P. paraelginensis* Lange-Bertalot, *P. abiskoensis* (Hustedt) Lange-Bertalot & Metzeltin, *P. ignorata* (Schimanski) Lange-Bertalot, *P. rostrata* (Ant.Mayer) E.J.Cox and *P. undulata* (Østrup) Lange-Bertalot. Most of these taxa are widely distributed and rarely found in high numbers. They can occur in habitats with different environmental conditions, but mostly, they prefer mesotrophic to eutrophic waters with medium electrolyte content. During observations of different habitats (lakes, ponds, streams, wetlands, peat bogs) throughout North Macedonia seven species were recorded. In Taor canal (near the city of Skopje), on mud, one new species from this complex was observed. It is characterized by elliptic-lanceolate valves with distinctly capitate apices, broad central area and distantly spaced striae (10–12 in 10 µm). All seven species are illustrated with LM and SEM and their morphological features are compared. Additionally, shape analyses of all species have been performed using software DiaOutline. For visualization and statistical evaluations, Principal Component Analyses (PCA), and Linear Discriminant Analyses (LDA) were used. Results showed that all analyzed species are significantly different with respect to the valve shape. Important separating features for the identification of species from this complex include valve shape, valve margin, shape of the valve apices and stria density.

P3: Two new *Punctastriata* (Bacillariophyta) species from Alpine French lakes

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Two new diatom species belonging to the genus *Punctastriata* D.M.Williams & Round are described from Lake Annecy and the Lake Entonnoir (Eastern France). Both species possess the features that allows them to be included into the genus *Punctastriata*: multiseriate striae (production of viminules), vimines slender and short, lack of rimoportulae, presence of a single reduced apical pore field, valvocopula entire, open and fimbriate and copula entire and open. *Punctastriata* sp. nov. 1 from Lake Annecy has widely elliptical, slightly heteropolar valves, with rounded apices; lanceolate wide central sternum, and radiate striae. Relatively long and irregularly bifurcated spines are located on the virgae and allow the formation of short colonies (up to four cells observed). The epicingulum consists of three to four elements: a wide, open valvocopula and two to three narrower copulae. The main distinguishing features visible in light microscopy when compared to other know elliptical species in the genus are the larger cells sizes and wide sternum. *Punctastriata* sp. nov. 2 from Lake Entonnoir is similar in light microscopy to *Staurosirella mutabilis* (W.Smith) E.Morales & Van de Vijver and to '*Staurosirella pinnata* (Ehrenberg) sensu auct. nonnull'. The cells are widely elliptical, with rounded apices with a straight lanceolate central sternum and radiate striae. Relatively long and strongly silicified spatulated spines are located on the virgae allowing the formation of long colonies. The epicingulum consists of three to four elements: a wide, open valvocopula and two to three narrower copulae. New illustrations from the type material of *Punctastriata lancettula* (Schumann) P.B.Hamilton & Siver from the original material are presented as well. A short revision of the main characters of the seven species up to date included in the genus *Punctastriata* are discussed along with discussion on similarities of both new species with other recently described 'small araphid' species.

P8: *Cocconeis rouxii* Héribaud & Brun a forgotten common benthic diatom species from the Massif Central, France

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Cocconeis rouxii was described by J. Héribaud & J. Brun from samples collected in mountainous freshwater sources in the Auvergne region, France. The species has been treated as a variety under *Cocconeis placentula* by several diatomists since late 19th Century and its identity is somewhat obscure in the literature, despite being abundant in several samples from the Massif Central (France). Some inconclusive attempts to investigate the original gatherings during the 80's, and the exclusion of the taxon in major floristic works led to the almost complete abandon of the name. The original material was investigated by Holmes et al. (1982), but their examinations of material gathered by Héribaud from Saint-Saturnin and deposited in the British Museum (Natural History) were far inconclusive because the diatoms in this sample were badly eroded. While observing samples from freshwater sources in the Auvergne region we have found a common freshwater *Cocconeis* that we have initially identify as an unknown species, until a deeper search in the literature led us to the name *Cocconeis rouxii*. The species has not been included in the recent floristic works on freshwater diatoms from Europe, but our own observations have confirmed the species frequently (sometimes dominant) present in samples from France, namely the former Limousin and Auvergne regions, but also in parts of Bourgogne, Languedoc-Roussillon, Midi-Pyrénées and Rhône-Alpes regions. Most of these regions are somewhat located on the Massif Central, showing that the species seems to be restricted to this type of geological formation. So far, we could not find in the literature images that would correspond to *C. rouxii* except from the original drawings made by Héribaud himself in 1893. We here provide detailed light and scanning electron microscopy of one population found in the spring Bernadette, located nearby its type locality. The species seems to be quite common in several regions of France with metamorphic geological properties (i.e. crystalline rocks). A detailed historical bibliographic revision is provided as well.

References

Holmes, R.W. et al. (1982) *Phycologia* 21(3): 370-381.

P1: Intraspecific morphological variation in *Cyclotella cavitata* from Lake Ohrid

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Lake Ohrid (Macedonia/Albania) is considered as the oldest European lake, with an estimated age of ~ 2–10 Ma. Numerous taxonomic and evolutionary studies have demonstrated its extraordinary biodiversity, with high levels of endemism and relictiness. However, the origin and age of the lake and its species remained open questions for more than 100 years of research. Within the frames of the project "Scientific Collaboration on Past Speciation Conditions in Lake Ohrid (SCOPSCO)", a deep drilling was performed in the central basin of the lake (DEEP site), and 584 m long sediment sequence was recovered, which covers the large portion of limnological history of the lake. Diatom analyses of selected samples throughout the entire DEEP site sediment succession show presence of high species richness, with around 200 endemic and relict taxa. Among those the extinct species, *Cyclotella cavitata* was found to dominate the diatom assemblages throughout the largest part of the sequence. According to the observations, *C. cavitata* appears for the first time in the sediment record at around 960 ka ago (ca. 340 m core depth). The last occurrence was recorded at around 225 ka (ca. 100 m core depth). This species is characterized with high intraspecific morphological variability, with more than 15 different morphotypes observed across its biostratigraphic range. Variations are noted in its: valve shape and size (from circular, elliptic to rhombic); central area size ($\frac{2}{3} - \frac{1}{8}$ of valve diameter) and ornamentation (tangentially undulated, colliculate, with or without papillae on elevated side, with or without depressions on depressed side). Also, striae can be biseriate to triseriate or multiseriate, their density varies from 11–18 in 10 μm . We consider that this high intraspecific morphological variability can be related to some environmental and/or climate change, its nature and exact causes remain to be explored in future research.

P24: PhD project: Application of diatoms (Bacillariophyta) as paleo-limnological proxies for estimation of past salinity changes in selected lakes in Ethiopia

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Due to its unique tropical mountainous topography and diverse geological formations, Ethiopia is home to a number of biologically productive and unique inland water bodies: freshwater lakes, saline-alkaline lakes, rivers, wetlands and marshes. The water bodies play an important role in the cultural and socio-economic activities of the riparian communities. Nevertheless, studies since the 1960's indicated many of the lakes have been threatened by human activities and climate change in which they have shown remarkable changes over the last half century or so. In particular, some lakes along the Ethiopian Rift Valley exhibited sharp increase and decrease in salinity/conductivity. Apart from some paleo-reconstruction of salinity in Lake Abijata, there are little studies conducted on paleo-limnological environment of lakes in Ethiopia. Such inadequacy of information on the trends of lake salinity over longer period in the past makes it difficult to establish relationship between such changes and known anthropogenic disturbances and/or long-term climatic trend as well as specific climatic episodes. This PhD research project is proposed to first establish countrywide diatom floristic list based on updated taxonomy. It also aims to establish Ethiopian diatom-environmental variables training set for a transfer function. Lake sedimentation rate and change in salinity over the past 200 years will be determined with ²¹⁰Pb-dating and reconstruction from transfer function from short lake sediment cores respectively. A preliminary floristic sampling of diatoms from 7 lakes in Ethiopia yielded in 147 species in 50 genera. In this poster, micrographs from SEM and LM of representative taxa have been presented as highlights. A number of taxa require further observation for complete species determination.

P18: Colonizers of new substrates in Antarctic marine waters - results from a short-term experiment at the South Bay, Livingston Island

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Diatoms are known to be among the first colonizers of newly exposed substrates, often preconditioning the substrates for further development of other organisms. In the Antarctic, although some studies addressed the colonization (and succession) of marine benthic algae (e.g. Campana et al. 2018), no real data exist on the development of marine benthic diatom communities on newly exposed substrates. A short-term diatom colonization experiment was carried out during November-December 2018 at two contrasting sites of the South Bay, Livingston Island, the South Shetland Islands: (1) Johnson's Dock (JD), which is a coastal inlet with increased sedimentation rate and receiving glacier melt-water, and (2) the "Mongolian port" (MP) - a small open bay, not influenced by glacier melt-water during summer. Panes with roughened Plexiglass® tiles as new substrate were anchored at each site and kept afloat at the same depth under sea level. Samples from the tiles (3 tiles per sample) were taken on a regular basis (weather permitting, usually 3-7 days), together with measurements of basic environmental parameters (Secchi depth, salinity, conductivity, total P, PO₄-P, NO₂-N, SiO₂). Samples from natural epilithon at each site were also obtained.

The poster presents the results from the early stages of the diatom colonization experiment. The colonization and growth of diatom communities on newly exposed substrates in the Antarctic marine waters was relatively fast, with a visible bio-film developed at both sites on days 12-14. The diatom growth rate seemed to be higher at JD (5.6×10^5 valves per cm² on day 7 and 636.3×10^5 on day 14 vs. 3.4×10^5 on day 7 and 198.5×10^5 on day 12 at MP). The early diatom communities on the tiles at site JD were dominated by the sea-ice diatoms *Navicula glaciei* Van Heurck, followed by *N. aff. perminuta* Grunow, whereas *N. aff. perminuta* was a clear dominant in the developing communities at site MP. The latter species was also observed in great numbers in the natural epilithon at both sites. *N. glaciei*, although present in the natural epilithon, was not found as a dominating species in natural samples. Our observations suggest that "sea-ice diatom" *N. aff. perminuta* is an important constituent of the Antarctic marine phytobenthos, whereas *N. glaciei* could also be associated with substrates influenced by glacier melt-water inflow in summer.

References

Campana, G.L. et al. (2018) Polar Biology 41(2): 377-396.

P21: German Barcode of Life ² (GBOL²) – Diatom eDNA metabarcoding in the context of the EU Water Framework Directive (EU WFD)

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The GBOL²-Project, funded by the German Federal Ministry of Education and Research is the second project phase of GBOL running from 2016-2019. It focuses on the extension of DNA barcode reference libraries to integrate the genetic diversity of animals, fungi, algae and plants in Germany. GBOL is a national network of various natural history museums and other biodiversity research institutions. One of the project parts located at the Botanic Garden and Botanical Museum, Freie Universität Berlin, is focussing on compiling a diatom DNA barcode reference library, aiming to obtain DNA barcodes of the 400 most important indicator species of the 1700 diatom species expected to live in German limnic waters. For all processed taxa the DNA barcodes and all correlated information will be made available in publicly accessible DNA barcode reference databases. The DNA stocks will be deposited in the BGBM DNA Bank (GGBN) connected to taxonomically validated voucher specimens deposited at Herbarium Berolinense (B) following specific standardised procedures.

Up to now one thousand clonal strains belonging to 50 genera and 250 species have been established, harvested and processed. DNA has been extracted from all these taxa and for more than 95% of those 1000 strains both of the target barcode regions (18S V4 rDNA and *rbcl*) have been sequenced. The morphology of each strain has been documented with light microscopy and scanning electron microscopy images. This barcode reference library uses the EDIT platform for cybertaxonomy, providing the opportunity to assign environmental sequences gained from eDNA metabarcoding. Additionally a fully automated, modular platform for eDNA metabarcoding data evaluation (<https://github.com/sproft/MetBaN>) has been developed. This project shows a best practice use case for documenting and displaying barcode reference libraries, environmental and eDNA data. This will contribute in the development of a sequenced-based time and cost-efficient method to analyse diatom community composition in environmental samples via eDNA metabarcoding for water quality assessments and biomonitoring. In addition, all samples and vouchers will be made available through the GGBN Data Portal (<http://www.ggbn.org>).

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