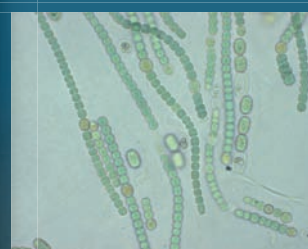
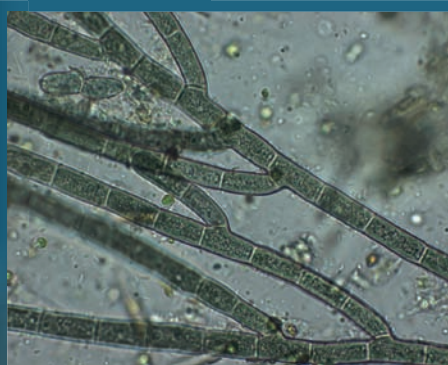


8<sup>th</sup> International Symposium

# Use of Algae for Monitoring Rivers

19<sup>th</sup> - 22<sup>nd</sup> June 2012



**UAMRIVER 2012**  
Alcalá de Henares  
Madrid

## Program and Abstracts



# Index

.....

Welcome .....5

Committees .....6

Program .....7

General Information.....10

Plenary Sessions ..... 11

Oral presentations ..... 17

Poster Session .....41

Author list .....59

Participant list .....63



# Welcome

---

The organizing committee welcomes all participants to the 8th International Symposium “Use of Algae for Monitoring Rivers” which will take place in Alcalá de Henares (Madrid) from 19 -22 June 2012.

Since the pioneering European Symposium in 1991 in Düsseldorf, algae have become relevant organisms in monitoring programs of surface waters status in Europe but also in many countries around the world. The Madrid symposium will give the opportunity to share all the advances in the field since we last met in Luxembourg three years ago. In a friendly setting, we shall be able to discuss which challenges we need to face in order to make a significant progress towards the full implementation of the European Water Framework Directive; the experience of participants from countries other than Europeans will contribute in a decisive way and enrich such discussions.

The symposium will be held in Alcalá de Henares, a historical and lively city located close to Madrid. Alcalá is the birthplace of Miguel de Cervantes, the writer who created Don Quixote de la Mancha. The city is also home of one of Europe’s oldest universities (founded in 1499) and one of the earliest examples of a planned-university town. Both Alcalá and its university were declared in 1998 a UNESCO World Heritage Site. The venue of the symposium will be the university’s ancient assembly hall, Colegio de San Ildefonso, host of the most important Spanish literary award ceremony, the Cervantes Prize. Alcalá with its university is a place for science and knowledge but also a place to enjoy its historic and cultural heritage as well as its tasty food and wine!

Looking forward to meeting you in Alcalá de Henares!

**The Organizing Committee of UAMRIVER 2012**

# Committees

---

## Organizing Committee

**Prof. Dr. Pilar Mateo Ortega**

Universidad Autónoma de Madrid, Spain

**Dr. Francisca Fernández Piñas**

Universidad Autónoma de Madrid, Spain

**Dr. Elvira Perona Urizar**

Universidad Autónoma de Madrid, Spain

**Prof. Dr. Roberto Rosal García**

Universidad de Alcalá- Institute IMDEA Water, Spain

**Dr. Eloy García Calvo**

Universidad de Alcalá- Institute IMDEA Water, Spain

**Prof. Dr. Sergi Sabater Cortés**

Universitat de Girona and Catalan Institute for Water Research, Spain

## Scientific Committee

**Prof. Dr. Brian Whitton**

Durham University, United Kingdom

**Prof. Dr. Éva Ács**

Hungarian Academy of Sciences, Hungary

**Prof. Dr. Keve Kiss**

Hungarian Academy of Sciences, Hungary

**Prof. Dr. Eugen Rott**

University of Innsbruck, Austria

**Dr. Marco Cantonati**

Museo delle Scienze Trento, Italy

**Prof. Dr. Marina Aboal**

Universidad de Murcia, Spain

**Dr. Concepción Durán**

Confederación Hidrográfica del Ebro, Spain

**Prof. Dr. Pilar Mateo Ortega**

Universidad Autónoma de Madrid, Spain

**Dr. Francisca Fernández Piñas**

Universidad Autónoma de Madrid, Spain

**Dr. Elvira Perona Urizar**

Universidad Autónoma de Madrid, Spain

**Prof. Dr. Roberto Rosal García**

Universidad de Alcalá- Institute IMDEA Water, Spain

**Prof. Dr. Sergi Sabater Cortés**

Universitat de Girona and Catalan Institute for Water Research, Spain

# Program

## Tuesday, June 19

16.00-19.30	<b>Registration</b>
18.00-19.00	<b>Visit to the Symposium Venue-‘Colegio de San Ildefonso’</b>
19.30-21.00	<b>Welcome reception</b>

## Wednesday, June 20

08.00-09.00	<b>Registration</b>
09.00-10.00	<b>Symposium opening &amp; Plenary Session</b> <i>Javier Ruza Rodríguez, Control and Monitoring of Water Quality Department. Spanish Minister of Agriculture, Foods and Environment, Spain</i> <i>Use of algae in the official monitoring programmes for the classification of the ecological status of water bodies in Spain</i>
10.00-11.00	Oral presentations <b>Session 1. Implementation of the European Water Framework Directive</b> <i>Chaired by K. Kiss &amp; É. Ács</i>
10.00	<u>Foerster J.</u> , Eckartz-Nolden G. <i>Assessing the ecological quality of running waters by means of the aquatic flora in North Rhine Westphalia, Germany</i>
10.20	<u>Gutowski A.</u> , Foerster J., Schaumburg J., Schranz C. <i>Novel developments concerning the use of benthic algae (excl. diatoms and Charophyceae) assessing the ecological status of running waters in Germany</i>
10:40	<u>Cantonati M.</u> , Angeli N., Spitale .D. <i>Towards the development of benthic-algae tools for the bioassessment of the quality and ecological integrity of spring habitats</i>
11.00-11.30	<b>Coffee break</b>
11.30-12.30	<b>Plenary Session</b> <i>Keve Kiss and Éva Ács, Hungarian Academy of Sciences, Hungary</i> <i>Phytoplankton and phytobenthos method development for large river assessment: experience and case study on River Danube</i>
12.30-13.30	Oral presentations <b>Session 2. Last advances in algal monitoring methodologies</b> <i>Chaired by E. Rott &amp; M. Cantonati</i> <i>Subsession I (soft algae- &amp; diatom-based bioassessment)</i>
12.30	<u>Rott E.</u> , Schneider S. <i>River quality assessment along pH and TP gradients using benthic soft algae from Norway and Austria</i>
12.50	<u>Lavoie I.</u> , Campeau S., Fortin C., Zugic-Drakulic N., Winter J. <i>The Eastern Canadian Diatom Index: an overview of 10 years of index development and ongoing challenges</i>
13.10	<u>Delmas F.</u> , Boutry S, Gassiole G., Rosebery J., Giraudel JL., Peres F., Coste M. <i>Indice Diatomique Réunion (IDR) : a new river diatom index dedicated to a specific ultramarine and tropical biogeographical context</i>
13.30-15.00	<b>Lunch</b>
15.00	<b>Technical visit</b>

## Thursday, June 21

09.00-10.00	<p>Oral presentations</p> <p><b>Session 2. Last advances in algal monitoring methodologies (Continued)</b></p> <p><i>Chaired by E. Rott &amp; M. Cantonati</i></p> <p><i>Subsession II (cyanobacteria-based bioassessment with focus on N &amp; P)</i></p>
09.00	<p><u>Loza V.</u>, Morales A., Perona E., Mateo P.</p> <p><i>Application of temperature gradient gel electrophoresis to the study of cyanobacterial diversity in Guadarrama and Guadalix rivers, Spain</i></p>
09.20	<p><u>Muñoz-Martín M.</u>, Mateo P., Leganés F., Fernández-Piñas F.</p> <p><i>Bioreporters of Nitrate and Phosphate bioavailability in aquatic ecosystems based on cyanobacteria</i></p>
09.40	<p><u>Martínez-Rosell A.</u>, Muñoz M., Mateo P., Perona E., Fernández-Piñas F.</p> <p><i>Bioavailable phosphorus for cyanobacteria in central Spain lotic systems, a polyphasic approach</i></p>
10.00-11.00	<p><b>Plenary Session</b></p> <p>Libuse Opatrilova, T. G. Masaryk Water Research Institute, Czech Republic</p> <p><i>The whole phytobenthos community as a base for ecological status assessment in the Czech Republic</i></p>
11.00-11.30	<b>Coffee break</b>
11.30-12.30	<p>Oral presentations</p> <p><b>Session 3. The whole phototrophic community.</b></p> <p><i>Chaired by L. Opatrilova and E. Perona</i></p>
11.30	<p><u>Tornés E.</u>, Pérez MC., Durán C., Sabater S.</p> <p><i>Regulation overrides natural climate variability effects on phytoplankton communities of the Ebro River</i></p>
11.50	<p><u>Kunpradid T.</u></p> <p><i>The assesment of ecological situation and water quality by using benthic algae in Mekong river and its tributaries</i></p>
12.10	<p><u>Komulainen S.</u></p> <p><i>Phytoplankton in rivers of Murmansk Region (Northwestern Russia)</i></p>
13.00-15.00	<b>Lunch</b>
15.00-17.00	<p>Oral presentations</p> <p><b>Session 4. Environmental toxicology using algae</b></p> <p><i>Chaired by R. Rosal and F. Fernández-Piñas</i></p>
15.00	<p><u>Rodea-Palomares I.</u>, Gonzalo S., Santiago J., Leganés F., García-Calvo E., Rosal R., Fernández-Piñas F.</p> <p><i>Nanoceria toxicity in aquatic photosynthetic organisms</i></p>
15.20	<p><u>Haigh Flórez D.</u>, Orellana G., de la Hera C., Costas E.</p> <p><i>Microalgal fiber-optic biosensors for water quality monitoring</i></p>
15.40	<p><u>González-Pleiter M.</u>, Fernández-Piñas F., Rodea-Palomares I., Rosal R., Gonzalo S. &amp; Leganés F.</p> <p><i>Toxicological interactions of antibiotics in the aquatic environment</i></p>
16.00	<p><u>Brient L.</u>, Lengronne M., Moulin C., Petit L.</p> <p><i>Monitoring of benthic cyanobacteria</i></p>
16.20	<p><u>Conforti V.</u>, Nannavecchia P., Tolivia A., Ruiz L., Leonardi P.</p> <p><i>Ultrastructural alterations in euglenoids species as a result of the excess of organic matter in the culture medium</i></p>
17.00-18.30	<b>Poster Session</b>
18.30-20.00	<b>Visit to historical Alcalá de Henares</b>
21.00	<b>Conference dinner</b>



## Friday, June 22

09.00-10.00	<b>Plenary Session</b> Brian A. Whitton, Durham University, United Kingdom <i>A world-wide view of the ecology of river algae</i>
10.00-11.00	Oral presentations Session 5. <b>Algal ecology in rivers</b> <i>Chaired by B. Whitton &amp; S. Sabater</i>
10.00	Leitao M., Abonyi A., Lançon AM. <i>The phytoplankton monitoring of the river Loire (France)</i>
10.20	Berrendero E., Fernández-Valiente E., Perona E., Loza V., Mateo P. <i>Nitrogen fixation in a mountain river and possible implication for monitoring nutrient dynamics</i>
10.40	Chapuis .I, Aboal M., Gómez V., Martínez Salmerón A., Luque Y., Sánchez Castillo P. <i>Approach to the use of Lemnaceae (Rhodophyta) as bioindicators of the environmental quality of the Hydrographic Duero Basin.</i>
11.00-11.30	<b>Coffee break</b>
11.30-12.30	Oral presentations Session 5. <b>Algal ecology in rivers</b> <i>Chaired by B. Whitton &amp; S. Sabater</i>
11.30	Wojtal A., Siwek J, Bascik M. <i>Response of epilithic diatom assemblages to nitrate pollution in springs of the Małopolska Upland</i>
11.50	Leira M., Tornes E., Sabater S. <i>The effects of nutrient enrichment on local and regional diatom community structure</i>
12.30	<b>Symposium closure</b>
13.30	<b>Lunch</b>

# General information

---

## Venue

Colegio de San Ildefonso  
Alcalá de Henares University  
Pza. San Diego, s/n  
28801 Alcalá de Henares, Madrid

## Dates

June 19<sup>th</sup> to 22<sup>nd</sup>, 2012

## Set up

Tuesday, June 19<sup>th</sup>, 2012

## Commercial Exhibition

June, 20<sup>th</sup>, 21<sup>st</sup>, 22<sup>nd</sup>

## Registration

The registration desk will be open as follows:

Tuesday, June 19 <sup>th</sup>	16.00 to 19.30
Wednesday, June 20 <sup>th</sup>	08.00 to 13.30
Thursday, June 2 <sup>st</sup>	08.30 to 18.30
Friday, June 22 <sup>nd</sup>	08.30 to 13.30

## Social Events

**Visit to the Symposium Venue “Colegio de San Ildefonso”** - 19<sup>th</sup> June from 18.00 to 19.00h

**Welcome reception** - 19<sup>th</sup> June

It will take place at the congress venue at 19.30h

**Technical Visit\*** - 20<sup>th</sup> June from 15.00h, Lozoya River and “El Páular” monastery

\* An informal dinner included

**Congress dinner\*** - 21<sup>st</sup> June, La Hostería del Estudiante  
(Parador de Alcalá de Henares) at 21.00h.

\* Not included in the registration fee

Address: C/ Colegios, 3 y 8 28801. Alcalá de Henares

## Technical Secretariat



Congresos

C/Francisca Delgado nº9 plta. 5ª  
28108 Alcobendas, Madrid, Spain  
T. +34 91 1967654  
Email: uamriver2012@vibocongresos.com

**Plenary Sessions**

## **Use of algae in the official monitoring programmes for the classification of the ecological status of water bodies in Spain**

Javier Ruza, Alejandra Puig, Elena Barrios, Alfredo Corrochano

Control and Monitoring of Water Quality Department. Spanish Minister of Agriculture, Foods and Environment. Madrid, SPAIN

---

Since the entry into force of the Water Framework Directive, in Spain the role of algae in the water quality monitoring programmes has turned out to be very important as they are being used to classify the ecological status of water bodies.

WFD establishes the obligation to use aquatic flora as a biological quality element to classify ecological status, but does not specifically indicate the need to use algae. In order to fulfil this obligation it is then possible to choose from macrophytes, diatoms, macro algae or even phytoplankton in some large rivers. The Spanish ecological classification system for rivers includes the use of macrophytes, benthic diatoms and some macro algae taxa as aquatic flora.

In order to assure good quality of the information produced in biological monitoring networks and to obtain meaningful classifications, the Ministry of Agriculture, Food and Environment has carried out several tasks covering the whole information cycle, such as the design of monitoring programmes, the definition of sampling and sorting protocols or the establishment of a common database and storage system including standardised taxa lists (TAXAGUA), calculation / aggregation methods, and reporting and publication tools.

## Methodological development for water quality assessment of large rivers based on phytoplankton and phytobenthos data: experiences and a case study on the River Danube

Keve T. Kiss <sup>1</sup>, Éva Ács <sup>1</sup>, Gábor Borics <sup>2</sup>, Gábor Várbíró <sup>2</sup>, Viktória B. Béres <sup>3</sup>, Gizella Fehér <sup>4</sup>, Levente Molnár <sup>1</sup>, Zsuzsanna Szilágyi <sup>5</sup>, Bence Tóth <sup>1</sup>

1. Danube Research Institute, Hungarian Academy of Sciences, Centre for Ecological Research, HUNGARY
2. Balaton Limnological Institute, Hungarian Academy of Sciences, Centre for Ecological Research, HUNGARY
3. Trans Tiszanian Inspectorate for Environment, Nature and Water, HUNGARY
4. Lower Danube Valley Directorate Environment and Water, HUNGARY
5. University of Debrecen, Department of Hydrobiology, HUNGARY

Most parts of large rivers can be characterized with a relatively high nutrient supply and moderate water velocity and transparency. Therefore, abundant and species rich phytoplankton develops in these rivers during growing season. The species composition and abundance of phytoplankton changes in space and time in large rivers (in growing season abundance is usually high in low water periods and low during floods). The main drivers of abundance and community structure are nutrients (N, P), light climate and retention time. The first and most important question of monitoring is the sampling. The spatial homogeneity of phytoplankton, the frequency of sampling and sampling strategies along the river course has to be considered.

The EU Water Framework Directive (WFD) requires member states to use phytoplankton and phytobenthos both for type and stressor specific (e.g. hydromorphological risk or nutrient loadings) ecological state assessment of surface waters. The phytoplankton method should be based on the combination of a composition and a biomass metric, while our phytobenthos method was based on diatom indices. The latter has already been successfully intercalibrated. An important task is to distinguish the natural and human impacts on the algal communities, and to separate their effects on the metrics. The aim of our phytoplankton and phytobenthos studies carried out in the river Danube was to examine this problem.

## **The whole phytobenthos community as a base for ecological status assessment in the Czech Republic**

Libuše Opatøilová<sup>1</sup>, Petr Marvan<sup>2</sup>

1. T.G.Masaryk Water Research Institute, P.R.I.

2. Limni s.r.o., Brno, CZECH REPUBLIC

---

The Czech Republic belongs to countries that have decided to base the assessment of ecological status of rivers not only on diatoms, but on all phototrophic organisms of microbenthos. The main reason was the possible increase in number of indicator taxa resulting in achieving higher level of reliability of results.

Apart from the including the whole phytobenthos community, the main difference of the Czech method is that the contribution of individual diatoms indicators is not quantified by the number of valves, but by their estimated coverage (expressed in abundance classes).

The main principles of the approach to the evaluation are as follows:

- \* The Czech method is based on the evaluation calculated from the weighted arithmetic average of the individual (species specific) environmental characteristics.

- \* It is emphasized that as far as possible the method reduces the influence of dead diatoms (their empty boxes) on the result. The main source of knowledge concerning the representation of taxa in the sample is considered by in vivo analysis, when dead and living cells are still distinguishable.

- \* The influence of widely represented (dominant) species on the results is significantly reduced and vice versa an information benefit of under-represented components is stressed.

- \* It is emphasized the need of a clear taxonomic definition of indicator names.

- \* Reliability of the results is expressed as a standard deviation of the weighted average of individual species-specific characteristics and moreover, a minimal limit for the sum of indicator weights of individual taxa in the sample was determined as well.

Outcomes obtained from the assessment both only diatoms and the whole phytobenthos community is discussed together with results of correlations with parameters of the abiotic environment and with results of the evaluation by other systems of indicators

(TI, IPS, SI according to Rott et al.).

## **A World-Wide View of the Ecology of River Algae**

Brian A. Whitton

Durham University, UK

---

A brief overview of algae growing in rivers in different geographical and climatic regions is presented to try to establish how much is really known about their distribution and ecology. Some apparently well known and less well known genera are then chosen for more detailed discussion.





Oral Presentations

001

### **Assessing the ecological quality of running waters by means of the aquatic flora in North Rhine Westphalia, Germany**

Julia Foerster, Gabriele Eckartz-Nolden

North Rhine Westphalian State Agency for Nature, Environment and Consumer Protection, GERMANY

---

In the federal state of North Rhine-Westphalia (Germany), the State Agency for Nature, Environment and Consumer Protection is responsible for the monitoring of the chemical and biological quality of the watercourses as prescribed by the European Water Framework Directive (WFD). Besides macro-invertebrates and fish, also the aquatic flora needs to be investigated. North Rhine-Westphalia has a diverse landscape resulting in a high natural variability in its water bodies, and various pressure impacts affect aquatic organisms.

During the last years, a great effort has been made to survey the aquatic flora of the federal state's 1850 water bodies. Employees have been trained to sample and identify species of macrophytes and soft benthic algae. Samples of benthic diatoms were analyzed by external specialists. During the years 2006 – 2010, diatoms were sampled at more than 1300 sampling sites, macrophytes were surveyed at more than 1200 sampling sites and benthic soft algae were collected at more than 600 sampling sites.

The resulting species lists form the basis for the assessment of the ecological status according to the PHYLIB routine for diatoms, soft algae and macrophytes. Additionally, a regional assessment routine was applied to the macrophyte data.

The results will be reported to the European Union and be published via Internet. The data are also used for statistical analyses for a better understanding of specific stressors (see report by Völker et al. in this session) and for developing criteria for future monitoring concepts.

002

### **Novel developments concerning the use of benthic algae (excl. diatoms and Charophyceae) assessing the ecological status of running waters in Germany**

Antje Gutowski<sup>1</sup>, Julia Foerster<sup>2</sup>, Jochen Schaumburg<sup>3</sup>, Christine Schranz<sup>3</sup>

1. AlgaLab, Bremen, GERMANY

2. North Rhine Westphalian State Agency for Nature, Environment and Consumer Protection, Recklinghausen, GERMANY

3. Bavarian Environment Agency, Wielenbach, GERMANY

Since 2004, a monitoring routine according to the water framework directive (WFD) exists in Germany to assess the ecological status of running waters by means of the composition and abundance of the aquatic flora (Schaumburg et al., 2004, 2005). This method, called 'PHYLIB' procedure, considers three components, i.e., aquatic macrophytes, benthic diatoms, and benthic algae of other organismic classes.

Although the routine was extended in 2006, the need for a basic revision became apparent after several years of application and was realized on behalf of the Federal Environment Agency (Umweltbundesamt) of Germany. Results of this analysis will be demonstrated with regard to the non-diatom algae called 'phytobenthos without diatoms' (PoD). Monitoring data collected from 1999 to 2007 showed that enough taxa of this indication component do occur generally in all types of running waters in Germany.

Rivulets in the geochemically silicate conditioned low mountain ranges turned out to be especially rich in number of taxa and to exhibit high abundances. Many taxa were characteristic for special geomorphological types of running waters, especially those of the alps, the foothills of the alps, the geochemically silicate-conditioned low mountain ranges, or carbonate-conditioned types. To specify the indication value of the taxa, tolerances and their preferential occurrence with regard to physical and chemical parameters were investigated. In summary, all current and literature data were considered to evolve a new list of 231 indicator taxa which are classified to belong to four categories or indication groups for nine types of running waters. For the assessment of a sampling site, the abundances of these indicator species are used to calculate an index from which the ecological status can be inferred. All details of this routine and software for application are available at [http://www.lfu.bayern.de/wasser/gewaesserqualitaet\\_seen/phylib\\_deutsch/index.htm](http://www.lfu.bayern.de/wasser/gewaesserqualitaet_seen/phylib_deutsch/index.htm) including an English version.

003

### **Towards the development of benthic-algae tools for the bioassessment of the quality and ecological integrity of spring habitats**

Marco Cantonati, Nicola Angeli, Daniel Spitale

Museo Delle Scienze - Limnology and Phycology Section, ITALY

Springs are special habitats that host a rich biodiversity. However, they are endangered mainly because of tapping to gain drinking water. This impact is likely to increase because of the predicted reduction in precipitations. Epilithic cyanobacteria and algae are probably the most widespread photoautotrophic organisms in mountain springs, beside bryophytes and lichens. CRENODAT (2004-2008) is a comprehensive project that was carried out in the south-eastern Alps: 110 springs were sampled covering a wide range of altitudes and lithotypes. In Europe, the Water Framework Directive promotes the bioassessment of the actual situation and the comparison with reference situations. We therefore identified benthic algae and diatom indicator taxa, and assemblages characteristic for the main ecomorphological spring types of the study area. We are convinced that the bioassessment methods that we are developing for the spring habitat should address not only quality issues but also ecological integrity and relevance for aquatic biodiversity conservation. Preliminary results also suggested that bioassessment procedures should be habitat-type specific (and keeping well in mind that springs differ from streams), and adapted for the different geographic areas (in the case of springs, this is necessary because both of distributional patterns of some organisms and of the uneven geographical distribution of morphological spring types). We first aim at developing a diatom-based trophic index specific for the spring habitats, and for the part of the Alpine ecoregion covered by the CRENODAT study.

Two investigations, in the northern and southern part respectively, are underway in the Western Alps, and, together with other spring studies we previously carried out, will provide data to extend this approach to the entire Alpine ecoregion. A special case -that will be briefly mentioned- in the benthic-algae bioassessment of springs is the use of teratological forms of selected diatom species to reveal heavy-metal contamination.

004

### **River quality assessment along pH and TP gradients using benthic soft algae from Norway and Austria**

Eugen Rott <sup>1</sup>, Susanne Schneider <sup>2</sup>

1. Institute of Botany, Faculty of Biology, University of Innsbruck, AUSTRIA

2. Norwegian Institute of Water Research, Oslo, NORWAY

For both Norway and Austria geographically extended, taxonomically sound datasets on benthic soft algae (algal groups except diatoms) are available. The taxonomic groups recorded from both ecoregions were Cyanobacteria / Cyanophytes, Chlorophyceae (in the widest sense), Rhodophyceae, Chrysophyceae, Xanthophyceae and Phaeophyceae. The most coincidences in the data of the two regions were found for Cyanophyceae, the richest taxonomic group in both cases (with 32 species taxa in common or 57% of the Norwegian species found also in Austria) and within the species poor groups Rhodophyceae, Phaeophyceae and Chrysophyceae. For Chlorophyceae the second species rich group coincidence was only 15 of 44 species (or 34% of the Norwegian species found in Austria as well). We will test the ecological responses of selected species found in both datasets to pH and nutrient gradients and other determinants in spite of different geochemical and climatic settings in Norway and Austria. We intend to evaluate the specific taxa responses on the background of the specific features (potentials and bias) of the two datasets. For lotic taxa of Chamaesiphon (Cyanobacteria) we will discuss the use molecular data from in situ isolations for testing model niche related diversification on the background of results from preliminary studies.

O05

### **The Eastern Canadian Diatom Index: an overview of 10 years of index development and ongoing challenges**

Isabelle Lavoie <sup>1</sup>, Stéphane Campeau <sup>2</sup>, Claude Fortin <sup>1</sup>, Natasa Zugic-Drakulic <sup>3</sup>, Jennifer Winter <sup>4</sup>

1. Institut National de la Recherche Scientifique, centre Eau Terre Environnement, CANADA

2. Section Géographie, Université du Québec à Trois-Rivières, Québec, CANADA

3. Faculty of Environmental Governance and Corporate Responsibility, EDUCONS University, Sremska Kamenica, SERBIA

4. Ontario Ministry of the Environment, Environmental Monitoring and Reporting Branch, Toronto, CANADA

The Eastern Canadian Diatom Index (IDEC: Indice Diatomées de l'Est du Canada) was developed almost 10 years ago with the purpose of monitoring the biological integrity of streams and rivers in Eastern Canada. Since the creation of the IDEC, two upgraded versions have been developed, featuring a larger geographic area as well as redefined biological integrity classes providing a more ecologically relevant interpretation of the diatom community changes along a pollution gradient (mainly reflecting eutrophication).

The IDEC gained popularity in Eastern Canada and has been successfully used to evaluate the biological status of more than 1000 sites over the past 10 years. The experience we gained on diatom-based monitoring over the years as well as the large number of samples added to our database lead to the modeling of a new version of the IDEC, covering an even broader geographic area. As for the previous versions, the IDEC3.0 was developed using Self-Organizing-Map (SOM) to group diatom communities into biotypes, followed by the ordination of sites using a Correspondence Analysis (CA). This presentation will explain the steps to the creation of the new IDEC3.0, and will show the modifications that were made to the index over the years.

This presentation will also offer our reflections on 10 years of diatom-based development.

006

### **Indice Diatomique Réunion (IDR): a new river diatom index dedicated to a specific ultramarine and tropical biogeographical context**

François Delmas<sup>1</sup>, Sébastien Boutry<sup>1</sup>, Gilles Gassiole<sup>2</sup>, Juliette Rosebery<sup>1</sup>, Jean-Luc Giraudel<sup>3</sup>, Florence Peres<sup>4</sup>, Michel Coste<sup>1</sup>

1. IRSTEA / Bordeaux Research Centre, Cestas, FRANCE

2. ASCONIT Consultants C/O Pareto, Village Entreprise, Ste. Clotilde, FRANCE

3. EPOC / LPTC, UMR CNRS 5805, Université de Bordeaux, Périgueux, FRANCE

4. ASCONIT Consultants / Agence de Perpignan, Toulouges, FRANCE

The Water Framework Directive (JOCE 2000) needs to be applied on the European continental area as for other ultramarine territories as French overseas departments (in our case, Reunion Island). For such specific territories with a strong biogeographical concern, biological indexes set-up and validated in continental Europe cannot work properly. The main problems encountered result from strong specificities in the field of geochemical and climatic conditions, of taxa list and of their local ecology.

Under the joint demand of the Reunion Water Office, local services of Environment Ministry (DEAL Reunion) and ONEMA, a scientific consortium grouping ASCONIT Consultancy and IRSTEA drove a 3 year-study based on network sites and other particular sites, aiming to: 1) describe in situ abiotic environmental condition of rivers (physico-chemistry, chemistry, descriptors of general ambiance like shading, flow velocity, depth...); 2) identify and count relative abundances of taxa; and 3) set-up a new Diatom Index dedicated to Reunion, based on relationships between abiotic descriptors and taxa ecology.

The study was based on 256 samples and records obtained during 3 years at 55 different sites along five field campaigns covering 2 different seasons. A huge work was to identify and count the species in this new context. 343 different species have been observed, of which 162 determined at the species level. 28 other species were close to a known species (cf or aff.), 153 identified at the genus level were given a number code at the species level. 175 enough occurring species were used to build the index and were given an ecological profile.

Because of a very dilutive context, we chose to principally base the index calculation on a list of alarm taxa named "Taxa —", which presence is synonym of strong anthropogenic alteration. This new index provides satisfying assessment results which will be presented.

#### References:

BOURRELLY P, COUTE A, 1986 - Algues d'eau douce de l'Ile de la Réunion

(Diatomées exclues) -Cryptogamie, algologie 7(2) 87-121. COSTE M., BOUTRY, S., TISON ROSEBERY, J., DELMAS, F. (2009) Improvements of the Biological Diatom Index (BDI): Description and efficiency of the new version (BDI-2006). Ecological Indicators, 9: 621-650. J.O.C.E. 09/2000 - European Parliament and Council 2000 Water Framework Directive 2000/60/EC establishing a framework for community action in the field of water policy. Official Journal of the European Communities L327, 1–73.

MANGUIN, E. (1941). Contribution à la connaissance de la Flore des diatomées d'eau douce de Madagascar. Revue Algologique 12: 153-157.

007

### **Application of temperature gradient gel electrophoresis to the study of cyanobacterial diversity in Guadarrama and Guadalix rivers, Spain**

Virginia Loza, Aurelio Morales, Elvira Perona, Pilar Mateo

Universidad Autónoma de Madrid (UAM), SPAIN

In order to monitor the cyanobacterial diversity in rivers of central Spain we applied molecular methodologies, namely temperature gradient gel electrophoresis (TGGE) with primers targeting fractions of the cyanobacterial 16S rRNA gene and, in parallel, a cultivation approach as well as microscopic examination of field-fixed samples. The presence and abundance of cyanobacteria in the rivers were studied by complex TGGE patterns, band extracting and subsequent sequencing of 16S rDNA gene fragments. Environmental parameters, such as pH, dissolved oxygen, conductivity, and inorganic nutrients were determined in order to characterize the trophic status of the studied waters. We found a eutrophic gradient downstream in both rivers, and the results of the multivariate analyses (Cluster analysis and Canonical correspondence analysis) indicated that the nutrient status of the river's water influences the cyanobacterial assemblages. Shifts in the cyanobacterial community composition were related to changes in water quality. Microscopic and molecular approaches indicated that cyanobacterial diversity decreased in downstream sites in relation to variations in the distribution of sensitive and tolerant species in the river. According to genetic analysis results, the isolated strains represented the most common genotypes found in TGGE sequences. In relation to environmental parameters, some phylotypes were related to low nutrient concentrations and high dissolved oxygen, and in contrast, other phylotypes were associated to eutrophic-hypertrophic conditions. TGGE technique could enable the efficient and rapid routine analysis of changes in cyanobacterial diversity in response to pollution, allowing us to monitor rivers in surveillance networks of watercourse quality.



008

### Bioreporters of Nitrate and Phosphate bioavailability in aquatic ecosystems based on cyanobacteria

M. Ángeles Muñoz-Martín, Pilar Mateo, Francisco Leganés, Francisca Fernández-Piñas

Universidad Autónoma de Madrid (UAM), SPAIN

Cyanobacteria are the main primary producers in surface waters and mainly responsible for the blooms and eutrophication processes caused by excess nutrients, mostly phosphorus and nitrogen, making them suitable for testing the bioavailability of these nutrients in water.

Cyanobacteria have mechanisms to detect the presence of these nutrients in the environment they live and activate or repress specific genes or operons depending on their bioavailability. So monitoring the expression of these genes allows us to know the availability of nutrients. For this, we have constructed self-bioluminescent strains of the cyanobacterium *Anabaena* sp. PCC 7120 expressing promoters of genes responsive to nitrogen and phosphorus fused to luxCDABE operon. Thus, light emission becomes a measure of nutrient bioavailability.

We constructed 3 bioreporters of phosphorus by fusing the promoters of the following genes: *phoA*, alkaline phosphatase A (strain A. AP), *phoA*-like, similar to alkaline phosphatase A (strain A. AP-L) and *pstS1C1A1B* operon, involved in the transport of phosphate (strain A. PST). The strains A. APL and A. PST, but not A. AP, respond to increasing amounts of organic and inorganic phosphorus in the medium and have been used to detect the bioavailability of phosphorus in different stretches of several rivers of central Spain [1]

We also constructed 5 strains to detect the bioavailability of nitrogen by fusing the promoters of these genes: *glnA* (two versions), involved in ammonium assimilation; *glnA*, negative regulator of *glnA*, and the *NirA-ntrABCD-NarB* operon (two versions), involved in nitrate assimilation. The response of these strains to different amounts of ammonium and nitrate is being tested. The usefulness of these bioreporters to detect nitrogen bioavailability in river waters will be evaluated.

#### References

[1] Muñoz-Martín, M.A., Mateo, P., Leganés, F., Fernández-Piñas, F. *Anal Bioanal Chem* 400 (2011) 3573-3584

009

### **Bioavailable phosphorus for cyanobacteria in central Spain Lotic systems, a polyphonic approach**

Aitor Martínez Rosell, M<sup>a</sup> Ángeles Muñoz, Pilar Mateo, Elvira Perona, Francisca Fernández-Piñas

Universidad Autónoma de Madrid (UAM), SPAIN

Conventional assays to measure dissolved reactive phosphorus in freshwater systems are sometimes not enough to quantify the total bioavailable phosphorus for cyanobacteria. This situation could lead regulatory agencies not to be able to detect imminent ecosystem-degrading phenomena such as cyanobacteria blooms. It could also be an obstacle to study the ecophysiological requirements of freshwater cyanobacterial communities. Four rivers located in central Spain were monitored in this study (both high and low pH water rivers). Conventional colorimetric assays were used to measure P from water samples. In situ alkaline phosphatase activity assays were also carried on in order to quantify the production of such enzyme, responsible of transforming unavailable phosphorus forms into available ones. Microscopic morphology of samples collected in the field was also studied, which in many cases may reveal the existence of structures characteristic of phosphorus deficiency, or the accumulation of polyphosphate granules, indicative of high concentrations of bioavailable phosphorus. A novel aspect of this project is the use of a biosensor based on an *Anabaena* strain (PCC 7120) containing the *phoA*-like gene promoter fused to *luxCDABE*, which is capable of specifically measuring the bioavailable phosphorus, providing valuable information in this regard. In general, the used biosensor detected more bioavailable phosphorous than that measured using conventional methods.

Phosphatase activity was higher in cyanobacterial samples collected from low bioavailable and dissolved phosphorous monitoring spots. Morphological structures related to phosphorus uptake were more frequently observed in cyanobacterial samples collected from low bioavailable phosphorus locations. Poliphosphate granules were present in higher rates in samples from phosphorus rich sampling spots. It is essential to use poliphasic approaches for freshwater system monitoring, which could be make it possible to perform less frequent sampling and gather many complex variables to be analyzed. It is proposed the use of this methodology for monitoring multiphase lotic systems.

### Regulation overrides natural climate variability effects on phytoplankton communities of the Ebro River

Elisabet Tornés <sup>1</sup>, María del Carmen Pérez <sup>2</sup>, Concha Durán <sup>3</sup>, Sergi Sabater <sup>1,4</sup>

1. Catalan Institute for Water Research (ICRA), Scientific and Technologic Park of the University of Girona, SPAIN

2. Phytoplankton Consultant, Valencia, SPAIN

3. Confederación Hidrográfica del Ebro, Zaragoza, SPAIN

4. Institute of Aquatic Ecology, Faculty of Sciences, University of Girona, Campus Montilivi, SPAIN

Regulation of large rivers for human purposes (e.g. hydroelectricity production, flood prevention, recreation activities) alters the longitudinal distribution of phytoplankton communities. The present study analyses the seasonal dynamics of phytoplankton communities of the Ebro River (N Spain) in 6 upstream, 1 intermediate and 5 downstream sites from a reservoir system, from September 2008 to December 2011. Phytoplankton communities were sampled four times a year throughout the study, accounting for wet (March, December) and dry (June, September) periods. A total of 168 samples were analyzed and 190 taxa were identified, being diatoms and coccal green algae the most representative groups. Analyses revealed that upstream of the reservoirs phytoplankton communities changed throughout the year with seasonal definition. However, in the intermediate site only two moments (that corresponded to dry and wet periods) were clearly defined. At the sites downstream of the reservoirs, community dynamics was overridden by the effect of the reservoirs, without distinguishable differences between dry and wet periods. Centric diatoms of the genera *Cyclotella*, *Cyclotella*, *Stephanodiscus* and *Thalassiosira*, along with pennate diatoms of the genera *Diadesmis*, *Fragilaria*, *Navicula* and *Synedra* were persistent in the 3 defined sections of the Ebro River (upstream, intermediate and downstream) throughout the year. Dinophyceae were affected by high flows, and were only present during dry periods upstream of the reservoirs and in the intermediate site, as well as coccal green algae *Desmodesmus* cf. *quadricauda* and *Monoraphidium* *contortum*. *Cocconeis* cf. *placentula* was characteristic of the downstream section, where mostly diatoms dominated phytoplankton communities. The present study evidences that river regulation interferes in the longitudinal patterns of the phytoplankton communities, altering their natural dynamics in lower water courses.

---

O11

### **The assesment of ecological situation and water quality by using benthic algae in Mekong river and it's tributaries**

Tatporn Kunpradid

Chiang Mai Rajabhat University, THAILAND

---

Using benthic algae as diatoms and macroalgae for the monitoring in ecological situation of the Mekong River and its tributaries was carried out from August 2006 to May 2008. Twelve sampling sites along the Mekong River and its tributaries in Thailand part were investigated. One hundred and ninety-four species of Benthic Diatom and 51 species of macroalgae were found. Some species could be used as a potencial bio-monitor of water quality in the Mekong River and its tributaries. The computer statistical package was analyzed and used to determine the ecological assemblages and indicate water quality. The water quality assessment of the Mekong River and its tributaries by using the distribution of benthic diatoms, macroalgae and macroinvertebrate as biomonitors showed that in the upstream and tributaries revealed moderate water quality and moderate ecological health. In contrast, some sites in the lower Mekong River showed moderate-mild polluted and low ecological assemblages. The computer statistical package was analyzed to establish the Mekong Index. Multivariate Statistical Package (MVSP) and PC Ordination were used to determine the dominant species to indicate water quality by the level of scores. The index was based on the quality of water within sites as physical and chemical parameter. The comparisons between the Mekong Index and other index showed a similarity, however the research for finding the suitable species of benthic diatoms and macroalgae in Mekong River should be keep continuously for more precise and accurate index.

### Phytoperiphyton in rivers of Murmansk Region (Northwestern Russia)

Sergey Komulaynen

Institute Of Biology of Karelian Research Centre Russian Academy of Sciences, RUSSIA

The purpose of this paper is to assess how informative phytoperiphyton structural parameters for biological monitoring of river quality, and to identify essential patterns and causes of the natural spatial variability of the structure of algal communities in rivers, which must be taken into account when planning and organizing monitoring, and interpreting its results.

Phytoperiphyton samples were collected during a late summer low-water discharge period in riffle zones in the 27 rivers of Murmansk Region. The species compositions and relative species abundance are compared; the role of superspecies taxa in the formation of attached algal communities is evaluated. The influence of anthropogenic impacts on periphyton communities was analyzed in terms of species richness, species diversity, species ecology values, chlorophyll and heavy metal concentration.

All rivers are subjected to different kind of anthropogenic impacts in addition to natural disturbance. With regards to the species composition the differences between the urban and natural stretches of rivers are obvious. The data obtained demonstrate that the phytoperiphyton communities in urban streams are dominated by broadvalent, pollution-tolerant and even saprophilic taxa. Substantial changes in periphyton structure were often caused by an enhanced mechanical impact by storm run-off, which retarded colonization, rather than any chemical influence. The burial of algae by sand and silt resulted in the loss of species or entire algal assemblages were observed. As result the communities are dominated by a few species with high recolonization potential. Analysis of heavy metal concentration in phytoperiphyton makes it possible to identify polluted regions, streams, and their reaches.

O13

### Nanoceria toxicity in aquatic photosynthetic organisms

Ismael Rodea<sup>1</sup>, Soledad Gonzalo<sup>2</sup>, Javier Santiago<sup>2</sup>, Francisco Leganés<sup>1</sup>, Eloy García-Calvo<sup>2,3</sup>, Roberto Rosal<sup>2,3</sup>, Francisca Fernández-Piñas<sup>1</sup>

1. Universidad Autónoma de Madrid (UAM), SPAIN

2. Universidad de Alcalá, SPAIN

3. IMDEA Agua, Madrid, SPAIN

The commercial applications of engineered nanoparticles (ENPs) have widely expanded over the last years with subsequent increased release into the environment. The particular physicochemical properties of nanoparticles have raised serious concerns about their potential environmental risks. Algae and cyanobacteria are ecologically relevant organisms which are at the base of aquatic food webs and have essential roles in nutrient cycling.

Cerium oxide nanoparticles are interesting nanomaterials which have widespread applications due to their redox properties which are based in the mixed valence state of CeO<sub>2</sub> (Ce<sup>3+</sup> and Ce<sup>4+</sup>). Nanoceria exhibited strong toxicity to the green alga *Pseudokirchneriella subcapitata* and the cyanobacterium *Anabaena* CPB4337; in both organisms nanoceria exposure resulted in highly damaged cells with extensive membrane disruption [1]. We found no evidence of nanoparticle uptake by cells, but our observations suggested that their toxic mode of action required direct contact between nanoparticles and cells [1].

Photosynthesis was studied by measuring oxygen evolution and chlorophyll a fluorescence emission parameters. Nanoceria significantly inhibited photosynthesis in the cyanobacterium. Chlorophyll a fluorescence experiments indicated that nanoceria had a significant impact on the primary photochemical processes of photosystem II.

Flow cytometry experiments and confocal microscopy revealed a strong generation of reactive oxygen species (ROS) which caused oxidative damage in both organisms. It is proposed that nanoceria increase the production of hydrogen peroxide (a normal ROS by-product of light-driven photosynthesis) in both the green alga and cyanobacterium; this may increase lipid peroxidation, compromising membrane integrity and also seriously impairing photosynthetic performance, eventually leading to cell death.

#### References

[1] Rodea-Palomares I, Boltes K, Fernández-Piñas F, Leganés F, García-Calvo E, Santiago J and Rosal R. *Toxicological Sciences* 119 (2011): 135-145. Acknowledgements- This work was funded by Comunidad de Madrid grants S-0505/AMB/0321 and S-2009/AMB/1511 (Microambiente-CM) and by the Spanish Ministry of Science and Innovation [grant CGL2010-15675, sub-programme BOS].

O14

### Microalgal fiber-optic biosensors for water quality monitoring

David Haigh Flórez <sup>1</sup>, Guillermo Orellana <sup>1</sup>, Cristina de la Hera <sup>2</sup>, Eduardo Costas <sup>2</sup>

1. Facultad de Ciencias Químicas, Departamento de Química Orgánica, Universidad Complutense de Madrid, SPAIN

2. Facultad de Veterinaria, Departamento de Producción Animal, Universidad Complutense de Madrid, SPAIN

Simazine is widely used as a non-selective herbicide due to its inhibitor activity over the photosynthetic system. It is currently banned in EU countries (EU 91/414/EEC) but not in USA or Japan, among others.

Novel fiber-optic biosensors have been developed for the analysis of simazine and other pesticides in water. They use selected microalgae immobilized into porous silicone (biomembrane) as the recognition element and O<sub>2</sub>-sensitive luminescent thin films as transducers (photosynthetic status). An optoelectronic device, based on emission phase-shift measurements, interrogates the O<sub>2</sub> transducer that are placed in close contact with the microalgae membranes. The biosensor comprises a dual head. One of them contains an immobilized simazine-sensitive microalgal strain (SSS) and the other one, a simazine-resistant strain (SRS), the differential response of which (O<sub>2</sub> photogeneration), in the presence of the target pollutant, imparts selectivity to the biosensor (Table 1). A modified Luria–Delbrück fluctuation analysis and a ratchet protocol were used to obtain the simazine resistant strain (no GMOs). 2 Sensitivity is provided by selected cell strain. Table 1. Criterion to assess the existence of target toxicant. Figure 1. Biosensor measurements before and after addition of simazine (10-800;g L<sup>-1</sup>) to water (immobilized sensitive microalgal strain: *Dictyosphaerium chlorelloides*).

#### Acknowledgements

This Project was funded by the Madrid Community Government (grant no.CM-S-505/AMB/0374), the European Regional Development Fund and the European Social Fund. It is now being funded by AQUALOGY Aqua Ambiente Servicios Integrales, S.A. (Madrid, Spain) under EU LIFE10 ENV/ES/000521 (AQUATIK) project.

DH thanks Merck Sharp & Dohme Spain for a grant.

#### References

- [1] R. J. Cremllyn, J. Agr. Sci., 118 (1992) 397–401.
- [2] G. Orellana, V. López-Rodas, E. Costas, E. Maneiro, D. Haigh, Patent PCT/ES2008/000465 and WO2009/013370.
- [3] D. Haigh, G. Orellana, Curr. Anal. Chem. 4 (2008) 273–295.

O15

### Toxicological interactions of antibiotics in the aquatic environment

Miguel González-Pleiter<sup>1</sup>, Francisca Fernández-Piñas<sup>1</sup>, Ismael Rodea-Palomares<sup>1</sup>, Roberto Rosal<sup>2</sup>, Soledad Gonzalo<sup>2</sup>, Francisco Leganés<sup>1</sup>

1. Universidad Autónoma de Madrid (UAM), SPAIN

2. Universidad de Alcalá, SPAIN

In the present study, the toxicity of antibiotics used in veterinary medicine such as amoxicillin, erythromycin, levofloxacin, norfloxacin and tetracycline has been examined in two organisms representative of the aquatic environment, a cyanobacterium as a target organism and the green alga *Pseudokirchneriella subcapitata* as a non-target organism. As the green alga was quite resistant to the tested antibiotics with the exception of erythromycin, the combined toxicity of the antibiotics is being studied with a bioluminescent cyanobacterial test [1]; toxicological interactions of antibiotics in binary and multicomponent mixtures are being analyzed using the Combination-Index (CI) method [1]. The results so far obtained indicate that at low effect levels, synergistic interactions predominated in the binary mixtures of antibiotics.

Our group previously reported that intracellular free calcium levels could be considered as early intracellular biomarkers of pollution [2]; for that, we recorded and analyzed calcium signatures in a recombinant cyanobacterial strain, which constitutively expresses the calcium-binding photoprotein apoaequorin, in response to different pollutants applied individually and in binary mixtures. The calcium signatures could predict to some extent the toxicological interactions of the pollutants [2]. At present, we are analyzing the calcium signals induced by antibiotics also when applied singly and in binary mixtures; so far, the results show very similar calcium signatures even in antibiotics with different mode of action which might indicate a similar way of detection of antibiotic drugs by the cell.

[1] I. Rodea-Palomares, A.L. Petre, K. Boltes, F. Leganes, J.A. Perdígón-Melón, R. Rosal, F. Fernández-Piñas. 2010. *Water Res*, 44 427-438.

[2] A. Barrán-Berdón, I. Rodea-Palomares, F. Leganés, F. Fernández-Piñas. 2011. *Anal Bioanal Chem* 400, 1015 - 29.

**Acknowledgements-** This work was funded by Comunidad de Madrid grants S-0505/AMB/0321 and S-2009/AMB/1511 (Microambiente-CM) and by the Spanish Ministry of Science and Innovation [grant CGL2010-15675, sub-programme BOS].



O16

### Monitoring of benthic cyanobacteria

Luc Brient <sup>1</sup>, Engineer Marion Lengronne <sup>1</sup>, Engineer Christelle Moulin <sup>2</sup>, Engineer Lionel Petit <sup>2</sup>

1. University of Rennes, UMR CNRS ECOBIO, FRANCE

2. Regional Health Agency, FRANCE

Death of more than 30 dogs in the river Tarn in France between, criticized by the presence of anatoxin and homoanatoxin and benthic cyanobacteria indicated that a major difficulty of their management by the health sanitary. Although planktonic cyanobacteria in France since 2003 to involve regulation concerning recreational water, health agencies are find it difficult to manage the development of algal biofilms in river. Using the management recommendations for the cyanobacterial water bodies we try with the health services on the river Tarn to develop another approach to better manage the risks from benthic cyanobacteria. This approach based on the establishment a referential of images on the appearance of biofilms, their presences, colors, thickness and the presence of mats to the water surface.

The decision tree risk management is established on four levels associated with these observations. Level 2 implements a public information and weekly monitoring of bathing sites in rivers. Levels 3 and 4 incorporating mortality of animals involve more specific analyzes and laboratory particular cyanotoxins. There are still several difficulties: it simply estimates the qualitative distribution of biofilms on the bed of the river but also that of our lack of knowledge and range of cyanotoxins detection.

The visual observation using a referential is a means of assessing the health risk management in the absence of more global tool in the field as phycocyanin sensors or other methods of fast analysis of cyanotoxins in the field.

O17

### Ultrastructural alterations in euglenoids species as a result of the excess of organic matter in the culture medium

Visitación Conforti <sup>1</sup>, Paula Nannavecchia <sup>1</sup>, Analía Tolivia <sup>1</sup>, Laura Ruiz <sup>1</sup>, Patricia Leonardi <sup>2</sup>

1. Dpto. Biodiversidad y Biología Experimental, Facultad de Cs. Exactas y Naturales, UBA, Buenos Aires, ARGENTINA

2. Univ. Nacional del Sur y CONICET. 8000, Bahía Blanca, ARGENTINA

Excessive enrichment of freshwater bodies with organic matter is mainly caused by industrial, domestic and agricultural processes. Depending on the characteristics and concentration of the pollutants, microalgae of these affected environments, may suffer changes in their number, morphology, and ecophysiology. In this type of freshwater body, we commonly observe euglenoid specimens with marked deformations [1], which we assume to be related to the excess of organic matter. To test this hypothesis, *Lepocinclis acus* and *Phacus brachykentron* were isolated from the Matanza River, Buenos Aires, Argentina, which presents a high degree of organic contamination derived from waste waters of the local meat industry [2]. These cells were cultured in soil water medium [3]. When transferred to medium enriched with soil beef extract, marked cell alterations were observed. These changes were unexpected in non-metabolic species, a condition which was previously shown in studies of the pellicle fine structure. Optical, scanning, and transmission electron microscopy observations show in both species marked morphological and ultrastructural alterations as a result of the enriched medium. Among these we can enumerate changes in cell dimensions, strips number and orientation, increased number and volume of paramylon grains and vacuoles, the presence of membrane whorls in vacuoles, and cell lysis. These responses were fast, observed within 48 hours of exposure to enriched medium. In this presentation we will compare the fine structure of organisms grown in medium with and without organic matter enrichment and discuss the systematic and ecological importance of our results.

#### References

[1] Conforti, V. Nov. Hedw. 53 (1991) 73-98.

[2] Conforti, V., Alberghina, J. & Gonzalez Urda, E. J. Aquatic Ecosystem 4 (1995)59-75

[3] Pringsheim, E. G. J. Ecol. 33 (1946) 193-204.

O18

### The phytoplankton monitoring of the river Loire (France)

Maria Leita<sup>1</sup>, Andras Abonyi<sup>2</sup>, Anne Marie Lançon<sup>1</sup>

1. Bi-Eau, Angers, FRANCE

2. Bi-Eau & Univ. of Pannonia, Veszprem, HUNGARY

The phytoplankton of the River Loire is monitored since the 90s, conducted by the Loire-Bretagne Water Authority, France. The nearly 20-year data set built up by the Bi-Eau Consultancy provides an excellent base for different phytoplankton considerations in rivers. The aim of this presentation is to show (i) how Loire phytoplankton has been monitored in the last two decades (ii) the relevant queries concerning future monitoring to apply the WFD's requirements (iii) the emergent scientific questions of Loire phytoplankton, at different scales. We highlight different trends in the River Loire (i) its middle course shows decreasing phytoplankton biomass with increasing Shannon-Weaver diversity at long term scale (1993-2011) (ii) at whole river length, some human impacts can be identified using phytoplankton functional groups metric (2009), influencing both richness and species diversity (iii) some inter-annual variations among phytoplankton data along the whole river course (2009-2011). Based on our results, we hope to be able to participate in a general discussion about criteria aiming to build an optimal phytoplankton monitoring in large rivers.

O19

### **Nitrogen fixation in a mountain river and possible implication for monitoring nutrient dynamics**

Esther Berrendero Gómez, Eduardo Fernández Valiente, Elvira Perona, Virginia Loza, Pilar Mateo

Universidad Autónoma de Madrid (UAM), SPAIN

Growth of stream algal communities is frequently limited by N but biological nitrogen fixation can alleviate this nitrogen limitation. Diazotrophic cyanobacteria have competitive advantages and may also constitute the energy base of benthic food webs.

N<sub>2</sub>-fixation rates in streams are potentially controlled by availability of nutrients, and N additions have been widely demonstrated to suppress N<sub>2</sub>-fixation by cyanobacteria because it is a costly process that will not occur when cyanobacteria have access to environmental N. On the other hand, low concentrations of stream nitrate-N are associated with N-fixing cyanobacteria. The present study was planned as part of a program to develop biological monitoring methods to assess nutrient characteristics of upland calcareous streams and rivers. Nitrogenase activity is proposed as a good indicator of nitrogen limitation, and field materials could be used to study changes in nutrients dynamics. Nitrogen fixation has been mainly studied in marine and hypersaline environments; however this activity has been seldom studied in rivers and streams in spite of the common presence of heterocystous cyanobacteria in stream benthic communities. The calcareous River Muga, north-east Spain, at a site 10 km downstream from its source in the Pyrenees, was chosen for the present study because it is a river which shows low levels of combined N and abundant presence of heterocystous cyanobacteria in upstream waters. However, the dominant community is a mat mainly composed by non-heterocystous cyanobacteria morphologically identified as belonging to the genus *Schizothrix* although macroscopic colonies of *Rivularia* sp. were also abundant. Thus, we performed in situ nitrogen fixation, photosynthesis measurements, combined N (<sup>15</sup>NO<sub>3</sub><sup>-</sup> and <sup>15</sup>NH<sub>4</sub><sup>+</sup>) incorporation experiments as well as analyses of the *nifH* and 16S rRNA gene diversity on these communities in order to estimate ecophysiological importance and its potential use for monitoring rivers

### Approach to the use of Lemnaceae (Rhodophyta) as bioindicators of the environmental quality of the Hydrographic Duero Basin

Iara S. Chapuis <sup>1</sup>, Marina Aboal <sup>2</sup>, Victoria Gómez <sup>1</sup>, Alicia Martínez Salmerón <sup>1</sup>, Yaiza Luque <sup>3</sup>, Pedro M. Sánchez Castillo <sup>1</sup>

1. Phycology Group, Botany Department, Sciences Faculty, Granada University, SPAIN

2. Algology Laboratory, Plant Biology Department, Faculty of Biology, Espinardo Campus, Murcia, SPAIN

3. Infraestructura y Ecología, Madrid, SPAIN

Macrophytic vegetation (aquatic vascular plants) and macroscopic algae constitute, together with phytoplankton and microphytobentos (diatoms) the indicators of the biological quality of aquatic flora considered by the European Water Framework Directive [1]. The project Iberian Flora of Continental Algae (FIAC II), in its second phase, consists in the compilation of a catalogue of filamentous freshwater algae, among which the red algae are a significant part. One of its added aims is to treat the use of the Rhodophyta as bioindicators of the environmental quality.

The family Lemnaceae (Rhodophyta), as the most conspicuous element of the filamentous red algae in the Ibero-Balear territory, includes only the genera *Lemanea* y *Paralemanea*. This family has been extensively used in several aspects for environmental monitoring, from detection of heavy metals [2] to the evaluation of the biological quality, by means of indices such as the IVAM [3]. In spite of this, there are few floristic/ecological group studies in this geographical area. At the European level, the PIT in Norway [4] or the MTR in the UK [5] are two of the indices, amongst others, that use this family. This study focuses on the morphological variability, the geographical distribution and the ecological range of this family, in order to define its potential use as an indicator of environmental quality. The data presented is related to the Duero River basin. This basin forms a shared depression between Portugal and Spain. From all 375 sampled points during 2010 and 2011, 90 samples were analyzed with Lemnaceas. The physico-chemical characterization of the water from the sampling points, and the morpho-ecological characterization of the treated individuals has been the starting point for a posteriori analyses of correspondence between the obtained data. The preliminary data obtained confirm their value as indicators.

O21

### **Response of epilithic diatom assemblages to nitrate pollution in springs of the Malopolska Upland**

Agata Wojtal<sup>1</sup>, Janusz Siwek<sup>2</sup>, M.Sc. Maria Bascik<sup>2</sup>

1. Institute of Botany, Polish Academy of Sciences, Krakow, POLAND

2. Jagiellonian University, Institute of Geography and Spatial Management, POLAND

Nitrate contamination of groundwater is an increasing problem in Europe (EU Nitrates Directive (91/676/EEC) and worldwide. In Poland, groundwater constitutes a large part of the countries total freshwater resources but, especially in karstic areas e.g., in the Malopolska Upland, it is one of the most threatened by pollution water body. However, the springs are still an important source of drinking water and can serve important data for groundwater quality monitoring (Wojtal & Sobczyk, in press). The Malopolska Upland is built of Triassic dolomites (SE) overlaid by Jurassic limestone Cretaceous marl and limestone in NE part. The bedrock structures are partly covered by Quaternary loess formations and postglacial deposits of varied thickness. The groundwater aquifers are highly vulnerable to nitrate pollution due to poor isolation and well developed system of cracks and conduits in bedrock matrix. Agriculture and insufficient wastewater treatment are serious sources of contamination by nitrates as the area is dominated by farmland (70-80%), with the average fertilizer application 50-90 kg NPK ha<sup>-1</sup> yr<sup>-1</sup>. In this study, 21 natural springs affected by diverse human impacts were selected from over 200 localities sampled in September 2011. The values of nitrate concentration in 13 of the 21 springs were higher than 20 mg L<sup>-1</sup>, reaching up to 49.5 mg L<sup>-1</sup>, whereas orthophosphate concentrations were below or at around the detection limit in 11 springs.

The springs were inhabited by low number of widespread diatoms with wide tolerance ranges, though the diatom assemblages differed between springs. Most of springs were dominated by alkaliphilous, N-tolerant, and mesoeutraphentic species. The structure of the diatom assemblages was affected by natural and human-related factors, but the second reduces species richness and number of pollution sensitive species.

Wojtal & Sobczyk, Hydrobiologia, in press.

The work was partly supported by the Polish National Science Centre (N N305 023640)

O22

### The effects of nutrient enrichment on local and regional diatom community structure

Manel Leira<sup>1</sup>, Elisabet Ternes<sup>2,3</sup>, Sergi Sabater<sup>2,3</sup>

1. University of Vigo, SPAIN

2. Catalan Institute for Water Research (ICRA), SPAIN

3. Institute of Aquatic Ecology (University of Girona), SPAIN

Nutrient enrichment represents a widespread and important anthropogenic impact on aquatic ecosystems. Recent work has suggested that nutrient enrichment tends to reduce beta-diversity by decreasing the importance of stochastic processes in structuring assemblages [1, 2]. The effects of nutrient enrichment may be manifested most strongly in the benthic zone owing to increased roughness of environmental conditions for biological communities by, for instance, reducing oxygen availability and light, and eventually leading to a reduction of primary production and structural complexity. As beta-diversity, regulates the relationship between local and regional species diversity across scales, homogenization of biological assemblages can have important implications for bioassessment. There is a relatively long history of the use of diatoms in river bioassessment. However, current understanding of the effects of nutrient enrichment on diatom assemblages compositional heterogeneity remains poor. We tested the hypothesis that nutrient enrichment homogenizes diatom epilithic assemblages by analyzing data extracted from a regional database for Catalonia. Further, as spatial scale can affect the nature of productivity–biodiversity relationships, and productivity is generally related strongly to nutrient concentrations, we also examined whether relationships between the extent of nutrient enrichment and the compositional heterogeneity of diatom epilithic assemblages varied between local (within-catchment) and regional (among-catchment) scales.

[1] Chase, J. M. 2007. Drought mediates the importance of stochastic community assembly. *Proceedings of the National Academy of Sciences (USA)* 104:17430–17434

[2] Donohue, I., Jackson, A.L., Pusch, M.T. & Irvine, K. (2009) Nutrient enrichment homogenizes lake benthic assemblages at local and regional scales. *Ecology* 90: 3470-3477





Poster Presentations

## Application of Hungarian potamoplankton method for assessment of ecological status in Croatian lowland rivers

Igor Stankovi<sup>1</sup>, Marija Gligora Udovic<sup>2</sup>, Gábor Várbíró<sup>3</sup>, Gábor Borics<sup>3</sup>, Koraljka Kralj Borojevi<sup>2</sup>

1. Hrvatske Vode, Central Water Management Laboratory, Zagreb, CROATIA 2. University of Zagreb, Faculty of Science, Division of Biology, Department of Botany, Zagreb, CROATIA

3. Tisza Research Department, Balaton Limnological Research Institute of The Hungarian Academy of Sciences, Debrecen, HUNGARY

Implementation of the European Water Framework Directive is one of key issues for every EU member state country. Therefore efforts are taken to make good assessment systems of ecological status for each water body. The aim of this study was to test Hungarian potamo-plankton method developed by Borics et al. (2007) for assessment of ecological status of rivers (Q(r)) on four lowland rivers in Pannonian ecoregion in Croatia. This research is not only an application of already developed assessment system, but also to use the phytoplankton functional groups as indicators of human impact on Pannonian lowland rivers. Chemical, physical and hydrological data are analyzed together with phytoplankton functional groups in four investigated rivers (Mura, Drava, Danube and Sava rivers) on nine sampling sites from April till September of 2010. Ecological status (Q(r)) was compared with chemical data and their ecological class boundaries for each river type on the basis of valid Croatian typology. Dominant functional groups were C, D (unicellular centric diatoms) and TB (benthic Pennales) through all investigation period with exception in summer when T (elongated and filamentous greens) became co-dominant or dominant. Index values showed maximum values at the beginning and at the end of investigated period, while minimum values were observed in summer months. Functional group concept already showed as good descriptor of phytoplankton community in lowland Pannonian rivers was demonstrated here as well as good indicator of human impact and good basis for assessment of ecological status in large lowland rivers. This research showed successful application of the method on Pannonian lowland rivers and together with previous applications on Danube, Tisza rivers (Hungarian sections), Narva River (Estonian section) and Loire River (France) is going towards unique assessment system for the Europe (Abony et al. 2012, Borics et al., 2007).

### References

- [1] Abonyi, A., M. Leitão, A.-M. Lançon & J. Padisák, this volume. Application of phytoplankton functional group concept for characterization of functional sections and anthropogenic impacts in the River Loire (France). *Hydrobiologia*, Online First.
- [2] Borics, G., G. Várbíró, I. Grigorszky, E. Krasznai, S. Szabó & K. T. Kiss, 2007. A new evaluation technique of potamo-plankton for the assessment of the ecological status of rivers. *Large Rivers* 17(3-4):465-486.
- [3] Stankovi, I., T. Vlahovi, M. Gligora Udovi, G. Várbíró & G. Borics, 2012. Phytoplankton functional and morpho-functional approach in large floodplain rivers. *Hydrobiologia*, Online First.

## **Are diversity indices based on macrophytes Communities' pertinent tools to monitor reservoirs ecological potential?**

Khadija Sossey <sup>1</sup>, Daniel Galoux <sup>2</sup>, Pr Francis Rosillon <sup>3</sup>

1. University of Liege-DSGE - department of Environmental Sciences and Management, BELGIUM

2. Walloon Public Service (SPW) ex CRNFB, Department of the environment, agriculture, Nature and Water

Management, BELGIUM 3. University of Liege-DSGE - department of Environmental Sciences and Management, BELGIUM

---

Diversity and trophic metrics based on macrophytes communities were calculated to test their pertinence to assess the ecological potential of Walloon reservoirs (Belgium). The BE-FL method (4 complementary metrics) and the United Kingdom method (five parameters calculated using information on taxonomic composition and abundance of macrophytes species and groups of such species). Highly significant correlations were found between the four tested chemical variables (bicarbonate, calcium, phosphorus and ammonium nitrogen) and trophic index LMNI and between them and the abundance of disturbance indicators (V). Macrophytes groups of species metrics do not necessarily provide any direct information on the quality or degree of degradation of the environment from which the sample was taken, whereas trophic indices do.

**Do benthic diatom communities reflect abiotic typology: a case study of Croatian rivers and streams**

Koraljka Kralj Borojevi, Marija Gligora Udovi, Petar Zutini, Anelka Plenkovi Moraj

University Of Zagreb, Faculty of Science, Division of Biology, CROATIA

Benthic diatoms are, as good environmental indicators, widely used in Europe as well as worldwide to assess ecological status of running waters. Also, one of key goals of Water Framework Directive is to classify rivers and streams using biological quality parameters and type specific reference conditions. For description of water types system B that allows usage of additional abiotic descriptors (as flow, granulometric properties of waterbed, tuffa forming conditions and permanence of flow) was used in Croatia and, in total, 24 types were described. For biological analyses 92 rivers and streams with total of 157 sampling points were chosen. Along with samples of natural benthic diatom communities, samples of water for chemical analyses were also taken. TWINSpan analysis was used to define biotypes from species composition and abundance of benthic diatom species. Altogether 11 groups and subgroups of biotypes were identified. Nonmetric Multidimensional Scaling with grouping according to both typologies was used for their comparison. Although biotypes show similar grouping of samples as abiotic types, especially if we ignore subdivisions of abiotic groups according to elevation, there are three biotype groups consisting of only a few sampling points that could, according to abiotic types, fall into other larger groups. Canonical Correspondence Analysis was used to investigate the relationship between sampling points and nutrient concentrations to reveal if chemical and physical factors were the cause of such separation.

## Evaluation of water quality in mediterranean marshes based on Macroalgae: the case of pego-oliva natural park (east Iberian Peninsula)

María Eugenia García Fernández, Martina Aboal Sanjurjo

Laboratory of Algology, Department of Plant Biology, University of Murcia, SPAIN

Mediterranean marshes besides the high anthropogenic influence maintain a remarkable algal biodiversity which is likely related with the environmental heterogeneity and the presence of several environmental gradients. The Water Framework Directive (WFD 2000/60/EC) aims at achieving a “good ecological status” of all European surface water bodies included transitional waters. Many indices have been developed in transitional waters based on fish, phytoplankton, macrophytes, benthic invertebrates as biology quality elements, but none has used composition and abundance of macroalgae as bioindicator [1] [2]. Pego-Oliva Natural Park is an important wetland from the Spanish Mediterranean coast. It is located in the east of the Iberian Peninsula between Alicante and Valencia and contains a wide variety of freshwater and brackish water habitats from streams, springs (freshwater and saline), irrigation ditches to rice fields. This study presents a preliminar evaluation of the ecological status of this Mediterranean marsh using six variables: composition and abundance of macroalgae (and microalgae that form macroscopic aggregates) with a taxonomic resolution of genera, dissolved oxygen, temperature, conductivity and nutrient concentrations. Results indicate a clear separation of taxa according to salinity gradients and nutrient concentrations. The habitats with the highest status are springs with *Hildenbrandia* and *Batrachospermum* as dominants, while the moderate or deficient status are represented by irrigation ditches where the predominant taxa are filamentous green algae as *Cladophora* and *Spirogyra*. The ecological status of rivers changes from good to moderate, and their macroalgae community is composed mainly by *Compsopogon*, *Vaucheria* and *Enteromorpha* with *Polysiphonia* forming extensive growths. A similar approach would be useful in water quality assessment in other Mediterrean regions.

### References

- [1] Rodrigo M.A., Rojo C., Armengol X. & María M., *Limnetica*, 20(2) (2001) 329-339.
- [2] Giordani G., Zaldívar J.M. & Viaroli P., *Ecological indicators*, 9 (2009)

## **First study of the dynamics of the populations Phytoplanktoniques in the dike sidi abderrahmane-safi-morocoo**

Wafae Belokda <sup>1</sup>, Khalid Elkalay <sup>2</sup>, Mohamed Loudiki <sup>3</sup>, Karima Khalid <sup>2</sup>

1. University Cadi Ayyad, Safi, MOROCCO

2. Ecole upper Essaouira Technology, University Cadi Ayyad Al Jadida Essaouira, MOROCCO

3. Faculté Semlalia Science, University Cadi Ayyad, Marrakech, MOROCCO

---

To build restraints on rivers or near is a Moroccan politics adopted since 1984 to favor a balanced access to the water on the whole country, to give the means for the storage of the water for a while for the redistribution. Neo-less, it is obvious that these arrangements in rivers, that they are of small or big capacities, have an incidence on the diet of flow because they can modify more or less temporarily the natural hydrology of streams, and consequently to provoke modifications in the local ecosystem.

It is in this sense that we thought of estimating the trophique state of the restraint Sidi Abderrahman in Safi city, Morocco as first scientific study on the site, and it via the follow-up of the dynamics of the phytoplanktoniques populations during the period of follow-up.

The data of observations and ecological and hydrochemical samplings led between May, 2011 and Mars 2012 on the dike Sidi Abderrahman.

## The ecological indicator value of epilithic algae in the Magdalena River

Mariana Cartajena Alcántara, Javier Carmona Jiménez, Rocío Ramírez Rodríguez, Miriam Bojorge García, Enrique Cantoral Uriza

Departamento de Ecología y Recursos Naturales, Facultad de Ciencias, Universidad Nacional Autónoma de México, D. F. MÉXICO

Applying and developing environmental regulation for catchment management requires identifying elements of biological quality, parameters and measurements that allow for establishing their ecological state. To that means, the present study has the objective of characterizing the ecological indicator value of diatom and other benthonic algae taxa for assessing the ecological state of the Magdalena River basin in the Mexico City. Six sites were studied in which the physicochemical characteristics of water were described and 180 samples were taken. Data were analyzed by a canonical correspondence analysis, which showed three groups of sites along a gradient going from pristine to low environmental quality. Highly polluted sites were recorded in the lower portion of the catchment and were differentiated from those in the upper catchment. The species indicator value (IndVal) was calculated to evaluate taxa sensitivity to environmental changes. Physical differences (temperature, stream flow) were evident in little disturbed sites. The species associated to oligotrophic sites were *Achnanthes minutissimum*, *Fragilaria capuccina*, *Navicula cryptocephala*, *Rhoicosphenia abbreviata*, *Placoma regulare* and *Vaucheria bursata*, while nutrient enrichment and other human activities were related to changes in the benthic community and to presence of populations of *Phormidium* cf. *autumnale* that are tolerant to eutrophic conditions.

## Use of diatoms for monitoring Moroccan Mediterranean rivers

Mohammed Loudiki, El Mostafa Aouane, Khadija Mouhri

Cadi Ayyad University, Faculty of Sciences Semlali, MOROCCO

The objective of this study was to monitor the water quality of two mountain rivers: Oued N'fis and Oued Rérhaya. This monitoring was carried out by both the physico-chemical parameters and the Biological Diatom Index (IBD) approaches in accordance with AFNOR T90-354. The waters from the two rivers were analyzed for general parameters measured in the field (conductivity, oxygen, pH, temperature). Water samples were taken to measure different parameters: anions and cations. Water was also analyzed for nutrients in its inorganic and organic forms (nitrogen, phosphorous and silica). The water quality was assessed through biological indices. The basic index used was the IBD (indice biologique Diatomées) with comparison of the data with others Diatom indices (IPS, IDP..).

The comparison of the results obtained by both approaches in the two rivers shows that the water quality is slightly more deteriorated, particularly during the summer period characterized by a severe flow decrease, especially in the downstream of rural agglomerations. On the other hand, several sampling sites in Oued N'fis become exceptionally dried, particularly during the summer, which could lead to an ecological and environmental stress of the river. Others sampling sites, not totally dried, have recorded a significant decline in their class water quality especially evaluated by the physical and chemical parameters. By contrast, the diatom index IBD appears not much affected by the low flows occurred during the summer.

In term of this study, a map of water quality of these mountain rivers, carried out by both the physico-chemical and biological approaches, is presented. Furthermore data about ecological characteristics and human activities may be affecting water quality of these fragile Mediterranean rivers are presented and discussed considering the specificities of the river type studied and the local population's characteristics.



## Identification and Allelopathic Effects of three seaweeds extracts on the germination and growth of different plants and weeds

Amal Houssien <sup>1</sup>, Ahmed Ismail <sup>2</sup>, Farid Sabra Sabra <sup>3</sup>

1. Central Agric. Pesticides Lab. Agric. Research Center, Sabahia, Alex, EGYPT

2. Pesticides Depart. Fac. of Agric. Kafrelsheikh, Univ., Kafr El-Sheikh, EGYPT

3. Plant Production & Protection Dept., College of Agric. & Vet. Med., Qassim Univ., SAUDI ARABIA

This study was planned to estimate the allelopathic effect of three seaweeds from different algae classes commonly dispersed in Alexandria beaches on certain (narrow and broad leaves) weeds and crops which grown in both summer and winter seasons as pre-emergence application. In addition qualitative and quantitative determined of the allelochemicals, phenol derivatives in algae using HPLC. The oxidative enzymes and total phenols were also detected. Moreover, to assess its effects as a foliar application on these plants as a post-emergence application by determined the algae phytotoxicity on chlorophyll a, b, carotinoids and total protein. The tested plants and weeds showed different response to the allelopathic effects of the water soluble extract of the tested algae. *Ulva lactuca*, the green alga was the most effective one followed by *Pterocladia pinnate*, the red alga. The seaweed *Leathesia difformis*, the brown alga came at the last on this manner. Concerning summer plants, tomato was the most affected plant. *Leathesia difformis* by all concentration had no inhibitory effect on the winter weeds and crops germination. *Pterocladia pinnat* had no effect on the germination of barley and bean but this alga not only prevent completely shoot growth but also significantly reduce root growth in these two plants, also the lowest concentrations had the same effect on the rest of the plants. Concerning the acetone extracts of the seaweeds, *Pterocladia pinnate* had no effect on all plants germination. Tomato plants were the most affected one followed by lettuce, whereas, the highest concentrations of *Ulva lactuca* and *Leathesia difformis* prevent tomato germination. HPLC analysis reflected that, Vanillin and p-coumaric acid were highly concentration in *Ulva lactuca*, *Pterocladia pinnate* and *Leathesia difformis*. Contrary, Salicylic acid and Ferulic acid had the lowest concentration in all tested seaweed.

## **Algal benthic communities from Pastoruri micro-basin (Andes, Peru): Interest in biomonitoring in a climate change scenario**

Miguel Bobadilla <sup>1</sup>, Carlos Cielos <sup>2</sup>, Edwin Palomino <sup>2</sup>, Marina Aboal <sup>1</sup>

1. University of Murcia, SPAIN

2. National University "Santiago Antúnez de Mayolo", PERU

Glacier recession in Los Andes mountains is linked to growing of algal assemblages in micro-basins. However, information concerning freshwater benthic algal diversity and their potential uses in biomonitoring procedures of high-altitude aquatic habitats are scant. For these reasons the objective of this study was to identify benthic algal communities in order to relate their distribution and dominance with physical and chemical parameters, including heavy metals and nutrients. Six monitoring points were selected in ponds, streams and wetlands along an altitudinal gradient (5,031-3,820 masl) of Pastoruri micro-basin (Peru), and sampled between 2011 and 2012. *Zygogonium* (30%) and *Ulothrix moniliformis* (35%) were the dominant taxa in acidic streams and ponds (pH 2.9-5.5/5,031-4,763 masl). Concentrations of nitrite and nitrate were low (0.11 mg L<sup>-1</sup>) while Fe, Mn, Co Ni and Zn reached levels below 5 mg L<sup>-1</sup>. In alkaline stream and ponds (pH 7-8.9/4,486-3,820 masl) *Mougeotia* and *Ulothrix zonata* were dominant (40%) with concentrations of nitrite and nitrate slightly higher (0.46 mg L<sup>-1</sup>) and Fe, Mn, Co, Ni and Zn concentrations below 0.05 mg L<sup>-1</sup>. In acidic wetlands (pH 3.6-5.5/4,218 masl) with concentrations of heavy metals ranging from 0.15 to 0.2 mg L<sup>-1</sup>, *Zygogonium* and *Pleurodiscus* (53%) were predominant. Throughout the micro-basin, the concentration of orto-phosphate remained below the limits of detection (0.5 mg L<sup>-1</sup>) while dissolved oxygen and conductivity were fairly constant (5.22-2.05 mg L<sup>-1</sup>/381-231μS cm<sup>-1</sup>). The dominance of Zygnematales and Ulotrichales may suggest a good adaptation to the especial conditions of the habitats studied. The environmental factors explaining the distribution of benthic algal communities seem to be acidity and alkalinity, availability of nutrients and presence of heavy metals. Our study recommends the use of these algae as reliable indicators of ecological status of wetlands, ponds and streams of the Andean micro-basin or other regions with similar environmental characteristics.

## Distribution of spring phytoplankton in the Velikaya River (North-West of Russia)

Ekaterina Sileenkova

Institute of Lake Research Russian Academy of Science, RUSSIA

The Velikaya River is situated in the north-western part of Russia and belongs to the Baltic Sea basin. It originates from small lakes in the south of Pskov region and falls to the Pskovskoye Lake (system of the large Pskovskoye-Chudskoye Lake) forming the large mouth. River's length is 406 km, catchment area – 25420 km<sup>2</sup>. Almost 60% of catchment area is covered by plough lands and grassland, 36% - forests, 4% - lakes and swamps. In the upper stream the river passes through the lake system (21 lakes), connected by the flows. Total content of ions in the river changes from 200 to 500 mg/l. Water has slightly alkaline reaction, belongs to hydrocarbonate class of calcium group and has high water coloring (100 – 300 Pt mg l<sup>-1</sup>). Quantitative phytoplankton was sampled at 13 stations along the river in spring 2011. 253 algae taxons from 8 divisions have been found. The most diverse are Bacillariophyta - 128 taxons (50,6%) and Chlorophyta – 67 taxons (26,5%). Other divisions were less diverse. The number of phytoplankton taxons increases to the river mouth. Biomass of spring phytoplankton varied from 0,04 to 0,43 mg/l and also reached the maximum in the mouth area after the city Pskov. The distribution of phytoplankton biomass is confirmed by chlorophyll “a” content at the same stations, which changed from 0,22 (upper stream) to 7,15 mg/m<sup>3</sup> (mouth area). According to biomass values, the level of chlorophyll “a” content and also nutrients (ammonium nitrogen, phosphate ion) the Velikaya river can be characterized as mesotrophic. Analysis of phytoplankton according to saprobity has showed that the river can be classified as “mesosaprobic – moderately polluted (saprobity indices 1,7 – 2,1). Saprobity indices have increased near settlements and towns, especially near the city Pskov.

## Ecological criteria for algal monitoring of the Jordan River

Sophia Barinova

Institute of Evolution, University of Haifa, ISRAEL

The world famous Jordan River flows from altitudes about 2200 m in Golan Highlands to the Dead Sea at 440 m b.s.l. The river is 160 km long and divided into two segments by the Lake Kinneret at 140 m b.s.l. The Upper Jordan River is a source of drinking water, whereas the Lower Jordan River is impacted by domestic wastewater and saline water from Saline Water Carrier and Bitania. Our data come from sampling in 2006–2011 in both segments. In the Upper Jordan River we found 232 taxa of algae and cyanobacteria, with diatoms prevailing. Fluctuations of algal diversity and composition reflects of anthropogenic influences, mostly in winter. Fluctuation in species richness correlates with saprobity index S. The CCA reveals that the most important variables for winter monitoring are those associated with the trophic conditions such as nutrients level, electric conductivity, TDS, pH, Saprobity Index S and the number of species in the community. The Lower Jordan River is one of the most polluted in Israel. We identified 152 taxa of algae and cyanobacteria among which diatoms, greens, and euglenoids predominate. The dynamics of algal taxonomic diversity over the stations shows a dramatic degradation of the community structure. The round year fluctuation of electric conductivity, Saprobity Index S, and species richness over the river stations is correlated with the biotest by sensitive bacteria results. Toxic substances come to the river from the Saline Water Carrier and Bitania, impacting the algal community and self-purification capacity of the Lower Jordan River ecosystem. Therefore, biological monitoring of the Upper Jordan River must include as basic ecosystem variables the species richness, conductivity and nutrients measured twice per year, whereas in the Lower Jordan River the species richness and conductivity have to be added by the biotest at least once per year only.

## Ecology and diversity of freshwater algae and cyanoprokaryotes in Drakensberg Mountains, Southern Africa

Anatoliy Levanets<sup>1</sup>, Sanet Janse van Vuuren<sup>1</sup>, Annelie Swanepoel<sup>2</sup>, Jonathan Taylor<sup>1</sup>, Arthurita Venter<sup>1</sup>, Leon van Rensburg<sup>1</sup>

1. North-West University, SOUTH AFRICA

2. Rand Water, SOUTH AFRICA

Some data on diversity and ecology of cyanoprokaryotes in Clarens Sandstone cliffs of DM were reported. Our results had shown rich cyanoprokaryotic diversity in Northern DM. These organisms are closely related with honeycombed weathering structures and that the only source of water was strongly alkaline (pH 9) seepage water. Desmids are poorly studied in DM. Our work on the streams and tarns has revealed a total 86 species from 18 genera of desmids. 1 genus (*Teilingia* Bourr.) and 28 species were recorded in Southern Africa for the first time. The diatom flora of DM has been limited in the past to the Tugela River and its tributaries. More recently work on the mountain tarns has revealed a total of 35 species diatom from 14 genera. The dominants were *Frustulia saxonica* Rab. and *Encyonema gracile* Krammer, while *Gomphonema* sp.1 (aff. *angustum*) (Kütz.) Rab. and *Nitzschia sinuata* var. *delgonei* (Grun.) Lange-Bertalot, had comparatively low abundances but did show high local occurrences. A number of species were specific to only a limited number of tarns, yet had a relatively high number of individuals. We investigated the changes in algal composition and associated environmental variables since the construction of the Mohale Dam until the present. Sampling indicated that dissolved inorganic nitrogen concentrations decreased, while dissolved inorganic phosphorus concentration increased 12-fold, resulting in increases in algal concentration and a shift from green algal dominance in 2003 to cyanobacterial dominance in 2006. Cyanobacteria were favored by high temperatures and low DIN:DIP ratios. Although currently non-problematic, the dominance of cyanobacteria may pose future potential problems, especially if further increases in nutrient concentrations occur. Our data revealed a high algal diversity in the DM and confirmed that the DM is one of the most diverse algal areas in Southern Africa.

**Effect of riparian shading on diatom assemblages in headwater streams**

Daša Hlúbiková, Maria Helena Novais, Lucien Hoffmann, Luc Ector, Gabriel Lippmann

Public Research Centre, LUXEMBOURG

Differences in the structure of diatom assemblages in headwater streams with contrasting shading conditions were studied in order to evaluate the influence of the lack of riparian vegetation on the biofilm. The objective was to simulate the effect of global warming by sampling along the longitudinal gradient at selected streams differing clearly in their catchment land use: presence or absence of riparian vegetation. Two pairs of streams in Luxembourg were selected in order to maximize the differences in the land cover and minimize other environmental gradients (e.g. geology, granulometry, mineralization and catchment size). The effect of changed light conditions was evaluated by comparing the taxonomic composition of diatom assemblages, diatom indices as well as by examining distribution of diatom ecological guilds and their responses to stressors and disturbances among studied sites. Ecological guilds were assigned to all diatom taxa according to their growth form: low-profile guild, high-profile guild and motile guild. The statistical analysis proved that low-profile guild diatoms typically dominated in forested headwaters with limited resources and high disturbance, whilst assemblages at open sites showed a wide range of growth forms corresponding to high-profile and motile guild indicating that resources availability at these sites is naturally higher and level of disturbance lower. In forested streams, the diatom assemblages showed to be mostly influenced by temperature, oxygen and conductivity, typical for oligotrophic sites with high disturbance due to fast current and shading, whilst in open streams, importance of nutrients prevailed. The latter trend was also well reflected by the IPS index that showed lower values at open sites correlating most significantly with temperature, phosphates and nitrates.

Our results indicate that the lack of riparian vegetation in headwaters is a crucial factor influencing directly other environmental variables leading to significant changes in diatom biofilms in terms of their composition and structure

## New benthic algal assessment protocol for monitoring water quality of rivers

Natasa Zugic-Drakulic<sup>1</sup>, Marianne Douglas<sup>2</sup>

1. Faculty of Environmental Protection, EDUCONS University, SERBIA

2. Canadian Circumpolar Institute and Department of Earth and Atmospheric Sciences, CANADA

Aquatic monitoring using biological indicators are complementary to physical and chemical monitoring networks, and are considered by some to be a superior monitoring technique, as living organisms and their communities represent the integrated sum of their immediate physical, chemical and biological environment. Algal assessment protocol could be beneficial to numerous user groups ranging from government agencies and conservation authorities to private citizen groups, since it is based on a standard and easy-to-use guide, including information on sampling, evaluating and reporting on aquatic ecosystem condition using algal indicators. Rapid algal assessment protocols are designed to enable numerous sites to be monitored at affordable costs that are attractive to monitoring agencies. The major goal of this study is to develop a rapid assessment protocol (Ontario Benthic Algal Assessment Protocol) that would enable evaluation of the aquatic ecosystem health. Proposed protocol is based upon a 3-tiered examination. At the first level, an initial on-site visual assessment is used to describe the extent of algal growth. At this stage, a rapid visual assessment of benthic algal cover, description and abundance scoring of growth forms with measurement of thickness of films and filament length is recorded and analyzed. At the second level of assessment, biomass (chlorophyll a) analyses are used together with a rapid taxonomic identification of algal groups (at the genus level). At the third level of assessment, detailed high taxonomic resolution analysis are applied on diatom samples. At each level of assessment, we determined the relative predictive ability of algal data to assess which methods of rapid assessment provide sufficient information on algal responses along gradients of disturbance to be useful in the biological monitoring of Ontario Rivers.

**Temporal and spatial variation in diatom indices for aquatic pollution assessment**Manel Leira <sup>1</sup>, Rafael Carballeira <sup>2</sup>, M<sup>a</sup> Carmen Rodríguez López <sup>2</sup>

1. University of Vigo, SPAIN

2. University of Santiago de Compostela, SPAIN

There is a relatively long history of the use of diatoms in bioassessments. Since their original introduction, a substantial number of 'diatom indices' (DI) have been developed, refined, and improved with increased usage, understanding, and application in various geographic areas [1]. However fewer studies have addressed the temporal and spatial variation of DI scores. Assemblage variation that results in similar assemblages over time and space produces autocorrelation patterns. The contribution of the temporal succession of diatom assemblages in lotic ecosystems to this variability is well-known. However, the relative contributions of various sources of this variation (random sampling variation, hydrologic variation, and weather variation) have not yet been addressed in many studies. In lotic ecosystems, significant spatial autocorrelation can be caused by greater similarity of site conditions among adjacent sites than among distant sites. Spatial autocorrelation is common in ecological variables and can occur when assemblages are similar over some distance. Although ecologists identify the presence of autocorrelation, few lotic studies explicitly test for spatial and temporal autocorrelation in DI. The objectives of this study were to use an annual regional database for diatom assemblages in small and mid size temperate rivers (Galicia, NW Spain) to determine: (1) if the DI scores based on samples obtained within the same year are significantly different, (2) the presence and direction of temporal changes in DI scores at individual sites over the period of records, (3) if the river location – DI relationship changed with time, (4) whether within-year temporal variation in DI is greater at lower quality sites than at higher quality sites, and (5) if autocorrelation is present for DI scores.

[1] Delgado C., Pardo I. and L. García (2010) A multimetric diatom index to assess the ecological status of coastal Galician rivers (NW Spain). *Hydrobiologia* 644 (1): 371-384



## The investigation on the blue-green algae of Delice River (Kýzýlýrmak)

Ayla Batu, Nuray Akbulut

Hacettepe University, Ankara, TURKEY

Blue- Green Algae (Cyanobacteria) are only organisms group that has 16S rRNA, chlorophyl-a and capacity of photosynthesis. They can produce organic carbon and oxygen and also capture atmospheric N<sub>2</sub> and CO<sub>2</sub>. Cyanobacteria are equipped to flourish in aquatic environments where they can produce blooms, scums and mats. They also produce a diverse range of toxins.

The blue-green algae structure and dynamics of Delice River are analyzed within the scope of proposed work. There are some samples of the algae in the laboratory which were collected from Delice River (July 2007- May 2008). As part of this study, these algae samples have been studied monthly the physical and chemical parameters of the water depending on climatic changes. There are 11 taxons in Delice River which were determined in this study. Some species such as *Microcystis aeruginosa*, *Oscillatoria formosa*, *Lyngbya maior*, *Phormidiumambiguum*, *Spirulina sp.* in Delice River were frequently observed and they are illustrated with photographs. In addition, the aim of this study is learning of the identification of the blue-green algae species in river habitat and it is proposed to be based on the study of blue-green algae toxicity by using this useful information.

Consequently, it is estimated the available species in terms of taxonomic and ecological properties in stream.

---

## **Toxic cyanobacteria in the River Nile, Egypt: Isolation, identification and diversity studies**

Ranya Amer, Sara Saad El Din, Rehab El-Shehawy

City of Scientific Research and Technology Applications (SRTA City), Alexandria, EGYPT

---

Many cyanobacterial species are known to produce potent toxins. Cyanotoxins are classified according to their mode of action in vertebrates as hepatotoxins, neurotoxins, cytotoxins, dermatotoxins, and irritants. Hepatotoxins are widely distributed and commonly found in eutrophic water bodies. The Nile River is the main drinking source in Egypt as well as nine other countries serving a population of 160 million inhabitants. The River suffers from eutrophication, which led to increased algal growth including toxic cyanobacteria. Off-shore samples were collected for cyanobacterial isolation, purification and identification. Classic microscopic identification combined with PCR amplification of the 16S rDNA and ITS region using specific cyanobacterial primers were performed. Furthermore, Real-time PCR was performed to quantify the number of cyanobacteria present in water including the potentially hepatotoxic ones. The combined use of molecular gene markers and light microscopy demonstrated the dominance of different freshwater *Microcystis* phylotypes, including the potential hepatotoxin producers. *M. wesenbergii* and *M. aeruginosa*. Our data stress that water management in the region needs to take into consideration the presence of these potentially toxic organisms.

Author List

A		Foerster, Julia	O01, O02
Aboal, Marina	O20,P04, P09	Fortin, Claude	O05
Abonyi, Andras	O18	G	
Ács, Éva	PL2	Galoux, Daniel	P02
Akbulut, Nuray	P16	García Fernández, María Eugenia	P04
Amer, Ranya	P17	García-Calvo, Eloy	O13
Angeli, Nicola	O03	Gassiole, Gilles	O06
Aouane, El Mostafa	P07	Giraudel, Jean-Luc	O06
B		Gligora Udovi, Marija	P03
Barinova, Sophia	P11	Gómez, Victoria	O20
Barrios, Elena	PL1	González-Pleiter, Miguel	O15
Bascik, Maria	O21	Gonzalo, Soledad	O13,O15
Batu, Ayla	P16	Gutowski, Antje	O02
Belokda, Wafae	P05	H	
Béres, Viktória B.	PL2	Haigh Flórez, David	O14
Berrendero Gómez, Esther	O19	Hlúbiková, Daša	P13
Bobadilla, Miguel	P09	Hoffmann, Lucien	P13
Bojorge García, Miriam	P06	Houssien, Amal	P08
Borics, Gábor	PL2, P01	I	
Borojevi, Koraljka Kralj	P01	Ismail, Ahmed	P08
Boutry, Sébastien	O06	J	
C		Janse van Vuuren, Sanet	P12
Campeau, Stéphane	O05	K	
Cantonati, Marco	O03	Khalid, Karima	P05
Cantoral Uriza, Enrique	P06	Kiss, Keve T.	PL2
Carballeira, Rafael	P15	Komulaynen, Sergey	O12
Carmona Jiménez, Javier	P06	Kralj Borojevi, Koraljka	P03
Cartajena Alcántara, Mariana	P06	Kunpradid, Tatporn	O11
Chapuis, Iara S.	O20	L	
Cielos, Carlos	P09	Lançon, Anne Marie	O18
Conforti, Visitación	O17	Lavoie, Isabelle	O05
Corrochano, Alfredo	PL1	Leganés, Francisco	O8,O13,O15
Costas, Eduardo	O14	Leira, Manel	O22,P15
Coste, Michel	O06	Leitao, Maria	O18
D		Leonardi, Patricia	O17
de la Hera, Cristina	O14	Levanets, Anatoliy	P12
Delmas, François	O06	Lippmann, Gabriel	P13
Douglas, Marianne	P14	Loudiki, Mohammed	P05, P07
Durán, Concha	O10	Loza, Virginia	O07,O19
E		Luc, Brient	O16
Eckartz-Nolden, Gabriele	O01	Luque, Yaiza	O20
Ector, Luc	P13	M	
Elkalay, Khalid	P05	Marion, Lengronne	O16
El-Shehawy, Rehab	P17	Martínez Rosell, Aitor	O09
F		Martínez Salmerón, Alicia	O20
Fehér, Gizella	PL2	Marvan, Petr	PL3
Fernández Valiente, Eduardo	O19	Mateo, Pilar	O07, O08, O09, O19
Fernández-Piñas, Francisca	O08, O09,O13, O15	Molnár, Levente	PL2
		Morales, Aurelio	O07

Mouhri, Khadija	P07	Spitale, Daniel	O03
Moulin, Christelle	O16	Stankovi, Igor	P01
Muñoz, M <sup>a</sup> Ángeles	O08, O09	Swanepoel, Annelie	P12
		Szilágyi, Zsuzsna	PL2
N			
Nannavecchia, Paula	O17	T	
Novais, Maria Helena	P13	Taylor, Jonathan	P12
		Tolivia, Analía	O17
O		Tornes, Elisabet	O10, O22
Opatøilová, Libuše	PL3	Tóth, Bence	PL2
Orellana, Guillermo	O14		
P		U	
Palomino, Edwin	P09	Udovic, Marija Gligora	P01
Peres, Florence	O06	V	
Pérez, María del Carmen	O10	van Rensburg, Leon	P12
Perona, Elvira	O07,O09, O19	Várbíró, Gábor	PL2, P01
	O16	Venter, Arthurita	P12
Petit, Lionel	P03	W	
Plenkovi Moraj, Anelka	PL1	Winter, Jennifer	O05
Puig, Alejandra		Wojtal, Agata	O21
R		Z	
Ramírez Rodríguez, Rocío	P06	Zugic-Drakulic, Natasa	O05, P14
Rodea-Palomares, Ismael	O13, O15	Zutini, Petar	P03
Rodríguez López, M <sup>a</sup> Carmen	P15		
Rosal, Roberto	O13, O15		
Rosebery, Juliette	O06		
Rosillon, Francis	P02		
Rott, Eugen	O04		
Ruiz, Laura	O17		
Ruza, Javier	PL1		
S			
Saad El Din, Sara	P17		
Sabater, Sergi	O10, O22		
Sabra, Farid	P08		
Sánchez Castillo, Pedro M.	O20		
Santiago, Javier	O13		
Schaumburg, Jochen	O02		
Schneider, Susanne	O04		
Schranz, Christine	O02		
Sileenkova, Ekaterina	P10		
Siwek, Janusz	O21		
Sossey, Khadija	P02		



## Participant List

## A

Acs,Eva	evaacs@freemail.hu
Agirre,Coro	kori@ekolur.com
Akbulut,Nuray	emir@hacettepe.edu.tr
Amer,Ranya	ranyaamer@yahoo.com

## B

Barinova,Sophia	barinova@research.haifa.ac.il
Bengtsson,Roland	roland.bengtsson@mikroalg.se
Berrendero Gomez,Esther	esther.berrendero@uam.es
Bessudova,Anna	annabessudova@mail.ru
Bobadilla,Miguel	mcba_1122@yahoo.es
Boltes,Karina	karina.boltes@uah.es

## C

Cantonati,Marco	marco.cantonati@mtsn.tn.it
Carballeira Coego,Rafael	rafael.carballeira@gmail.com
Cartajena,Mariana	camestruz@yahoo.com
Conforti,Visitacion	conforti@bg.fcen.uba.ar
Corrochano,Alfredo	acorroch@tragsa.es
Chapuis,Iara S.	iaraschapuis@gmail.com

## D

Delmas,François	francois.delmas@irstea.fr
-----------------	---------------------------

## E

El-Shehawy,Rehab	rehab@imdea.org
------------------	-----------------

## F

Fernández-Piñas,Francisca	francisca.pina@uam.es
Foerster,Julia	Julia.Foerster@lanuv.nrw.de

## G

García Fernández,María Eugenia	marujegf@gmail.com
González Pleiter,Miguel	mig.gonzalez@uam.es
Gonzalo Muñoz,María Soledad	soledad.gonzalo@uah.es
Gutowski,Antje	a.gutowski@t-online.de



## H

Haigh Florez,David	david.haigh@quim.ucm.es
Harding,Phil	phil.harding@environment-agency.gov.uk

## K

Kiss,Keve	kis7972@ella.hu
Komulainen,Sergey	komsf@mail.ru
Kralj Borojevi,Koraljka	kora.kralj@gmail.com
Kunpradid,Tatporn	tatporn@gmail.com

## L

Lavoie,Isabelle	ilavoie.bio@gmail.com
Leira,Manel	mleira@uvigo.es
Leitao,Maria	leitao@bieau.fr
Lopez Rodriguez,M <sup>a</sup> Carmen	mdelcarmen.lopez.rodriquez@usc.es
Loza,Virginia	virginia.loza@uam.es
Llaneza,Verónica	vllaneza@ufl.edu

## M

Martinez Rosell,Aitor	aitor.martinez@estudiante.uam.es
Mateo,Pilar	pilar.mateo@uam.es
Muñoz,M. Ángeles	mangeles.munnoz@uam.es

## N

Novais,Maria Helena	novais@lippmann.lu
---------------------	--------------------

## O

Opatrilova,Libuse	Libuse_Opatrilova@vuv.cz
-------------------	--------------------------

## P

Perez Baliero,Maricarmen	perez.baliero@gmail.com
Perona,Elvira	elvira.perona@uam.es

## Q

Quirós,Jennifer	jquiros2@hotmail.com
-----------------	----------------------

## R

Rodea Palomares, Ismael	ismael.rodea@uam.es
Rosal, Roberto	roberto.rosal@uah.es
Rott, Eugen	eugen.rott@uibk.ac.at
Ruza, Javier	

## S

Sabater, Sergi	ssabater@icra.cat;sergi.sabater@udg.edu
Sánchez Castillo, Pedro M.	psanchez@u8gr.es
Sileenkova, Ekaterina	Katerina.sil@mail.ru
Solak, Cüneyt Nadir	cnsolak@gmail.com
Sossey Alaoui, Khadija	ksossey@ulg.ac.be
Stankovic, Igor	igorstankovic1@gmail.com

## V

Tornes, Elisabet	etornes@icra.cat
------------------	------------------

## V

Verdugo Althöfer, María	marveralt@hotmail.com
-------------------------	-----------------------

## W

Whitton, Brian	b.a.whitton@durham.ac.uk
Wojtal, Agata	a.wojtal@botany.pl

## Z

Zugic-Drakulic, Natasa	natasa@educons.edu.rs
------------------------	-----------------------



## Sponsors



## Collaborative Institutions



## Technical Secretariat



C/Francisca Delgado nº9 plta. 5ª  
28108 Alcobendas, Madrid, Spain  
T. +34 91 1967654  
Email: [uamriver2012@vibocongresos.com](mailto:uamriver2012@vibocongresos.com)