IRGC NEWS

INTERNATIONAL RESEARCH GROUP ON CHAROPHYTES

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Edited by: A. García, C. Martín-Closas and S. Schneider
President: Carles Martín-Closas (Barcelona, Spain) cmartinclosas@ub.edu
Vice-President: Susanne Schneider (Oslo, Norway) susi.schneider@niva.no
Secretary: Adriana García (Wollongong, Australia) adriana@uow.edu.au
Treasurer: Emile Nat (Amsterdam, The Netherlands) e.nat@kranswieren.nl

25

April 2014

CONTENTS

EDITORIAL

Twenty-five years have passed since our association was founded. Happy birthday! As a PhD student I had the chance to be present at the birth of our group. The IRGC was, in its childhood, a relatively local operation, with the main board based in the Laboratory of Paleobotany at the University of Montpellier, France, although from the very beginning the IRGC-meetings were attended by colleagues from all around the world. In its 25th anniversary our association is much more international and active, but faces very serious challenges. One of them is keeping up with basic costs in a time of global crisis. This is only possible thanks to the membership fees. These fees are basically utilised to help the organisers of regional and international charophyte meetings and to pay the costs of the bulletin you are reading. Please be aware that the continuity of these activities depends on the payment of your fees and I strongly encourage you to keep them updated. As a result from meetings and personal contacts between members of our association, a large number of research activities are developed yearly. This year I would like to highlight the special issue devoted to Charophytes that will be soon published in the international journal 'Aquatic Botany'. This publication gathers the main results of the 6th Symposium of the IRGC held in Mendoza, Argentina, in 2012 and represents a significant effort to demonstrate the contribution of our association to the progress of charophyte knowledge. Also an increasing number of books and papers are being published every year. Susanne Schneider presents here a selection of the main results. I am sure you will enjoy reading all these new contributions to "charology" or charophyte science.

Carles Martín-Closas

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The task of the Regional Correspondents is **to collect relevant information about meetings, books, individuals etc. from their area and forward it to the IRGC Secretary** by February-mid-March every year.

WELCOME TO NEW IRGC MEMBERS

It is a great pleasure to welcome our new members Julio C. Rodríguez Reyes, who studies modern charophytes from Venezuela, and Alba Vicente Rodríguez who works on fossil charophytes from the Upper Cretaceous of Catalonia (Spain).

FINANCIAL MATTERS OF THE IRGC

In order to reduce bank costs the Executive Committee has decided not to offer the credit card service anymore. Only a few members used this way to pay their membership fees and the contribution costs and commission fees the European Merchant Services (EMS) charged us were not affordable for the IRGC. The only way to pay your membership is by bank to bank account transfer. Please find the instructions in the IRGC fees form. If you find any inconvenience in paying the IRGC fees by this way please contact any member of the Executive Committee.

Emile Nat, The Netherlands
IRGC Treasurer

REPORT OF PAST MEETINGS

2013

1 – 6 December
INQUA (International Quaternary)-Early Career Research inter-congress meeting, Wollongong, Australia

This meeting was the result of a new initiative from the International Union for Quaternary Research (INQUA) dedicated to expose young researchers to a variety of the techniques used in Quaternary Research, advice on writing and presentation skills. The graduate students and post-doctoral researchers also had the opportunity to present their own work. There were about 60 delegates from around the world.
There were several workshops organised by specialists in each field involving dating methods for Quaternary and biological and geochemical proxies used in palaeoenvironmental reconstructions. Specifically in the area of palaeolimnological studies, charophytes, ostracods, pollen and diatoms were included in the workshops which had also a laboratory component.

Adriana García
University of Wollongong (Australia)

FORTHCOMING MEETINGS

2014

27 - 29 June
The German Working Group on Characeae (AGCD)

The German Working Group on Characeae (AGCD) will hold its Annual Meeting to investigate the macrophytes at the **lower lake of Lake Constance.** Collection by diving and snorkelling can be undertaken.
Accommodation at: Gaienhofen-Horn, Hotel Seehörnle

Contact: Thomas Franke<thomas.franke@ivl-web.de

11 – 14 September
19th Meeting of the GEC (Group of European Charologists), Vilnius (Lithuania)

The meeting will take place at the Institute of Botany of Nature Research Centre. Vilnius is the capital of Lithuania and its largest city situated in southeastern Lithuania at the confluence of the Rivers Vilnia and Neris. The organization of the meeting will be as traditionally arranged, with presentations followed by the field trips in order to collect charophytes and subsequent determination in the laboratory. A one-day excursion is planned in the surroundings of Vilnius to *Lychnothamnus* - bearing lakes. Lake Šventininkai is the oldest locality where *Lychnothamnus barbatus* was found, at the beginning of the 19th century. Lake Balsys is situated in the green-belt of Vilnius city within Verkiai Regional Park. A visit to the ancient capital and the castle in Trakai is also planned. Charophyte determination will be arranged at the conference building. Another day will be devoted to charophyte - bearing lakes in southern Lithuania – Žuvintas and Dusia.

Nearly 30 participants were preregistered before 1 March 2014. The deadline for final registration and abstract submission is 31 May 2014.
The cost for the field excursions will be given in the next circular.

Contact: Zofija Sinkevicine
e-mails:zofija.sinkeviciene@botanika.lt
zofijasin@gmail.com

28 September - 3 October
IV International Palaeontological Congress, Mendoza, Argentina

The 4th International Palaeontological Congress will be held in Mendoza, Argentina, from 28 September to 3 October, 2014, hosted by the Centro Científico Tecnológico CONICET Mendoza and partner organizations.

This international meeting is devoted to Palaeontology and convenes every four years under the aegis of the International Palaeontological Association. Following three previous meetings in Sydney (2002), Beijing (2006) and London (2010), it will now come to the American continent for the first time.

The congress will be accompanied by field excursions before and after the meeting. Please check the website for details.

Website:http://www.ipc4mendoza2014.org.ar/

Contacts:secretary@ipc4mendoza2014.org.ar
Dr Claudia V. Rubinstein
e-mail: crubinstein@mendoza-conicet.gov.ar;
Dr Beatriz G. Waisfeld
e-mail: bwaisfeld@efn.uncor.edu

2015

27 July - 2 August
XIX INQUA Congress, Nagoya, Japan
Theme: *Quaternary Perspectives on Climate Change, Natural Hazards and Civilization.*

The International Quaternary meeting provides a platform to present research involving the last 2.6 Ma of Earth history. In particular, researchers dealing with palaeoenvironmental and palaeoclimatic issues involving the use of biological proxies (of course with the inclusion of charophytes!), have in these conference a nice opportunity to discuss with colleagues from around the world. Usually 1,000 to 2,000 delegates participate in the INQUA meetings, where also field excursions are offered.

Contact: Secretary of the event: 2015inqua-sec-ml@aist.go.jp
Website: http://inqua2015.jp/

4 - 7 August
13th International Paleolimnology Symposium (IPS2015)

The organizing committee and Chinese paleolimnologists have announced that the 13th International Paleolimnology Symposium (IPS2015) will be held in Lanzhou, China (the conference's official website will be launched soon).

The guiding theme of the IPS2015 is “Paleolimnological Perspectives on Environmental Change”, however it will also embrace all oth-

er aspects related to paleolimnological research.

This would be an opportunity to present paleolimnological research involving charophytes!

Contact: Prof. Fahu Chen, Lanzhou University, China
e-mail: fhchen-ips2015@lzu.edu.cn

2016

22 - 31 August
7th Symposium of the International Research Group on Charophytes, Astana, Kazakhstan

Take note that these dates and program are preliminary.....small changes may occur.

22 August: Registration in Astana.
22 - 24 August- field excursions to Zerendy and The Shchuchinsko - Borovoe resort area (collection of living charophytes) (about 400 km north of Astana).

Borovoye Lake (Aulie Lake) is 319 m asl, with view to the mysterious Zhumbaktas (Sphinx) rock. From different angles it is possible to see the profile of a young girl turning into the image of an old woman. This site has populations of *Nitellopsis* and *Chara*.

25 - 26 August: Scientific Sessions at the L.N. Gumilyov Eurasian National University in Astana.

27 - 30 August: Post-conference field trip. Departure to Almaty – 1354 km south-east of Astana (Institute of Geological Sciences named for K.I. Satpaev). Field excursions are being planned to the Kolpakov Depression (Middle Eocene deposits) and Ili Basin (Oligocene - Miocene-Pliocene deposits with Miocene-Pliocene charophytes).

Aktau Mountains belong to the southern spurs of Jungar Alatau. Paleogene-Neogene deposits contain remains of flora and fauna, and charophytes can be found in Miocene and Pliocene sediments.

Organiser
Dr Aizhan Zhamangara, L.N. Gumilyov Eurasian National University, 5 Munaitpasov Street, 010008 Astana, Kazakhstan
e-mail: kashagankizi@mail.ru

28 August - 4 September
35th International Geological Congress, Cape Town, South Africa

The 35th International Geological Congress (IGC) will be held in Cape Town, South Africa from 28 August to 4 September 2016. This is one of the largest international geological congresses. Every four years the IGC is held under the auspices of the International Union of Geological Sciences (IUGS). IUGS together with the IGC African Organising Committee seeks to make this Congress a prime scientific event.

The event will showcase the region's geoscientific superlatives; world-famous geology and geoheritage together with its geological and scenic wonders. There will be an extremely diverse scientific programme of oral and poster presentations, workshops, short courses and business meetings.

Contact: Daniel Barnardo, General Secretary; barnardo@geoscience.org.za

Website: http://www.35igc.org

PUBLICATION OF THE PROCEEDINGS 6TH IRGC, MENDOZA

The proceedings of the 6th IRGC (2012) will be published as a Special Issue of *Aquatic Botany* by mid-2014. The Guest Editors of this SI, Carles Martín-Closas, Susanne Schneider, Allan R. Chivas and Adriana García, want to thank the authors for their contributions, as well as a long list of reviewers who helped to improve the manuscripts. There are 15 research articles in different stages in the reviewing process, covering areas of modern and fossil charophytes, including palaeolimnology, palaeobiogeography, taxonomy, ecology, biogeography, chemistry and physiology. As always, the proceedings of the IRGC symposia are of high quality and discuss many aspects of charophytes.

We are organising a hard copy of the SI at a convenient price, but will depend on the final number of pages of the issue. **In the meantime please contact Adriana or Carles expressing your interest in purchasing this issue.** This will give us an idea of the number of copies to be negotiated with the printing company.

Guest Editors (A. García, C. Martín-Closas, S.C. Schneider & A.R. Chivas)

REFERENCE ARTICLE: AN ACCOUNT OF STUDIES ABOUT EXTANT CHAROPHYTES

2013: What's new about *Chara*? A short overview of some interesting studies on charophytes

Just for the fun of it, I tried to get an overview over "the latest news" regarding charophytes. So I simply searched ISI Web of Science using "Chara" and "2013" as search criteria, and this returned 83 hits. Very many of these manuscripts described exciting new findings. Summarizing them all would have become a "book-project", so I had to select. Please note that this selection represents mostly my personal interest, and by no means reflects scientific quality. There were also quite some palaeoecological publications dealing with charophytes, but I simply have to admit that I do not understand enough paleoecology to be able to – in an understandable way – summarize their main findings. Sorry to those whose interests are not included, this is mostly just a matter of space.

Charophytes have often been used for ecosystem restoration, including removal of heavy metals. Sooksawat et al. investigated the potential of *Chara aculeolata* and *Nitella opaca* to remove heavy metals (lead, cadmium and zinc) from wastewater. They showed that *C. aculeolata* performed best in removing Cd and Pb from the water, and that this species also was more tolerant of Cd and Pb than *N. opaca*. Both species tolerated Zn, though. Clabeaux et al. investigated a different species (*Chara australis*) and focused on uptake of heavy metals from sediment. They found that *Chara* can take up and accumulate Zn and Cd from sediments, and there was no interaction between those two heavy metals. This indicates that *Chara* should be effective at phytoextraction of mixed heavy metal contamination in sediments.

It is known that charophytes can remove phosphorus from water and store large amounts in the sediment due to co-precipitation with calcium carbonate. But how much of that P is actually bound to calcium, compared to the part which is incorporated in plant biomass? Kufel at al. found that about half of the total P contained in *Chara* is incorporated in organic matter, 26 % is loosely bound inorganic P, while calcium-bound P constituted about 21% of TP, respectively. These fractions differed, however, among species. It is important to remember that only the Ca-bound P may be considered a P sink in lake sediments after plant decay. These results are important for understanding phosphorus-circling in *Chara* dominated lakes, where charophyte biomass can reach impressive amounts. Pełechaty et al. found up to more than 1 kg dry mass per m^2, containing up to 75 % $CaCO_3$. These values are enormous and document the significance of charophytes in lacustrine $CaCO_3$ sedimentation. Such huge biomasses can achieve correspondingly high rates of primary production. Christensen et al. studied ecosystem metabolism in a shallow, clear-water nutrient-poor pond dominated by charophytes, and documented very high rates of gross primary production and community respiration. In fact, the rates of benthic charophytes under oligotrophic conditions are comparable to those obtained by pelagic phytoplankton communities under highly eutrophic conditions. Charophytes likely can achieve such high metabolic rates by using sediment resources. An interesting aspect of these numbers is also that eutrophication in fact is de-

fined via “increased plant growth” or “increased primary production”. How can ecosystems with a high charophyte production be termed oligotrophic, while ecosystems with an equally high phytoplankton production clearly are eutrophic?

Irrespective of such academic discussions, most people agree that charophytes usually are advantageous in aquatic ecosystems. During eutrophication processes, however, many freshwater habitats lose charophytes and other macrophyte vegetation. Eutrophication not only comes along with increased nutrient concentrations and turbid water, but often also is accompanied by eutrophic and anoxic sediments. Rodrigo and Alonso-Guillén investigated if such eutrophic sediments could support viable charophyte populations, if only the overlying eutrophic water were exchanged by oligotrophic clear water. The answer was – fortunately - yes, reestablishment of charophytes might very well be possible both naturally from buried oospores in the sediment as well as through management measures, if the water were exchanged. Charophytes tolerate anoxic sediment. This is good news for many restoration projects.

So, we know that charophytes may disappear during eutrophication, and we learned that they also spontaneously may re-appear during re-oligotrophication. Under oligotrophic conditions, they are surprisingly strong competitors, and they even may replace tall-growing angiosperms like *Myriophyllum spicatum*. Richter and Gross tried to explain that phenomenon and investigated if *C. globularis* can negatively affect the performance of *M. spicatum*. They found that *C. globularis* indeed reduced the growth of *M. spicatum* much more strongly than that of conspecifics. Increasing density of *C. globularis* led to a lower chlorophyll a/b ratio and lower nitrogen content in *M. spicatum*. That means that *C. globularis* meadows can negatively affect tall-growing angiosperms such as *M. spicatum* when the environmental conditions, such as low phosphorus availability and high water-clarity, are appropriate. These findings may be useful in lake management, specifically in those where a nuisance growth of tall macrophytes occurs. Similarly, Bonachela et al. found that submerged aquatic vegetation, especially *Chara* species, improved water quality in Mediterranean irrigation ponds by increasing water oxygenation and decreasing chlorophyll a concentrations. They therefore recommend preserving charophytes as an environment-friendly, cost-effective alternative to biocide application for irrigation pond management.

Eutrophication has caused a decline of charophyte species in many shallow lakes in Europe. But even though external inputs of phosphorus are declining, internal loading of P from the sediment seems to delay the recovery of these systems. Iron is a chemical binding agent often used to combat internal phosphorus loading, but its effects on charophytes were not known. Immers et al. found that iron additions did not affect growth of *C. virgata*, while *C. globularis* growth significantly decreased with increasing iron concentrations. Nonetheless, the biomass of both species increased in all treatments relative to starting conditions, so both species did grow. The authors conclude that when iron is added in a way that does not cause a drop in pH, then iron (III) chloride can potentially be a useful restoration method and will have little effect on charophytes.

Very interesting results were published by Chucholl. He investigated the feeding ecology and ecological impact of the crayfish *Procambarus clarkia*. This species is said to be the world's worst invasive crayfish and a recent invader in colder climates. While *P. clarkii* generally is a polytrophic omnivore, the crayfish significantly reduced the biomass of the indigenous *Myriophyllum spicatum* and *Chara* sp. (unfortunately the *Chara* was not determined to species level), whereas the non-native *Elodea nuttallii* was able to gain biomass. Thus *P. clarkii* indirectly facilitated a dominance of *E. nuttallii*.

Also Rodrigo et al. (b) reported an example of the deleterious effects of herbivores on submerged aquatic vegetation, including charophytes. In a newly created lagoon in Spain, submerged vegetation was first growing well, but then it suddenly disappeared. Rodrigo et al. (b) showed that the deleterious effect of exotic fauna (particularly carps and crayfish) in combination with the high herbivory pressure by waterfowl were the major factors that prevented the regrowth of submerged vegetation in the lagoons.

That charophytes possess allelopathic substances has long been known, but do all targeted species react in the same way? Pakdel et al. showed that *C. australis* had a significant negative effect on the cyanobacterium *Anabaena variabilis*, but no effect on the green alga *Scenedesmus quadricauda*. This confirms earlier findings that macrophyte allelochemicals are specific to particular target organisms, and suggests that *Chara* has the potential to

mitigate cyanobacterial blooms. The finding that the allelopathic effect of charophytes differs among different target organisms is supported by Rojo et al. They showed that charophyte exudates, particularly those of *C. hispida*, lead to an overall decrease in phytoplankton biomass, by decreasing diatoms and cyanobacteria, but not chlorophyte biomass. They also showed that a mixed culture of *C. hispida, C. baltica, C. vulgaris, N. hyalina* and *M. spicatum* had an even greater allelopathic effect than monocultures. This is an additional reason why ecosystem restoration measures should be targeted towards establishing diverse macrophyte communities. But target organisms of charophytes may become even smaller. Cai et al. studied whether charophytes may be useful as an antimicrobial agent. It turned out that extracts of *Nitellopsis obusa* and *C. vulgaris* inhibited the growth of Gram-positive bacteria, but not Gram-negative bacteria or yeast. It will be interesting to see if these results someday may find a genuine application in applied science or medicine.

Baastrup-Spohr et al. used data on Danish freshwater charophyte distributions from around 1940 and compared them with data from recent years to evaluate the historical development of species richness and dominance patterns. They found that common species have become relatively more abundant and uncommon species relatively rarer. Species that declined most were typically deep-growing perennial species preferring alkaline waters, because large deep alkaline lakes are today rare in Denmark. Species increasing in abundance had wide tolerances to alkalinity and water nitrogen content. The authors also tested to what extent historical changes of species abundance in 29 waterbodies were related to landscape features, water quality and species traits. They found that the historical decline of species richness in these lakes was significantly related to higher nutrient concentrations, higher phytoplankton biomass and lower transparency of eutrophied waterbodies.

Urbaniak and Combik performed molecular biological analyses on the group around *C. hispida, C. rudis, C. polyacantha, C. baltica* and *C. intermedia*, and confirmed earlier results that these species are difficult to differentiate, both morphologically and genetically. Morphological traits of charophytes may be determined genetically, but may also be influenced by the environment. Bociag et al. studied the effect of wave-induced disturbances on the morphology of *C. globularis*. They found that individuals from wave-exposed sites had more lateral shoots than those from sheltered localities, they were shorter (the main axis, side shoots, and internodes) and they also had shorter branchlets than those from sheltered localities.

Soulié-Märsche et al. described the occurrence of an “alien” *Chara* species in an artificial pond in South France. *Chara fibrosa* has probably arrived from the tropics together with rice seed material, which has been imported to the Camargue. Although the species has formed a very large population in that particular pond within a few years, it might not be classified as "invasive" because its occurrence is linked to a specific man-made habitat with, for southern France, an unusual water regime (high water level in late spring and summer).

Finally, another piece has been added to the jigsaw puzzle about the question “who is the direct ancestor of land plants?” Turmel et al. analyzed mitochondrial DNA in several Streptophyte algae, in order to learn more about the transition toward the first land plants. Unfortunately for all friends of the charophytes, their results are consistent with previous phylogenetic studies in favouring that the morphologically complex Charales are NOT the sister group of land plants. In my opinion, this certainly is a pity …

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Susanne Schneider
NIWA (Norway)

NEWS FROM REGIONAL GROUPS AND INDIVIDUALS

News from regional groups

Charophyte research from North and South America

Brazil

Norma Catarina Bueno and co-authors are developing studies of the micro-algal community structure (especially about periphyton living on charophytes) in reservoirs and rivers of the Paraná River basin, Brazil.

Meurer, T., Bueno, N. C., 2012. The genera *Chara* and *Nitella* (Chlorophyta, Characeae) in the subtropical Itaipu Reservoir, Brazil. Brazilian Journal of Botany 35, 219-233.

Henry-Silva, G.G., Santos, R. V., Moura, R. S. T., Bueno, N. C., 2013. Primeiro registro de *Chara indica* e *Chara zeylanica* (Charophyceae, Charales, Characeae) em reservatórios do semiárido do estado do Rio Grande do Norte, Brasil. Biotemas 26, 243-248.

Rafael de Souza Faria is teaching at the Universidade Estadual de Campinas and is developing a project about the Late Paleozoic palae-

obotany of the Paraná sedimentary basin, Brazil.

Faria, R. S., Ricardi-Branco, F., Cortez, I., 2013. Permian *Leonardosia* organic oospores from Southern Brazil. Palaeontology 56, 1-9.

Simone Baecker Fauth is a researcher at the Technological Institute of Micropaleontology (ITT FOSSIL) and continues studying the Santonian–Campanian charophytes from the Santos Basin.

Fauth, G., Santos, A., Vieira, C.E.L., Bergue, C.T., Musacchio, E.A., Ferreira, E.P., Escamilla, J.H., Carvalho, M. A., Viviers, M. C., Baecker-Fauth, S., 2012. Bioestratigrafia integrada do Cretáceo Superior da Bacia de Santos: ostracodes, carófitas e palinomorfos. Boletim de Geociências da PETROBRAS (Impresso) 20, 220-258.

USA

Joe Hannibal and co-authors are writing an article on using charophytes and other fossils to determine provenance of chert millstones in a forthcoming issue of PALAIOS:

Hannibal, J. T., Reser, N. A., Yeakley, J. A. Kalka, T. A. and Fusco, V. (2014) Determining provenance of local and imported chert millstones using fossils (especially Charophyta, Fusulinina, and Brachiopoda): examples from Ohio. Palaios (2014)

Joe expressed his indebtedness to several kind and helpful members of the IRGC who provided advice for and reviews of the manuscript. He is currently working on expanding this study across North America.

Venezuela

Julio Rodríguez and collaborators are developing a new project entitled: "Charophytes of some wetlands in different regions of the Bolivarian Republic of Venezuela", funded by the Research Council of the Orient University (CI-06-030603-1870-13).
Acting as project manager, M.S. Julio Rodriguez and his collaborators M.S. Aidé Velasquez, M.S. Juan López and M. Anahy-Marcano are researchers at the Environmental Investigation Center, Nueva Esparta State, Orient University (Venezuela).

Rodríguez, J.C., Guilarte, A.J., Marcano, A., Barreto, J., Ávila, L., López, J., López, D., Velásquez, A., 2012. Carófitos de la Isla de Margarita, Venezuela. Acta Bot. Venez. 35, 71-90.

Simone Baecker-Fauth
Technol. Institute of Micropaleontology
(Brasil)

News from Individuals

PhD THESIS COMPLETIONS

The Charophytes from the Eocene-Oligocene Boundary of the eastern margin of the Ebro Foreland basin (Catalonia, Spain)

PhD student: Josep Sanjuan Girbau, University of Barcelona

Supervisor: Carles Martín-Closas

On 11 December 2013, Josep Sanjuan Girbau defended his thesis, in English, in front of the jury composed of Pere Anadón (Barcelona), Ingeborg Soulié-Märsche (Montpellier) and María A. Rodrigo (Valencia).
Charophytes are important elements of Paleogene and Neogene continental deposits with a high stratigraphic value at the Eocene-Oligocene boundary (about 25 Million years ago). The thesis presents a very complete geological and paleontological study of the eastern parts of the Ebro basin. Eleven sections were sampled in detail for their sedimentological sequences and their content of fossil charophyte gyrogonites. Starting from these fundamental data, 18 charophyte species, belonging to 8 genera, are described and illustrated by excellent SEM-photographs with special attention paid to intraspecific variation. As a consequence of international importance, the results will lead to the revision of the European Charophyte Biozones at the Eocene-Oligocene boundary. Josep presents interesting and original aspects about paleoecology. His detailed sedimentological facies analyses allowed him to infer the habitat preferences of these extinct species. Lacustrine, fluvial and coastal environments are distinguished, thereby drawing an

overview of the various landscapes of that region during the Eocene and Lower Oligocene. His developments in palaeobiogeography create a link from fossil to extant charophytes. Based on contrasting distribution patterns through time, at the scale of millions of years, of the fossil *Lychnothamnus* and *Nitellopsis* species, he proposes original considerations about the dispersal mechanisms of monoecious vs dioecious charophytes.

The original title is "Els carofits del limit Eocé-Oligocé de la Conca de l'Ebre" (in Catalan with English summary of 20 pages). The thesis was performed in the frame of the project BIOGEOMODELS granted by the Spanish Ministry of Science and Innovation. Josep has benefited from 2-3 months research visits to the Universities of Montpellier and Paris and, additionally, from the European Community Research Support to visit the British Museum of Natural History so as to examine and restudy type material of significant species. Five publications in indexed journals bring the results to a larger readership and can be obtained as a PDF from the author.

Ingeborg Soulié-Märsche
University of Montpellier, France

Distribution and dynamics of charophyte communities: Impact of local and regional environmental factors

PhD student: Aurélie Rey-Boissezon, University of Geneva

Supervisors: Jean-Bernard Lachavanne and Dominique Auderset Joye (University of Geneva)

Aurélie Rey-Boissezon defended her PhD thesis on 27 March 2014 in the University of Genève. She obtained the highest mark and the congratulations of the jury, formed by Dr Bastiaan W. Ibelings (University of Genève), Dr María A. Rodrigo (University of Valencia) and the two supervisors, Prof. Jean-Bernard Lachavanne and D. Dominique Auderset Joye (University of Genève). The thesis represents a very thorough piece of work which brings new insights into the ecology of charophytes, particularly on their distribution and community dynamics. The work presented consisted of a total of 5 papers (published and submitted). The thesis aims at determining the responses of different charophytes species present in alpine regions to environmental gradients at the regional and the local scale, in order to predict the potential changes of their distribution in a climate-warming context and to propose relevant management recommendations. At the regional scale, environmental information acting at the scale of watr body or watershed and data on species occurrence were obtained in 1402 localities distributed across the whole Swiss territory and used to fit species distribution models. The obtained models were used as a basis for the prediction of current and future (under a climate change scenario) species occurrences. A sub-sample of charophyte water bodies was considered to analyze inter-species differences in macro-habitats by considering supplementary physical and chemical parameters. Regional environmental parameters related to the waterbody size (which affects the system functioning and the micro-habitats diversity) and to climate play a major role for the distribution of charophyte species in Switzerland, the water quality taking part lastly. All species do not occupy the same habitat and display different tolerances to the considered environmental parameters. On the horizon 2050, under a scenario that predicts a warmer and drier climate, the species that currently inhabit preferentially large deep lakes would decrease (potential "losers", e.g. *Nitellopsis obtusa*) whereas species associated with small water bodies susceptible to drying at the end of summer will probably increase their distribution area (potential « winners », e.g. *Chara vulgaris*). At the local scale, a 4-year survey realized on a single site offered the opportunity to study the response of a maximum number of species to proximal variations in water level and temperature. The relationship between biological and phenological traits of one species particularly and the accumulated heat over time and the water depth was also addressed. The variability of flooding conditions drives the dynamics of the macrophyte community, i.e. its composition, richness and heterogeneity. The diversity of the assemblage, and particularly the charophyte species richness, was maximized the years following an autumnal drought-spring inundation cycle (timing) and by intermediate intensity of disturbance (duration of drought from 6 to 10 weeks). The variety of responses of species to depth, to duration and seasonality of droughts contributed to the variability of the community structure in space and time. This thesis also showed that *N. obtusa* is able to

adapt to permanent shallow habitats by reproducing sexually.

María Antonia Rodrigo
University of València (Spain)

Reconstrucción paleolimnológica de la Laguna Llancanelo (Mendoza, Argentina) a través del estudio de ostrácodos del Cuaternario

PhD student: Sabina D'Ambrosio, Universidad de La Plata

Supervisors: Dr Cristina Claps (Universidad de La Plata, Argentina) and Dr Adriana García (University of Wollongong, Australia)

Sabina defended her PhD thesis (Paleolimnology of Laguna Llancanelo (Mendoza, Argentina) based on Quaternary ostracods) on the 26 March 2014, obtaining the highest mark, and a recomendation to publish the results.

The thesis was mainly focused on ostracods, but included a modern as well as a palaeontological component. Seasonal sampling of the water-bodies forming part of the catchment of this endorheic lake, included collection of water physical and chemical characteristics in the field, and water and biota samples (ostracods, charophytes, invertebrates and phytoplankton) from 20 sites. Charophytes showed a clear discrimination in their distribution in relation to salinity, with *Chara vulgaris* s.l. and *Nitella* sp. found mostly in the freshwater wetlands, while in the saline Laguna Llancanelo the taxa present were *Chara hornemannii, Chara halina, Chara* sp., and *Lamprothamnium* sp. These data were used as modern analogues to interpret the palaeoecological changes during the Quaternary, based on the study of 2 sediment cores representing the past ~ 30 ka (thousand years). However, some distinct taxa are present in older sediments but absent in recent times. The understanding of the Pleistocene - Holocene environmental, biological and climatic changes occurring in this region of central Argentina, only about 70 km east of the Andes, provides information about the changes occurring during the last glaciation (Last Glacial Maximum, ~ 20 ka ago) and subsequent warmer times.

The palaeo work of the thesis was based on ostracods and their geochemistry (trace-elements), used for palaeosalinity and palaeotemperature reconstructions. Sabina had the opportunity to visit the University of Wollongong for one year, during which time she was supervised by A. García and A. Chivas. Papers discussing the biological and ecological characteristics of the area, as well as the interpretation of the Quaternary environments based on microfossil associations and geochemistry are in preparation.

Adriana García
University of Wollongong (Australia)

NEW BOOK

***The Physiology of Characean Cells* (2014)**

Mary J. Beilby and Michelle T. Casanova Springer-Verlag Berlin Heidelberg ISBN 978-3-642-40287-6 (978-3-642-40288-3 for eBook)

The book is a testament to the value of societies like the International Research Group on Charophytes. There has long been an unfortunate division between physiologists, cell biologists, and biophysicists working on characean algae, and those working on taxonomy, evolution, and ecology. There has been a tendency for researchers to communicate more with those working with similar tools on other organisms, rather than those working on the same organisms with different tools. As a cell physiologist, I often found the taxonomic relationships between the organisms opaque and confusing, as important as this is comparing work from different laboratories, and in doing comparative studies within a lab. Michelle Casanova has done an excellent job on the taxonomic side, pointing out the morphological characters and cellular structures that are used for taxonomic determination, with strong emphasis on those species, largely ecorticate, that have been most used for physiological studies. The drawings are excellent, elegant and useful. She also provides quick surveys of development, ecology, and culture techniques which all prove useful for the laboratory scientist. I found myself wishing for more (phylogenetic trees? more on culturing techniques? how exactly does one prepare a voucher specimen?), but only so much can be included in one chapter, and I am glad for what was there.

Mary Beilby began her academic career as a physicist, and the equations and thermodynam-

ic derivations in her chapters may be daunting to some, but she applies what is learned by these rigorous techniques to questions that should be of interest to many working on charophytes, including the supply of carbon for photosynthesis, the uptake of nutrients, water relations and salinity stress, mechanical stress, wounding response, transport along the axis (by cytoplasmic streaming and cell-to-cell transport), gravitropism, and phytoremediation. This integration of rigorous biophysical analysis with applications to these topics of broader interest should interest a large spectrum of charologists, from the hard-core transport physiologist to the eco-physiologist. Again, there are so many interesting questions about charophytes that one could always wish for more topics, but this slim volume covers areas that have been best studied. It is well organized, well-illustrated, and accessible, even if the reader skims the equation-heavy bits (they will bear returning to with familiarity!). The book fills an important niche in the study of charophytes, and everyone can learn something from it.

Mary A. Bisson
University at Buffalo (USA)

NEW IRGC MEMBERS AND CHANGES OF ADDRESSES AND E-MAILS

Addresses and e-mails of new members

Julio C. Rodríguez Reyes
Centro Regional de Investigaciones Ambientales (CRIA), Universidad de Oriente, Núcleo Nueva Esparta, Avenida 31 de Julio, Sector Guatamare, Porlamar, Isla de Margarita, Estado Nueva Esparta, Venezuela
e-mail:juliorod58@gmail.com

Alba Vicente Rodríguez
Dept. Estratigrafía, Paleontología i Geociències marines, Facultat de Geología, Universitat de Barcelona, 08028 Barcelona, Spain
e-mail: albavicenterodriguez@ub.edu

Changes of e-mail address
Anders Langangen: langangen@hotmail.com
Jan Simons:jan.simons@gmx.com
Kerstin Wallström: kwruddu@telia.com

Change of address
Kerstin Wallström
Långruddu 517
SE-748 95 Örbyhus
Sweden

CHAROPHYTE DISCUSSION FORUM

Dr Robin Scribailo (USA) has established **charophyte-L**, our quick and new way of communication.

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Landelijk Informatiecentrum voor Kranswieren (**LIK**):
http://www.kranswieren.nl (in dutch)

The International Fossil Algae Association (**IFAA**): http://www.ku.edu/~ifaa/

The Charophycean Green Algae Home Page: http://www.life.umd.edu/labs/delwiche/Charophyte.html

Homepage of the German Working Group on Characeans (**AGCD**): http://www.biologie.uni-rostock.de/oekologie/agcd

Homepage of the electronic journal *Charophytes*: http://www.charophytes.com

International Phycological Society **(IPC)**: http://www.intphycsoc.org/links.lasso

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ALIX M.S.	malix@pnc.edu
ALONSO-GUILLEN, J-L.	j.luis.alonso@uv.es
ANADON, P.	panadon@ija.csic.es
ASAEDA, T.	asaeda@post.saitama-u.ac.jp
AUDERSET-JOYE, D.	Dominique.Auderset@unige.ch
AZELLA M.	mattia.azzella@uniroma1.it
BAECKER-FAUTH, S.	SBFauth@unisinos.br
BASSLER, B.	b.bassler@lrz.uni-muenchen.de
BEILBY, M. J.	mjb@newt.phys.unsw.edu.au
BENGTSSON, R.	Ro-land.bengtsson@microalg.se
BHATIA, S. B.	sudhashi0903@gmail.com
BISSON, M.	bisson@buffalo.edu
BLAZENCIC, J.	jelenablazencic@gmail.com
BLINDOW, I.	blindi@uni-greifswald.de
BOCIAG, K.	dokkb@univ.gda.pl
BOISSEZON, A.	Aurelie.Boissezon@unige.ch
BORYSOVA, O.	oborysova@yandex.ru
BREITHAUPT, C.	Christian.breithaupt@gmx.de
BRUINSMA, J.	bruinsma@dse.nl
BUENO, N.C.	normacatarina@hotmail.com
CÁCERES, E.	uscacere@criba.edu.ar
CASANOVA, M. T.	amcno-va@netconnect.com.au
CHEN, Jing	chenjing_24@163.com
CHEMERIS, E.	elchem@ibiw.yaroslavl.ru
CHIVAS, A. R.	toschi@uow.edu.au
CHOU, Jui-Yu	jackyjau@yahoo.com.tw
CHRYSULA, C.	xchristi@UPATRAS.GR
COMPERE, P.	P.Compere@BR.fgov.be
COOPS, H.	hugo.coops@wldelft.nl
DAMINO, S.	sara.damino@tin.it
DEREKE, Zane	zdekere@email.lubi.edu.lv
DOEGE, A.	adoege@pinzigberg.de
DU, Pin-de	dupinde@hotmail.com
ELKHIATI, N.	nelkhiati@gmail.com
FEIST, M.	mjcfeist@hotmail.fr
FLOR-ARNAU, N.	nurnu@yahoo.es
FOISSNER, I.	ilse.foissner@sbg.ac.at
FU Hua-long	fuhl@pridns.scu.edu.cn
GAO Qin-qin	gaoqqin@sina.com
GARCIA, A.	adriana@uow.edu.au
GRILLAS, P.	grillas@tourduvalat.org
GRINBERGA, L.	laura.grinberga@gmail.com
GUERLESQUIN, M.	michel-ine.guerlesquin@uco.fr
HANNIBAL, J.	jhanniba@cmnh.org
HAAS, J. N.	Jean-Nicolas.Haas@uibk.ac.at
HENRICSON, C.	Catherine.henricson@helsinki.fi
HUTOROWICZ, A.	ahut@infish.com.pl
JIANG Fei-hu	jiangfeihu2002@sina.com
JOHANSSON, G.	Gustav@hydrophyta.se
JOHN, J.	J.John@curtin.edu.au
KALIN, M.	margarete.kalin@utoronto.ca
KAROL, K.	kkarol@nybg.org
KOISTINEN, M.	maria.koistinen@helsinki.fi
KOSSLER, A.	Kossler@zedat.fu-berlin.de
KRISHNAN, U.	ushak30@yahoo.com
KRUPSKA, J.	jkrupska@poczta.onet.pl
KOVTUN, A.	anastasia.kovtun@ut.ee
KWIATKOWSKA, M.	kwiat@biol.uni.lodz.pl
KYPRIANOVA, L.	kipriyanova@ad-sbras.nsc.ru
KYRKANDER, T.	tina.kyrkander@terralimno.se
LAMBERT-SERVIEN, E.	elambert@uco.fr
LAN, Li-qiong	llqcg@263.net
LANGANGEN, A.	langangen@hotmail.com
LI, Wei-tong	lironc@sina.com
LIU, Jun-ying	liujunyingyh@sohu.com
LU, Hui-nan	luhuinan@nigpas.ac.cn
LUCAS, S.	spencer.lucas@state.nm.us
MAËMETS, H.	helle.maemets@emu.ee
MAIER, E.	eduardmaier@wanadoo.nl
MANN, H.	hmann@grenfell.mun.ca
MARTIN, G.	georg.martin@ut.ee
MARTIN-CLOSAS, C.	cmartinclosas@ub.edu
McCOURT, R.M.	RMcCourt@nsf.gov
MEBROUK, F.	mebrouk06@yahoo.fr
MEIERS, S.	ST-Meiers@wiu.edu
MELZER, A.	arnulf.melzer@wzw.tum.de
NASRIN, J.D.	Nasrinjahan_diba@yahoo.com
NAT, E.	e.nat@kranswieren.nl
NAZ, S.	sabrina_naz@yahoo.com
NOWAK, P.	petra.nowak@uni-rostock.de
PELECHATY, M.	marpelhydro@poczta.onet.pl

POPLONSKA, K.	popkat@biol.uni.lodz.pl
PORTER, J.	john.porter@unsw.edu.au
PREISIG, H. R.	preisig@systbot.unizh.ch
PRIMAVERA, M.	mile-na.primavera@ateneo.unile.it
PUKACZ, A.	andrzeypukacz@wp.pl
QING, Ren-wei	qingrenweif@yahoo.com.cn
RAABE, U.	uraabe@yahoo.de
RATAI, L.	lothar.ratai@t-online.de
RAY, S.	ray_samit1@yahoo.co.in
RIVELINE, J.	riveline@ccr.jussieu.fr
RODRIGO, M.	maria.a.rodrigo@uv.es
RODRIGUEZ, J.	juliorod58@gmail.com
ROMO, S.	susana.romo@uv.es
SAKAYAMA, H.	hsak@bio.c.u-tokyo.ac.jp
RUBIO, F.	fidel.rubio@uv.es
SCHAIBLE, R.	ralf.schaible@biologie.uni-rostock.de
SANJUAN-GIRBAU J.	josepst.juan@hotmail.com
SCHNEIDER, S.	susi.schneider@niva.no
SCHUBERT, H.	hendrik.schubert@biologie.uni-rostock.de
SCHUDACK, M.	schudack@zedat.fu-berlin.de
SCRIBAILO, R.	rscrib@purduenc.edu
SIMONS, J.	Jan.Simons@gmx.com
SINKEVICIENE, Z.	zofija.s@botanika.lt
SKURZYNSKI, P.	p.skurzynski@gmail.com
SOULIÉ-MÄRSCHE, I.	ingeborg.soulie-marsche@univ-montp2.fr

STEVANOVIC, B.	vstev@EUnet.rs
STEWART, N.	Nfstewart@freeuk.com
SUGIER, P.	piotr.sugier@poczta.umcs.lublin.pl
SVIRIDENKO, B.	common@omsk.edu
TORN, K.	kaire.torn@ut.ee
TRAJANOVSKI, Sasho	trajsa@hio.edu.mk
TRJANOVSKA, Sonja	trajsa@yahoo.com
URBANIAK, J.	urbaniak@biol.uni.wroc.pl
VAN DE WEYER, K.	klaus.vdweyer@lanaplan.de
VESIC, A.	gmvalex@gmail.com
VICENTE RODRIGUEZ, A.	albavicenterodriguez@ub.edu
VILLALBA BREVA, S.	sheilavillalbabreva@ub.edu
WALLSTRÖM, K.	kwruddu@telia.com
WANG, Qi-fei	qfwang@nigpas.ac.cn
WANG, Wei-Lung	wlwang@cc.ncue.edu.tw
WINTON, M. de	m.dewinton@niwa.co.nz
WOJTCZAC, A.	wojag@biol.uni.lodz.pl
YANG, Jing-lin	jlyang@nigpas.ac.cn
ZAKOVA, L.	luba_zhakova@mail.ru
ZAMANGARA, A.	kashagankizi@mail.ru
ZHANG, Ze-run	zhangzerun@yahoo.com.cn
ZHOU, Xiu-gao	clxb@cug.edu.cn
ZVIEDRE, E.	egita.zviedre@dabasmuzejs.gov.lv

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