IRGC NEWS

INTERNATIONAL RESEARCH GROUP ON CHAROPHYTES

ISSN 1834-6030

Edited by: K. Torn, S. Schneider, A. Pukacz and E. Nat

28

March 2017

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EDITORIAL

Another year has passed, and our small but very active organization has contributed with a number of exciting activities. Not at least, the 7th IRGC symposium was held in Astana, Kazakhstan. I thank the organizing committee, namely Aizhan Zhamangara, Raikhan Beisenova, Sherim Tulegenov, Leyla Akbayeva and Saida Nigmatova, for their excellent work, and the hosting institution, the L.N. Gumilyov Eurasian National University, for their hospitality. Please find the reports of the meeting in this issue of the IRGC-news; for all those who could not participate, the reports are an excellent chance to get up-to-date with the activities at the meeting, and for all others they are a wonderful opportunity to remember the scientific exchange, the hardships of the weather, and the very nice talks with friends and colleagues. At the meeting, a new Executive Committee was elected, and I thank all voting members for the confidence placed in the new Committee. Our warm thanks go to Carles Martin-Closas and Adriana Garcia, for their competent, smooth and pleasant leadership over many years. The new committee stands on your shoulders!

The change in the Executive Committee also means that the location of our website has changed. Please check http://www.sea.ee/irgcharophytes/, and – most importantly – please inform us about ongoing activities, forthcoming conferences, new books, etc., such that we can share this information with the world. You may also share charophyte pictures with us, to be posted on the website (with proper reference to the author, of course). Thanks to all of you who help keeping our association alive, by preparing information for the IRGC news or the website, organizing and participating in meetings, and by keeping up the enthusiasm for a fascinating group of algae.

Susanne Schneider

NEW EXECUTIVE COMMITTEE

President: Susanne Schneider (Oslo, Norway), susi.schneider@niva.no
Vice-President: Andrzej Pukacz (Słubice, Poland), pukacz@europa-uni.de
Secretary: Kaire Torn (Tallinn, Estonia), kaire.torn@ut.ee
Treasurer: Emile Nat (Amsterdam, The Netherlands), e.nat@kranswieren.nl

Members at large
Robin Scribailo (USA)
Dominique Auderset Joye (Switzerland)

Regional Correspondents
Uwe Raabe (Europe)
Simone Baecker-Fauth (North and South America)
Sha Li (China)

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

IN MEMORIAM

Dr Micheline Guerlesquin (1928-2016)

Born January 11th, 1928 in Saumur along the River Loire Valley (France), Micheline Guerlesquin, grew up, nearby, in Angers where she spent all her life. In 1944 she entered the

National School of Medicine and Pharmacy of Angers and went on in Paris to obtain her diploma in Pharmacy from the Faculty of Paris (1950). In 1951 she joined, like Mr. Corillion, the "Laboratory of Vegetal Biology and Phytogeography" from the Catholic University (UCO-Angers) and completed her studies with a postgraduate certificate in Chemistry Biology and one in Mineralogy. She got married in 1953 to Jacques Guerlesquin, who unfortunately died in 1961. She was a very discreet person regarding her family but I would retain her attachment for them. She passed away near her 89 th birthday, in Angers on the 11th of December 2016.

8th GEC Meeting in Barcelona (1994). From left to right: Carles Martín-Closas, Nicole Grambast-Fessard, Micheline Guerlesquin, Marie Claire Berger, Jean Pierre Berger, Maria Kwiatowska, Monique Feist, Alicia Masriera, Ursula Winter, Janusz Maszewsky

The principal subject of her research was the study of charophytes. Mr. Corillion had a fundamental role in the evolution of her career. Under his direction she undertook her "Research on Antheridia of the Charophyceae - Morphological, biological and systematic studies" that allowed her to obtain a Diploma of Higher Studies of Natural Sciences (1958). Within the framework of the CNRS (National Center of Scientific Research) from 1959 to 1993, promoted to the rank of Research Director in August 1985, and Director of the "Vegetal Biology and Phytogeography Laboratory" from 1983 to 1996, she worked all her life in the UCO. She became Doctor of Natural Sciences at the Faculty of Toulouse (1967), presenting her PhD Thesis about "Karyotypic and cytotaxonomic research on the Charophyceae of Western Europe and North Africa with a second subject related to the Karyotypes of the Charophyceae in their relations with biogeography and systematics".

Her research led to numerous fieldworks with Mr Corillion, in France and abroad: studies of charophyte vegetation in Italy (Corillion, Guerlesquin 1963); Exploration of the aquatic environments of Western Senegal (1967-1970) in order to complete the research of A. Braun, 1868 « die Characeen Afrika's». This led to a major publication in 1972, "Research on the Charophyceae of West Africa: systematics, phytogeography and ecology, cytology". Between 1974-1995, she worked on the charophytes of Marocco and Tunisia, presenting chromosomic, cytological and cytotaxonomical observations. She also worked on charophytes from India (1979), and South America (Guerlesquin 1981 « *Nitella clavatoides*, new species from Bolivia») or Characeae species in high altitude lakes 1991-1992). Along the years she completed with R. Corillion the work about the french charophytes in different regions (*Tolypella sp., Nitellopis obtusa, Lamprothamnium sp., …*). Member of the IRGC and the GEC, she co-organized the Symposium on "Current and Fossil Charophytes" in Montpellier in 1989 with Mrs N. Grambast-Fessard.

She was also a member of the GIS (Scientific Interest Group) "Macrophytes of the continental waters" when the IBMR (Macrophytic River Biological Index) standard was introduced to assess the quality of water, using the presence of macrophytes including some charophytes (Haury et al., 1997&1998). Within the Natura 2000 framework and the Habitats Directive, she contributed to a better knowledge of the charophyte vegetation (Lambert & Guerlesquin, 2002).

Her work concerned also Phanerogams. Together with R. Corillion, she realised the vegetation maps of Cherbourg, Caen and La Rochelle included in the vegetation cartography framework of the West and North-West of France supervised by the CNRS. She participated in the regular monitoring of species, carried out since 1961, on the Natural Reserve of Pont Barré (49), a site with a remarkable concentration of exceptional plant species, acquired by R. Corillion. She worked on the flora of the Loire Valley and that of the Armorican Massif, their richness and the impact of human activities, through studies or excursions with various botanical societies: Société Botanique de France ; Society of Phycology ; Society of Scientific Studies of Anjou (of which she was president from 1992 to 1994).

This career led her to be an Advisory Member of various commissions: "Sites and Landscapes commission"; "Quarries Departemental Commission"; "Regional scientific council of the natural heritage of Pays de la Loire", She received several awards for her work: Prize of the French Botanical Society Council, the CNRS Medal, the Academic Palms.

One of her last tasks was to participate at national herbaria meetings in order to highlight the importance of the collected specimens constituting the Herbarium of the UCO (internationally referenced as ANGUC).

The richness of her knowledge, her desire to share it through lectures, to welcome PhD students and researchers in her laboratory, have led to numerous exchanges with colleagues from different continents. Her memory will be kept alive among them. For my part I will always be grateful to her for having welcomed me since 1984 in this UCO Laboratory. I will never forget her help and her advice as well as those of Mr. Corillion. They allowed me to discover the botanical richness of the River Loire Valley and introduced me to the world of charophytes.

Elisabeth Lambert-Servien (France)

Selected publications of M. Guerlesquin dealing with charophytes:

GUERLESQUIN M., 1958 - Recherche sur l'anthéridie chez les Charophycées. Morphologie, biologie et systématique. D.E.S. univ. Toulouse, 100 p. dactyl., 22 pl., 13 photos.

CORILLION R. & GUERLESQUIN M., 1959 - Premières observations cytotaxinomiques sur le genre *Tolypella* (Charophycées). *Bull. Soc. Et. sci. Angers,* N. S., 2: 167-170.

CORILLION R. & GUERLESQUIN M., 1963 - Contribution à l'étude des végétations de Charophycées d'Italie péninsulaire (étage méditerranéen). *Bull. Soc. sci. Bretagne*, XXXVIII (3-4): 193-211.

GUERLESQUIN M., 1965 - Sur quelques cas de variabilité naturelle du stock chromosomique haploïde dans les spermatocystes des genres *Tolypella, Nitellopsis* et *Chara* (Charophycées). *Bull. Soc. Et. Sci. Anjou,* N. S., 5: 53-59.

GUERLESQUIN M., 1967 - Recherches caryotypiques et cytotaxinomiques chez les Charophycées d'Europe occidentale et d'Afrique du Nord. Thèse Doct. Sci. nat. d'Etat Toulouse (1967) 1 vol. 265 p., 32 pl., 16 cartes. *Bull. Soc. sci. Bretagne,* 1966, XL1, fasc. H. S.

GUERLESQUIN M., 1971 - Recherches sur *Chara zeylanica* Klein ex Willd. (Charophycées) d'Afrique occidentale. *Revue Algologique.,* N. S., 10 (3): 231-247.

CORILLION R. & GUERLESQUIN M., 1972 - Recherches sur les Charophycées d'Afrique occidentale (Systématique, Ecologie et Phytogéographie, Cytologie). *Bull. Soc. sci. Bretagne,* XLVII, fasc. H. S.: 169 p.

GUERLESQUIN M., 1977 - Observations chromosomiques sur les Characées du Sud Tunisien. *Bull. Soc. Phycol. France*, 22: 60-69.

GUERLESQUIN M., 1978 - Les Characées du Maroc : bilan et répartition de la Flore. *Travaux R.C.P. 249,* C.N.R.S., IV: 139-148, 2 tabl.

GUERLESQUIN M. & VAQUER A., 1980 - Quelques observations biologiques et floristiques sur les rizières de Camargue: biotopes à Characées. *Bulletin d'Ecologie,* 11 (2): 113-124.

GUERLESQUIN M., 1981 - Contribution à la connaissance des Characées d'Amérique du Sud (Bolivie, Equateur, Guyane française). *Rev. Hydrobiol. trop.*, 14 (4): 381-404.

GUERLESQUIN M., 1981 - *Nitella clavatoides,* nouvelle espèce du genre *Nitella* (Charophycées), de Bolivie. *Cryptogamie : Algologie,* 2 (4): 303-308.

GUERLESQUIN M., 1984 - Nombres chromosomiques et ploïdie chez les Charophytes. *Cryptogamie : Algologie,* V (2-3): 115-126.

GUERLESQUIN M., EL KHIATI N., RAMDANI M. & VAQUER A., 1987 - *Lamprothamnium succinctum* A. Br. in Asch., espèce de Characée nouvelle pour le Maroc. *Bull. Inst. sci. Rabat,* 11: 129-133.

GUERLESQUIN M., 1987 - Recherches récentes sur les Charophycées : morphogenèse et reproduction sexuée. *Bull. Soc. bot. Fr., Actualités botan.*, 134 (1): 17-30.

GUERLESQUIN M., SULMONT G. & WATTEZ J.-R., 1990 - Biotopes riches en Charophycées dans les milieux humides de la Picardie occidentale. *Bull. Soc. Linn. Nord-Picardie,* 1990, 8: 59-64.

GUERLESQUIN M., 1990 - Contribution to morphogenesis and sexual reproduction in Charophyta. *Phytomorphology,* 40 (1 & 2): 189-216.

GRAMBAST-FESSARD N. & GUERLESQUIN M., 1991 - Charophytes actuelles et fossiles : avant-propos. *Bull. Soc. bot. Fr., Actualités botan*., 138 (1): 3-7.

GUERLESQUIN M., 1992 - Charophytes, chap. VI-2b *in* "Lake Titicaca, a synthesis of Limnological Knowledge", Dejoux & Iltis éd., Kluwer Acad. Publ., *Monographiae biologicae,* ORSTOM, 68: 232-240.

GUERLESQUIN M., 1992 - Systématique et biogéographie du genre *Lamprothamnium* (Characées) caractéristique des biotopes aquatiques saumâtres. *Rev. Sci. Eau,* 5 (3): 415-430.

Mc COURT R. M., KAROL K. G., GUERLESQUIN M. & FEIST M., 1996 - Phylogeny of extant genera in the family Characeae (Charales, Charophyceae) based on rbcL sequences and morphology. *American Journal of Botany,* 83 (1): 125-131.

GUERLESQUIN M., 1996 - On the variability of the known Chromosome numbers observed in the Characeae. *In "Cytology, Genetics and Molecular Biology of Algae",* Chaudhary & Agrawal éd., SPB Acad. Publ. Amst.: 95-113.

HAURY J., JAFFRE M., DUTARTRE A., PELTRE M.-C., BARBE J., TREMOLIERES M., GUERLESQUIN M. & MULLER S., 1997 & 1998 - Application de la méthode "Milieu Et Végétaux aquatiques fixés" à 12 rivières françaises : typologie floristique préliminaire. *Annales de Limnologie,* 1998, 34 (2): 129-138.

LAMBERT E., GUERLESQUIN M., 2002. Eaux oligo-mésotrophes calcaires avec végétation benthique à Chara spp. Fiche 3140. Communautés à Characées des eaux oligo-mésotrophes basiques. Fiche 3140 (1). Cahiers d'habitats Natura 2000 "Connaissance et gestion des habitats et des espèces d'intérêt communautaire " – Tome 3 Habitats humides – Ed. La documentation française : 97-106.

Prof. HUANG Renjin (1938-2014)

Prof. HUANG was born in 1938 in Liyang City, Jiangsu Province, China, graduated from the Nanjing University in 1963 and then worked in the Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences until 1998 when he retired. Prof. HUANG passed away on 7th of October, 2014 because of lung cancer. He was the member of IRGC, Palaeontological Society of China and Micropalaeontological Society of China.

Prof. HUANG contributed a lot to the development of petroleum in China. He had attended lots of fieldworks for oil field of Jiangsu, Shengli, Dagang, Liaohe, Zhongyuan and others in China. Through studying charophyte biostratigraphy and stratigraphic correlation, he helped staff at the oil field to date and correlate the strata, which is important for finding oil.

During the 70s to 80s of the 20th century, Prof. HUANG published a series of papers on Cretaceous-Paleocene charophytes from Mesozoic and Cenozoic lacustrine basins in China, including Nanxiong and Sanshui Basins of Guangdong Province, Sichuan Basin of Sichuan Provinces, North Jiangsu Basin of Jiangsu Province and Dongpu Sag of Henan and Shandong Provinces (Huang, 1979; Wang et al., 1982; Huang and Zhang, 1984; Huang, 1985; Zhao and Huang, 1985; Huang, 1988; Huang et al., 1988; Huang and Zhang, 1989). He concluded that the Paleogene charophytes are usually ornamented with tubercles on spiral cells and apical nodules, differing from the Cretaceous charophytes. Prof. HUANG also studied charophytes from the Jurassic deposits in the Sichuan Basin (Huang, 1986). He established two assemblages and concluded that the first assemblage can be compared to the Middle Jurassic charophytes from Yunnan Province, China and the second assemblage can be compared to the Late Jurassic charophytes from Germany and America. Furthermore, Prof. HUANG studied Triassic charophytes from the Huangmaqing Formation in Nanjing city, Jiangsu Province. He concluded that the charophyte flora was mainly composed of the genus *Stellatochara*, which could be compared with the flora found in Europe, Russia and other parts in China with the age of Middle Triassic.

Prof. HUANG was also an active member of the IRGC. He attended the first IRGC conference in Montpelier in 1989, giving a report on K/T boundary charophyte assemblages from Southern China. His report and study was recognized and respected by charophyte peers. Prof. HUANG was an energetic, enthusiastic and intelligent person, especially contributed a lot to the development of charophyte research in China, having a profound and far-reaching influence for young generations of charophyte scientists.

Li Sha and Wang Qifei (Nanjing, China)

WELCOME TO NEW IRGC MEMBERS

It is a great pleasure to welcome our new members. Akram Ahmadi (Iran), Anja Holzhausen (Germany), Robin Sleith (USA), Stephen Gottschalk (USA), Sophia Barinova (Israel), and Gregor Kozlowski (Switzerland) are warmly welcomed. Please see their affiliation in the addresses section.

MINUTES OF THE GENERAL ASSEMBLY 2016

The general assembly of the IRGC was held during the 7th IRGC Symposium in Astana, Kazakhstan, on 01.09.2016.

IRGC's president's report

Carles Martín-Closas welcomed everybody, and read through the minutes of the previous IRGC general assembly in Mendoza 2012, which were also visible to all participants of the assembly projected on a screen. They were also published in 2013 in the IRGC news 24. The minutes were approved afterwards.

The president informed about the present legal situation of the IRGC. Despite the fact that nobody from the Executive Committee presently has a legal address in France, the IRGC is formally registered in Montpellier (France). It is still more advantageous to manage the IRGC

account in France than moving the organization to another country.

A brief account of the activities of the association during the 4-years period was presented next. The IRGC supported during these last four years two GEC meetings (European branch of the IRGC) which have been held in Vilnius (Lithuania) in 2014 organized by Zofija Sinkeviciene and in Geneva (Switzerland) in 2015, organized by Dominique Auderset-Joye and Aurélie Boissezon. Thanks to all organizers for the fruitful and well-organized meetings.

The next GEC meeting was announced, which will be held in Valencia (Spain) in 2017, by Maria Rodrigo and Sara Calero. Maria invited all participants to the meeting, and briefly described the University of Valencia, and interesting sites for the field trips.

There was a discussion about the activities of regional groups. It was noticed, that the most active group within IRGC is GEC and there is little activity and reports from other parts of the world. The new members were mentioned and welcomed.

The IRGC president dedicated special thanks to the organizers of the 7th IRGC Meeting, Aizhan Zhamangara, Sherim Tulegenov and Raikhan Beisenova, for organizing such a successful meeting. About 30 delegates attended the Symposium coming from Canada, the United States, Spain, France, the Netherlands, Germany, Norway, Estonia, Poland, Lithuania, Israel, Iran, Russia, Kazakhstan, China, Japan and Australia. More than 40 presentations were given, about most of the fields in charophyte research.

Carles Martín-Closas summarized the activity of the IRGC News, which has been regularly published by the first trimester of every year, thanks mainly to the contribution of the Executive Board. Special thanks were addressed to Adriana Garcia for the whole editorial job and Susi Schneider who prepared every year a useful and interesting summary of publications about charophytes. It was also mentioned that some members send every year important summaries about successfully defended PhD-thesis on charophytes, reports on past meetings and other information. The executive board encouraged the members to help in the preparation of the IRGC news, which continues to be the most useful means of communication within the association.

The proceedings of the last IRGC meeting in Mendoza have been published in the journal "Aquatic Botany" thanks to the management of Adriana Garcia, Susi Schneider, Allan Chivas and Carles Martín-Closas. This well-ranked journal allowed our association to reach a wider audience for the outcomes of our activities.

The proceedings of the present IRGC meeting could also be published in a special issue of a journal with an Impact Factor of medium rank (i.e. ca. 1) if there was enough interest by the audience (at least 15 eligible papers). It was stressed that in such journals only papers interesting for an international audience will be accepted. Two international journals were mentioned: "Procedia" (suggested by Margarete Kalin) and "Botany Letters" (suggested by Elisabeth Lambert). 15 persons declared they would be willing to prepare a manuscript. Everyone agreed to prepare the abstracts by November 1st to check the possibilities of publishing. Carles Martín-Closas accepted to contact the possible publishers.

Since the last IRGC meeting a number of books have been published that were not directly sponsored by the association but were written or edited by the members, sometimes as the result of a collaboration promoted in part by our association. They are:

- The Physiology of Characean Cells (Mary Beilby and Michelle Casanova), 2014
- Armleuchteralgen - die Characeen Deutschlands (the German Group of Charophytes), 2016
- Guide des Characées de la France Méditerranéenne (Ingeborg Soulié-Märsche and coauthors), 2016

The members of our association change continuously, but the IRGC keeps a quite regular pool of about 100 members. 14 new members joined the IRGC since the Mendoza meeting. Michael Schudack passed away on January 2016. He was secretary of our organization in the period of 2000-2004 and organized a GEC Meeting in 1991. Some of us felt very heavily this loss.

It is important that the members keep their fees updated since this is the only income that allows us to do and send the IRGC News and to give some financial support to the Regional Meetings and the IRGC Symposium. The membership fee of 20 Euro per year is extremely low in comparison to most legally inscribed scientific associations.

Presently our association contributes with a symbolical sum of 300 Euro to Regional Symposia (GEC) and 600 Euro to organizers of IRGC meetings. The Executive Committee proposed to raise this sum to 500 and 1000 Euro, respectively, starting from 2017. The assembly approved this proposal.

Carles Martín-Closas informed us that Robin Scribailo (USA) stays in charge of the charophyte-L forum and Dominique Auderset Joye (SUI) will continue her work on the IRGC bibliography.

The assembly discussed about Regional Correspondents: Uwe Raabe is the European correspondent and Simone Becker-Fauth reports activities from N and S America. Additionally, Li Sha (China) was proposed to take over from Qifei Wang. The assembly approved this proposal, and Li Sha accepted the task as regional correspondent for Asia.

According to the proposal approved during the general Assembly in Rostock-2008, an IRGC 2016-price of 100 Euro will be awarded for the best oral or poster presentation of a pre-doctoral participant. The proposed jury was formed by Mary Beilby, Hidetoshi Sakayama and Ingeborg Soulié-Märsche. All the young people were asked to attend the closing ceremony, when the results were announced. The award was given on 2nd September to Alba Vicente.

IRGC Treasurers report

The IRGC balance was presented by Emile Nat (see table below) and was unanimously approved. Our income is modest and based exclusively on membership fees. All the members were encouraged to pay regularly, which is very important to keep financial liquidity. The assembly agreed to keep the fee of 20 Euros. Many colleagues updated their membership fees during the meeting in Astana. We also agreed that dismissal from membership will be applied for non-payment of fees for more than two years.

Table. IRGC balances of the years 2012-2015

	2012	2013	2014	2015
Bank credit on January 1st	€ 1,929.79	€ 1 761,52	€ 1 820,42	€ 3 147,15
INCOME				
Individual membership fees	€ 1,370.00	€ 300,00	€ 2 588,00	1868,71*
***including Special Issue Aquatic Botany**				
Total income	€ 1,370.00	€ 300,00	€ 2 588,00	€ 1 868,71
EXPENDITURES				
IRGC-News copies & mailing costs	€ 388,62		€ 843,77	€ 299,76
Bank and transfer charges, postal fees	€ 74,10	€ 80,30	€ 117,50	€ 107,60
Contribution to IRGC meeting Mendoza	€ 600,00			
Students Award	€ 100,00			
Gift to the Musacchio family	€ 43,00			
EMS (credit card) costs	€ 332,55	€ 160,80		
Contribution to GEC meeting Vilnius			€ 300,00	
Contribution to GEC meeting Geneva				€ 300,00
Special Issue Aquatic Botany				€ 607,00
Total expenditures	€ 1 538,27	€ 241,10	€ 1 261,27	€ 1 314,36
Yearly balance	€ 168,27	€ 58,90	€ 1 326,73	€ 554,35
Total credit on December 31st	€ 1 761,52	€ 1 820,42	€ 3 147,15	€ 3 701,50

Next IRGC Symposium

In a four-year sequence, the next IRGC meeting shall be in 2020. Carles Martín-Closas presented the candidature of Dr. Khaled Trabelsi (University of Sfax, Tunisia) to organize the 8th IRGC Symposium in Gammarth, Tunisia. Ingeborg Soulié-Märsche gave a short presentation of the possible venue and interesting sites for the field trips. In turn, Carles, on behalf of Khaled, presented several possibilities for the post-conference field trips on fossil charophytes and some additional sites. Most of the assembled (22) voted in favor of this idea, noticing that it will depend on the geopolitical situation in that part of the world.

Election of Officers and the Executive Committee

The IRGC president announced the elections and informed that the voting material has been sent three months in advance to all members in order to give all members the opportunity to vote and suggest the candidates. Carles Martín-Closas (previous President) and Adriana Garcia (previous Secretary General) resigned after a two-term office. Two other committee members were standing for re-election: Susanne Schneider (new role as President) and Emile Nat (re-election as Treasurer). Additionally, Kaire Torn (Estonia; Secretary General) and Andrzej Pukacz (Poland; Vice-President) had been nominated.

Thirty-two (32) votes were either received by mail or during the meeting. All the ballots were opened and counted by Maria Rodrigo and Alba Vicente during the General Assembly. The new Executive Committee was elected as follows:

Susanne Schneider (President): 30 votes
Andrzej Pukacz (Vice-President): 31 votes
Kaire Torn (Secretary General): 31 votes
Emile Nat (Treasurer): 32 votes

After approving the voting Carles Martín-Closas thanked all the committee members for the cooperation so far. He also expressed his best wishes for a long-lasting and fruitful continuation of the IRGC activities and handed the chair over to Susanne Schneider.

On behalf of the newly elected committee Susanne Schneider expressed her thanks to the former Executive Committee and to the audience for the votes. Then she briefly outlined the main goals of the future work, emphasizing the great diversity of subjects within our organization. One of the main objectives will be intensification of the scientific exchange and continuation of the IRGC News and our website. After this short presentation Susanne Schneider gave the floor back to Carles Martín-Closas who closed the General Assembly.

REPORT ON PAST MEETINGS

28 August – 5 September 2016
7th International Symposium on Extant and Fossil Charophytes, Astana, Republic of Kazakhstan

Scientific sessions

The scientific session of the 7th meeting of the IRGC occurred on 31 August to 2 September 2016 in Astana, the very young capital of Kazakhstan. The symposium was organized by Aizhan Zhamangara and vigorously supported by Sherim Tulegenov. The meeting took place in the L.N. Gumilyov Eurasian National University in a kind and almost familiar atmosphere. Up to 36 oral and poster presentations were given by speakers from 15 countries from Europe, Asia, America and Australia filled with a wide spectrum of charophyte research. This report will try to summarize the main results of the presentations by ordering them to four main subjects: 1) Fossil charophytes - biogeographic trends & endemism, 2) Taxonomy, diversity and distribution, 3) Ecology and 4) Physiology & biochemistry.

Fossil charophytes - biogeographic trends & endemism

The IRGC president**, Carles Martín-Closas** (Spain) opened the oral presentations and spoke about the findings of Iberian endemic charophytes at the Eocene-Oligocene boundary with a few species that are exclusive from the Ebro Basin. **Alba Vicente** (Spain) won the prize of the IRGC best student presentation for her very interesting talk about cosmopolitan and endemic charophytes from the Upper Cretaceous and Lower Palaeocene. She demonstrated that extant and fossil charophytologists have similar objectives and that both are faced with intraspecific polymorphism. The presentation of **Li Sha** (China) focused on Chinese charophytes during the Cretaceous-Paleogene boundary and correlated them to the charophyte records from Europe. Taxonomy and distribution of charophytes from Kazakhstan on the boundary of Eocene and Oligocene were

presented by **Aizhan Zhamangara** (Kazakhstan) identifying three stages of charophyte development in the observed period. She emphasized that Kazakhstan can serve as a connection between Europe and Asia to examine the common characteristics and differences between fossil charophytes of both continents and thus a better understanding of the evolution of charophytes. **Joe T. Hannibal** (USA) showed that the occurrence of charophytes in some French buhr millstones can be linked to specific quarry sites within the Paris Basin.

Taxonomy, diversity & distribution

Roman E. Romanov (Russia) presented in three oral and two poster presentations the current state of knowledge of charophytes from Sinai, Kazakhstan, Tajikistan, Russia and the permafrost areas of Yakutia. For the mainly desert region Sinai he confirmed 11 species and illustrated that Kazakhstan has the highest species richness among the Central Asian states - with 29 confirmed charophyte species. The most frequently collected species in Tajikistan even up to an altitude of 3800 m in the Pamir Mountains is *Chara vulgaris*. Roman E. Romanov also presented that a large number of charophytes occur in the river valleys in Yakutia . Based on detailed studies of herbaria of several universities, institutes and private collections he confirmed 46 charophyte species and updated the current knowledge of distribution and richness of charophytes in Russia. **Ingeborg Soulié-Märsche** (France) summarized the knowledge on charophyte floras from Morocco, Algeria and Tunisia and showed also that temporal waters, wadis or artificial lakes play a role for the presence of charophyte species. She considered the idea that *Chara oedophylla* could be presented an intermediate state within the evolution of *C. vulgaris* from a monoecious to dioecious species. Based on intensive sampling from 185 localities **Freshteh Ahmadi** (Iran) improved the knowledge of the charophyte distribution in Iran and described 17 charophyte species including the new diplostichous species *Chara kohrangiana*.

Our knowledge about taxonomy and terminology about charophytes, charophyte green algae and the origin of land plants was summarized by **Adriana Garcia** (Australia) with the suggestion using the term charophyte exclusively for stoneworts and charophyte green algae or charophytic algae when referring to the clade of green algae including land plants. **Hidetoshi Sakayama** (Japan) presented the results of the first reliable transcriptome and genome sequence data obtained from *Chara braunii* and showed that many gene families hypothesized to be important in plant development are present in *Chara*. He asks for material of *C. braunii* for his phylogeographical analyses. Unfortunately, **Kenneth G. Karol** (USA) could not attend the meeting in the last moment, but Robin S. Sleith (USA) presented his work about the mitochondrial and plastid genome sequences of 15 Characeae species and showed that both organellar genomes evolved differently and told different stories about phylogenetic relationships of Embryophytes and Charophyceae.

Stephen D. Gottschalk (USA) presented an overview of the historical treatments of *Chara* subsection Willdenowia that Wood & Imahori reduced to only one species. In contrast to this, current data based on morphology, biology and a four gene phylogeny suggested the existence of more than 16 distinct species. The picture was different for phylogenetic analyses of *Chara* species presented by **Susanne C. Schneider** (Norway) indicating that morphological traits may serve as diagnostic tools for species delineation, but that they are not generally suitable for inferring genetic differentiation. That charophytes also can be listed as aggressive invasive species showed **Robin S. Sleith** (USA) in his presentation about the movement and distribution of *Nitellopsis obtusa* in North America (Fig. 1, page 33). Specimens introduced from Europe occurring in habitats with high nutrients and high conductivity and showing remarkably little genetic variation. For better understanding of the spread of *Nitellopsis obtusa* he is asking for material. Stephen D. Gottschalk on behalf of **Kenneth G. Karol** (USA) talked about the presence of *Lychnothamnus barbatus* in North America first documented in 2012 and discussed the question if this species is native or exotic.

Ecology

Intensive sampling and measuring of water chemistry data around New England and New York allowed investigations of species richness using multivariate analyses and species distribution models by **Robin S. Sleith** (USA). Conductivity or pH constrains species in different ways indicating that conservation efforts should try to protect a wide range of habitats. **Hendrik Schubert** (Germany) analysed the occurrence and distribution of charophytes in Chile, demonstrating that ionic composition caused differences in the distribution patterns

of *Chara* and *Nitella* species, except *C. braunii* which was found under ionic compositions similar to *Nitella* species. **Sara Calero** (Spain) studied the short life cycle of a parthenogenetic population of *Chara canescens*. In response to the fluctuating habitat and the annual character, she found that *C. canescens* only has a reproductive cycle of 5 months and that the size of oogonia depends on the position of the whorl. In her next presentation Sara Calero analysed the phenology of three charophyte species demonstrating that temperature seems to be a key factor in the regulation of the reproductive pattern. Additionally she reported that increased salinity negatively affected the sexual reproduction of *Chara hispida*, by delaying the reproductive onset, shortening its reproductive period and decreasing the frequency of oospore production. It seemed that salinity promotes the presence of long-stalked antheridia. The response of charophytes from shallow water bodies to global warming was presented by **Maria A. Rodrigo** (Spain) showing that stressors like temperature, salinity, nitrate concentration, UVR etc. interact and that the charophyte responses to climate change differ not only among species, but show also intra-specific differentiations. The seasonal dynamics of primary production of charophytes was analysed by **Kaire Torn** (Estonia) demonstrating that during mild winters *Chara tomentosa* is not only able to exist, but also to produce. **Elisabeth Lambert** (France) analysed the vegetation of saltmarshes from the French Atlantic coast and demonstrated that *Tolypella salina* occurs only in habitats with regular drying periods combined with changing salinities from brackish to hypersaline. A Polish-German project for the protection of charophyte lakes of Lubuskie voivodship (Poland) and Brandenburg (Germany) regions was presented by **Andrzej Pukacz** (Poland) demonstrating that light conditions and proportions between forests and industrialized areas in the catchment basin are the key factors for the charophyte occurrence and species richness.

Analyses of subfossil charophyte oospores in the littoral part of the Curonian Lagoon were presented by **Zofija Sinkevičienė** (Lithuania). She showed that viable oospores were concentrated mainly in the upper sediment layers, which partly can be explained by biological peculiarities of charophytes and hydrodynamic activities in the estuarine lagoon. **Petra Nowak** (Germany) analysed the recent macrophyte community of Baltic coastal waters in relation to the diaspore reservoir in the sediment and its regeneration potential showing that the diaspore bank could play a role for regeneration and conservation of coastal water ecosystems. The presentation of **Anja Holzhausen** (Germany) focussed on the dormancy and vitality of oospores. Pre-treatment with cold temperatures as well as desiccation can be identified as condition to break the dormancy. The vitality of oospores can be detected with 2,3,5 - Triphenyltetrazoliumchlorid.

Physiology and biochemistry

Mary J. Beilby (Australia) improved our knowledge about the signalling of charophyte cells under salinity stress and showed that Ca^{2+} in Characeae action potential (AP) comes not only from the internal stores but also from outside and formation of inositol triphosphate (IP_3) is probably involved in that process. In her second presentation Mary J. Beilby answered questions about the reaction of proton pumps and H^+/OH^- channels participating in the pH banding pattern under salinity stress and showed that the latter ones can be blocked by 1 mM $ZnCl_2$. **Allan R. Chivas** (Australia) analysed the low molecular-weight compounds within the thalli of charophytes and demonstrated that *Chara* has a remarkable organic chemistry, spanning the range of all marine algae and terrestrial higher plants whereas *Lamprothamnium* behaves as other submerged and floating-leaf aquatic plants. **Margarete Kalin** (Canada) showed that charophytes can provide a solution for the removal of certain contaminants (e.g. uranium, radium) from alkaline mine waste effluents. With apical growth and basal decay, charophytes can stabilize sediments and facilitate bio-mineralization processes. During her second presentation Margarete Kalin provided a summary of the concentrations of elements in effluents of mining waters and in the biomass of charophytes growing abundantly in effluent lakes or ponds showing that the relationship between the elemental concentrations in the water and that in the biomass are remarkable.

Anja Holzhausen and Petra Nowak (Germany)

Pre-Symposium Field Excursion Report: results in context of regional charophyte knowledge

The presymposium excursion has been organized during 29-30th August on four lakes in North Kazakhstan, at the northern part of the Kazakh Uplands, known as Kokshetau Upland. Three of them, the freshwater lakes Burabay, Ulken Shabakty and Katarkol, are situated on the territory of the State National Natural Park "Burabay". The fourth lake – oligohaline Lake Zerendy - is a part of the Kokshetau State National Nature Park. The last lake has been surveyed at two stations, 52.906111N 69.130333E (Fig. 2, page 33) and 52.936972N 69.134722E, the first one also included shallow waters which became a part of the lake due to high water level in 2016. The northern bay of Lake Burabay, 53.0876548N 70.2535879E, south-western bay of Lake Ulken Shabakty (eastern of peninsula, 53.09662688N 70.2579117E) and south-eastern part of Lake Katarkol, 52.9545331N 70.4251099E (Fig. 3, page 33), have also been visited during our excursion. The determination workshop has been organized in L. N. Gumilyov Eurasian National University in Astana during the symposium.

Nine species of *Chara* and *Nitellopsis obtusa* (Desv.) J. Groves have been found during our excursion (see Table below). The most species-rich was Lake Zerendy with nine species. Five species have been collected from Lake Katarkol, three – in Lake Burabay and only one – in Lake Ulken Shabakty. Moreover *Chara cf. arcuatofolia* Vilh., *C. aspera* Willd. and *C. globularis* Thuill. have been found in a small water body near the second station on Lake Zerendy, 52.938056N 69.136833E.

Charophytes were collected previously from the lakes visited and we have numerous species records for them (see Table below). Lakes Katarkol and Ulken Shabakty are notable as a type locality of *Chara locuples* Hollerb. (Hollerbach, 1960). This is a haplostephanous morphotype of *C. strigosa* A. Braun occurring with different frequency in distant populations across the species distribution range; haplostephanous and diplostephanous stipulodes can both be present within the same plant (Langangen, 2000; Romanov et al., 2014a).

All specimens from the lakes visited are available in the Herbarium of the Komarov Botanical Institute of the Russian Academy of Science in Sankt-Petersburg (LE) and have been checked and identified by R.E. Romanov. As a result of this revision *Chara connivens* Salzm. ex A. Braun and *C. filiformis* A. Braun in Hertzsch must be excluded from the species list for North Kazakhstan because their records were based on misidentified specimen of *C. aspera* or voucher specimens are unknown (Table).

All available records from the lakes visited have been summarized in the Table below. Nine species are known from Lake Zerendy, six from Lake Katarkol, eight from Lake Ulken Shabaky and seven from Lake Burabay. Inter-annual water level fluctuation and associated changes of salinity and chemical composition of the water may be responsible for differences in species composition for Zerendy and Katarkol lakes in different years. The high species richness in individual water bodies as well as the presence of communities of *Chara papillosa* and *Nitellopsis obtusa* which are very rare in North Kazakhstan highlight the importance of the lake visited for charophyte species conservation in the region.

Several species collected during the excursion are notable due to their comparatively limited distribution range. *Chara altaica* has been found mainly in Central Asia; it is also known from the southern Ural, south of West Siberia, South Siberia, Mongolia, China and Japan (see references in Romanov et al., 2014b). *Chara neglecta* has been reported from Central Asia and also from North Kazakhstan, southern Ukraine and from the south of the European part of Russia (l.c.). *Chara kirghisorum* is known from South Ural in Russia, Kazakhstan, Uzbekistan and Iran (Romanov, 2009; Ahmadi et al., 2012). *Chara arcuatofolia* has been found in Kazakhstan, Ukraine, China and South Siberia (Romanov, Kipriyanova, 2010).

But one of the most remarkable findings was waiting for us during the postsymposium excursion in South Kazakhstan. *Chara globata* Mig. was found in Kapchagay Reservoir in the vicinity of the dam, 43.9242259N 77.1056986E, 03-ix-2016. This is a flagship species of arid and semiarid regions of West and Central Asia (Romanov et al., 2015), which was known from water bodies within the flooding area of Kapchagay Reservoir but not from the reservoir (Shoyakubov, 1979).

Roman E. Romanov (Russia) and Aizhan Zhamangara (Kazakhstan)

Table. Species records from the lakes visited during presymposium excursion

Species*	Date	Collector	Reference
Lake Zerendy (Zerenda)			
Chara altaica A. Braun in A. Braun et Nordst., *C. canescens* Loisel., *C. globularis* Thuill. (as *C. fragilis* Desv.), *C. tomentosa* L., *C. vulgaris* L.	20,21-vii-1986	B.F. Sviridenko	Sviridenko, 2000; Sviridenko, Sviridenko, 2008
C. altaica, *C. aspera* Willd., *C. canescens*, *C. contraria* A. Braun ex Kütz., *C. globularis*, *C. papillosa* Kütz., *C. tomentosa*	17-ix-2015	R. Romanov, A. Zhamangara	This report, NS
C. altaica, *C. aspera*, *C. canescens*, *C. contraria*, *C. globularis*, *C. neglecta* Hollerb., *C. papillosa*, *C. vulgaris*, *C. tomentosa*	29-viii-2016	Participants of 7th IRGC Symposium	This report
Lake Katarkol (Kotyrkol)			
C. aspera, *C. globularis*	24,26-viii-1948	L.A. Demchenko	LE
C. strigosa A. Braun (as *C. locuples* Hollerb., holotype)	25-viii-1948	L.A. Demchenko	LE; Hollerbach, 1960; Hollerbach, Krassavina, 1983
C. aspera (also under *C. connivens* Salzm. ex A. Braun)	11-vii-1962	V.M. Katanskaya	LE; Katanskaya, 1975
C. altaica, *C. aspera*, *C. globularis*, *C. tomentosa*	15-ix-2015	R.E. Romanov, A.K. Zhamangara	This report
C. altaica, *C. aspera*, *C. globularis, C. kirghisorum* Lessing em. Hollerb. ster., *C. tomentosa*	30-viii-2016	Participants of 7th IRGC Symposium	This report
Ulken Shabaky (Bolshoye Chebache)			
Chara cf. contraria, *C. cf. globularis* ster., *C. kirghisorum*, *C. papillosa*	11,21-vi-1912	unknown collector whose name was unreadable in field labels	LE
C. aspera, *C. tomentosa*	13-vii-1942, 24-vii-1942	A.A. Richter, N.N. Woronichin	LE
C. kirghisorum	1942-1943	N.N. Woronichin	LE
C. kirghisorum	24-v-1943	V.Schm.	LE
C. aspera	13-iv-1943, 08-ii-1947	N.N. Woronichin	LE
C. aspera, *C. globularis* (as *C. fragilis*), *C. strigosa*	-	L.A. Demchenko	Demchenko, 1948 cit. ex. Krassavina 1968
C. kirghisorum, *C. tomentosa*, *C. strigosa* (as *C. locuples*, syntype), C. globularis, *C. contraria*	06-08-viii-1948	L.A. Demchenko	LE; Hollerbach, 1960; Hollerbach & Krassavina, 1983
C. aspera, *C. kirghisorum*, *C. tomentosa*	03-ix-1979	V.M. Katanskaya	LE
C. altaica, *C. aspera*, *C. contraria*, *C. kirghisorum*, *C. strigosa* (as *C. locuples*), *C. tomentosa*	26, 28-30-vii-1986	B.F. Sviridenko	Sviridenko, 2000; Sviridenko, Sviridenko, 2008
C. aspera, *C. tomentosa*	15-ix-2015	R.E. Romanov, A.K. Zhamangara	This report, NS
C. tomentosa	30-viii-2016	Participants of 7th IRGC Symposium	This report
Species*	Date	Collector	Reference
Lake Burabay (Borovoe)			
C. globularis	04-vi-1943	V.Schm., N. Woronichin	LE
C. strigosa	1946	-	Dobrokhotova, 1953
C. aspera, *C. globularis* (as *C. fragilis*)	29,31-vii-1947, 23-viii-1947	L.A. Demchenko	LE; Dobrokhotova, 1953
C. strigosa	30-viii-1947	Cherepalova	LE
C. globularis	23-viii-1948	L.A. Demchenko	LE

Nitella flexilis (L.) C. Agardh	20-vi-1948	L.A. Demchenko	LE
C. filiformis A. Braun in Hertzsch	-	-	Sviridenko, 2000**
C. globularis, *C. strigosa* (under *C. tenuispina* A. Braun)	10-vii-1962	V.M. Katanskaya	LE, Katanskaya, 1975
C. globularis	02-ix-1979	V.M. Katanskaya	LE
Nitellopsis obtusa (Desv.) J. Groves, *C. globularis* (as *C. fragilis*), *C. strigosa* (as *C. locuples*)	31-vii-02-viii-1986	B.F. Sviridenko	Sviridenko, 2000; Sviridenko, Sviridenko, 2008
N. obtusa, *C. globularis*, *C. papillosa*	15-ix-2015	R.E. Romanov, A.K. Zhamangara	This report, NS
N. obtusa, *C. globularis*, *C. papillosa*	30-viii-2016	Participants of 7th IRGC Symposium	This report

Notes: All studied specimens of *Chara aspera* belong to f. *subinermis* Kütz.*Synonyms and misidentifications reported in the cited references were noted. ** This is obviously an erroneous statement of B.F. Sviridenko (2000) because *C. filiformis* is absent in the reference cited by him (Katanskaya, 1975), therefore the true source of the cited data is unknown.

References

Ahmadi, A., Riahi, H., Sheidai, M. & van Raam, J. (2012): Some charophytes (Characeae, Charophyta) from Central and Western of Iran including *Chara kohrangiana* species nova. *Cryptogamie, Algol.* 33: 359-390.

Demchenko, L.A. (1948): *[Aquatic vegetation of Lake Borovoe]*. – Proc. State Nature Reserve „Borovoe“ 1: 52-61 (in Russian).

Dobrokhotova, K.V. (1953): *[Charophytes in coenoses of aquatic macrophytes]*. – Proc. All-Union Hydrobiol. Soc. AS USSR 5: 258-263 (in Russian).

Hollerbach, M.M. (1950): *[The systematic list of charophytes found on USSR territory till 1935 inclusively]*. – Trudy Bot. Inst. Akad. Nauk SSSR. Ser. 2, Sporovye rasteniya 5: 20-94 (in Russian).

Hollerbach, M.M. (1960): De speciebus novis generis Chara e sectione Haplostephanae Triplostichae. *Notulae Systematicae e Sectione Cryptogamica Instituti Botanicic nomine V. L. komarovii Academiae Scientiarum URSS*. 13: 101-107. (in Russian and Latin).

Hollerbach, M.M. & Krasavina, L.K. (1983): *The charophytes – Charophyta. The Identification Manual of Freshwater Algae of USSR*. 14. Nauka, Leningrad (in Russian).

Katanskaya, V.M. (1975): *[Aquatic vegetation of plain Kazakhstan lakes in relation to interdecadal variability of their state]*. – Lakes of Kazakhstan and Kirghizia and their history. P. 216-228. Nauka, Leningrad (in Russian).

Krassavina, L.K. (1968): *Bibliography of Soviet references for algae for 1941-1960*. Publ. Center AS USSR Library, Leningrad (in Russian).

Langangen, A. (2000): On the morphology and ecology of *Chara strigosa* A. Braun (Charophyceae) in Scandinavia, with notes on its total distribution. *Aquilo, Series Botanica* 38: 1-12.

Romanov, R.E. (2009): Charophytes of the south [of the southern part] of the West-Siberian Plain. *Plant Life of Asian Russia* 1(3): 19-30 (in Russian with English abstract).

Romanov, R.E., Chemeris, E.V., Vishnyakov, V.S., Chepinoga, V.V., Azovskii, M.G., Kuklin, A.P. & Timofeeva, V.V. (2014a): *Chara strigosa* (Streptophyta: Charales) in Russia. *Botanicheskii Zhurnal* 99(10): 1148–1161 (in Russian with English abstract).

Romanov, R.E., Gontcharov, A.A. & Barinova, S.S. 2015. *Chara globata* Mig. (Streptophyta: Charales): rare species revised. *Fottea, Olomouc* 15(1): 39-50.

Romanov, R.E. & Kipriyanova, L.M. (2010): Charophyte species diversity and distribution on the south of the West-Siberian Plain. *Charophytes* 2: 72-86.

Romanov, R.E.; Zhakova, L.V.; Bazarova, B.B. & Kipriyanova, L.M. (2014b): The charophytes (Charales, Charophyceae) of Mongolia: a checklist and synopsis of localities, including new records. *Nova Hedwigia* 98: 127-150.

Shoyakubov, R.Sh. (1979): *Charophytes of Uzbekistan*. Fan, Tashkent. (in Russian).

Sviridenko, B.F. (2000): *Flora and vegetation of water bodies of Northern Kazakhstan*. Omsk (in Russian).

Sviridenko, T.V. & Sviridenko, B.F. (2008): [*The herbarium of charophytes (Charophyta) in the Hydromorphic Ecosystem Laboratory of the Scientific Research Institute of the Natural Management and Ecology of the North of the Surgut State University*]. – Biol. Res. Ecosystem Exploitation 11: 64-100 (in Russian).

Post-Symposium Fieldtrip Report: extant and fossil charophytes from South Kazakhstan

The post-symposium fieldtrip on September 3−5, 2016 was attended by a group of 19 people from 9 countries and 4 continents, including the participants and the organizers. The field excursion started after a pleasant meal in the city of Almaty. Boarding a bus, we crossed the city seeing great palaces and parks, but also the building of the Museum of Almaty among others. We soon enjoyed the views of the Alatau Mountains which form part of the Himalayan orogenic belt. In our way to Basshyi village we discovered the large and aromatic steppe of *Artemisia* that aroused the interest of some of the participants by their resemblance with the Pleistocene European steppes. Later, an unexpected stop in the Kapshagay reservoir, located in a volcanic landscape, allowed courageous participants to dive shortly into the waters in order to collect extremely nice specimens of *Chara globata* (Fig. 4 page 33).

Once we continued the trip, the wide steppes gave rise to the semi-deserts and the mountains surrounding Altym-Emel State National Nature Park. We overnighted there, in the small town of Basshyi.

After the first night, Aizhan and her nice crew from the Institute of Geological Science of Almaty, Saida Nigmatova, Madina Salmenova and Nurgaly Shadaiev boarded us in an incredible trip to the Aktau Mountains ("White Mountains" from Kazakh) where we made several stops (Fig. 5, page 33). The name comes from the dominant colour of the very thick continental deposits which can be observed tens of kilometers away. These continental deposits were dated from the Upper Eocene up to the Miocene and contain an almost continuous sequence of lacustrine and sabkha deposits, formed by green, red and yellowish claystones with a reddish-white alternation of claystones and gypsum at the top. After a few steps, we observed with the hand lenses the first fossil charophyte gyrogonites, that were large and well-preseved enough for us to identify *Nitellopsis*. The assemblage also contained *Lychnothamnus*, small *Chara* gyrogonites and perhaps *Peckichara*. Along with this charophyte remains some fossil macroremains of vascular plants were recognized too.

After a refreshing snack, we headed for the second stop where the thickness of the deposits where mainly formed by white, mainly Miocene lacustrine claystones with some sporadic limestones that contained large *Nitellopsis* gyrogonites. There, Aizhan's crew prepared a camp where we were pleased with a nice lunch and refreshments that helped us get back on track.

During the afternoon, we reached the top of a closer plateau, where we made our last stop of the day. From the plateau to the deeper parts of the valley we observed a very thick and continuous sequence formed of humid/arid sedimentary cycles as documented by the colour alternation of claystones in the succession. A closer view of the sediments allowed recognizing gyrogonites from genera *Chara* and *Lychnothamnus*, probably Pliocene in age (Fig. 6, page 33). At the end of the day, this beautiful scenario was completed with panoramic views and we were accompanied with a beautiful sunset in our way to Basshyi. There we enjoyed a traditional dinner, served inside a Yurta, which is a typical and cozy nomad tent.

On the next day, our organizers gifted us with a beautiful trip, full of geological and cultural inputs, which helped us to understand better the history of Kazakhstan. We boarded again our trucks and we headed south from Basshyi to the so called Singing Dune, a 120 meter dune that emits a characteristic sound when the sand moves. From the top of the dune we observed a panoramic view of the Illy River and the fluvial floodplain around it.

Before we returned to Almaty, we had the opportunity to visit the Besshatyr ("five tents" from Kazakh) archaeological site, formed by a complex of five burial mounds from the time of Genghis Khan, and the surrounding stone blocks bounding the mounds.

I would like to thank Aizhan Zhamangara, Saida Nigmatova, Madina Salmenova and Nurgaly Shadaiev for organizing the excursion, showing us the southern part of Kazakhstan and revealing us marvelous fossil charophyte localities. We also want to thank them for making this fieldtrip trip a funny and familiar trip learning about the culture of the Kazakhs. Special thanks to Carles Martín-Closas for reviewing the text.

Alba Vicente (Catalonia, Spain)

PUBLICATION OF THE PROCEEDINGS 7TH IRGC, ASTANA

Special issue on charophytes in the Journal "Botany Letters"

A Special Issue on charophytes is being prepared to publish the proceedings of our last IRGC meeting in Astana (Kazakhstan) as well as other papers related to living and fossil charophytes. This will be the 8th special issue on charophytes published by our association. Twenty proposals of papers have been accepted by the main editor of the journal Botany Letters (formerly Acta Botanica Gallica) and can be already uploaded in the editorial system of this journal until the **31st May 2017**, to start the revision process. **Please do not wait until the last minute to upload your manuscript!** The invited editors to manage this Special issue are Carles Martín-Closas (coordinator), Susi Schneider, Andrzej Pukacz and Mary Beilby. The special issue should be sent to production before the end of the year and will be published in 2018.

Carles Martín-Closas (Catalonia, Spain)

CALL FOR PARTICIPATION

Stonewort management practices working group: call for participation

Preventing the extinction of stonewort species is a real challenge, for researchers and practitioners. Taxonomy, physiology, biogeography and ecology are the most studied areas. Although there is a relatively abundant literature dealing with these subjects, this is not the case for *in situ* and *ex situ* conservation techniques.

Several of us have been asked to design and conduct efficient management plans for stoneworts. People (not many) are doing this in different places, in different ways but don't have the opportunity to tell each other about this.

Hence, to improve stonewort conservation projects, there is an urgent need to share and gather our practical charophyte management experience (*in situ* and *ex situ*).

The goal of this group is to open a discussion /forum and review available information with interested people from different parts of the world.

The specific goal is to publish together a review of good and bad practices in an appropriate journal and organise a workshop if needed and possible.

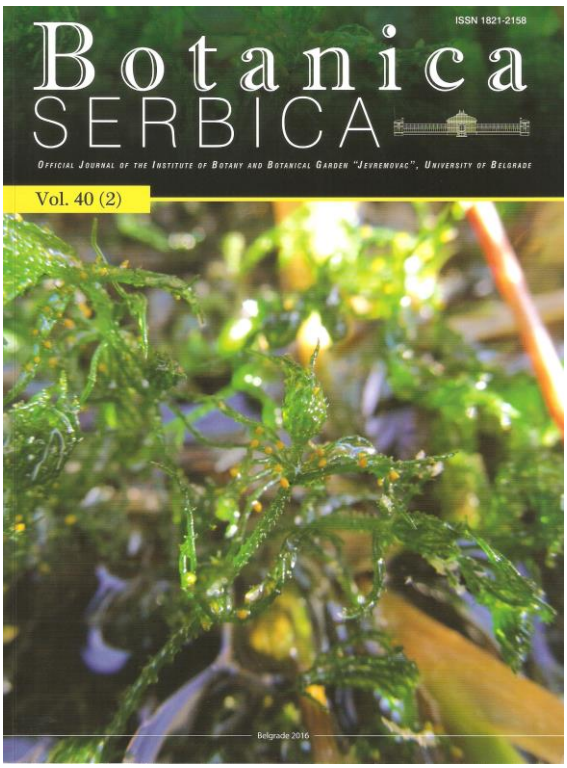
If you are involved in such topics and interested to participate in this working group, or if you need more information, please contact Aurélie Boissezon (Dr) by e-mail: aurelie.boissezon@hesge.ch

Present yourself (institution, main projects, main questions). Suggestions for topics are warmly welcome!

Aurélie Boissezon (Switzerland)

SPECIAL ISSUE

Botanica Serbica 40(2), a volume in honour of Jelena Blaženčić



In occasion of the 80th birthday of our dear colleague Jelena Blaženčić a special issue of the Open Access journal Botanica Serbica was devoted to freshwater algae, the aquatic macrophytes and fungi. The volume is exquisitely edited and illustrated with high quality pictures. The first paper by Branka Stevanović, who was one of the editors, is an analysis of the academic biography of Jelena. A number of contributions were specifically devoted to charophytes. A. Alegro and coauthors revisit the macrophytic vegetation of lake Vrana at

Cres, one of the Croatian islands in the N-Adriatic, after 50 years of the last conspectus. The flora that includes *Chara aculeolata, C. virgata* and *Nitella opaca* was negatively affected by the over-explotation of the water of this oligotrophic lake. S. Trajanovski and colls. presented a study on the role of the macrophytes to structure the macrozoobenthos. It comes out that the meadows dominated by charophytes but mixed with some angiosperms were the most attractive habitats for molluscs, insects and annelids. C. Martín-Closas and colls. provide a synthesis of the studies on fossil charophytes from the Iberian Peninsula. The records last from the Jurassic to the Recent, and represent one of the hotspots for the study of charophyte paleontology in Europe. A. Langangen describes and analyses biogeographically the occurrence of *Chara vulgaris* f. *longibracteata* in nine springs from the Greek Island of Amorgos in the Aegean. M. Rodrigo and J.L. Alonso-Guillén provide a synthesis about the charophyte flora from the Albufera de València Natural Park in Spain. Up to 15 species were distributed in different habitats such as rice fields, springs, channels, interdunal ponds or constructed wetlands. R. Romanov & S. Barinova documented the species of *Nitella* from Israel highlighting that they represent an impoverished version of the Euroasiatic *Nitella*. I. Soulié-Märsche & S.D. Muller report new findings of *Chara oedophylla* in Tunisia. The differences between this species and *C. vulgaris* a include sejoined gametangia, large antheridia and vertically geminate oogonia. Finally A. Vesić and colls. revisit the charophyte flora of Vojvodina (Serbia) 20 years after the first appraisal. Up to 20 species were reported and their distribution in maps is analysed from the conservational viewpoint.

The papers of this issue may be freely accessed at http://botanicaserbica.bio.bg.ac.rs/2016_40_2.html

Carles Martín-Closas (Catalonia, Spain)

REFERENCE ARTICLE

What's new about Chara? A short overview over some interesting charophyte studies published in 2016

When I searched Web of Science on January 17 using the search criteria "Chara" and "2016", I got 87 hits. As usual, "Chara" is maliciously hijacked by astrophysics, but there still were quite many interesting publications on "our" (= the real) *Chara*. Several of the papers I found dealt with calcification/carbon, and several others with molecular biology/genetics, but there also were many on "miscellaneous" topics. I can only present a very small selection of the papers here, and there were many more interesting publications. Please accept my apologies if you are one of those who's paper is not presented here.

Pukacz et al. (a) studied the month-to-month variability and $CaCO_3$ precipitation in dense charophyte beds of a shallow lake over one vegetation period. They found that $CaCO_3$ precipitation was higher in shallow (1m) than in deeper water (3m), that charophyte dry weight may exceed 2 kg/m^2, and that the $CaCO_3$ content may exceed 80% of the dry weight. These really are enormous amounts, and they mean that charophytes should significantly influence the biogeochemical cycling in lakes with dense *Chara* beds. In a second publication, Pukacz et al. (b) analysed different species from different lakes, and found that *C. tomentosa* generally had a higher $CaCO_3$ content than *C. globularis*. However, how high the $CaCO_3$ content exactly was, differed between the studied lakes. This means that – even if it is possible to roughly "guesstimate" $CaCO_3$ content for a certain *Chara* species, the exact content will vary from lake to lake. So we'd better be careful when estimating $CaCO_3$ budgets for lakes. Results from Kufel at al. agree with this. They analysed calcite and phosphorus fractions in six charophyte species, and found that calcite encrustation was highest in *C. rudis* and *C. tomentosa*, and lowest in *C. globularis* and *C. intermedia*. With respect to phosphorus, all analysed species accumulated more inorganic than organic phosphorus, but the amount of calcium-bound phosphorus differed among species. This means that charophytes are capable of accumulating quite large amounts of calcium carbonate and phosphorus (bound to calcium) in lake sediments, but the exact amount will vary among species.

Pronin et al. analysed stable isotope ratios in *C. tomentosa* and *C. globularis*, and found that *C. tomentosa* had less negative delta-C13 values than *C. globularis*. This means that *C. tomentosa* was enriched in C13 compared to

C. globularis, even if the delta C13 in the lake water DIC (dissolved inorganic carbon) right above the charophyte stands did NOT differ between the two species. In addition, there were indications that *C. tomentosa* just may grab "any" DIC molecule that is passing by in the water, without paying too much attention whether it is C12 or C13, while *C. globularis* was pickier, and preferentially takes up the light isotope. This could indicate that the relatively short *C. globularis* preferentially takes up carbon from waters near the bottom of the lake rather than from the well-mixed water above the stands. The near-bottom water is usually enriched with C12, because it partly is derived from decomposition of organic matter in the surface sediment. In contrast, the much larger *C. hispida* stands seem to take up more carbon from the well mixed water above the charophyte stands. In my view, this also may have something to do with the amount of calcification. It turned out that the delta C13 of carbonates was much less negative than the delta C13 of organic carbon. Given that *C. tomentosa* is more calcified than *C. globularis*, it is quite plausible that *C. tomentosa* generally had a less negative delta C-13 than *C. globularis*. I have no scientific background on that whatsoever, but in my opinion this should indicate that the organic carbon has actively been taken up into the plant (and the light isotope has been preferred in this process), while the $CaCO_3$ precipitation on the plant is a result of a passive process (and therefore there occurs no selection for a particular isotope). But I am not sure I am correct, so I would be happy to receive your comments on this.

Anyway, things are not so easy (as always). Rodrigo et al. analysed isotopic signatures in three charophytes (*C. hispida*, *Nitella hyalina* and *Tolypella glomerata*) and in *Myriophyllum spicatum* monthly during a whole year. They also separately analysed different plant parts (apical nodes, internodes, rhizoids, reproductive organs, oospores), and measured delta C13 in the sediment where the plants were rooted. They found that *Myriophyllum* was most enriched in C13. Among the charophytes, *C. hispida* had the least negative delta C13 values, followed by *Tolypella* and *Nitella*. This fits with the above results by Pronin et al., since the *Chara* will have more $CaCO_3$ (which is less negative in its delta C13) than *Tolypella* or *Nitella*. It may also explain the fact that *C. hispida* showed a significant seasonal variation (with C13-poor values in the cold season), while the others had not. Pukacz et al. (a) observed the highest $CaCO_3$ content in August, and August is probably not "the cold season". So, more $CaCO_3$ precipitation in summer may explain why Rodrigo et al. found less negative delta C13 values in summer than in winter. However, charophyte rhizoids were more C13 enriched than other parts. This does not really match with the explanation provided by Pronin et al. who argue that the near-bottom water is usually enriched with C12 (and not C13), because it partly is derived from decomposition of organic matter in the surface sediment. On the other hand, Rodrigo et al. also found that the delta C13 in the sediment varied throughout time. Clearly, some puzzle pieces are still missing before we really understand carbon assimilation and precipitation in charophytes.

A second group of papers dealt with charophyte molecular biology/genetics. Domozych et al. remind us of the fact that in North America, the term "charophytes" is used differently than in Europe. They also classify taxa such as *Micrasterias*, *Penium* and *Coleochaete* as charophytes, which is not common practice in Europe. Nevertheless, their mini-review on the evolution of charophytes and their use as model organisms is interesting reading.

Lee et al. collected the first specimen of *C. zeylanica* in Korea since 40 years. They analysed rbcL sequences, and found that the sequences from Korea were identical to those of *C. zeylanica* from Central America, the USA, China, Japan, and Israel, but differed from sequences of species from New Caledonia, Taiwan, Sri Lanka, and Australia by one to two basepairs. Unfortunately, things have a tendency to get more complicated the closer you look. Schneider et al. analysed a less conservative gene than rbcL (matK) in no less than 324 *Chara* samples collected from 19 countries. They were unable to consistenly resolve the so-called "*Chara hispida* group", and proposed that at least C. *hispida*, *C. rudis* and *C. polyacantha* are conspecific. Surprisingly, the same seems to be true for *C. virgata* and *C. strigosa*, as well as – perhaps less surprisingly - for *C. liljebladii*, *C. horrida* and *C. baltica*. This means that morphological traits may indeed be practically useful for the day-to-day work with *Chara*, but we should be extremely careful in using them. Species which have been described based on morphology should always be confirmed with genetic data. Some morphological variability must be ac-

cepted in a species, and a few shorter or longer spines, or more or less spines, may not be a sufficient argument for describing an extra species.

Nowak et al. used five barcode markers, and arrived at a similar conclusion than Schneider et al. They also were NOT able to separate *C. contraria* from *C. filiformis*, or *C. rudis* from *C. hispida*. In contrast, *C. vulgaris* was clearly different from *C. contraria*, even though these two sometimes are hard to tell apart (and the same is true for *C. globularis* and *C. virgata*, by the way). In contrast to Schneider et al., Nowak et al. did indeed manage to separate *C. baltica /horrida* from *C. hispida /rudis/ intermedia*. This should indicate that the brackish water group indeed may have differentiated from the freshwater group, only not (yet) far. Nowak et al. also managed to separate *C. intermedia* from *C. hispida/rudis*. However, in this case I would be careful, because Schneider et al. also could see two sub-groups within the large "*C. hispida*" group, but by analysing some 150 samples in this group it became clear that these two sub-groups did NOT match with current taxonomy. In other words: *C. intermedia* was in BOTH sub-groups, but it was more common in one then in the other. And this means it could very well have been coincidence that the two *C. intermedia* samples analysed by Nowak et al. were different from the four *C. hispida/rudis* samples. In this case, I advocate analysing more samples.

Noedoost et al. analysed the karyotypes of eight *Chara* species collected in Iran and found two different ploidy levels (n = 14 and n = 28). So far so nice, but the "problem" is that the number of chromosomes was not stable in a species. For example, some samples of *C. vulgaris* had 14, but others 28 chromosomes. The same was true for *C. contraria*, which also contained some specimen with 14 and others with 28 chromosomes. One could imagine that the different number of chromosomes affects *Chara* morphology … but again it is not so easy. Noedoost et al. analysed *C. vulgaris* var. *vulgaris*, *C. vulgaris* var. *longibracteata*, and *C. gymnophylla* (which according to Schneider et al. (2016) is genetically so closely related to either *C. vulgaris* or *C. contraria* that it probably rather is a variety than a species). It indeed turned out that specimen containing 14 and 28 chromosomes occurred in each of these varieties!!!! I find this really puzzling, and there clearly is quite a lot with respect to *Chara* chromosomes and *Chara* genetics which we do not yet fully understand.

But let us leave the genetics for now and continue to the "miscellaneous" topics. Blindow et al. published a very interesting study on the long-term and interannual changes in composition of submerged vegetation, diaspore reservoir and germination in a lagoon system in the Baltic Sea. Vegetation cover today was similar to 1932, despite a period of eutrophication between about 1960 and 1990. Species dominance shifted, however, from small charophytes to larger species like *Potamogeton pectinatus*. The occurrence of many oospores in a sediment, however, does not mean that they also will germinate. For example, Blindow et al. found numerous *Tolypella* oospores, which probably originated from a discrete period with high abundance during the 1950s, but they seem to have completely failed to germinate. Interannual changes in vegetation were explained by weather conditions, and this was most obvious in *C. canescens*. This annual species seems to be favoured by extensive winter ice cover. I would say, this is bad news in the face of climate change. Blindow et al. concluded that charophytes were outcompeted by larger angiosperms due to the combined effect of moderate eutrophication and climate change.

Laguna et al. did an interesting study on the effect of invasive fish on the decline of *Chara* sp. in the floodplain of a national park in Spain. By setting up exclosures, they could show that fish (common carp) explained the absence of charophytes. In fact, I have seen the same thing in the Osterseen lakes in Germany, many years ago. Inside simple exclosures which excluded carp and other fishes but allowed free exchange of water and passage of small organisms, the charophytes started to grow. Also the Osterseen are a protected area, but somehow we never dared to confront the fishermen with our findings. In contrast, the results by Laguna et al. led the National Park managers to begin the control of invasive fish as an urgent measure to assure the ecological conservation of this Mediterranean wetland. This is really good news!

And there is more hope, at least for some charophytes. Kornijow et al. found an increase in charophytes in a lowland lake in Poland. This lake was never dominated by phytoplankton in the last centuries. They found that first, the lake was dominated by floating-leaved vegetation at strongly reduced water levels. Starting from the mid-nineteenth century, probably as a result of climate fluctuations, vegetation switched at first to sub-

merged angiosperms, and then, in the second half of the twentieth century, towards charophytes. Within charophytes there were switches between *C. globularis* and *C. vulgaris* communities, depending on lake productivity or hydrological stress. Kornijow et al. concluded that within a longer period with clear water, the community of macro-vegetation can be highly dynamic. This may be a response to different productivity levels and/or hydrological stress.

Sooksawat et al. studied whether dried *C. aculeolata* and *Nitella opaca* could remove lead (Pb), cadmium (Cd), and zinc (Zn) from synthetic solutions and municipal wastewater. They found that the *Chara* took up slightly more heavy metals than the *Nitella*, and that the metals seemed to adsorb in a monolayer to the charophyte surface. This also means that there occurs an antagonistic interaction when several metals are present: the more of the one, the less of the other can be adsorbed. They concluded that charophyte biomass may be considered for the treatment of metal contamination in municipal wastewater. This seems fair enough to me, but I am left wondering from where they want to collect the large amounts of dried charophytes which probably are necessary for treating wastewater.

But living charophytes may indeed be useful for removing various chemicals from waters (by the way, the removal of chemicals is a so-called ecosystem service). Grung et al. studied the uptake and degradation of pyrene, a polycyclic aromatic hydrocarbon (PAH) which is relatively common in the environment (because it is formed during incomplete combustion of organic compounds). It turned out that pyrene entered into the cytoplasm of *C. rudis* (which shows that PAHs indeed can get **into** algal cells), and was degraded there, first to 1-OH-pyrene, presumably by the *Chara* itself. On the cortex, however, pyrene was degraded faster and further, probably at least partly by microorganisms living on the *Chara*. Generally, the degradation of pyrene was faster when conditions were warmer and there was more light (resembling conditions in the epilimnion), than at colder and darker conditions (resembling deeper parts of a lake).

Shimmen et al. studied how neighbouring cells of *C. corralina* communicate with each other. If they killed one cell by severing, the neighbouring cell - which was not injured - generated a sharp spike followed by a long-lasting depolarization. A similar effect was observed when the turgor of the victim cell was decreased by adding methanol to the medium. Shimmen et al. suggest that it is the sudden disappearance of the turgor pressure in one cell, which triggers the sharp spike in the neighbouring cell. In this way, a *Chara* cell can send a "death message" to its neighbouring cell.

Romanov and Bulionkova published an interesting note on the observation of *C. vulgaris* in a "terrestrial" habitat. *C. vulgaris* had a moss-like habit and grew on wet soil in small compact turfs probably germinated from oospores. The upper branchlets were curved in a hook-liked manner and convergent above the apex of the thallus (which is what many *Chara* species do in order to protect themselves from too much light). Many years ago, we observed something similar in France (together with Ingeborg). Such "terrestrial" charophytes really look amazing, you almost feel you can "watch" how charophytes colonized the land and how the evolution towards land plants began.

Volkmann et al. studied the uptake of dissolved inorganic nitrogen (DIN, ammonium and nitrate) and dissolved organic nitrogen (DON, amino-acid mixture) in *C. aspera*, *C. tomentosa*, and *Potamogeton pectinatus* from water and sediment. They used a two-compartment-device and 15N labelling to discriminate between the roles of roots and shoots in nitrogen uptake. The results showed that DON and DIN were taken up by all species, but ammonium was preferred over amino acids which were preferred over nitrate. While nitrate and ammonium were translocated in basipetal and acropetal directions in both charophytes, no transport was detected in *Potamogeton pectinatus*. Volkmann et al. state that they found the transport in *Chara* unexpected, given the lack of vascular bundles. I personally find it is rather the other way round: *Chara* is known for its very intense cytoplasmic streaming, and it is known that this contributes to the transport of solutes in *Chara*. But actually, other submerged macrophytes such as *Potamogeton pectinatus* are also capable of transporting nutrients from roots to shoots. So I find it strange that this did not happen in the experiment performed by Volkmann and co-workers. Anyway, it is certainly important to remember that **organic** nitrogen may indeed be taken up (but not transported) by *Chara* and by *Potamogeton pectinatus*. This means that by measuring only **in-**

organic nitrogen we underestimate the nutrient pool which is available to macrophytes.

As you see, many interesting findings on charophytes were published in 2016, and IRGC members contributed to many of them. I am happy to see the IRGC so active, and I wish you all good luck with the publications you are planning in 2017.

Susi Schneider (Norway)

References

Blindow, I., Dahlke, S., Dewart, A., Flugge, S., Hendreschke, M., Kerkow, A., Meyer, J. (2016). Long-term and interannual changes of submerged macrophytes and their associated diaspore reservoir in a shallow southern Baltic Sea bay: influence of eutrophication and climate. Hydrobiologia 778, 121-136.

Domozych, D. S., Popper, Z. A., Sorensen, I. (2016). Charophytes: Evolutionary Giants and Emerging Model Organisms. Frontiers in Plant Science 7, Article Number 1470.

Grung, M., Ruus, A., Schneider, S.C., Hjermann, D.O., Borga, K. (2016). Toxicokinetics of pyrene in the freshwater alga Chara rudis. Chemosphere 157, 49-56.

Kornijow, R., Kowalewski, G., Sugier, P., Kaczorowska, A., Gasiorowski, M., Woszczyk, M. (2016). Towards a more precisely defined macrophyte-dominated regime: the recent history of a shallow lake in Eastern Poland. Hydrobiologia 772, 45-62.

Kufel, L., Strzalek, M., Biardzka, E. (2016). Site- and species-specific contribution of charophytes to calcium and phosphorus cycling in lakes. Hydrobiologia 767, 185-195.

Laguna, C., Lopez-Perea, J.J., Vinuela, J., Florin, M., Feliu, J., Chicote, A., Cirujano, S., Mateo, R. (2016). Effects of invasive fish and quality of water and sediment onmacrophytes biomass, and their consequences for the waterbird community of a Mediterranean floodplain. Science of the Total Environment 551, 513-521.

Lee, E.Y., Choi, K. C., Lee, S. R., Kim, Y. H., See, J. E., Kim, J. H. (2016). Re-examination of the morphological characteristics and rbcL gene sequences of Chara zeylanica Willdenow (Charales, Charophyceae) in Korea. Aquatic Botany 134, 97-102.

Noedoost, F., Sheidai, M., Riahi, H., Ahmadi, A. (2016). Karyotype analysis in some Chara species (Charales, Charophyceae) in Iran. Caryologia 69, 162-169.

Nowak, P., Schubert, H., Schaible, R. (2016). Molecular evaluation of the validity of the morphological characters of three Swedish Chara sections: Chara, Grovesia, and Desvauxia (Charales, Charophyceae). Aquatic Botany 134, 113-119.

Pronin, E., Pelechaty, M., Apolinarska, K., Pukacz, A., Frankowski, M. (2016). Sharp differences in the delta C-13 values of organic matter and carbonate encrustations but not in ambient water DIC between two morphologically distinct charophytes. Hydrobiologia 773, 177-191.

Pukacz, A., Pelechaty, M., Frankowski, M. (2016a) Depth-dependence and monthly variability of charophyte biomass production: consequences for the precipitation of calcium carbonate in a shallow Chara-lake. Environmental Science and Pollution Research 23, 22433-22442.

Pukacz, A. Pelechaty, M., Frankowski, M., Pronin, E. (2016b). Dry weight and calcium carbonate encrustation of two morphologically different Chara species: a comparative study from different lakes. Oceanological and Hydrobiological Studies 45, 377-387.

Rodrigo, M. A., Garcia, A., Chivas, A. (2016). Carbon stable isotope composition of charophyte organic matter in a small and shallow Spanish water body as a baseline for future trophic studies. Journal of Limnology 75, 226-235.

Romanov, R.E., Bulionkova, T.S. (2016). Research Note: Observations on a terrestrial charophyte in a temperate environment. Phycological Research 64, 118-120.

Schneider, S.C., Nowak, P., von Ammon, U., Ballot, A. (2016). Species differentiation in the genus Chara (Charophyceae): considerable phenotypic plasticity occurs within homogenous genetic groups. European Journal of Phycology 51, 282-293.

Shimmen, T., Ogata, K., Yanagihara, N., Yoshihisa, T. (2016). Electrical Perception of "Death Message" in Chara: The Role of Turgor Pressure. Cytologia 81, 242-247.

Sooksawat, N., Meetam, M., Kruatrachue, M., Pokethitiyook, P., Inthorn, D. (2016). Equilibrium and kinetic studies on biosorption potential of charophyte biomass to remove heavy metals from synthetic metal solution and municipal wastewater. Bioremediation Journal 20, 240-251.

Volkmann, C., Halbedel, S., Voss, M., Schubert, H. (2016). The role of dissolved organic and inorganic nitrogen for growth of macrophytes in coastal waters of the Baltic Sea. Journal of Experimental Marine Biology and Ecology 477, 23-30.

REPORT INTRODUCTION

Joaquim J, Schwarzer A, Bétrisey S, Fragnière Y, Kozlowski G. 2016. Characeae of the canton of Fribourg – Inventory 2015-2016 (in French). Natural History Museum Fribourg (NHMF), Switzerland, pp. 28.

This report presents all Characeae species observed so far in the Canton of Fribourg (Switzerland). It combines results of intensive field surveys carried out during the last two years (2015-2016) with all available historical records (herbaria, literature, etc.). Altogether, 15 Characeae species were detected, representing three genera: *Chara* (11 species), *Nitella* (3) and *Nitellopsis* (1). One of the main highlights was the rediscovery of *Nitella tenuissima*, a taxon considered to be extinct in Switzerland. Additionally, three species were observed for the first time in the Canton of Fribourg: *Chara denudata*, *C. virgata* and *Nitella opaca*. The report is available in PDF format (only in French version) on the webpage of the Natural History Museum Fribourg (http://www.fr.ch/mhn/fr/pub/projets/milieux_aquatiques.htm).

Gregor Kozlowski (Switzerland)

IMAGES COLLECTION

Images of the charophytes in the Fritsch Collection of Freshwater, Brackish and Terrestrial Algal Illustrations

The Algal Reference Collection begun by Professor F.E.Fritsch in 1912, to compare the different illustrations of algal species in the scientific literature, has been of use to many over the years. He used to beg for two reprint copies so that he could use one for filing his species but not all colleagues obliged! The Collection was left to the Freshwater Biological Association on his death. It has been updated ever since and is now slowly being digitized.

The total Collection comprises over 100,000 foolscap sheets with up to 30 author referenced illustrations, including varieties and forms, on one sheet. The layout follows Fritsch's overall algal classification in his '*Structure and reproduction of the Algae*' (1935, 1945) with subdivisions, of which the charophytes is one. Within each subgroup, the genera and species are filed alphabetically and all taxa are filed by species as published by the authors (which can include errors, mis-identifications, mis-spellings or incorrect authorities).

We have completed the digitization of all the charophyte sheets in our Collection but not all genera are represented: there are 36 genera, 493 species names, 152 original figures and 134 type diagnoses now within the 1198 digitized images. Although most species have just one or two sheets, there are 29 sheets of *Chara globularis* illustrations and 36 of *Chara vulgaris*; 22 of *Nitella gracilis* and 33 of *Nitella furcata*.

Before photography, the sheets were checked and species data recorded on an excel spreadsheet. We have tried to make corrections, especially of the more bizarre errors! We replaced some microfilm prints which were difficult to read. We also to replace Plates in publications where Professor Fritsch had cut up the reprint he received.

Sadly we do not yet have a website to allow researchers to see them, although we have made out a grant application. However we can email specific copies to those who need them.

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ANNOUNCEMENT

A book about the Charophytes of Europe

We believe it is time for a European Monograph.
After the IRGC meeting in Astana, a group of enthusiasts therefore met in Berlin last year December and mid March in Leiden and scheduled a potential scenario, how such a product could be prepared – now we have a kind of preliminary structure, a schedule and a kind of a taxa list. Nothing of them is fixed yet, but we guess we are prepared to start a broader discussion.
The main question we want to address to you is: we would be very grateful if you would join the team responsible for gathering biogeographical (distribution) data of European

species as well as preparing species descriptions.
The work will be distributed in a way that lead authors for each species are guiding the work of all colleagues who know about the respective species – but with respect to authorship, the lead authors are just honoured by being "first author" of the respective chapter – everyone contributing substantially by providing distribution overviews, checking herbarium records etc. will be offered co-authorship.
Because we expect also that field work is still necessary to answer some of the open questions with respect to distribution as well as taxonomic issues of phenology and morphology, the whole project will take about 3 years from now.
Therefore, we want to start as soon as possible.
We would be very grateful if you could bring in your expertise in this project.
This request is not reserved to the European colleagues only. We are sure the input of people from the other continents is needed to make this project a success.
In case you agree, we will provide you with more details in mid-April. But in case of further requests, don't hesitate to ask.
To gather your (hopefully positive) answer – please reply to Hendrik Schubert:
hendrik.schubert@uni-rostock.de
In case of queries / need for more information etc. you are free to ask any of the initiators (mentioned in alphabetical order), who are wishing you all the best:

Emile Nat (Netherlands)
Uwe Raabe (Germany)
Roman Romanov (Russia)
Hendrik Schubert (Germany)
Nick Stewart (Great Britan)

PhD THESIS COMPLETION

LI Sha, University of Chinese Academy of Sciences; Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences

Supervisors: ZHANG Haichun, WANG Qifei, Carles MARTÍN-CLOSAS

PhD thesis title: **Late Cretaceous–Paleocene charophyte floras from the Pingyi Basin and Songliao Basin of China and their biostratigraphic significance**

On November 23th, 2015, Li Sha defended her thesis in front of the jury composed of Prof. SHA Jingeng, Prof. LU Huinan, Prof. FENG Hongzhen, Prof. LI Yue and Prof. JIANG Baoyu. Among them, Prof. FENG and Prof. JIANG are from the Nanjing University, and three other professors are from the Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences.

Charophyte floras from the Upper Cretaceous and Paleocene formations in the Pingyi Basin (Shandong Province, Eastern China) and Songliao Basin (NE China) are studied in this thesis. In the Pingyi Basin, the mainly latest Campanian–Maastrichtian charophyte flora is composed of up to 7 species, *Feistiella anluensis*, *Peckichara praecursoria*, *Microchara cristata*, *M.* cf. *nana*, *Chara* sp., *Lamprothamnium ellipticum* and *Mesochara voluta*, while the mainly Paleocene flora consists of only two species, *Peckichara varians* and *Sphaerochara parvula*. These floras contain regional elements as well as species with a Eurasiatic distribution, the latter allowing for comparison at a larger palaeogeographic scale. Although the charophyte assemblages from Pingyi are species-poor, many species show a high degree of polymorphism with intermediate forms in a number of morphotypes.

The environment was not uniform within the Pingyi Basin. In Late Cretaceous, *Microchara cristata*, *M.* cf. *nana* and *Peckichara praecursoria* grew in carbonate lakes under the fluvial context of a braided river. *Lamprothamnium ellipticum* and *Mesochara voluta* inhabited in overbank ponds of a braided river and *Feistiella anluensis* thrived in brackish water carbonate lakes. In the Paleocene, *Peckichara varians* was dominant in shallow carbonate lakes. Taking into account these morphological, palaeoecological and facies constraints, the charophyte biozonation of the latest Campanian–Paleocene developed by Lu in Zhang et al. (2014) is revised. The biozonation proposed here consists of two biozones based on two index species with a Eurasian distribution that are well dated in Europe: *Microchara cristata* (uppermost Campanian–lower Danian) and *Peckichara varians* (upper Danian–lowermost Eocene).

In the Songliao Basin, the middle Campanian–Maastrichtian charophyte flora is composed of up to 12 species, *Microchara leiocarpa*, *Lychnothamnus yuntaishanensis*, *Atopochara trivolvis ulanensis*, *Lamprothamnium ellipticum*, *Mesochara biacuta*, *M. volu-*

ta, *Microchara gobica*, *M. cristata*, *M. prolixa*, *Nodosochara Turbochara specialis*, *Nemegtichara prima* and *Sphaerochara parvula*. The Paleocene subzone also consists of 9 species. Besides *Microchara cristata*, *M. prolixa* and *Sphaerochara parvula* coming from the underlying deposits, 6 species newly appeared including *Grovesichara changzhouensis*, *Lychnothamnus vectensis*, *Sphaerochara jacobii*, *Collichara taizhouensis* and *Peckichara* (before as *Neochara*) *sinulata*. The biozonation proposed here consists of four biozones and one undefined zone that are well dated according to the GPTS: Undefined zone (middle Campanian), Atopochara trivolvis ulanensis zone (late Campanian but latest Campanian not included), Microchara gobica zone (latest Campanian–early Maastrichtian), Microchara prolixa zone (late Maastrichtian) and Grovesichara changzhouensis zone (earlymost Danian). Within the Songliao Basin, the sedimentaty environment is unifoim from mid-Campanian to early Paleocene, growing in flooded ponds and lakes belonging to the meandering river and shallow lakes.

The comparison of biozones of the Pingyi Basin with those of the Songliao Basin suggests the following two conclusions. On the one hand, the two floras from the two basins are different probably due to different paleogeography and environments. In the Late Cretaecous, geographically, *Atopochara trivolvis ulanensis* was only found in the Songliao Basin and adjacent areas such as Inner Mongolia and Mongolia. Ecologically, the brackish species *Feistiella anluensis* inhabitated the Pingyi Basin but did not live in the Songliao Basin without brackish water sediments. In the Paleocene, the difference between the two floras increased mainly due to totally different environments. In the Songliao Basin, a diverse flora consisting of *Microchara cristata*, *M. prolixa*, *Lychnothamnus vectensis*, *Sphaerochara parvula*, *S. jacobii*, *Collichara taizhouensis*, *Grovesichara changzhouensis* and *Peckichara sinulata* thrived in flooded lakes, while in the Pingyi Basin the flora was dominant by *Peckichara varians* inhabiting in carbonate lacustrine environments with little terrigenous inputs. On the other hand, the two basins also share the same species, such as *Lamprothamnium ellipticum* and *Mesochara voluta* in the Late Cretaceous and *Microchara cristata* in Late Cretaceous to Paleocene. In the Paleocene, the two basins shared the species *Sphaerochara parvula*. In fact, some of these species are widely distributed in Eurasia. They are very important for correlations among different basins.

Li Sha and Wang Qifei (China)

Anastasiia Kovtun-Kante, Estonian Marine Institute, University of Tartu

Supervisors: Kaire Torn and Ülo Suursaar

PhD thesis title: **Charophytes of the Estonian inland and coastal waters: distribution and environmental preferences**

On 10 December 2015 Anastasiia Kovtun-Kante defended her PhD thesis at the Faculty of Science and Technology, University of Tartu. An independent specialist in the person of Mariusz Pełechaty acted as opponent.

The dissertation was published as a summarising article, compiling 3 research publications previously published in the international peer-reviewed scientific journals.

The main problem considered in the thesis is the absence of compiled information of charophyte species that could be found in Estonian waters mainly due to lack or outdated information about freshwater charophyte species. This, in turn caused absence of general information on rare and common species, their environmental preferences and factors that influence the distribution of charophytes. To fill this gap and give an overview of charophyte species present in Estonia and their distribution in both coastal and inland waters, more than 11000 locations (including over 300 inland locations) were investigated. The potential suitable habitats in coastal waters were predicted based on available georeferenced environmental data. In addition, the recovery ability of charophyte communities was assessed though light manipulation experiments.

22 charophyte species from the genera *Chara*, *Nitella*, *Tolypella* and *Nitellopsis* were found in Estonian waters. 17 species were recorded from freshwater bodies, 7 species occurred in marine brackish water. Most freshwater charophyte species were found in hard or moderately hard water. As a rule, the preferred substrate type was mud. The amount of organic matter content in the water bodies where freshwater charophytes were found showed that charophytes preferred water bodies with a low to moderate organic matter content, which refers to a relatively good water quality. Still, many species could also survive in waters with high organic matter content.

Brackish-water species were mostly restricted to the shallow, sheltered, soft-bottom archipelago environments, found especially in western Estonia. Analysis of the occurrence pattern in relation to environmental data revealed that the most important factors influencing charophyte distribution in brackish water environment are depth, substrate properties and exposure to waves. In combination with interrelated light and attachment conditions (via substrate type) these factors defined geographical patterns of charophyte communities. Among the other things, charophytes showed a good adaptation and recovery ability in a short-period low light environment.

Probable occurrence of *Chara* spp. likely might be predicted by depth in the area, wave exposure and the proportion of soft sediment. The reliability of the modelled results in relation to real *Chara* distribution patterns makes the predicted occurrences map a powerful tool for the general assessment of the distribution of species of interest in sparsely sampled areas.

Updated general information on charophyte species composition, distribution and abundance is useful both at national and international levels and may be used in Estonian charophytes' biodiversity assessment.

The full text of the thesis is available from http://dspace.ut.ee/handle/10062/49417.

Anastasiia Kovtun-Kante (Estonia)

Aleksandra Vesić, University of Belgrade
Supervisor: prof dr Jasmina Šinžar-Sekulić

PhD thesis title: **The ecological study of charophytes (Charophyceae) of standing and slow running waters of Vojvodina**

On September 26th, 2016, Aleksandra Z. Vesić defended her thesis at the Faculty of Biology, University of Belgrade, in front of the jury composed of four members: dr Gordana Subakov-Simić, associate professor, dr Dmitar Lakušić, full professor, University of Belgrade, Faculty of Biology, dr Vladimir Ranđelović, full professor, University of Niš, Faculty of Sciences and Mathematics, dr Goran Anačkov, associate professor, University of Novi Sad, Faculty of Sciences.

The charophytes are underinvestigated on the territory of Serbia. All the species are classified in one of the IUCN categories. This dissertation is an attempt to gather more knowledge on their floristic richness, distribution and ecology. Primarily, historical records were collected from all available literature and herbarium data on charophytes in Serbia, one overall database was made and preliminary ecological analyses were done. Moreover, detailed field investigations, covering more than 250 localities, were conducted on the territory of Vojvodina, in the period between 2012 and 2014. The localities were selected in order to achieve a balanced geographical and ecological coverage of the study area. The charophyte and macrophyte coverage was studied and data regarding 16 ecological parameters were gathered. Additionally, each locality was characterized with 20 bioclimatic parameters.

Altogether, in the flora of Vojvodina, the charophytes are represented with 20 species, which can be considered as significant floristic richness, given that it represents about 45% of Balkan flora. Species belonging to four genera can be found, *Chara*, *Nitellopsis*, *Nitella* and *Tolypella*. Five species are only to be found on the territory of Vojvodina and have never been recorded on the remaining territory of Serbia. Two of them are new for the territory of Vojvodina and Serbia.
Historical data report charophyte findings at 47 localities in Vojvodina. In the newest survey, they were discovered at 54 localities. All data were georeferenced and species distribution maps were given. In accordance with data availability, the ecological analyses were done. The analyses confirmed two main types of charophyte habitats and three „groups" of charophyte species inhabiting them: generalist species, spring species living mostly in temporary pools and a third group, made of species inhabiting deeper and more stable habitats, such as sandpits and rivers. Hence, one of the important conclusions of this work was the importance of more frequent investigations, particularly during the spring time, as well as studying the ecology of the individual species, aiming to better understand their adaptations and presupposed adaptive advantage in the future, in accordance with the predicted climate scenario.
The great number of charophyte findings in both habitat types is related to their ability to act as pioneer species. In contrast, they were found considerably less frequently in habitats already inhabited by other submerged macrophytes or algae, which apparently have a competitive advantage over charophytes.

Generally, the protected areas of Vojvodina stand out as the richest areas by the number of charophyte findings and by the charophyte species richness.

Aleksandra Vesić (Serbia)

Anja Holzhausen, University of Rostock
Supervisor: Hendrik Schubert

PhD thesis title: **Resilience of aquatic ecosystems - vitality of seed banks**

On November 4, 2016 Anja Holzhausen defended her thesis at the faculty of mathematics and natural sciences of Rostock after receiving positive reviews of H. Schubert (Rostock) and L. Krienitz (Stechlin).

This thesis examined the estimation and evaluation of the germination potential of diaspore banks. For this, three parts were analysed – first, the species composition; second, the vitality of oospores and third the conditions for breaking the dormancy as well as inducing germination.

Assessments of diaspore bank potentials are necessary due to the role of macrophytes in aquatic systems to preserve their function and structure (resilience). A lot of studies incorporatemacrophytes, especially Characeae, actively in restoration processes. Problematic in most of these studies is the reliable estimation of the restoration potential of the diaspore bank and the conditions required for its activation. Consequently the number of diaspores and the vitality of these have to be determined as well as the mechanism of activating diaspores as prerequisite for successful recovery.

In this study, multidimensional analyses have been done to determine species by morphological oospore features. These investigations, especially of *Chara canescens* Loisel. 1810, have shown an effect on the morphology depending on the salinity of the habitat. The method of multidimensional analyses has been found to be a useful tool for the determination of *Chara* oospores.

For the detection of the vitality 2.3.5-Triphenyltetrazoliumchloride (TTC) was used. This method made it possible to differentiate between vital and non-vital oospores through a colour change which is due to the reduction of the colourless TTC to red coloured triphenylformazan in presence of active dehydrogenases. First results showed that only 54-90% of the oospores are vital in natural sediments, but to which extent these results are reliable has to be shown with further investigations (e.g. long-term experiments).

We also investigated species-specific effects of temperature, irradiance, desiccation and nutrient conditions on the germination rate of natural diaspore banks in laboratory experiments.

Both pre-treatments, temperature and desiccation, influence the dormancy state of *Chara* oospores. But only in concert with favourable conditions like nutrient supply or species-specific light irradiance this leads to a successful germination of oospores. According to our results, two germination groups can be distinguished with respect to light. First a group of light-dependent germination e.g. *Lychnothamnus barbatus*, *Nitella flexilis/opaca*, *Nitella mucronata*, *Tolypella glomerata*, *Chara filiformis* and *Chara aspera* and second a group of light independent germination (*Chara canescens*, *Chara contraria*, *Chara vulgaris*, *Chara globularis* and *Nitellopsis obtusa*). Although these results cannot be transferred directly to aquatic systems, due to numerous interactions which also influence successful recolonization, such as the activity and density of benthic invertebrates, seed size, the physical and chemical substrate characteristics as well as the underwater light climate, show these results a good accordance with the natural occurrence of the species.

Anja Holzhausen (Germany)

Liina Pajusalu, Estonian Marine Institute, University of Tartu
Supervisor: Georg Martin, PhD
Opponent: Christopher D. Hepburn, PhD, University of Otago, New Zealand

PhD Thesis title: **The effect of CO_2 enrichment on net photosynthesis of macrophytes in a brackish water environment.**

On 25 November 2016, Liina Pajusalu defended her thesis. The thesis is based on 4 original publications.

Today one of the greatest global environmental issues is ocean acidification, which is directly related to our carbon dioxide (CO_2) emissions. Ocean acidification (OA) is defined as a reduction in the global ocean pH, caused by the uptake of carbon dioxide from

the atmosphere. Any changes in the seawater pH also cause shifts in carbonate chemistry. OA is predicted to cause extensive changes in marine ecosystems.

In this thesis, macroalgae, charophytes and seagrass are collectively referred to as marine macrophytes. The objective of this thesis was to describe the effect of CO_2 enrichment on the net photosynthesis of macrophytes in a brackish water environment. In addition, we investigated whether increased CO_2 in combination with short-term natural fluctuations of environmental factors exerts an interactive effect on the net photosynthesis of macrophytes. The mesocosm experiments were carried out in the shallow semi-enclosed Kõiguste Bay, Gulf of Riga, northern Baltic Sea.

The experiments with charophytes were carried out with three species: *Chara aspera*, *C. tomentosa* and *C. horrida*. The mesocosm experiments were carried out in Kõiguste Bay during the field season of 2012 (salinity 5.6 PSU). Separate mesocosms were maintained at different pCO_2 levels: ca. 2000, ca. 1000 and ca. 200 µatm (control treatment). As a response variable – the photosynthetic rate of charophytes at different pCO_2 levels (mesocosms) was measured once a day using the oxygen method.

Our results showed that photosynthetic rates of charophytes varied both between species and treatments at different pCO_2 levels. *C. tomentosa* and *C. horrida* demonstrated increasing photosynthetic rates with elevated pCO_2 levels, while *C. aspera* showed only a slight response during the experimental period. Compared to the other charophyte species, *C. aspera* is considered to be the most tolerant species to the variation of environmental factors such as light, salinity, bottom substrate, depth and exposure. Due to species specific response to elevated pCO_2 levels that may have implications for interspecific competition and community structure in a future high CO_2 world. During the active vegetation period charophyte communities will have a buffering role under future increasing CO_2 concentrations in the north-eastern Baltic Sea conditions.

The thesis can be freely downloaded from the following site:
http://dspace.ut.ee/handle/10062/54274

Liina Pajusalu (Estonia)

FORTHCOMING MEETINGS

2017

15 – 18 June 2017
The German Working Group on Charophytes (AGCD)
The German Working Group on Charophytes (AGCD) will hold its Annual Meeting together with colleagues from Austria, the Netherlands and Poland in eastern Brandenburg near Frankfurt/Oder, including an excursion to lakes in neighbouring Poland (*Lychnothamnus bar-batus*!).
Accomodation at: Landeslehrstätte Lebus
Contact: Hendrik Schubert
hendrik.schubert@uni-rostock.de

2 – 7 July 2017
Symposium for European Freshwater Sciences, Olomouc, Czech Republic
http://www.sefs10.cz/

10 – 12 July 2017
Agrora Paleobotanica, Montpellier, France
Talks and posters in all areas of paleobotany, fieldtrip to the Permian basin of Lodeve. https://agorapaleobotanica.wordpress.com/accueil-en/

23 – 29 July 2017
XIX International Botanical Congress, Shenzhen, China
http://www.ibc2017.cn/

13 – 19 August 2017
11th International Phycological Congress, Szczecin, Poland
http://www.intphycsoc.org/congresses.php

18 – 21 September 2017
21th Meeting of the Group of European Charophytologists (GEC), Valencia, Spain
The meeting is organized by Cavanilles Insitute of Biodiversity and Evolutionary Biology, University of Valencia. First circular and registration form can be found in new IRGC webpage: http://www.sea.ee/irgcharophytes/
Contact: Maria A. Rodrigo
maria.a.rodrigo@uv.es

2018

18 – 23 February 2018
15th International Symposium on Aquatic Plants, Queenstown, New Zealand
http://www.aquaticplants2018.co.nz/

9 – 13 July 2018
The 5th International Paleontological Congress, Paris, France
https://www.waset.org/conference/2018/07/istanbul/ICL

23 – 24 July 2018
20th International Conference on Limnology, Istanbul, Turkey
https://agorapaleobotanica.files.wordpress.com/2017/01/ipc5_1stcircular.pdf/
12 – 17 August 2018
10th European Paelobotany & Palynology Conference, University College Dublin, Ireland
http://eppc2018.ie/

CHAROPHYTE DISCUSSION FORUM

Introduction

Charophyte-L is a discussion forum on any aspect of CHAROPHYTES *sensu* CHARALES, moderated under the auspices of the ***International Research Group on Charophytes (IRGC).*** Its purpose is to foster fruitful discussions and exchange useful information quickly and efficiently. Ultimately, the goal is to enhance global understanding of the ecological importance of charophytes from both a current and historical perspective. In striving for this, we hope to strongly encourage new researchers to engage in the study of charophytes.

Instructions

Please read the following very carefully, especially if you are not familiar with listservers.

1. To subscribe to the listserver, address the email to listserv@pnw.edu. In the body (not the subject) of the message type "subscribe charophyte-L your name". **It must be sent as a text message**. **Also make sure your signature is turned off for this email.** Once you are subscribed you can send messages to the list server subscribers as html which allows more flexibility in type and insertion of photographs and so on.
2. To send a message for distribution to all subscribers of the listserver send it to charophyte-L@pnw.edu. This is called "sending mail to the list", because you send mail to a single address and charophyte-L circulates copies to all subscribers. The main purpose of the charophyte list server is to act as an electronic forum. When you send a message to the list server, remember that it will be distributed by the computer at Purdue University Northwest to all subscribers. **We strongly recommend always putting charophyte-L as the subject of your message. You cannot post to the list except from the exact address from which you subscribed.**
3. To reply to messages from the list using the reply function will send your answer to the whole list. Depending on the subject, you may sometimes prefer to answer only to the person who sent the message by copying and pasting their email address into "to" on your reply email.
4. Messages containing commands must be addressed to **listserv@pnw.edu**

   Commands must always be placed in the body of the message, not the subject line – leave the subject blank! Remember they must be in plain text format and your signature should be off. Also be aware that failure to expand your message box to full size will cause insertion of a " > " at the beginning of your command and may result in the command not being recognized because of a syntax error. Below are some common commands.
5. You may leave the list at any time by sending the command : "unsubscribe charophyte-L" in the body of the message to listserv@pnw.edu
6. To receive a list of the most commonly used list server commands type "help" in the body of the message to listserv@pnw.edu
7. To receive a comprehensive listing of all list server commands type "info" in the body of the message to listserv@pnw.edu
8. Contributions sent to this list are automatically archived. You can get a list of the available archive files by sending an "index charophyte-L" command to listserv@pnw.edu .

Writing and Layout suggestions

Messages will appear with YOUR, the sender's, name as the sender. The list server's address only appears in the header of the message. In order to make sure that your message will be recognised as a charophyte-message and that it will not be deleted as an AD or SPAM, **we strongly recommend always putting charophyte-L as the subject of your message.** Indeed, your name as a sender could be overlooked if it is unknown or unusual to the list members.

You may also be advised to **start the body of your message with the topic of your mail**: For instance: "charophyte cultures" – "Nitella spp. " - etc.

* Don't use all capital letters for more than a word or two.
* Insert blank lines between paragraphs.
* Include website addresses as in http://seaweed.nuigalway.ie/.

Moderator

Robin Scribailo, Department of Biological Sciences, Purdue University Northwest, Westville, Indiana (rscrib@pnw.edu) is the onsite moderator for this list. Governing members of the IRGC will also act as off-site moderators.

Messages will not be screened for content prior to posting but will be read to make sure that standards of etiquette are upheld. If it is felt that the content of messages is too far off topics of interest to charophyte biologists a message may be sent to the server to that effect. Individuals that send irrelevant or offensive information to the server will be warned and then banned should the problem continue. Spammers will be removed from the list as quickly as possible but should be screened out

by Purdue North Central's extensive email monitoring system. If you ever need to get in contact with the moderator of the list send e-mail to rscrib@pnw.edu

Comments about ways to improve this service should be also addressed to the moderator at rscrib@pnw.edu.

Robin Scribailo (USA)

NEW IRGC HOMEPAGE

New **IRGC** homepage is available: http://www.sea.ee/irgcharophytes/ Members are welcome to send relevant information to Kaire Torn (kaire.torn@ut.ee).

CHAROPHYTES ON THE WEB

The **GEC** homepage is the responsibility of the organizers of the GEC meetings. The last GEC homepage was: http://www.gec.amu.edu.pl/

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/

MEMBERSHIP FEES

INTERNATIONAL RESEARCH GROUP ON CHAROPHYTES (IRGC)

Membership fees

Pleas **do not forget to send your mempership fee 20 Euro** (ca. 25 $US) per year payment for 2017. Multiple-year payment is encouraged to reduce mailing and banking costs.

Please find membership paymnet information below or download the form from the IRGC webpage at: http://www.sea.ee/irgcharophytes/index.php/membership/

Any questions about membership fees should be addressed to:
IRGC Treasurer Emile Nat, e.nat@kranswieren.nl

Bank to bank transfer

Please pay to the IRGC account at Banque La Poste, France, and then send the receipt of your payment to Dr Emile Nat (The Netherlands), IRGC Treasurer, for our records (e-mail address: e.nat@kranswieren.nl)

When doing the bank transfer please ensure that your name and year(s) of membership paid are included in the payment form.

To make the bank transfer, please give the following information to your bank:
Account-holder: IRGC (International Research Group on Charophytes)
Name of bank: BANQUE LA POSTE
BIC (International ID of Bank): PSSTFRPPMON
IBAN: FR 76 20041 01009 0350328M030 21

E-MAIL ADDRESSES OF IRGC MEMBERS

Please **send any address changes (both surface mail and e-mail)** to the IRGC-Secretary, Kaire Torn (kaire.torn@ut.ee) to ensure you receive forthcoming information. Updated March 2017.

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Fig. 1. Poster presentation by Robin S- Sleith. Photo by Kaire Torn.

Fig. 2. Collecting charophytes from Lake Zerendy, North Kazakhstan. Photo by Aizhan Zhamangara.

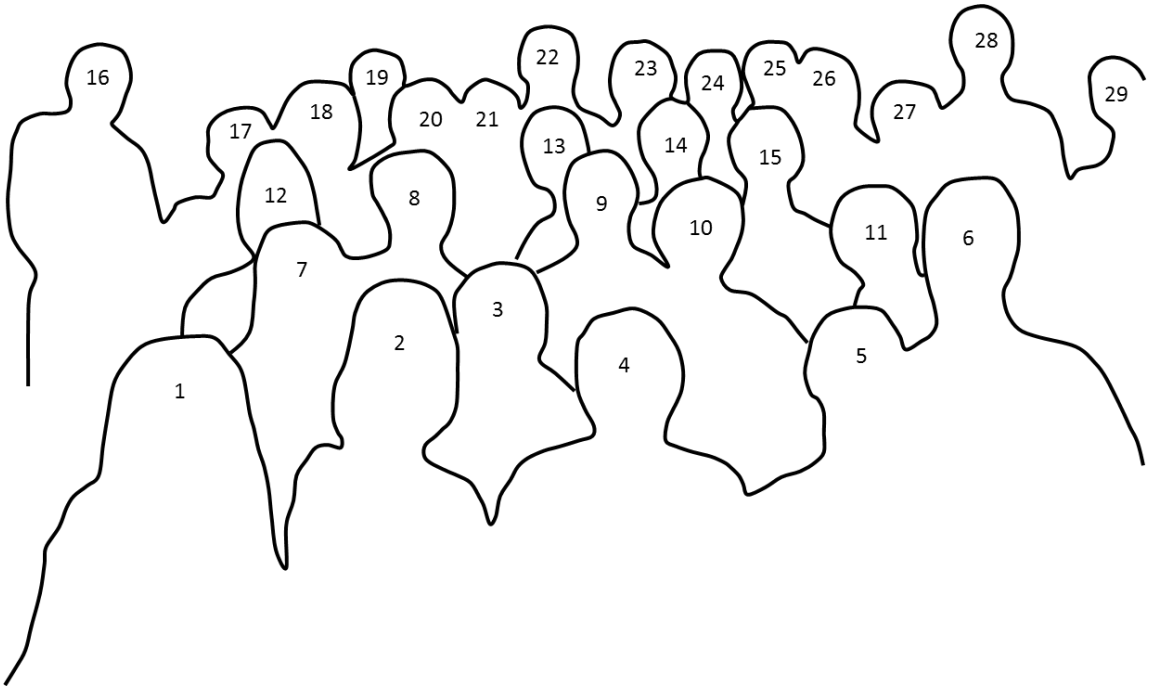
Fig. 3. Collecting charophytes from Lake Katarkol, North Kazakhstan. Photo by Aizhan Zhamangara.

Fig. 4. Charophytes from *Chara globata* of the Kapshagay water reservoir. Photo by Carles Martín-Closas.

Fig. 5. Views of the continental section of the Aktau Mountains, with Stephen D. Gottschalk on top of the hill al left. Photo by Alba Vicente.

Fig. 6. Observing fossil charophytes with a hand lens by Adriana García. Photo by Alba Vicente.

GROUP PHOTOGRAPH 7th IRGC, Astana, Kazakhstan



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