IRGC NEWS

INTERNATIONAL RESEARCH GROUP ON CHAROPHYTES

ISSN 1834-6030

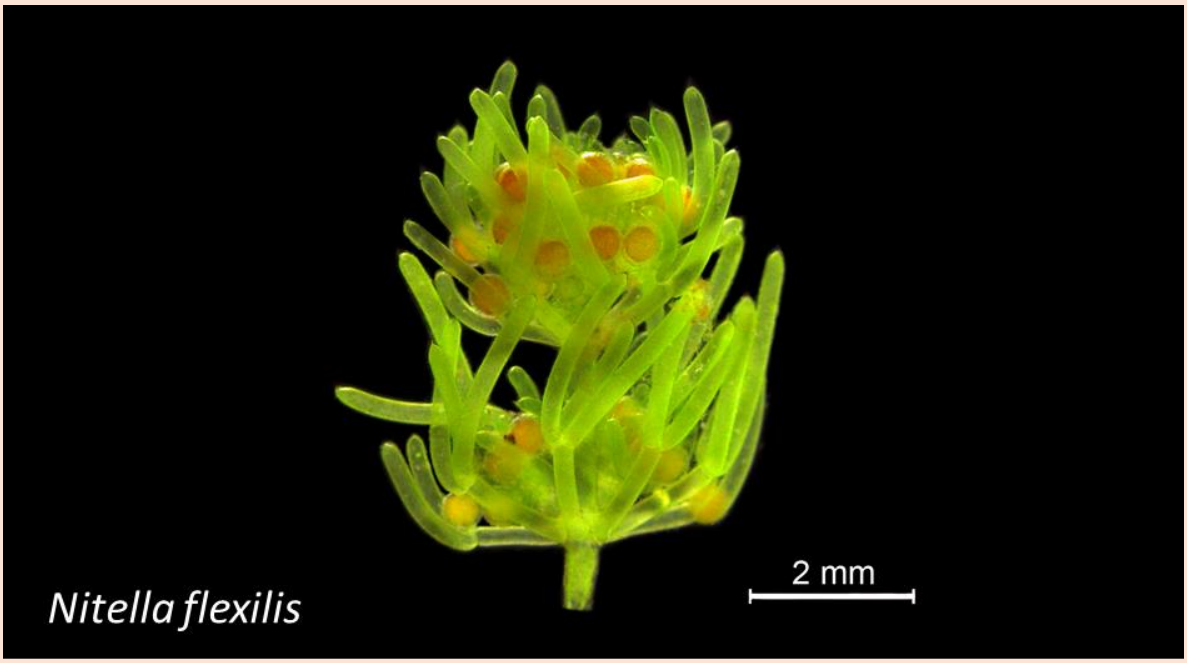
Edited by: K. Torn, M. Casanova, S. Schneider, A. Pukacz and E. Nat

31

March 2020

CONTENTS

Editorial	2	New project ECOCARPET	18
In Memoriam	3	IRGC elections	21
Report on past meeting	7	IRGC homepage	22
Forthcoming meetings	12	IRGC in Facebook	22
Reference article	13	Membership fees	23
Special section on charophytes in Webbia	17	E-mail addresses of IRGC members	23
A year in London	17		



EDITORIAL

Since the 8th international symposium on extant and fossil charophytes in Gammarth, Tunisia, is scheduled for the end of March 2020, you may right now, while holding this issue of the IRGC News in your hand, be about to depart to Gammarth. Or – if the post service works slowly – you may find it when coming back from Gammarth, with lots of memories from interesting talks and meetings with nice people. If you did not have the chance to participate, I hope you will find that this issue of the News brings at least some consolation. There was of course no time to include the reports of the meeting in this issue, but we will publish them next year, as well as any new meetings that are held in the coming years.

There was no bigger charophyte meeting in 2019, and this is the reason why this issue of the News is a little shorter than usual. However, it still contains a lot of information which we hope you will find interesting and useful. In general, please let us know about "charophyte events", they may be interesting for all IRGC members! The IRGC News may also be used to publish small charophyte findings, or to start discussions about topics which are relevant for charophyte research.

The IRGC is in constant change, and again one of our oldest members has passed away. You will find the obituary in this issue of the News. However, new members have joined, and the IRGC changes with its members. A big thanks to all of you who actively contribute to keeping our organization alive, by contributing to the News, organizing meetings, posting on our Facebook page, or by promoting charophyte research in some other way.

Susanne Schneider

IN MEMORIAM

Prof. Maria Kwiatkowska (1934-2020)

Maria Kwiatkowska passed away suddenly on 9 January 2020 in Łódź. She was born in Skierniewice on 22 November 1934. In 1956, after receiving a Masters degree in philosophy in the specialty of botany at the Faculty of Biology and Earth Sciences at the University of Łódź, she started working in the Department of Plant Anatomy and Cytology. In 1963, after completing her doctoral degree and becoming an assistant professor, Maria initiated her own research on the occurrence, structure and function of elaioplasts, which she then named – as they came to be known – lipotubuloids. In 1971, she presented her habilitation thesis based on a study of lipotubuloids in different plant species. In 1967-1968 she focused on the phenomenon of frost resistance in plants, working at the Institute of Genetics in Novosibirsk, and later, in 1975-1976 she carried out cytochemical and autoradiographic research into the dynamics of transcription in liver cells, working at the Cancer Research Institute in Villejiuif near Paris, under the guidance of professor Wilhelm Bernard. When she came back to Poland from France in 1986, she established a laboratory, which she then converted into the Department of Cytophysiology. In 1989 she was awarded the title of professor.

One of the main topics of her academic work concerned understanding proliferation mechanisms and cell differentiation during charophytes spermatogenesis. Her ultrastructural analysis showed relationship between wide plasmodesmata and synchronous mitotic antheridial filament division and dynamic plasmodesmata changes, concerning reversible plugging, transformation of simple plasmodesmata into complex ones and their role in gibberellin transport.

The next area of study her team pursued was cell cycle regulation and DNA endoreplication in generative and non-generative cells of charophytes antheridia. The results of this research broadened the knowledge of the ultrastructure of cell nucleus in the primeval (from the evolutionary point of view) cell cycle of the type S + G2 + M. The research also provided detailed description of the changeability of Golgi structures, mitochondria, transcription activity of chromatin, as well as it helped to establish what characterizes ultrastructural and metabolic processes of differentiating non-generative cells. Also, consecutive immunocytochemical and ultrastructural studies revealed the key role of endoplasmic reticulum in protamine synthesis and participation of the ubiquitin-proteasome system in chromatin remodelling during spermiogenesis.

Since 1989, she had been a member of Group of European Charophytologists (GEC) and International Research Group on Charophytes (IRGC). She established professional research collaboration with other scientists from France, Germany, Spain, The Netherlands, Romania, China and India.

In 2007, Maria retired but she still carried on with her scientific and research work. She turned again to studying lipotubuloids and her joint research with Professor Heredia's team resulted in numerous papers devoted to the role of lipids in creating the cuticle of plants.

Katarzyna Popłońska and Agnieszka Wojtczak (Poland)

14th GEC meeting (2006) in Barcelona. From left to right: Agnieszka Wojtczak (Poland), Katarzyna Popłońska (Poland), Maria Kwiatkowska (Poland), Adriana García (Australia), Jaume Cambra (Spain), Jan Simons (The Netherlands), Ingeborg Soulié-Märsche (France).

Selection of publications on charophytes by Maria Kwiatkowska

Kwiatkowska M., Maszewski J., 1976, Plasmodesmata between synchronously and asynchronously developing cells of the antheridial filaments of *Chara vulgaris* L., Protoplasma 87: 317-327

Kwiatkowska M., Maszewski J., 1978, Ultrastructure of the nuclei during different phases of the cell cycles in the antheridial filaments of *Chara vulgaris* L., Protoplasma 96: 317-327

Kwiatkowska M., Maszewski J., 1979, Changes in the content of condensed chromatin during the cell cycle in antheridial filaments of *Chara vulgaris* L. as related to DNA and RNA synthesis, 3H-actinomycin D binding and RNA polymerase activity, Protoplasma 98: 363-367

Kwiatkowska M., Maszewski J., 1979, Changes in the activity of the Golgi apparatus during the cell cycle in the antheridial filaments of *Chara vulgaris* L., Protoplasma 99: 31-38

Kwiatkowska M., Maszewski J., 1979, Changes in the activity of RNA polymerase detected *in situ* and the intensity of 3H uridine incorporation into the nucleus and the nucleus of interphase cells in antheridial filaments of *Chara vulgaris* L., Folia Histochem. Cytochem. 17 (3): 275-286

Godlewski M., Kwiatkowska M., 1980, Effect of gibberellic acid on the formation and development of antheridia and oogonia in *Chara vulgaris* L., Acta. Soc. Bot. Pol. 49: 459-469

Kwiatkowska M., Maszewski J., Maszewska M.M., 1980, Ultrastructure of cells after reversible dark-induced blocking of mitotic divisions in antheridial filaments of *Chara vulgaris* L., Acta. Soc. Bot. Pol. 49: 169-186

Kwiatkowska M., Godlewski M., 1981, Effect of gibberellic acid and AMO-1618 on the development of vegetative systems in generatively-matured thalli of *Chara vulgaris* L., Acta. Soc. Bot. Pol. 49: 445-458

Kwiatkowska M., 1981, Lack of duplication of the number of total volume of mitochondria in the cell cycle of antheridial filaments of *Chara vulgaris* L., Folia Histochem. Cytochem. 19 (4): 229-238

Maszewski J., Kwiatkowska M., 1984, Number, size, and transcriptional activity of nucleoli during different periods of interphase in antheridial filaments of *Chara vulgaris* L., Folia Histochem. Cytochem., 22 (1): 9-19

Kwiatkowska M., Maszewski J., 1985, Changes in ultrastructure of plasmodesmata during spermatogenesis in *Chara vulgaris* L., Planta 166 (1): 46-50

Kwiatkowska M., Maszewski J., 1986, Changes in the occurrence and ultrastructure of plasmodesmata in antheridia of *Chara vulgaris* L. during different stages of spermatogenesis, Protoplasma 132 (3): 179-188

Kwiatkowska M., Kononowicz A., Janas K., 1987, Observations on rRNA gene replication in *Chara vulgaris* evaluated by in situ [3H] rRNA-DNA hybridization,

J. Cell Sci., 88: 407-414

Kwiatkowska M., Maszewski J., 1987, Cell sizes and DNA level in antheridial filaments in relation to the initiation of spermatozoid differentiation in *Chara vulgaris* L., Folia. Histochem. Cytobiol., 25 (1): 79-89

Kwiatkowska M., Maszewski J., 1987, Ultrastructural and autoradiographic studies of non-generative cells in the antheridium of *Chara vulgaris*. I. Manubria, Folia Histochem. Cytobiol. 25 (3-4): 215-223

Kwiatkowska M., Maszewski J., 1987, Ultrastructural and autoradiographic studies of non-generative cells in the antheridium of *Chara vulgaris*. II. Capitular cells, Folia Histochem. Cytobiol. 25 (3-4): 225-231

Kwiatkowska M., Żylińska K., 1988, Ultrastructural and autoradiographic studies of non-generative cells in the antheridium of *Chara vulgaris* L. III. Shield cells, Folia Histochem. Cytobiol. 26 (4): 225-235

Kwiatkowska M., Godlewski M., 1988, Studies on the role of gibberellins in the regulation of spermatogenesis in *Chara vulgaris* L., Acta Soc. Bot. Pol. 57: 545-551

Kwiatkowska M., 1988, Symplasmic isolation of *Chara vulgaris* antheridium and mechanisms regulating the process of spermatogenesis, Protoplasma 142: 137-146

Kwiatkowska M., Popłońska K., Żylińska K., 1990, Biological role of endoreplication in the process of spermatogenesis in *Chara vulgaris* L., Protoplasma 155: 176-187

Kwiatkowska M., 1991, Light effects of DNA and protein synthesis in generative and non-generative cells of antheridium of *Chara vulgaris* (Charophyta), Phycologia 30 (2): 124-134

Kwiatkowska M., 1991, Autoradiographic studies on the role of plasmodesmata in the transport of gibberellin, Planta 183 (2): 294-299

Kwiatkowska M., Gosek A., Godlewski M., 1991, Effect of GA3, IAA and their mixture on the formation and development of cell systems in the vegetative and generative thallus of *Chara vulgaris*, Acta Soc. Bot. Pol. 60: 313-325

Gosek A., Kwiatkowska M., 1991, Cytochemical studies on the antheridial mucilage and changes in its concentration and amount during the spermatogenesis in *Chara vulgaris* L., Folia Histochem. Cytobiol. 29 (3): 91-99

Kwiatkowska M., Popłońska K., Gosek A., Malinowski S., 1992, Differentiated reaction of different types of antheridial cells in *Chara vulgaris* to the changes in light conditions during 24 hours, Folia Histochem. Cytobiol. 30 (1): 23-26

Kwiatkowska M., Maszewski J., 1992, Regulation of symplasmic domains in *Chara* antheridial system, Basic and Applied Research in Plasmodesmatal Biology 79-82

Gosek A., Kwiatkowska M., 1993, Autoradiographic studies of 3H-fucose incorporation into manubria and its translocation to antheridial space during spermatogenesis in *Chara vulgaris* L., Folia Histochem. Cytobiol. 31 (4): 233-237

Kwiatkowska M., 1995, Effect of symplasmic isolation and antigibberellin treatment on morphogenesis in *Chara*, Folia Histochem. Cytobiol. 33: 133-137

Kwiatkowska M., Malinowski S., 1995, The influence of the disappearance of plasmodesmal connections between antheridia and thallus on 3H-GA3 transport, Folia Histochem. Cytobiol. 33 (1): 53-55

Kwiatkowska M., Popłońska K., Gosek A., Malinowski S., 1995, Circadian rhythm of protein synthesis in generative and non-generative antheridial cells of *Chara vulgaris* L., Biol. Rhythm Res. 26: 55-67

Kwiatkowska M., 1996, Changes in ultrastructure of cytoplasm and nucleus during spermiogenesis in *Chara vulgaris*, Folia Histochem. Cytobiol. 34 (1): 41-56

Kwiatkowska M., 1997, PCC-like induction of mitosis in *Chara vulgaris* antheridia initiating differentiation of spermatozoids in the darkness, Acta Soc. Bot. Pol. 66: 33-39

Kwiatkowska M., Pala A., Maszewski J., 1997, Size-variation in the antheridial and oogonia of *Chara vulgaris* under different experimental conditions, Acta Soc. Bot. Pol. 66: 29-32

Gosek A., Kwiatkowska M., Duszyński R., 1997, Effect of cadmium on growth of vegetative thallus and development of generative organs of *Chara vulgaris* L. after short time of cultivation, Acta Soc. Bot. Pol. 66 (1): 67-72

Kwiatkowska M., Wojtczak A., Popłońska K., 1998, Effects of GA3 treatment on the number of spermatozoids and endopoliploidy levels of non-

generative cells in antheridial of *Chara vulgaris* L., Plant Cell Physiol. 39: 1388-1390

Kwiatkowska M., 1999, Plasmodesmal coupling and cell differentiation in algae, in Plasmodesmata structure, function, role in cell communication, eds. AJE van Bel, WJP van Kesteren. Springer-Verlag, Berlin, Heidelberg, New York (book chapter)

Kaźmierczak A., Kwiatkowska M., Popłońska K., 1999, GA3 content in antheridia of *Chara vulgaris* at the proliferative stage and in spermiogenesis estimated by capillary electrophoresis, Folia Histochem. Cytobiol. 37 (1): 49-52

Kwiatkowska M., Popłońska K., Gosek A., 1999, Disappearance of 3H-leucine incorporation circadian rhythm induced by symplasmic isolation of *Chara vulgaris* antheridium from thallus, Folia Histochem. Cytobiol. 37 (3): 219-221

Kwiatkowska M., Malinowski S., Maszewski J., 1999, The effects of pulse cycloheximide treatments on the light-induced recovery of mitotic division in antheridial filaments of *Chara vulgaris*, Acta Soc. Bot. Pol. 68 (1): 9-14

Kwiatkowska M., Papiernik E., 1999, Changes in the number and size of nucleoli of *Chara vulgaris* L. antheridial filament cells during the period preceding light-induced reinitiation of cell divisions following a mitodepressive effect of darkness, Acta Soc. Bot. Pol. 68: 251-254

Kwiatkowska K., Wojtczak A., Popłońska K., Gosek A., 2001, Occurrence ubiquitin during spermiogenesis *Chara vulgaris*, Folia Histochem. Cytobiol. 39 (2):135-136

Kwiatkowska M., Popłońska K., 2002, Further ultrastructural research of *Chara vulgaris* spermiogenesis: endoplasmic reticulum, structure of chromatin, 3H-lysine and 3H-arginine incorporation, Folia Histochem. Cytobiol. 40:85-97

Kwiatkowska M., Kaźmierczak A., Popłońska K., 2002, Ultrastructural, autoradiographic and electrophoretic examinations of *Chara tomentosa* spermiogenesis, Acta Soc. Bot. Pol. 71 (3): 201-209

Malinowski S., Kwiatkowska M., Popłońska K., Knake S., Sobala A., 2002, Velocity of cytoplasm streaming in basal and subbasal cells of antheridium as well as internodal cells of pleuridium in *Chara vulgaris* L. and GA3 influence on it. Videomicroscopic observations. Acta Soc. Bot. Pol. 71(4): 283-286

Kwiatkowska M., Wojtczak A., Popłońska K., 2002, Ultrastructural and autoradiographic study of *Chara vulgaris* manubria, Acta Biol. Cracov. Ser. Bot. 44: 99-105

Kwiatkowska M., Popłońska K., Wojtczak A., 2003, *Chara tomentosa* antheridial plasmodesmata at various stages of spermatogenesis, Biol. Plant. 46 (2): 233-238

Kwiatkowska M., Wojtczak A., Popłońska K., Teodorczyk M., 2003, The influence of epoxomicin, inhibitor of proteasomal proteolytic activity, on spermiogenesis in *Chara vulgaris*, Folia Histochem. Cytobiol. 41: 51-54

Kwiatkowska M., Popłońska K., 2003, RER and protamine-type proteins during *Chara tomentosa* L. spermiogenesis, Acta Soc. Bot. Pol. 72 (1): 5-9

Kwiatkowska M., Popłońska K., Wojtczak A., 2003, *Chara tomentosa* antheridial plasmodesmata at various stages of spermatogenesis, Biol. Plantarum 46 (2): 233-238

Popłońska K., Kwiatkowska M., Stępiński D., Gosek A., 2004, Immunocytochemical localization of ubiquitin and proteasomes in spermatids during spermiogenesis of *Chara vulgaris* (*Charophyceae*), European J. Phycology 39 (3): 309-315

Popłońska K., Wojtczak A., Kwiatkowska M., Kaźmierczak A., 2007, Cytochemical and immunocytochemical studies of the localization of histones and protamine-type proteins in spermatid of *Chara vulgaris* and *Chara tomentosa*, Folia Histochem. Cytobiol. 45 (4): 367-374

Wojtczak A., Kwiatkowska M., 2008, Immunocytochemical and ultrastructural analyses of the function of the ubiquitin-proteasome system during spermiogenesis with the use of the inhibitors of proteasome proteolytic activity in the alga, *Chara vulgaris*, Biol. Reprod. 78 (4): 577-585

Wojtczak A., Popłońska K., Kwiatkowska M., 2008, Phosphorylation of H2AX histone as indirect evidence for double-stranded DNA breaks related to the exchange of nuclear proteins and chromatin remodeling in *Chara vulgaris* spermiogenesis, Protoplasma 233: 263-267

Popłońska K., Kwiatkowska M., Wojtczak A., Polit J., 2009, Immunogold evidence suggests that endoplasmic reticulum is the site of protamine-type protein synthesis and participates in translocation of these proteins into nucleus during *Chara vulgaris* spermiogenesis, Biol. Reprod. 80 (3): 572-580

REPORT ON PAST MEETINGS

Meeting of The Oospore Research Group, London, United Kingdom, 12–13 August 2019

What is tiny and mostly calcified, with amazing ornamentations that provides the long-lived memory of lakes and ponds? Oospores!

A small group got together for a two-day meeting at the Natural History Museum in London with the aim of connecting researchers, discussing everyday problems regarding work with oospores, and also to create the structure for an oospore chapter for the European monograph on charophytes, Besides the organizers: **Michelle T. Casanova** (NHM, London) and **Anja Holzhausen** (University Rostock / University Marburg); **Nick Stewart** (London), **Ben Goldsmith** and **Carl Sayer** (both UCL, London), **Joe Wilbraham** (NHM, London) and **Hendrik Schubert** (University Rostock) attended the meeting.

In the famous surroundings of exhibitions of mammals, reptiles, British fossils, marine invertebrates and the moon, general issues of the European monograph (**Nick Stewart**), oospore characters, including ornamentation patterns (**Michelle Casanova**), sources of variability and the use of existing data / type material (**Anja Holzhausen**) were presented and discussed. Moreover, the option of amalgamating data from different researchers was discussed. The possibilities provided by a common database will be enormous, including the analysis of regional differences to clarify the reliability of oospore characters and the utility of a European-wide determination key or the necessity of regional restricted keys.

The second day started with an inspiring presentation of active restoration work by reactivating diaspore banks. **Carl Sayer** and **Ben Goldsmith** (both UCL, London) presented their impressive restoration projects. One example – Ghost ponds – is the activation of old dried, and often burried ponds at British farm areas. In cooperation with farmers, their team started digging old ponds, filling them with water and achieved great success after a short time period of one year. The images and diversity of plants and animals that recolonized the ponds in this project, including diverse charophyte species, speak for themselves.

At the end of a very fruitful and motivating meeting, the participants produced the cornerstone of a collaborative project on this impressive tiny object, and agreed to continue this work by planning an official oospore meeting in November 2020 in Rostock.

Anja Holzhausen (Germany)

Report on Author Meeting in St. Petersburg 24th-29th of March 2019 for the European Charophyte-monograph project

This meeting was held on 24 of March 2019 at the St. Petersburg Komarov Botanical Institute, which is one of the oldest academic institutions in Russia. Twenty-two brave charophytologists came together for a week for attending the author meeting and undertaking a winter field trip. They were coming from Australia (1), Austria (1), Belgium (1), France (1), Germany (6), Greece (2), Italy (1), Lithuania (1), Poland (2), Spain (1), UK (1) and Russia (4). In spite of

rougher cold weather, the atmosphere of this meeting was very warm.

The first day started in the Hall of the Academic Council by welcome speech by **Dr Dmitriy V. Geltman** Director of the Botanical Institute. He introduced into the history of the SPB Botanical Garden and its collections, highlighting its role as the oldest scientific institution in Russia, established in 1714. The Herbarium (LE) was saved by the efforts of scientists during WWII and it contains very valuable research material. Aside from several collections containing Ruprecht's personal herbarium, the herbarium contains several precious specimens of famous charophytologists as, e.g. Vilhelm, Migula, Braun, Hollerbach and many others. Dr Geltman wished us a fruitful meeting and was cheered by the participants for his kind support.

After that the work was started. **Roman Romanov** overviewed presentation of the status of knowledge about charophytes of the European part of Russia by giving an overview about distribution and detailing the recent research about the taxonomic status of species. The next presentation was by **Klaus van de Weyer** "Towards a species key for the European Charophyte Monograph". He explained in detail the concept for the determination key and discussed options for its inclusion in the book.

After the session we had a grand tour through the taxon list, guided by **Hendrik Schubert**. He outlined the list of taxa, including those that were already uploaded, and identified groups for which further discussion was needed. The last part of the day was concerned with a presentation on "Standardizations in Taxonomy and nomenclature". **Thomas Gregor** presented suggestions for dealing with the taxonomy and nomenclature in a consistent way in all the species chapters. Thomas presented the options available and discussed them with the audience. There will be an intro / short chapter about the taxonomic concept and a guideline will be distributed for the application of the decisions about the species chapters.

The rest of the afternoon was dedicated to an introduction to the herbarium. The herbarium is located on the second floor in old historical building. The path to it looks like a maze, it passes through the hall of the Botanical Museum and near the entrances to the greenhouses, along and up a narrow steep staircase. Small work rooms, old furniture and binoculars, tall herbarium cabinets created an unusual atmosphere.

When the work program of the first day was finished, all together went to the restaurant of Georgian cuisine near Botanical Institute for a welcome dinner.

The second day (26th of March) was dedicated to group work in the herbarium. A short get-together allowed us to finalize the presentations. In the evening was a guided tour along Newsy prospect from Griboyedov Channel to Winter Palace square. Despite cold weather and wet snow it was attended by most of the participants.

The whole third day (27th of March) followed the previous pattern of group work in the herbarium, with some gatherings presenting the results and defining targets. In the afternoon, a guided tour through the greenhouses or, alternatively a short walk along the riverbanks of the Neva River (Peter & Paul's fortress) allowed for some relaxation after intense debates.

In the morning of the fourth day (28th of March), the group gathered for an excursion to Peterhof located not far from St Petersburg. With the help of the conference organizers we were prepared to sample the Charophytes on Olga's pond. This is an artificial water body dug in the place of a spring swamp for Olga, the second daughter of Tsar Nicholas the First. Roman drilled a hole in the ice near the shore with the help of a special ice-drill and, on the first attempt, collected a species of *Chara*! As a sampling was an immediate success, so we had a time for tea in the open air near the pond and afterward enjoyed a guided tour through Peterhof Grand Palace. After a late lunch in the Russian style in the botanical garden café, the weather and sunset light allowed for a group photograph, before the final part of the meeting was used for summarizing the results of the discussions and presentations and coming to consensus. Hendrick summarized 5

key issues for European Charophyte monograph project and responsible persons for their implementation: 1. Taxonomical citation and standards (**Thomas Gregor**) 2. Charophyte glossary (**John Bruinsma**) 3. Organizing gathering of national Charophyte keys in English version (**Maria Rodrigo Alacreu**). 4. Red list of Charophytes (**Nick Stewart**: although this topic must be discussed in the editors group meeting in autumn, to make a final decision about this chapter's fate. 5. Maps and distribution data (**Heiko Korsch**).

Irrespective of having done a huge amount of work of compiling data, Heiko is still not satisfied with the recent status – there are very large gaps, especially in eastern Europe, but also some other countries. The final discussion of these issues will continue at the editors group meeting in autumn 2020.

The evening ended with a friendly dinner in the Georgian restaurant together with Russian colleagues who helped organize this meeting.

Charophyte sampling under the ice. *Chara subspinosa* from Olgaˈs pond. Photos by Michelle Casanova.

Elena Chemeris (Russia)

Annual excursion of the German charophyte working group to Sweden

Thirty-seven charophyte specialists from Germany, Sweden, Austria and The Netherlands met in south Sweden during end of June 2019 for the annual excursion of the German working group. The group was accommodated at the Limnological Field Station in Aneboda / Småland, a historical place: Here, the limnologists **Einar Nauman** introduced the terms "eutrophic" and "oligotrophic" in 1919 - terms that are most important in charophyte research!

Presentations were given by **Maria Carlsson**, Sweden, who reported about the Swedish action plan for threatened macrophytes, which also includes some rare charophytes. **Thomas Franke** informed us about the restoration of charophyte sites in northern Bavaria (Germany), and **Sebastian Bernhard** gave an introduction to the Red List of charophytes in Saxony (Germany). **Klaus van de Weyer**, **Heiko Korsch** and **Irmgard Blindow** reported on the ongoing work with the European charophyte book.

During the following days, a number of interesting sites were visited, some of them in small groups:

- Chara lake Krankesjön in Scania (snorkelling; guidance by **Ursula Zinko**, Sweden), with a number of charophyte species found, including transition forms between *Chara hispida* and *C. subspinosa.*

- oligotrophic softwater lake Fiolen close to Aneboda (diving) with a number of isoetid species (*Isoetes lacustris, Littorella uniflora, Subularia aquatica*, *Lobelia dortmanna*), the rare cyanobacteria *Nostoc zetterstedtii* and *Nitella flexilis l opaca* - the group here discovered that unfortunately, signal crayfish had been translocated into the lake.

- The macrophyte restoration project in several lakes in the city of Växjö, Småland (guidance Andreas Hedrén) with occurrence of *Nitella flexilis, Potamogeton praelongus* and other species.

- Chara lake Tåkern, Östergötland (boat trip; guidance by **Anders Hargeby**), a rich macrophyte community consisting of a number of *Chara* and *Potamogeton* species.

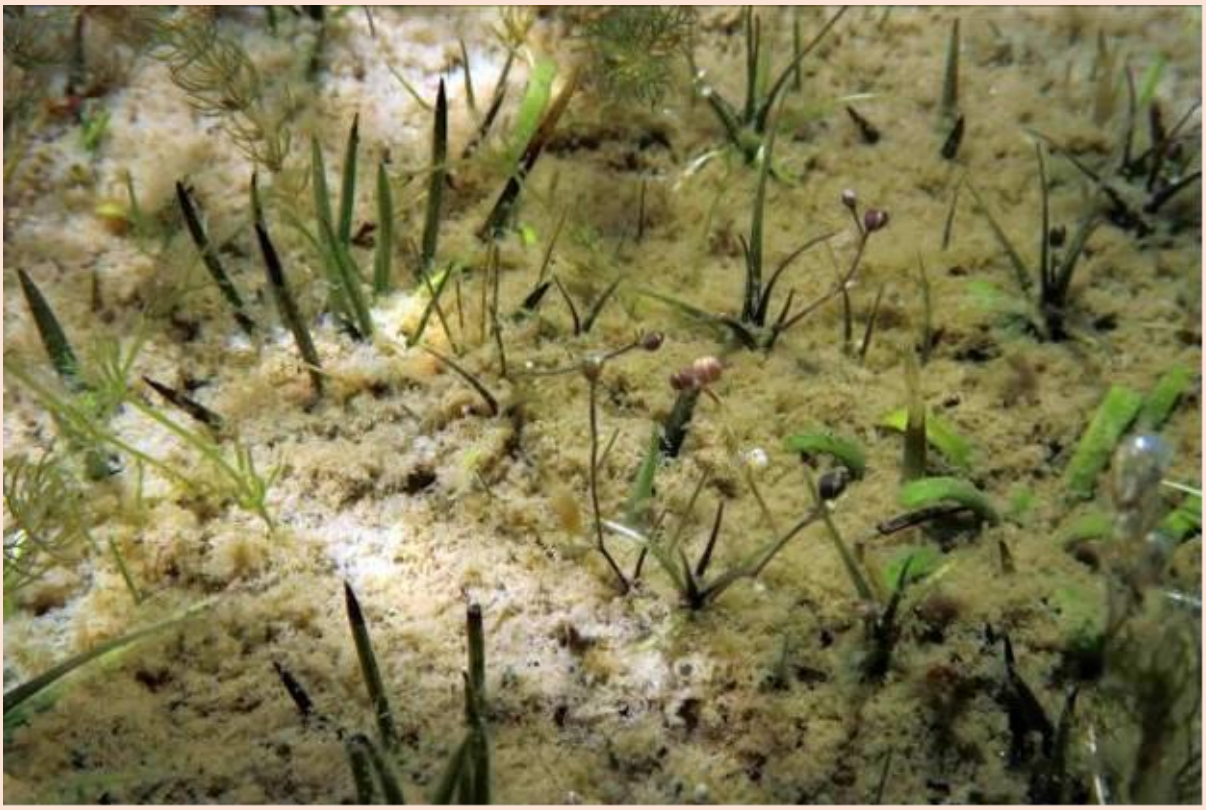
- oligotrophic Lake Vättern (several diving groups), the second largest lake in Sweden, with a number of isoetid species and several species of *Chara*, e.g., *Chara aspera f. subinermis.*

- Chara lake Levrasjön in Scania (diving, snorkeling and boat trip; guiding **Mikael Svensson**, **Tina Kyrkander** and others), with a number of charophyte species including *C. filiformis* (the only site in Sweden).

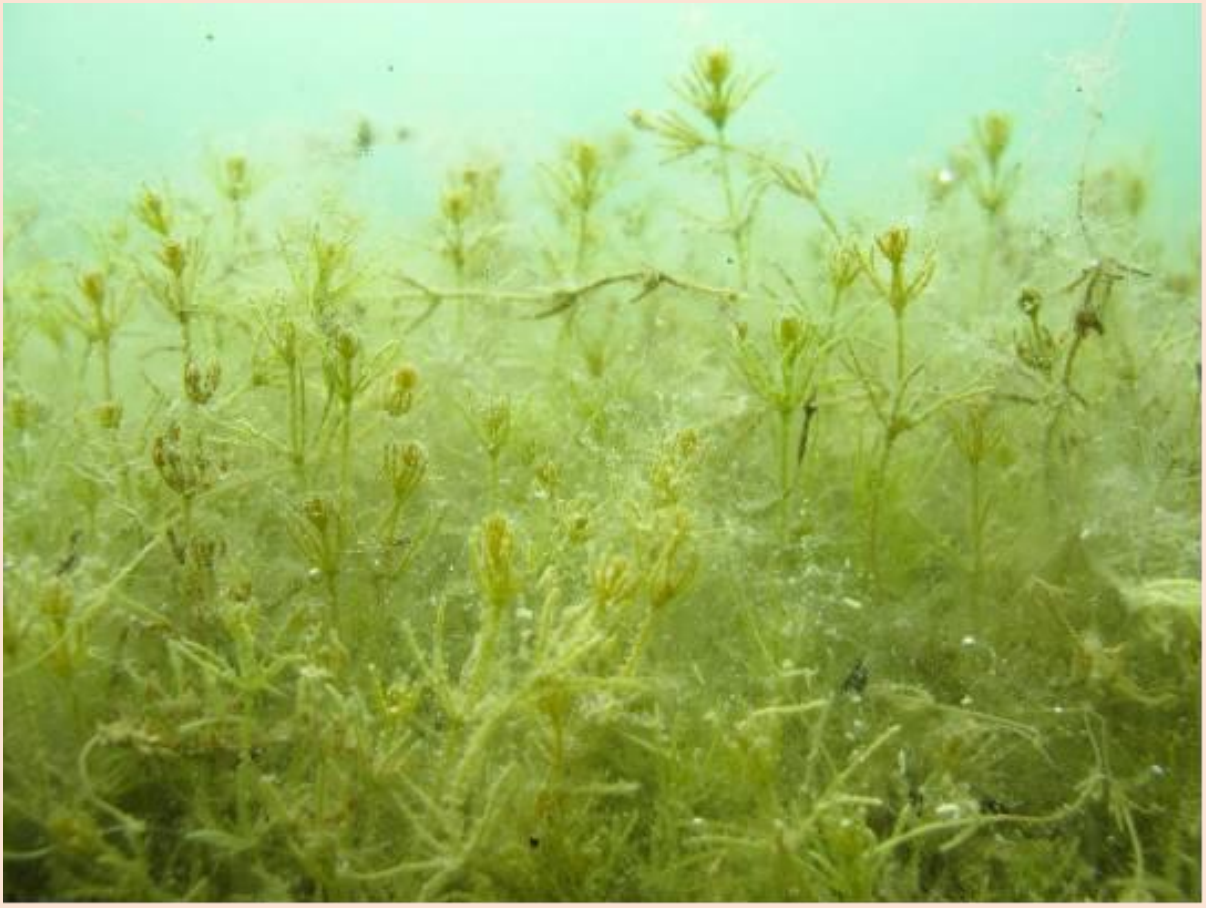
- the shallow brackish water lagoon Edenryd close to Lake Levrasjön with *Chara baltica, C. canescens, C. aspera* and *Tolypella nidifica.*

It was a fruitful excursion, thanks to the excellent preparation and great hospitality of the Swedish charophyte specialists who also successfully had arranged very nice weather. The evenings were spent with interesting discussions and, of course, charophyte determinations. One drop of bitterness was the message that Lunds university will close down the Aneboda field station - an important era of aquatic ecology has been finished!

Irmgard Blindow (Germany)



Myriophyllum alterniflorum, Nitella flexilis / opaca, Subularia aquatica, Lobelia dortmanna, Isoetes sp. in lake Vättern. Photo by Silke Oldorff.



Charophyte stand in lake Levrasjön. Photo by Volker Krautkrämer.

FORTHCOMING MEETINGS

GEC and IRGC meetings

September/October 2020
8th International Symposium on Extant and Fossil Charophytes
Gammarth, Tunisia
Contact: Khaled Trabelsi trabkhalfss@yahoo.fr
The meeting planned for March is postponed, further information by e-mail.

September 2021
23rd Meeting of the Group of European Charophytologists
Latvia, Riga. Organizer: Egita Zviedre

September-October 2024
9th International Symposium on Extant and Fossil Charophytes
Start planning to attend the IRGC meeting in Australia: venue to be Melbourne or Ballarat, more information will be available next year. Organizer: Michelle Casanova

Other meetings

26–30 April 2020, Palermo, Italy
Authors' meeting and workshop of the European charophytes monograph project
The meeting will depend on the current situation in April. The information is presented as originally planned:

The meeting is dedicated, as the previous ones, to the preparation of a European monograph on charophytes. The project started in December 2016, thanks to a group of enthusiasts who decided to fill the gap determined by the lack of a real Pan-European monograph of charophytes.

The meeting will be hosted at the Botanical Garden of Palermo. The rough schedule consists of the author meetings on April 27th (full day) and 28th (full day) and a field excursion on April 29th: this field excursion will be dedicated to coastal brackish ponds and wetlands in western Sicily (between Trapani and Mazara; we will visit the place where *Chara canescens* and *Tolypella salina* were collected). After the meeting there will be an excursion to Mount Etna (April 30 - May 1).

About 18 participants are currently expected to the meeting.

For information about the project contact Prof. Dr Hendrik Schubert (hendrik.schubert@uni-rostock.de), for information about the meeting contact Dr Angelo Troia (angelo.troia@unipa.it).

5–7 June 2020
German charophyte working group meeting
The 17th 'Characeen-Tagung' of the Arbeitsgruppe Characeen Deutschlands will take place in Ecocentrum “De Goren”, B-2400 Mol, Belgium. As usual, the meeting will include short lectures relating to charophytes (main language German, English possible), an identification session and a field trip in the north-eastern part of Belgium (both for wellies and wetsuits). Posters are welcome. Some places remain available. Local organization contact: luc.denys@inbo.be.

18–22 May 2020
EPCN 2020
9th European Pond Conservation Network conference
London, UK
http://www.europeanponds.org/conference

18–21 May 2020
5th IMERP
International Meeting of Early-stage Researchers in Palaeontology
Naujoji Akmene, Lithuania
Contact: imerp2020@gmail.com
https://imerp2020.weebly.com

7–12 June 2020
ASLO-SFS Joint Summer Meeting
Madison, Wisconsin, USA
https://www.aslo.org/madison-2020

15–19 June 2020
16th International Symposium on Aquatic Plants
Aarhus, Denmark

http://www.internationalaquaticplantsgroup.com/introduction.html

12–19 September 2020
25th International Palynological Congress
Prague, Czech Republic
www.prague2020.cz

21–26 March 2021
12th International Phycological Congress (IPC2021)
Puerto Varas, Chile
https://ipc2021.com

22 - 25th March 2021
15th International Paleolimnology Symposium
Bariloche, Argentine
https://www.paleolim.org/symposia
12th International Phycological Congress (IPC2021)
Puerto Varas, Chile
https://ipc2021.com/

REFERENCE ARTICLE

What's new about Chara? A short overview over some interesting charophyte studies published in 2019

This year I was a bit earlier searching Web of Science for "Chara" and "2019". I did it on the 2nd of January 2020, which is almost a week earlier than in previous years. This time I got 64 hits, which is considerably fewer than what I have obtained before (generally about 100, sometimes more). It is of course possible that some of the 2019 papers are not yet included in the Web of Science database on 2nd of January, but in fact, I do not think this caused the difference. Probably it just is natural fluctuation, and 2019 was a "low Chara" year. Nevertheless, there still were too many papers to summarize them all. I must also admit that some of the papers on *Chara* physiology were too far outside my competence, so I simply lack the background to properly understand their significance. The summary below therefore represents, as usual, only my personal interests. However, this year I rejected a few papers because their quality was simply not good enough.

Some of the papers described new discoveries of charophytes in different parts of the world. Trbojevic et al., for example, reported the re-discovery of *Chara canescens* in Serbia. This is the second confirmed finding of *C. canescens* in Serbia (the first one was in 2005 and it was thought to be extinct), and the species occurred in a eutrophic pond with high salt concentrations. They found only female plants, so this population is probably parthenogenetic (as *C. canescens* often is). Hrafnsdottir et al. searched for charophytes on Iceland, updated the species distribution and reported four species which previously were unknown to occur on Iceland: *Chara aspera, Chara contraria, Tolypella canadensis* and *Tolypella glomerata*. Since only four species were previously known to occur on Iceland (*Chara globularis, Chara virgata, Nitella flexilis* and *Nitella opaca*), the new findings double the number of the species in Iceland!

Bucas et al. studied charophytes in the Curonian Lagoon and tested which environmental factors could explain the species distribution. They found that the salinity gradient was most important, with *Chara baltica* and *Tolypella nidifica* occurring at higher salinities, and *Nitellopsis obtusa* at low salinities. In general, however, the explained variability was low (28%). This seemed to disappoint the authors a little, but I think it is not so surprising. Sometimes plants just appear by "coincidence", because a bird has dropped an oospore, or a fish has disturbed the sediment and brought an oospore up to the upper sediment layers where it germinated. Also, grazing is an important factor which can cause serious declines in macrophyte vegetation (see paper by Manara et al. below). So, when a species occurs in a certain place, you can be sure that the environmental conditions are within this species' tolerance. This means you can – to a certain degree - "explain" the presence of the species at this place. But it is a different story to explain the ABSENCE of a species in a certain place. This often just is coincidence, because the bird has never arrived, or the fish has not disturbed the sediment in this particular place. This coincidence – in a multivariate analysis – is part

of what is called “unexplained variation”, and it in my view is a natural part of an ecosystem.

There also were some papers on the “removal” of various “toxic” substances from water by charophytes. But many of these studies were so poorly performed, or insufficiently explained, that I decided to not summarize them here. An exception may be Amirnia et al., who studied how *Chara braunii* is able to remove arsenic from water. They of course found the calcite encrustation on the *Chara* surface, which we all know so well. But when the plants were grown in manganese-rich media, they also observed the formation of craterlike deposits of manganese oxides with diameters of 5-10 µm on the cell walls. They found that *C. braunii* removed most arsenic when the water also had high concentrations of Ca and Mn. The authors suggest that dissolved As (III) may be oxidized by the manganese oxides on the *Chara* surface, and the resulting As (V) is then precipitated. The authors also speculate that the arsenic which is bound to the biogenic Ca and Mn deposits on the *Chara* surface may contribute to preservation of arsenic in sediments in a less bioavailable form upon *Chara* senescence and decomposition. It is of course good that the arsenic is less bioavailable, and it doubtless it is better that the arsenic is bound in the sediment, than dissolved in the water. However, there is no denying that the sediment still contains all the arsenic, so it is not gone from the ecosystem.

I was able to understand some of the physiological papers, and I found them quite interesting. Eremin et al. studied the alternating patterns of acid and alkaline zones on the surface of characean internodal cells. These alternating zones facilitate the uptake of carbon required for photosynthesis. The authors used a pH-indicating membrane dye, to study the kinetics of alkaline band formation and decomposition. The differences in growth/decay kinetics suggested that growth of these banding patterns occurred as an active process, whereas decomposition was passive, due to diffusion. Interestingly, if they aligned internodal cells parallel to each other, then the banding patterns of the neighbouring cells started to match. In general, the authors showed that characean internodal cells react flexibly to environmental cues, including those originating from neighbouring cells. I am wondering if this may – at least partly - explain why charophytes grow and look differently in different environments. Bulychev and Krupenina studied how chloroplasts in Chara internodal cells communicate with each other. It seems that chloroplasts release a substance into the cytoplasm, and this substance is transported via the cell streaming. The authors found that cytoplasmic pH seems to play a role in the inter-chloroplast communication. Personally, I find it highly interesting that chloroplasts in *Chara* cells actually can “talk” to each other. But I am wondering WHY on earth they do this.

Several papers also dealt with the reaction of charophytes to climate change. For example, ultraviolet radiation (UV) is expected to increase with climate change, and this generally is supposed to be bad news for plants, because UV may be damaging. Rojo et al. studied if other factors which also are expected to change in the future, namely an increase in temperature and nitrate concentrations would modulate the effects of UV on *Chara hispida* and *C. vulgaris*. They showed that both warming and, to a lesser extent, increased nitrate concentrations, ameliorated the negative effects of UV radiation on the charophytes! So, charophytes will be able to cope better with UV radiation if temperature, or nitrate concentrations, also increase. However, different populations behaved differently: coastal populations were more resilient than populations collected from a mountain lake, probably because the coastal populations were adapted to a more variable environment.

Choudhury et al. studied a different aspect of climate change. In Nordic freshwater ecosystems, an increase in the humic content of rivers and lakes has been observed over the last decades. This means the water became browner. This phenomenon is called “brownification”, and it likely is related to climate change (although reduced acid precipitation also may play a role). Choudhury et al. studied the effect of increasing temperature and brownification on *Chara*

vulgaris in an outdoor mesocosm experiment. They showed that *C. vulgaris* initially benefited from warming and brownification, i.e. it grew faster when temperature and brownification increased by +2 degrees C and + 100%, respectively, above today's levels. However, if warming and brownification increased even further, Chara vulgaris declined. The authors therefore anticipate a certain threshold, above which they expect Chara vulgaris to collapse. This is maybe not so surprising. After all, all plants and algae have upper limits for optimum growth temperature, and a browner water also means less light, so less photosynthesis. I also expect that different *Chara* species will react differently.

Puche et al. looked not only at the charophytes, but also at other organism groups which commonly occur in charophyte dominated ecosystems. In a mesocosm experiment, they wanted to find out if different pelagic, periphytic and benthic species have central or connecting roles in relation to each other, and which role the charophytes play in this network. They found that charophytes had a central role, and that if the charophytes decrease, something which may happen with climate change, this will cause a major direct damage to the habitat around the charophytes and to the periphyton. In turn, when the periphyton is disturbed, it is very likely that this also will affect other elements in the ecosystem. I think it is important to try and understand how different elements in ecosystems interact with each other.

Manara et al. did an interesting grazing experiment. The so-called 'apple snail' eats macrophytes, and this snail seems to be extremely hungry. The apple snail is at home in the Southern Pampas of South America. However, the snail did not stay there, but went out to discover the world, and now is listed among the "100 of the worst invaders'' worldwide. The deleterious effect of the apple snail in invaded countries seems to be pretty obvious, but Manara et al. wanted to know what it does to the macrophytes in its native lands, i.e. the Southern Pampas in Argentina. They tested palatability of several macrophyte species in choice and no-choice experiments, and compared *Chara contraria, Zannichellia palustris, Stuckenia striata, Myriophyllum quitense* and *Ludwigia peploides*. The sad news is that *C. contraria* clearly was eaten most!!! The *Chara* simply was completely eradicated by the snails in every single experiment! At the other end of the scale was *Ludwigia peploides*, which basically was not eaten at all. In my view, the fact that *Ludwigia* was not eaten may partly explain why *Ludwigia* is a successful invasive species in Europe. For example, in France, *Ludwigia* can cover shallow lakes almost entirely. Overall, the results of this study clearly show that grazers can have massive impacts on the macrophyte vegetation in freshwater ecosystems!

There also were several papers on charophyte genetics. Urbaniak and Kwiatkowski did yet another study on the *Chara baltica – hispida – polyacantha – rudis* complex. Not surprisingly, they found no consistent morphological differences between these taxa, and barcoding showed no differences either (all taxa formed one group). I think it is about time that we start accepting that these taxa really are variations of only one species. A lot of evidence on this was accumulated in the last 15 years or so! A more interesting taxon with a potential for new discoveries would actually be *C. connivens*. Together with colleagues from Serbia, we have recently published a paper on a Chara which looked like *C. connivens*, collected in a lake in Serbia. However, in the DNA barcoding the species clustered to C. globularis instead of *C. connivens*, and formed an extra branch within *C. globularis*. It is therefore possible that «*C. connivens*» actually consists of two taxa which can be genetically separated (the paper was published in 2020, so I will write more about it next year). In this respect, the study of Rybak and Woyda-Ploszczyca is interesting, because they found *C. connivens* in a natural rock crevice in a riverbed on Fuerteventura (Canary Islands). The authors say that the distribution of *C. connivens* on the Canary Islands should be better studied, but I would like to add that barcoding of the samples also is important!

Nowak and Schubert compared the genetic variability of euryhaline, mesohaline and halotolerant charophyte species in the Baltic Sea. They found that all samples of the euryhaline *Lamprothamnium papulosum* were

basically genetically identical. This may have something to do with the fact that there are only few and small populations of this species in the Baltic Sea. However, also euryhaline *Tolypella* species had low genetic variability, although they occur abundantly in many places of the Baltic Sea. On the other hand, the mesohaline *Chara canescens* was genetically quite variable. *C. canescens* occurs abundantly in the Baltic Sea, but it reproduces parthenogenetically! Therefore, the high genetic variability is quite surprising. The halotolerant *Chara baltica* developed from freshwater ancestors which occur abundantly all over Europe. Despite this, the genetic variability of *C. baltica* was rather low. This probably indicates that only few of the freshwater ancestors managed to successfully colonize the Baltic Sea.

Langangen et al. did genetic analyses of charophytes collected in warm springs on Svalbard (for many probably known as Spitsbergen, a group of islands very far up in the North). It is a dangerous expedition to get there, not only because it is quite far from civilization, but also because it is a long journey, and one should be careful because of the polar bears. Charophytes from these warm springs were for the first time collected in 1910, and then later in 1958, 1992/93, and again in 2018. Some of the most famous charophyte experts determined the samples collected during the various expeditions, but since the morphology was really strange (ecorticated or partly corticated), there were doubts with respect to species identity. The samples were over the last 100 years alternatively determined as either belonging to *Chara canescens* or to *Chara aspera*. DNA barcoding now revealed that both species actually occur in the springs! This is quite remarkable, since the nearest known locality of charophytes is in Norway more than 1000 km further south, and across the ocean!! So, our beloved charophytes continue to surprise us, and I am happy that this is the case.

Susanne Schneider (Norway)

(references in the text and in the list below are given without the year published, since this is 2019 in all instances)

Amirnia et al. Manganese-mediated immobilization of arsenic by calcifying macro-algae, Chara braunii. Science of the Total Environment 646, 661-669.

Bucas et al. How much can the occurrence and coverage of charophytes in an estuarine lagoon (Curonian Lagoon) be explained by environmental factors? Estuarine Coastal and Shelf Science 216, 128-138.

Bulychev and Krupenina. Interchloroplast communications in Chara are suppressed under the alkaline bands and are relieved after the plasma membrane excitation. Bioelectrochemistry 129, 62-69.

Choudhury et al. Charophytes collapse beyond a critical warming and brownification threshold in shallow lake systems. Science of the Total Environment 661, 148-154.

Eremin et al. PH-dependent cell-cell interactions in the green alga Chara. Protoplasma 256, 1737-1751.

Hrafnsdottir et al. New finds of charophytes in Iceland with an update on the distribution of the charophyte flora. Nordic Journal of Botany 37, Article Number UNSP e02111.

Langangen et al. Charophytes in warm springs on Svalbard (Spitsbergen): DNA barcoding identifies Chara aspera and Chara canescens with unusual morphological traits. Botany Letters, DOI: 10.1080/23818107.2019.1672104.

Manara et al. The role of an invader in its native range: could differential grazing by apple snails structure the submersed macrophytes assemblages in Southern Pampas (Argentina)? Hydrobiologia 828, 229-242.

Nowak et al. Genetic variability of charophyte algae in the Baltic Sea area. Botanica Marina 62, 75-82.

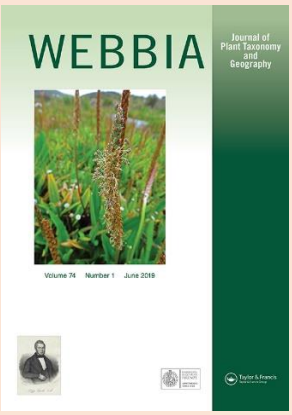
Puche et al. Structure and vulnerability of the multi-interaction network in macrophyte-dominated lakes. Oikos, DOI: 10.1111/oik.06694.

Rojo et al. The antagonistic effect of UV radiation on warming or nitrate enrichment depends on ecotypes of freshwater macroalgae (Charophytes). Journal of Phycology 55, 714-729.

Rybak and Woyda-Ploszczyca. Ecology and distribution patterns of Chara connivens (Charophyta, Characeae) on the Canary Islands - the first record from Fuerteventura. Oceanological and Hydrobiological Studies 48, 368-380.

Trbojevic et al. Rediscovery of Chara canescens Loiseleur in Serbia. Botanica Serbica 43, 97-102.
Urbaniak and Kwiatkowski. Taxonomic studies on the Chara section Hartmania in Poland based on morphological and molecular data. Phytokeys 135, 71-90.

SPECIAL SECTION ON CHAROPHYTES



A special section on charophytes, mainly based on studies presented in the last (22nd) GEC meeting in Palermo (Italy), has been published in the first issue of volume 74 (2019) of the journal "Webbia – Journal of Plant Taxonomy and Geography" (https://oaj.fupress.net/index.php/webbia). The 9 papers gathered in the section range across a spectrum of topics, from floristics to ecology, from genetic analysis to phytosociology. The section can be found online at this URL: https://www.tandfonline.com/toc/tweb20/74/1?nav=tocList

Angelo Troia (Italy)

A YEAR IN LONDON

A year to remember

In mid-2018 an advertisement arrived in my email inbox: *Maternity Leave Position available at the Natural History Museum in London*. The Algal Curator, Jo Wilbraham, was going on maternity leave and needed a replacement for about 1 year, starting in the second half of 2018. With an adult son at home, and all going well on the farm, I thought this could be a chance for me to work on charophytes for a year, among one of the best collections in the world. I applied.

I got an interview……and for a couple of days I thought that I had answered the questions wrongly, and that someone with REAL curatorial experience was what they wanted…..but I got the job! Some of you might know that since my son was born I have been living on a farm and working as a consultant, occasionally, and part time, for NGOs, government and in universities and herbaria, squeezing in work on charophytes where I could. This would be my first full-time job in 20 years! I was a little scared and mostly excited.

I obtained my visa to work, travelled to Palermo for the GEC (a great meeting!) and then to London, by myself. I started work, found a flat, set up my home and got busy! The people at the NHM (called BM in Index Herbariorum) were lovely to me, I made many good friends, including Jo, when she was able to come in towards the end of my time there. There were many advantages to being in the Northern Hemisphere, allowing me to visit friends, attend conferences, and travel to Devon, Yorkshire, Lincolnshire, Somerset, Cotswolds, Cornwall, Scotland, Russia, USA, Austria, Italy, Ireland and France; but more than anything else I was able to access the brilliant collection of charophytes in the Natural History Museum, and use the SEM to document oospore variation in many species of charophytes. It will take me years to process all the information, and I am happy to share what images I have with researchers. There is more work to do than a single person can do in a lifetime!

Most of my time was spent updating the museum database on British and Irish charophytes, geo-locating specimens and imaging oospores obtained from type material from around the world. The data has gradually become available on the internet, allowing anyone in the world to access the specimen details, distribution data and any images associated. I started adding the Overseas charophyte material to the database, but that has not yet been finished (all 6765 records can be accessed by searching the NHM data portal. Web ref 1). I plan to provide oospore images from type material to the website *Algaebase* in the near future, before the meeting in Tunisia, I hope.

My time in London allowed me to become more familiar with the world-wide diversity of charophytes, especially the European taxa. I thought that all the taxonomic problems would have been solved for this group long ago, and to some extent it has been. However, with new techniques, new collaborations and the new European book, there is still plenty of work to be done. I dream of having such a collaborative group of researchers work on the Australian *Characeae* before I am finished my career! I am looking forward to doing more work in the Northern Hemisphere is future years, starting with the meeting in Tunisia, where I hope to enjoy interesting times with dedicated colleagues!

Web ref 1: https://data.nhm.ac.uk/dataset/collection-specimens/resource/05ff2255-c38a-40c9-b657-4ccb55ab2feb?q=Characeae&view_id=ef185781-6b01-4c6a-8547-e2621805127b

Michelle T. Casanova (Australia)

NEW PROJECT ECOCARPET

ECOCARPET – new project on charophytes of Curonian lagoon

Curonian Lagoon is a perfect environment for luxurious charophyte populations. Variation in salinity conditions, shallow water and predominantly soft bottom sediment provide perfect conditions for number of charophyte species (mainly *Chara contraria* and *C. aspera*) and other macrophytes (*Potamogeton perfoliatus, P. rutilus* and *Stuckenia pectinata*). These communities are very important as spawning ground for fish, feeding ground for birds and performing different ecosystem services which have not been evaluated before.

The project ECOCARPET (Ecosystem services of charophytes in the estuarine hypereutrophic lagoon under seasonal and climate change) is carried out at the Klaipeda University and its main idea is to describe the functional role of charophytes in regulating and maintaining ecosystem services in the littoral ecosystem of the Curonian Lagoon, and evaluate possible effects of climate change by experiment manipulations and species distribution modelling. In this it is planned to test hypothesis: (1) charophytes play a fundamental role in the littoral ecosystem by fulfilling a number of key ecosystem functions and by providing several key ecosystem services; (2) climate change affects the functioning of the lagoon ecosystem and has influence on quality of the ecosystem services provided by charophyte communities.

The main objective of the study is to describe and assess ecosystem services provided by charophytes in the estuarine hypereutrophic lagoon under the climate change.

To achieve these goals following tasks are formulated:

1. To determine spatial-temporal patterns of charophytes' oospores and their relationship with the distribution of charophytes in the Curonian Lagoon.

2. To monitor phenological cycle of charophytes and determine an influence of environmental setting (light, salinity regime, etc.) on germination and development of charophytes and production of oospores.

3. To assess biodiversity (taxonomic and functional diversity of macrozoobenthos, fishes and birds) provided by charophyte habitat and describe its role in comparison to adjacent habitats in the lagoon.

4. To describe the importance of charophyte community in the food web of littoral ecosystem.

5. Experimentally to test the effects of increased water temperature and salinity on germination and development of charophytes.

6. To predict changes in provided ecosystem services by charophytes under climate change scenarios using empirical statistical models.

Work is organized in three work packages dealing with:

- Distribution of oospores and phenology of charophytes in the Curonian Lagoon

- Ecosystem services provided by charophytes
- Climate change impact on charophytes

Study on distribution of oospores is carried out by sampling of sediment and later microscopy. To test the effect of irradiance and salinity on germination of oospores, viable oospores in glass beakers (500 ml) with sediments and different salinities are be incubated in growth chamber with controlled irradiance.

In parallel the mapping of occurrence of charophytes is done using rake, snorkelling, drone and single beam sonar. At two sites with different salinities, phenological cycle of dominant charophyte species is monitored once a week during May-July and twice a month August-October.

To quantify the ecosystem services provided by charophyte communities species and abundance of biodiversity elements in vegetated and unvegetated habitats are estimated three times per vegetative season (late spring, mid-summer, early autumn). Fish and invertebrates are caught using an innovative pop-up net.

To discriminate the most productive feeding areas for waterfowl in the lagoon, waterfowl surveys are performed. Feeding habitats of swans are evaluated using GPS-GSM transmitters which provide precise information about bird usage of different areas during both day and night.

For the assessment of charophytes' role in a littoral trophic network, stable isotope analyses are performed using standard methodology. Sample collection of fishes, macrophytes and zoobenthos, detritus, particulate organic matter is performed 3 times during vegetative season. Muscles of caught fish, soft tissues of sampled invertebrates, hand-collected benthic macrophytes and epiphytes are used for the stable isotope analysis. Tissues (blood), feathers will be collected from living birds during their moulting period.

Primary productivity of charophytes is studied by in situ incubation experiments using oxygen method.

To test the effect of increased temperature and salinity on development of charophytes, viable oospores in glass beakers (500 ml) with sediments and different salinities are incubated in growth chamber with controlled temperature. Sprouted germlings are trans-

planted to 15 l tanks. Morphometrical parameters of plants are monitored by photo camera till the development of oospores.

The effects of increased temperature and salinity on ecosystem services provided by charophytes are assessed by modelling the distribution of charophyte species using predictive statistical methods.

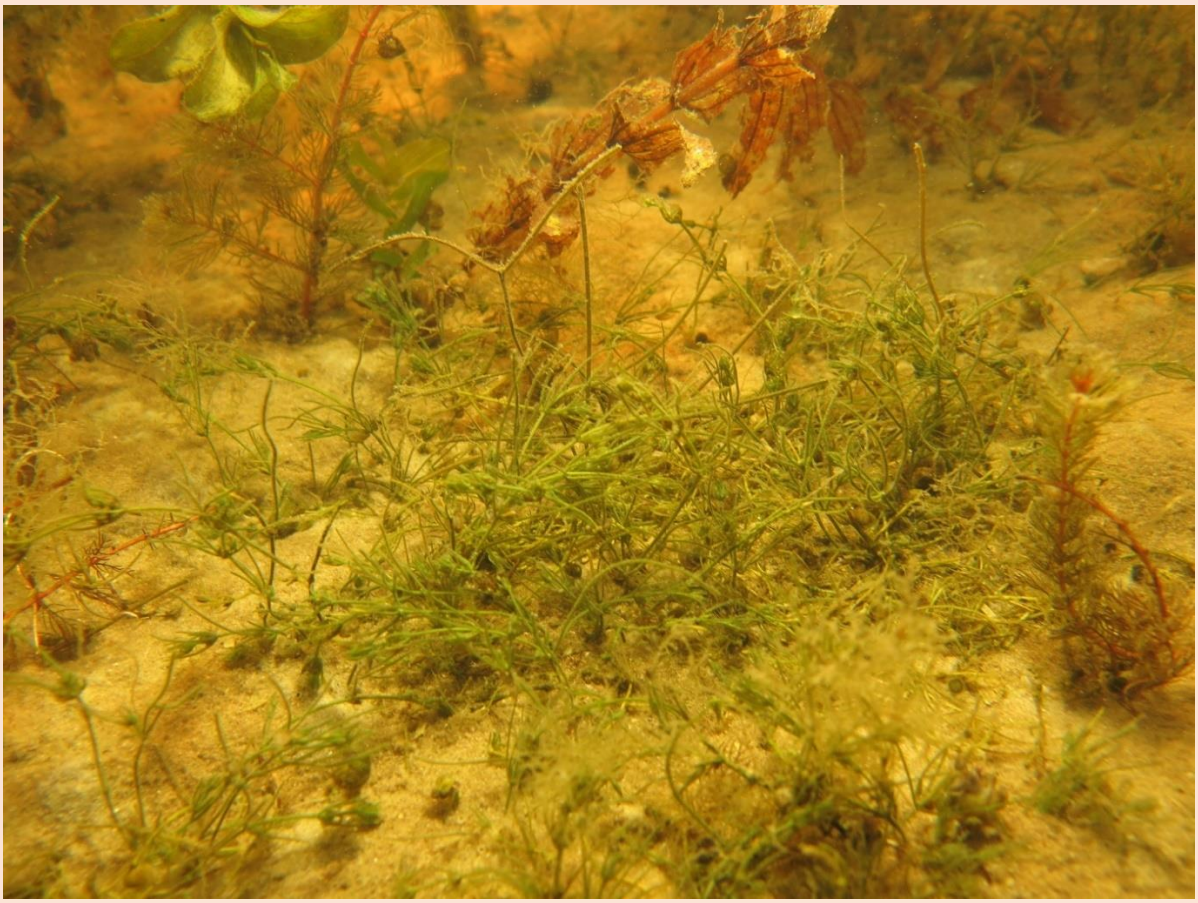
Project duration: 2019-2021

Project is planning to publish first results in late 2020 and will present them at future IRGC meetings.

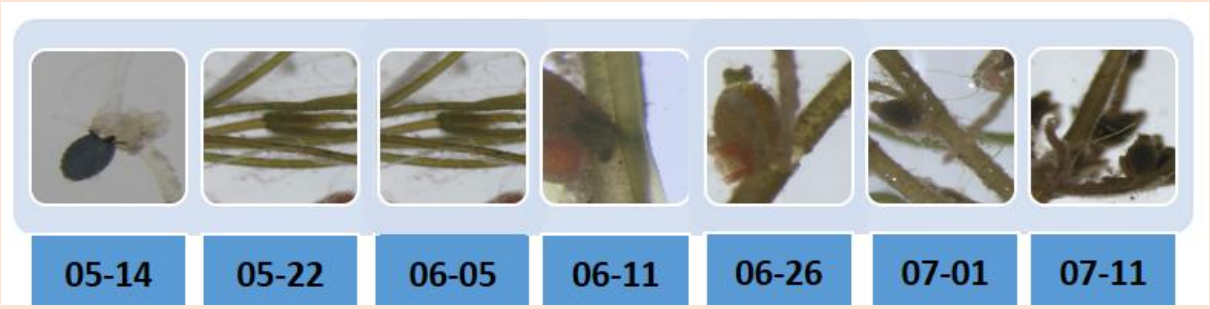
Project participants: Georg Martin, Martynas Bucas, Vaiva Stragauskaite, Tobia Politi, Paola Forni, Diana Viaciute, Jonas Gintauskas, Modestas Bruzas, Julius Morkunas, Jovita Miezine, Andrius Skersonas, Darius Daunys.

Georg Martin (Estonia), Martynas Bucas (Lithuania)

Sampling by pop-up nets in summer of 2019.



Stand of opposite stonewort (*Chara contraria*) in Curoonia Lagoon.



Phenological cycle of opposite stonewort (*C. contraria*) under laboratory conditions.

Mute swans feeding within upper littoral vegetated by macrophytes near Vente area, 2019.

IRGC ELECTIONS

As announced, the IRGC symposium in Gammarth had to be postponed due to the current situation with the Corona virus. This also has repercussions on the IRGC elections which were supposed to be held during the symposium. The elections will now be held during the POSTPONED symposium, which hopefully will be held in September/October 2020 in Gammarth. More specific information about the date will be given by the organizers in due time. Please note that all votes which already have been sent to Maria Rodrigo by email will CONTINUE TO BE VALID. Maria will keep the votes until the postponed meeting. Participants of the postponed meeting will have the opportunity to vote during the meeting, as usual. Votes can also be sent to Maria by email until the date of the postponed meeting.

This is a very unusual situation, not only for the IRGC but for the entire world. I hope to see many of you safe and sound this autumn in Gammarth, and I look forward to interesting discussions about charophytes.

Susanne Schneider, on behalf of the IRGC executive committee

IRGC HOMEPAGE

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

IRGC IN FACEBOOK

We have created group in Facebook – International Research Group on Charophytes. This is an unofficial group for IRGC members to share information. The group is closed, so only IRGC members can see the posts.

You are welcome to share your photos, field works, research questions etc. among our community. We are looking forward to see your photos from the past meetings or getting information/photos about your current activities.

We created a shared account for members who are not interested to have their own personal account in Facebook, but would like to visit the

IRGC group. Please contact Kaire Torn (kaire.torn@ut.ee) for details.

MEMBERSHIP FEES

Please do not forget to send your membership fee for 2020. Multiple year payment is encouraged to reduce banking costs.

INTERNATIONAL RESEARCH GROUP ON CHAROPHYTES

Membership fee annual amount – € 20
Multiple-year payment is encouraged to reduce mailing and banking costs.
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 years of membership paid are included in the payment form.
To do the bank transfer, please give the following information to your bank:

Account-holder: Int Research Grp on Charophytes
Dr Emile Nat
Grote Ruwenberg 17
1083 BS Amsterdam
Netherland
Name of bank: BANQUE LA POSTE
Address of Bank: Centre Financier, 13900 Marseille Cedex 20, France
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 2020.

Abdelahad, Nadia	nadia.abdelahad@uniroma1.it
Ahmadi, Akram	ahmadi2002fr@yahoo.com
Akbayeva, Lyailya	akbaeva659@mail.ru
Alix, Mitchell S.	malix@pnw.edu
Azzella, Mattia M.	mattia.azzella@gmail.com
Auderset Joye, Dominique	Dominique.Auderset@unige.ch
Barinova, Sophia	sophia@evo.haifa.ac.il
Båstrup-Spohr, Lars	lbaastrupspohr@bio.ku.dk
Becker, Ralf	becker.ra@web.de
Beilby, Mary Jane	m.j.beilby@unsw.edu.au
Beisenova, Raikhan	raihan-b-r@yandex.kz
Bengtsson, Roland	Roland.bengtsson@mikroalg.se
Benoit, Roch-Alexandre	roch-alexandre.benoit@laposte.net
Bernhardt, Karl Georg	karl-georg.bernhardt@boku.ac.at

Bisson, Mary A.	bisson@buffalo.edu
Blazencic, Jelena	jelenablazencic@gmail.com
Blindow, Irmgard	blindi@uni-greifswald.de
Boissezon, Aurélie	aurelie.boissezon@hesge.ch
Borysova, Olena	oborysova@yandex.ru
Breithaupt, Christian	Christian.breithaupt@gmx.de
Bruinsma, John	not updated
Brzozowski, Michał	mbrozozowski@gmail.com
Bučas, Martynas	martynas.bucas@jmtc.ku.lt
Calero Cervera, Sara	sara.calero@uv.es
Casanova, Michelle T.	amcnova@netconnect.com.au
Chivas, Allan R.	toschi@uow.edu.au
Christia, Chrysoula	xchristia@gmail.com
De Sosa Tomas, Andrea	adesosatomas@gmail.com
Demirci, Elvan	elvandemirci@hacettepe.edu.tr
Feist, Monique	mjcfeist@hotmail.fr

Flor-Arnau, Nuria	nurnu@yahoo.es
Foissner, Ilse	ilse.foissner@sbg.ac.at
Garcia, Adriana	adriana@uow.edu.au
Gottschalk, Stephen	stephen.gottschalk@gmail.com
Grillas, Patrick	grillas@tourduvalat.org
Grinberga, Laura	laura.grinberga@gmail.com
Haas, Jean Nicolas	Jean-Nicolas.Haas@uibk.ac.at
Hannibal, Joseph	jhannibal@cmnh.org
Herbst, Anne	anneherbst@gmx.de
Holzhausen, Anja	anja.holzhausen@uni-rostock.de
Hutorowicz, Andrzej	a.hutorowicz@infish.com.pl
Inkarova, Zhanslu	inkarzh@mail.ru
Kalin, Margarete	margarete.kalin@utoronto.ca
Karol, Ken	kkarol@nybg.org
Kirschey, Tom	Tom.Kirschey@NABU.de
Koistinen, Marja	marja.koistinen@helsinki.fi
Kozlowski, Gregor	gregor.kozlowski@unifr.ch
Kyrkander, Tina	tina.kyrkander@ biologiochmiljo.se
Lambert-Servien, Elisabeth	elambert@uco.fr
Li, Sha	shali@nigpas.ac.cn
Mann, Henry	hmann@grenfell.mun.ca
Marković, Aleksandra	gmvalex@gmail.com
Martin, Georg	georg.martin@ut.ee
Martin-Closas, Carles	cmartinclosas@ub.edu
Mebrouk, Fateh	mebrouk06@yahoo.fr
Meiers, Susan	ST-Meiers@wiu.edu
Millozza, Anna	Anna.millozza@uniroma1.it
Nat, Emile	e.nat@kranswieren.nl
Nowak, Petra	petra.nowak@uni-rostock.de
Pełechaty, Mariusz	marpelhydro@poczta.onet.pl
Pérez-Cano, Jordi	Jordi_perez-cano@ub.edu
Popłońska, Katarzyna	katarzyna.poplonska@biol.uni.lodz.pl
Pronin, Eugeniusz	gubu@o2.pl
Puche Franqueza, Eric	eric.puche@uv.es
Pukacz, Andrzej	pukacz@europa-uni.de
Raabe, Uwe	uraabe@yahoo.de
Ribaudo, Cristina	cristina.ribaudo@ensegid.fr
Rodrigo, Maria	maria.a.rodrigo@uv.es
Romanov, Roman	Romanov_r_e@ngs.ru
Romo, Susana	susana.romo@uv.es
Sakayama, Hidetoshi	hsak@port.kobe-u.ac.jp
Sanjuan Girbau, Josep	josepst.juan@hotmail.com
Schneider, Susanne	susi.schneider@niva.no
Schubert, Hendrik	hendrik.schubert@uni-rostock.de
Schwarzer, Arno	arno.schwarzer@aschwarzer.net
Scribailo, Robin W.	rscrib@pnw.edu
Simons, Jan	Jan.Simons@gmx.com
Sinkevičienė, Zofija	zofijasin@gmail.com
Sleith, Robin	robinsleith@gmail.com
Soulié-Märsche, Ingeborg	insouma43@gmail.com
Stewart, Nick	nfstewart@freeuk.com
Strzałek, Małgorzata	malgorzata.strzalek@uph.edu.pl
Sugier, Piotr	piotr.sugier@ poczta.umcs.lublin.pl
Torn, Kaire	kaire.torn@ut.ee
Trabelsi, Khaled	trabkhalfss@yahoo.fr
Trbojević, Ivana	ivanatrbojevic@yahoo.com
Troia, Angelo	angelo.troia@unipa.it
Tulegenov, Sherim	sh_tulegen@mail.ru
van de Weyer, Klaus	klaus.vdweyer@lanaplan.de
Vicente Rodríguez, Alba	albavicenterodriguez@ub.edu avicenro@gmail.com
Wang, Qi-Fei	qfwang@nigpas.ac.cn
Wojtczak, Agnieszka	agnieszka.wojtczak@biol.uni.lodz.pl
Zhamangara, Aizhan	kashagankizi@mail.ru
Zviedre, Egita	egita.zviedre@ldm.gov.lv