57TH ANNUAL MEETING OF THE CZECH PHYCOLOGICAL SOCIETY

GENERAL PROGRAM & BOOK OF ABSTRACTS

57TH ANNUAL MEETING OF THE CZECH PHYCOLOGICAL SOCIETY

Charles University, Faculty of Science, Czech Republic

19 – 21 September 2016

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Sponsorships

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GENERAL PROGRAM

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11:40	**Procházková K.**, Němcová Y., Neustupa J.: *Phyllosiphon ari* sp. nov. (Watanabea clade, Trebouxiophyceae), a new parasitic species isolated from leaves of *Arum italicum* (Araceae)
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LIST OF POSTERS

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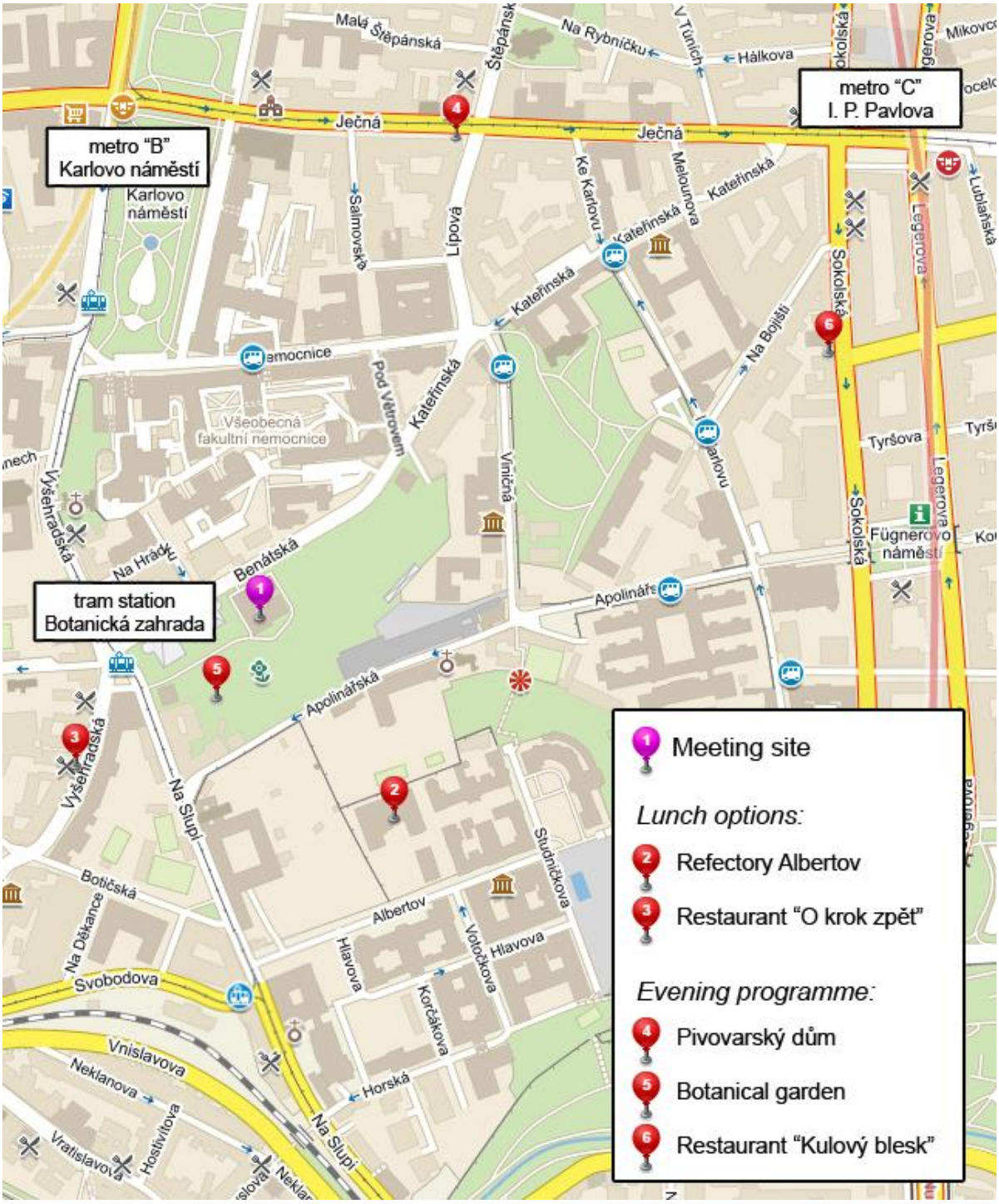
Kulichová A., Fialová M.: Correspondence between morphology and ecology: morphological variation of the *Frustulia crassinervia-saxonica* species complex reflects the ombro-minerotrophic gradient
Letáková M., Hašler P., Duchoslav M., Poulíčková A.: Epiphytic diatoms in the ponds of the Czech Republic
Poštulková A., Nedbalová L., Bešta T.: Palaeoecological reconstruction of Komořany Lake in Late Glacial based on diatom analysis
Řídká T., Peksa O., Škaloud P.: Enviromental preferences of photobionts associating with epigeic *Cladonia* communities
Šafránková M., Škaloud P., Rindi, F.: Prevailing chaos in the taxonomy of Trentepohliales (Ulvophyceae, Chlorophyta) – a challenging task of species delimitation
Ryšánek D., Holzinger A., **Škaloud P.**: Influence of substrate and pH to microalgal diversity: A potentially important factor for sympatric speciation
Vančurová L., Peksa O., **Škaloud P.**: Co-operation with three algal genera leads to a wide ecological amplitude of lichen
Urbánková P., Sabbe K., Vyverman W., Vanormelingen P.: pH preferences in a diatom species complex
Vondrášková A., Hauer T., Mareš J., Johansen J.R.: Molecular characterization of four cyanobacterial generitypes from their type localities in Scandinavia
Woodard K., Kulichová J., Poláčková T., Neustupa J.: Morphometric allometry of representatives of three naviculoid genera throughout their life cycle

VENUE & SOCIAL PROGRAM

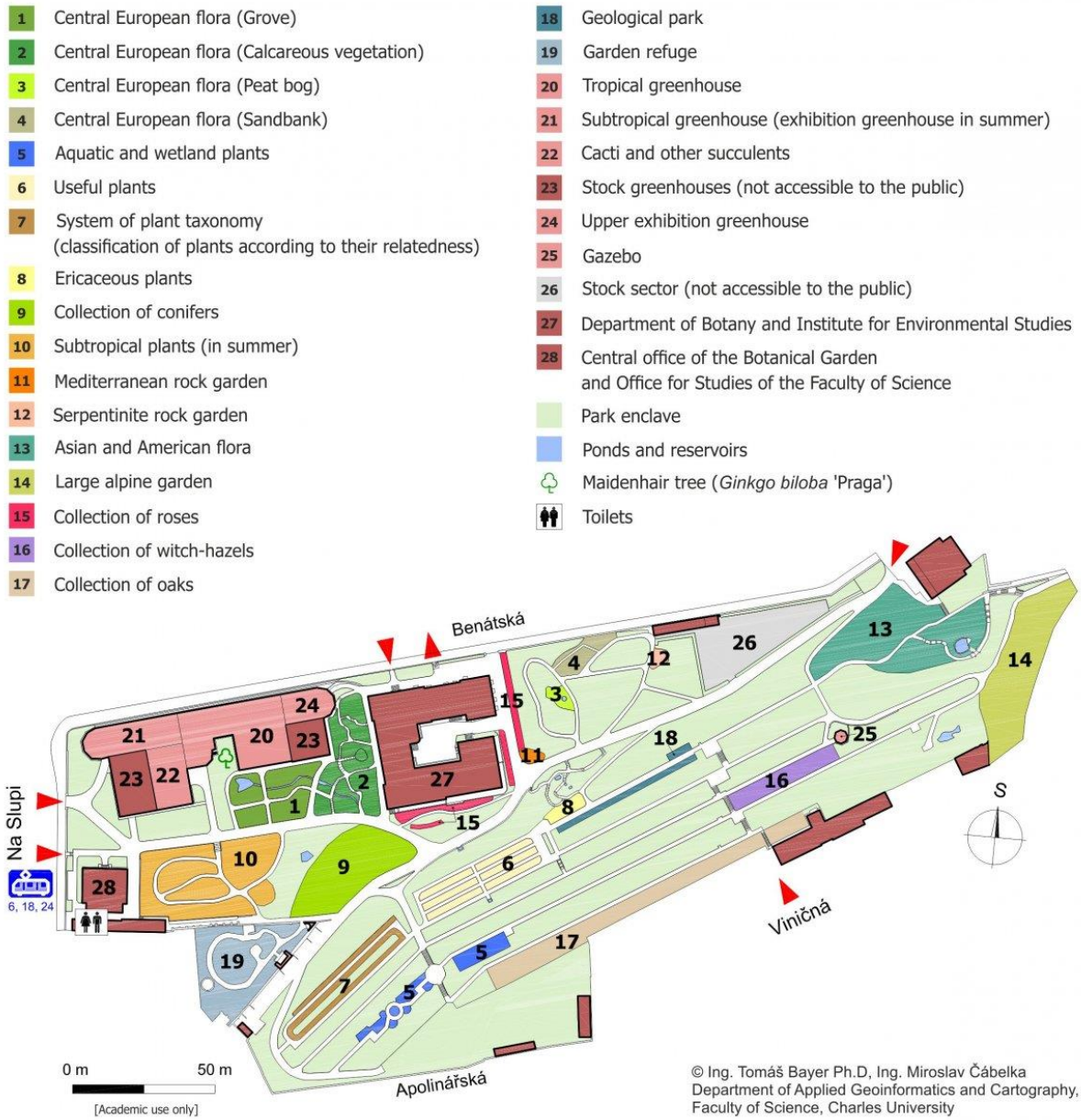
The meeting will be held in the building of Department of Botany, Faculty of Science. Meeting room "Krajinova posluchárna" is located on the 2nd floor (there will be arrows from the entrance showing the way).

Address: Benátská 2, Praha 2



BOTANICAL GARDEN

The meeting site is located in the area of the Botanical Garden of the Faculty of Science. The garden is accessible for free. It is open daily from 10am to 6pm. On Monday 19th September, the evening party will be held in the Garden refuge ("19" on the map below).



LUNCH OPTIONS

There are many restaurants in the vicinity of the meeting place. We are mentioning here just two nearest options:

Refectory Albertov

- Address: Albertov 7, Praha 2
- Price: from 69,- CZK

Restaurant "O krok zpět"

- Address: Vyšehradská 31, Praha 2
- Price: from 100,- CZK

EVENING PROGRAM

Sunday 18 September, 19:00

- Restaurant and beer gallery "Pivovarský dům"
- Address: Ječná/Lípová 15, Praha 2
- Enjoy 8 types of beer brewed just in-house, including dark, light, and specialty beers. Traditional Czech cuisine is offered, as well.

Monday 19 September, 19:00

- Botanical Garden of Charles University
- Address: Benátská 2, Praha 2
- The evening party will be held in the open air in the Botanical Garden of Charles University. Food and beverages will be served in a buffet form, Czech beer and wine will be offered.

Tuesday 20 September, 19:00

- Restaurant "Kulový blesk"
- Address: Sokolská 13, Praha 2
- The farewell party will be held in a non-smoking restaurant Kulový blesk. The restaurant offers a selection of at least 11 different beers on tap and typical Czech cuisine. Food in a buffet form is included for the registered conference participants.

ABSTRACTS

Ecophysiological Characterization and Photoacclimation of the Freshwater Red Alga *Batrachospermum turfosum* Bory

Siegfried Aigner[1], Andreas Holzinger[1], Ulf Karsten[2], Ilse Kranner[1]

[1] Innsbruck University, Austria, [2]University Rostock, Germany

Batrachospermum turfosum is one of the rare generalist species among freshwater red algae with a cosmopolitan distribution in latitude and altitude. Although, these algae can be exposed to seasonal fluctuations in light and temperature, no data exist on their ecophysiology and their response to enhanced UV irradiation. The alga was found to be adapted to a broad range of light and temperature, unusual for freshwater Rhodophyta. *Batrachospermum turfosum* is adapted to low-light with tolerance of high-light conditions and is able to acclimate to elevated levels of UVR. Although photosynthetic pigments were affected after UVR, the alga showed the ability to recover and appears to be capable of adapting its photosynthetic performance in response to irradiance.

Talk

Functional Consequences of Diversity of Macroalgae Assemblages

Francisco Arenas

CIIMAR, Porto, Portugal

We explored how successional dynamics modifies the relationship between diversity and productivity in seaweed natural communities. Two different successional scenarios were included: primary and secondary succession. We setup an experiment where relationships between two biodiversity proxies (species richness and evenness) and seaweed assemblages' productivity were assessed. Examining the results globally, we found that coexistence mechanisms driving community dynamics in primary and secondary succession produced differences in the effects of diversity on the productivity of the assemblages.

Talk

Burning Coal Spoil Heaps as a New Habitat for the Extremophilic Red Alga *Galdieria sulphuraria*

Dovilė Barcytė, Linda Nedbalová, Adam Culka, Filip Košek, Jan Jehlička

Charles University, Prague, Czech Republic

Galdieria sulphuraria (Cyanidiales) is a worldwide acclaimed thermoacidophilic red microalga with a limited distribution due to special conditions required for growth and metabolism. Until now, the alga was almost exclusively restricted to acid geothermal environments around the world. However, we have found *Galdieria* on the surface of a burning coal spoil heap in central Europe, what is the first record of this extremophile in such type of habitat. A rbcL phylogeny confirmed that a population of this alga belongs to the continental European lineage of *G. sulphuraria* and we consider Italy as a potential source of Czech *G. sulphuraria*. The dispersal of unicellular red microalgae is far from fully understood and the discovery of *Galdieria* in another part of Europe on a relatively newly established site allows us to understand better the distribution patters and disperals modes of this ecologically important algal group. In addition, here we also analyzed phylogenetic position of *Galdieria* strain isolated from the Czech Republic six-

teen years ago and confirmed it to belong to species *G. phlegrea*, until now known only from Italy. Hereby, we disclaimed the endemism of *G. phlegrea*.

Talk

Gralins, a New Protein Family Linking Prasinophyte Scales to the Cell Surface

Burkhard Becker

University of Cologne, Germany

Prasinophytes are characterized by cell-surface associated microscopic structures of distinct size and shape called scales. Prasinophytes scales consist mainly of acidic polysaccharides containing large amounts of unusual 2-keto sugar acids (Kdo, 5OMeKdo and Dha). Scales are linked to the cell surface by a novel family of PM receptors, which we have called gralins (green algal integrins). The identification and characterization of this new protein family will be presented.

Talk

Functional Biogeography of Desmids

Helena Bestová[1], François Munoz[2], Pavel Škaloud[1], Cyrille Violle[3]

[1]Charles University, Prague, Czech Republic, [2]UMR AMAP, Montpellier, France, [3]CEFE, CRNS, Montpellier, France

We analysed 148 desmid communities from Europe. We used a combination of network–based and functional trait-based approaches to explore the drivers of their biodiversity. Desmids are characterized by their cell volume and surface-to-volume ratio as markers of environmental influence on organismal morphology and physiology. Trait-based distribution within communities is compared to regional pools whose geographical structuring is analysed through the lens of a network topology analysis. The network topology highlights a geographical, environmental and functional structuring of desmid species pools. At community level, functional traits were non-randomly distributed, with environmental filtering and biotic interactions constraining size of desmids. Variation in trait distribution can be linked to environmental gradients, mainly climate. This is showing that niche-based processes, dispersal limitation and historical legacy are at play in shaping community assembly in desmids.

Talk

CYANOCOST: an EU COST Action on Cyanobacterial Bloom and Cyanotoxin Risk Management

Luděk Bláha[1], Geoffrey A. Codd[2], Anastasia Hiskia[3], Triantafyllos Kaloudis[4], Jussi Meriluoto[5], Antonio Quesada[6], Zorica Svircev[7], Petra M. Visser[8]

[1]Masaryk University, RECETOX, Czech Republic, [2]Stirling University, United Kingdom, [3]NCSR Democritos, Athens, Greece, [4]EYDAP S.A., Athens, Greece, [5]Åbo Akademi, Finland, [6]Autonomous University of Madrid, Spain, [7]University of Novi Sad, Serbia, [8]University of Amsterdam, Netherlands

CYANOCOST project includes over 100 active participants from 35 European and neighbouring countries. This EU COST ES1105 Action (www.cyanocost.com) runs from 2012 to 2016 and is focused on the assessment and mitigation of problems presented throughout Europe and beyond by cyanobacteria and cyanotoxins in water resources. Working groups of the action include: (i) collecting information on cyanobacteria and cyanotoxins in European waters and identifying appropriate methods for monitoring and analysis; (ii) assessing data on fate, envi-

ronmental and health impacts as well as on the economy and wider society; (iii) identifying measures for the reduction of cyanobacterial bloom development by in-lake and catchment methods, and for control of drinking water quality; and (iv) dissemination to end-users and stakeholders in the water resources and environmental sectors, plus the general public. This EU Action aims to disseminate best practices for the monitoring and analysis of cyanobacterial blooms and cyanotoxins, which is supported by four major outcomes of the action (handbooks and special journal issues) that focus on (1) Cyanobacterial monitoring and cyanotoxin analysis; (2) Molecular methods; (3) Prevention, control and mitigation of cyanobacteria; (4) Drinking water treatment and cyanotoxins.

Talk

Rekonstrukce morfologické evoluce a fylogenetických vztahů šupinatých chrysomonád rodu *Mallomonas*

Dora Čertnerová, Pavel Škaloud

Charles University, Prague, Czech Republic

Rod *Mallomonas* (Synurales, Chrysophyceae) se vyznačuje obrovskou variabilitou křemičitých šupin, složených na povrchu jednotlivých buněk do celistvé schránky. Šupiny se různí v mnoha křemičitých ultrastrukturách, například v přítomnosti pórů, papil, žeber či mohutných sítí. Přes jejich značnou různorodost se však předpokládá, že jejich ornamentace zůstává pro jednotlivé druhy specifická. Fylogenetické vztahy jednotlivých zástupců jsou známy jen pro velmi nízký počet z nich, doposud máme k dispozici molekulární data pro pouhých 20 % popsaných druhů. Rod *Mallomonas* je rozdělen do dvou hlavních evolučních linií, které lze rozlišit i dle přítomnosti V-žebra na šupinách. Poprvé je známa fylogenetická pozice šesti druhů tohoto rodu. Na základě výsledků našich dat rozdíly v morfologii šupin vskutku do značné míry odrážejí i fylogenetické vztahy jednotlivých zástupců. Morfologický koncept pojetí druhů se tak zdá být v kontextu našich dat oprávněný. Na základě analýzy morfologických znaků vyplývá, že některé taxony zůstávají v morfologické stázi i po dobu desítek milionů let. Naopak jiné prošly ve stejném časovém období nápadnou fenotypovou přeměnou. Pro mnohé křemičité struktury byl odhalen fylogenetický signál, resp. vývoj a změnu těchto struktur odráží fylogeneze jednotlivých zástupců. Z rekonstruovaných evolucí jednotlivých křemičitých ultrastruktur vyplývá, že některé vznikly v evoluci pouze jednou (např. síť na posteriorním okraji šupiny), zatímco jiné měly vývoj podstatně dynamičtější, kdy v evoluci několikrát vznikly i druhotně zanikly (např. póry na posteriorním okraji). Také charakter evoluce struktur je velmi variabilní a závisí jak na konkrétní evoluční linii rodu, tak i na konkrétním sledovaném znaku.

Talk

A Peculiar Chloroplast Genome Structure in the Green Algal Order Cladophorales

Andrea Del Cortona[1,2], Frederik Leliaert[1], Heroen Verbruggen[3], Klaas Vandepoele[1,2], Olivier De Clerck[1]

[1]Ghent University, Belgium, [2]VIB, Ghent, Belgium, [3]University of Melbourne, Victoria, Australia

Here we report on the chloroplast structure of the Cladophorales, an order of green seaweeds. Based on a combination of short NGS reads, long sequencing reads and RNA-seq, we conclude that they do not possess a single circular chloroplast genome but a ge-

nome fragmented into multiple molecules, 2-3 kb in size, each containing one protein-coding gene. In that aspect, the chloroplast genome of the Cladophorales resembles dinoflagellates chloroplast minicircles. However, in Cladophorales the molecules are linear single-stranded molecules that fold onto themselves in a hairpin-like structure due to the presence of extensive inverted repeats. Phylogenetic analysis indicates that the genes undergo very rapid evolution. As far as known such a chloroplast structure is unique among eukaryotes.

Talk

Epiphyte/Host Interactions in Seaweed: the Example of the Brown Alga *Pylaiella littoralis*

Christophe Destombe, Alexandre Geoffroy, Aurélien de Jode, Stéphane Mauger, Florian Molvot, Myriam Valero

CNRS, Piere and Marie Curie University, Station Biologique de Roscoff, France

During the last century, many authors have described a multitude of species, varieties or forms in the genus of *Pylaiella* according to their morphology, their life history and/or their ecology, nevertheless no clear consensus have been reached. In the present study, we investigated the diversity of *Pylaiella littoralis* along the Brittany coast using a DNA barcoding multilocus approach with nuclear, mitochondria and chloroplast markers. Moreover, population genetics approach was used using 10 microsatellite markers to investigate the gene flow between populations. Our results highlighted the occurrence of three genetic entities: the first one mainly grows during the summer on *Fucus vesiculosus*, the second grows from spring to summer on *Ascophyllum nodosum* and the third one is found in autumn on *Fucus serratus*. Even if the interactions between *Pylaiella* species and their hosts remain unknown, we hypothesize that ecological speciation plays a role in accelerating diversification between groups

Talk

Genome-wide Inference of Cyanobacterial Evolutionary Relationships

Petr Dvořák[1], Eva Jahodářová[1], Petr Hašler[1], Dale A. Casamatta[2], Aloisie Poulíčková[1]

[1]Palacký University, Olomouc, Czech Republic, [2]University of North Florida, Jacksonville, USA

Cyanobacteria represent an ancient group of prokaryotic photoautotrophic organisms with the global ecological significance. However, cyanobacterial biodiversity is still largely unknown especially in tropical areas. We identified a new tropical *Pseudophormidium*-like cyanobacterium *Elainella* based on combined phenotypic, ecological and genome-wide analysis. Phylogenomic dating revealed that *Elainella* likely belongs among ancient lineages of cyanobacteria. Functional genome analysis suggests that *Elainella* is capable of a production of various secondary metabolites and nitrogen fixation.

Talk

Eco-physiological Features and Evolution of Photosynthetic Microorganisms in Polar Environment

Josef Elster

Czech Academy of Sciences, Třeboň, Czech Republic

Prokaryotic cyanobacteria and eukaryotic microalgae are widespread in all polar environments, including extremes, and frequently produce visible biomass. Their combined

biomass represents a sizeable pool of global fixed carbon, influencing mineral cycling and energy flow, and affects the mineral and biological development of polar ecosystems. Microalgae, due to their evolutionary antiquity are widely adapted to all extremes related with changes in geological time. The seasonal and diurnal variations of polar terrestrial environments represent a series of water availability gradients ranging from aquatic and semiaquatic to dry habitats. These patterns initiate a number of different ecological and physiological acclimation and adaptation responses. Polar regions are geographically isolated, the issue of microalgae endemism is the subject of many debates. Various factors could be involved in their long-range dispersion between and across the polar regions, such as atmospheric circulation, which can transfer spores or even cells over large distances, as well as bird migrations and human activities. Several studies hypothesised and later tested that selected groups of microalgae survived several glaciations and occur in particular habitats from beginning of ancient glaciation. Our results, support the hypothesis that long-term survival took place in glacial refuges. Current debate concerns to what extent polar microbial flora is genetically different from the rest of the globe's microbial genepool and the effect that severe ecological constraints have on influencing the direction and speed of evolution in the polar regions. Lecture will bring information about present Czech polar phycological research in above mentioned directions.

Talk

Diatoms of the Western Carpathian Spring Fens

Markéta Fránková[1], Aloisie Poulíčková[2], Jindřiška Bojková[3], Michal Hájek[3]

[1]Czech Academy of Sciences, Třeboň, Czech Republic, [2]Palacký University, Olomouc, Czech Republic,[3]Masaryk University, Brno, Czech Republic

Species composition changes along the pH and calcium gradients within wetlands were frequently studied for different groups of organisms, but few data are available for algae. Diatom assemblages collected as epibryon and epipelon at 13 spring fens in the Western Carpathians in May 2006 were studied in vivo and also in permanent Naphrax mounts. Altogether 188 taxa were found. Species richness decreased along the gradient of mineral richness from calcareous fens to mineral–poor *Sphagnum*–fens. In agreement with fen typology based on higher plants, bryophytes, and molluscs, the same four fen types were identified based on diatom data. For each spring-fen type indicator species were suggested. Conductivity and pH appeared to be the most important environmental factors responsible for the variation in diatom species data.

Talk

Phytobenthos and phytoplankton of the Dehtář fishpond (South Bohemia, Czech Republic)

Markéta Fránková[1], Kateřina Šumberová[1], Jan Potužák[1,2], Ondřej Vild[1], Karel Císař[1]

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Dehtář is a large eutrophic fishpond (218-238 ha) situated in South Bohemia 12 km northwest from the city of České Budějovice. The Dehtář fishpond is subjected to a multidisciplinary study, including observations of phytoplankton, zooplankton and vegetation in relation to environmental factors and management. This research is also a part of

the NETLAKE COST Action involving high-frequency monitoring of standing water bodies across Europe. Phycological part of this complex research consisted of investigations of phytoplankton and epiphyton. Samples were collected at three sites in the vicinity of high-frequency monitoring stations. It is namely: 1) Fishpond Dam, 2) Babický Stream Bay, 3) Dehtářský Stream Bay. At the same time different chemical parameters and chlorophyll-a concentrations were analysed. Two ecological factors turned out to be the important in shaping the overall algal diversity of the Dehtář fishpond: an intensive wave action favouring substancial occurrence of some oligotrophic taxa such as *Pseudostaurosira brevistriata* and *Staurosirella leptostauron* as well as suppressing the occurrence of typically periphytic diatom taxa and extreme summer drough in 2015 causing increased values of total phosphorus and consequently elevated cyanobacterial biomass.

Poster

Diversiry of Marine Euglenophyceae

Vladimír Hampl, Soňa Lukešová

Charles University, Prague, Czech Republic

Euglenophyceae represent a group of unicellular algae with secondary chloroplasts. We focused on the exploration of diversity of Euglenophyceae and Pyramimonadales, green algae related to euglenophyceae chloroplast. Firstly, we amplified parts of the plastid genomes from environmental samples and determined their position in the tree. Secondly, we performed large-scale phylogenetic analyses using 16S rRNA from representatives of these groups and environmental sequences. The results revealed the presence of a large number of environmental sequences relative to the Pyramimonadales and also previously undetected diversity of environmental marine sequences branching within Euglenophyceae, even within Euglenales considered so far as strictly freshwater group.

Talk

Phylogenetic Position of the Genus *Kyrtuthrix* ERCEGOVIĆ Within the Order Nostocales

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The euendolithic genus *Kyrtuthrix* was originally described in 1929 by Ercegović from Dalmatian coast. Due to its isopolar filaments *Kyrtuthrix* is classified by the latest cyanobacterial system as part of the family Scytonemataceae, even though trichomes tapering towards their ends represent a feature typical for the family Rivulariaceae. Until recently only limited molecular data were available for this genus and they did not allow reliable assessing its phylogenetic relations to other cyanobacterial genera. However, we were able to obtain sequences of the 16S rRNA gene in sufficient length for phylogenetic analyses for two species of *Kyrtuthrix* - the type *K. dalmatica* collected on Dalmatian coast and *K. maculans* collected on Pacific coast in Peru. Our analyses revealed that both taxa are related to marine members of the genus *Rivularia* and thus confirmed the importance of trichomes tapering as a diacritical feature of this taxon. Consequently, the genus *Kyrtuthrix* should be re-classified into the family Rivulariaceae. Our results also show that in main world culture collections there are several strains under different generic assignments very closely related to our material.

Poster

Recentná tvorba stromatolitov z rodu *Rivularia* (Nostocales) na Slovensku

Alica Hindáková, František Hindák

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Na Slovensku sa z rodu *Rivularia* (Roth) Ag. ex Born. et Flah.1886 doteraz uvadzáli iba 4 druhy: R. beccariana (De-Notaris) Born. et Flah., R. dura Roth ex Born. et Flah., R. haematites Ag. ex Born. et Flah. a R. minutula (Kütz.) Born. et Flah. (Lhotský et al. 1964). Najstarší údaj pochádza z r. 1899 z Pienin, posledný údaj z r. 1956 z Vysokých Tatier. Všetky z nich boli akceptované v poslednej monografii Cyanoprokaryota – heterocytózne cyanobaktérie (Komárek 2013), autor ich výskyt menovite na Slovensku však neuviedol. V ostatných rokoch sme na našom území evidovali 4 lokality s výskytom druhov rodu *Rivularia* tvoriacich recentné stromatolitné útvary. Na travertínoch, vo vodách s vysokým obsahom vápnika ($CaCO_3$) sme našli tri druhy, a to *R. haematites* v slatinnom Šujskom rašelinisku a v PP Bukovinka južne od Ružomberka, *R. calcarata* (Voronichin) Poljanskij v Rybnej doline neďaleko Šujského rašeliniska a *Rivularia* cf. *dura* v odtoku aktívneho gejzíra v Gánovciach južne od Popradu. Na lokalite v Gánovciach sme nachádzali tri morfotypy kolónií, ktoré sa navzájom odlišovali makroskopicky. V našej štúdii porovnávame jednotlivé stromatolitné útvary na základe morfológie kolónií a vlákien.

Talk

Desiccation Induced Cell Walls Changes in Green Algae

Andreas Holzinger

University of Innsbruck, Austria

Green algae living in aeroterrestrial or intertidal habitats are naturally exposed to fluctuating water availability. In *Klebsormidium* sp. desiccation leads to an increase of the cell wall flexibilizer callose (β-D-1.3-glucan) by two fold, the compound was mainly incorporated into the cross-cell walls. In *Zygnema* sp. callose is restricted to the corners between individual cells and desiccation did not change its content. Resistant zygospores may be formed in *Zygnema* sp. protected by a 3-layered spore cell wall. In *Ulva compressa*, a flexible inner pectic cell wall layer was observed, that contributed to desiccation tolerance (to 27% relative water content). Our findings highlight that structural properties (flexible or deformable cell walls) and reorganisation processes (formation of zygospores) of green algae play a key role in surviving desiccation stress.

Talk

When the Same is not the Same: Unveiling a Hidden Cyanobacterial Diversity Using Polyphasic Approach

Eva Jahodářová[1], Petr Dvořák[1], Petr Hašler[1], Dale A. Casamatta[2], Kateřina Hloušková[3], Evgeniy Gusev[4], Aloisie Poulíčková[1]

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Cyanobacteria are admirable and notable organisms; they have existed on the Earth for billions years, surviving severe global ice ages, the impacts of meteorites and times of drought. Nowadays, they occupy the most extreme environments on the planet such as hot springs, deserts, arctic areas etc. Alt-

hough they possess a relatively high degree of morphological variability compared to other prokaryotes, there are still significant gaps in our knowledge of cyanobacterial diversity, which is unexplored and often overlooked especially in tropical areas. Traditionally, cyanobacteria were classified based only on morphological characters, but recent research demonstrates an abundance of cryptic diversity evidenced by molecular analyses, e.g. 16S rRNA gene and whole genome phylogeny. Here, we present novel, filamentous, tropical cyanobacteria described using morphology, ecology, 16S rRNA phylogeny, and 16S-23S ITS secondary structures. They were named: *Pinocchia* from lake in rain forest from Vietnam, *Elainella* from temporary waterbody in the forest from Vietnam and *Onodrimia* from hot water spring from Java.

Poster

Do We Need to Protect Microalgae? And How to Do It?

Josef Juráň[1,2], Jan Kaštovský[1]

[1]University of South Bohemia, České Budějovice, Czech Republic, [2]Czech Academy of Sciences, Třeboň, Czech Republic

Many states use red lists of nearly all groups of organisms to protect their natural biodiversity. Nevertheless, the practical protection of protist organisms, including microalgae, is still almost completely missing. Compiling red lists of microorganisms is a quite challenging task requiring knowledge of ecology, distribution, and endangering factors of this group of organisms. This set of information is much less comprehensive in comparison with the same set available for vascular plants, invertebrates, vertebrates or macroscopic fungi. It is primarily due to problematic taxonomic determination and our limited understanding of protists' distribution. This poster represents main problems of compiling a red list of microscopic organisms. It makes an effort to address some important topics, e.g. endemism vs. rarity, selection of a good morphologically determined species, or a role of ecological preferences. The goal is to provide practical red list that could be used not only by specialist from algology or protistology, but mainly by people from nature conservation institutions (environmentalist, restoration ecologist, etc.). The method of assembling an algal red list is introduced on the case study of Euglenophytes in the Czech Republic. This red list combines data from literature with floristic data collected from more than 200 localities across the state. It includes species typical for oligotrophic and mesotrophic habitats as well as for endangered habitats such as wetlands or peat bogs. In addition, taxa with rare occurrence or decreasing range of their distribution were added. The aim of this case study was to prepare a methodology for compilation of red lists reflecting recent and historical data on distribution, ecological preferences, and typical habitats of algae, with great emphasis on the list's applicability. This method can be combined with the idea of 'flagship species'. These species are characterized by clear morphology and ecology and play the role of key species for endangered biotopes.

Talk

Phycological Exploatation of the Venezuelan Table Mountains

Jan Kaštovský

University of South Bohemia, České Budějovice, Czech Republic

Table mountains – tepuis – from the northern part of South America represent a

unique ecosystem, composed of mosaics of wet rock walls, temporary rock pools, shallow wetlands and streams. Approximately one-kilometer-high vertical rock walls cause considerable isolation of the upper plateau (meseta) of table mountains from surrounding biotas. This geomorphological character of the meseta makes it an "inland island", with substantial levels of endemic species, as has been documented in the case of fungi, mosses, higher plants, invertebrates and vertebrates. Phycological studies from three tepuis (Roraima, Churí, Akopán) reached similar results also. In the last decade were described from these localities one new genus of desmid (*Vincularia*), one green alga (*Ekerewekia*), two new species of diatoms (*Eunotia churiensis* and *E. multirimoportulata*) and four Cyanobacteria (*Albrightia roraimeae, Entophysalis arboriformis, Porphyrosiphon latissimus* and *Schizothrix venezuelana*). Moreover, here occur numerous other algal organisms, which are probably new species (or genera), but because they are rare taxa we have not enough material for a reliable taxonomical description

Talk

Cell Structure and Microtubule Organization during Gametogenesis of *Ulva mutabilis* Føyn (Chlorophyta)

Christos Katsaros[1], I. Langos[1], I. Theodorou, Anne Weiss[2], Thomas Wichard[2]

[1]University of Athens, Greece, *[2]Friedrich-Schiller-University Jena, Germany*

The cell structure and the microtubule (MT) organization during gametogenesis of the Chlorophyte *Ulva mutabilis* was studied using light microscopy, transmission electron microscopy and tubulin immunofluorescence. The thallus of *U. mutabilis* is usually bilayered, consisting of isodiametric cells, bearing small nuclei and a large chloroplast with a distinct pyrenoid. The external cell wall is thick and multilayered. MTs in vegetative cells are organized in parallel bundles traversing the cortical cytoplasm. During gametogenesis induced blade cells are transformed to gametangia depending on the maturity of the algae and the removal of regulative sporulation inhibitors. This differentiation is accompanied by the formation of a conical cell projection towards the exterior of the thallus. MT organization is also changed during this stage. MTs form a clear, basket-like configuration converging towards the conical tip, but not reaching it. The conical MT structure stops below the tip, leaving a circular "opening". Parallel to the above, the cell wall of the top is differentiated, forming a "cap". Nuclear divisions start at this stage, to finally form the nuclei of the future gametes. Cytokinesis by membrane furrowing gives rise to the 16 oval-shaped gametes. The conical MT organization is gradually depolymerized, and a cortical, intensely fluorescing MT bundle is also characterizing each gamete. At this stage the cap at the conical cell wall projection opens and the biflagellate gametes are released to the environment upon additional removal of a swarming inhibitor accumulated in the growth medium during gametogenesis.

Talk

O moderním polyfázickém hodnocení v taxonomii sinic

Jiří Komárek

Czech Academy of Sciences, Třeboň, Czech Republic

Do taxonomické klasifikace sinic byly zavedeny v posledních desetiletích nové moderní metody. Nejdůležitější se jeví různé molekulární přístupy, např. sekvenace 16S

rRNA genů. Genetická hodnocení však musí být v koincidenci s jinými kritérii, např. životními cykly, morfologickými znaky, ekologickou variabiltou, metabolickými procesy a podobně. Proto se v poslední době propaguje termín polyfázický přístup, při němž genetické informace jsou brány jako základ, ale ostatní kritéria musí být s tímto hodnocením v koincidenci. Tento přístup je samozřejmě spojen s řadou metodických problémů, vstupní materiál (často pouze izolované kmeny) je často nesprávně identifikován podle starých morfologických znaků a sestavení nového systému je tedy spojeno s řadou problematických postupů. V prezentaci jsou krátce zmíněny hlavní problémy týkající se polyfázického hodnocení - tato problematika je zařazena na program mezinárodním symposiu IAC v Innsbruku začátkem září 2016 a v prezentaci budou zařazeny hlavní závěry z tohoto setkání.

Talk

Problems of Water Blooms in Tropical Oligotrophic Lakes

Jaroslava Komárková[1], Eliška Rejmánková[2], Margaret Dix[3], Jiří Komárek[4]

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Water blooms of cyanobacteria are commonly associated with high concentrations of nutrients in water. The main crucial factors are concentrations of inorganic N and P. In industrialized, developed countries of temperate regions, inorganic phosphorus is the main limiting element for autotrophic organisms while nitrogen supply in such environments exceeds many times the requirement of primary production. So, cyanobacterial blooms are always connected with high concentrations of phosphorus in waters there. However, in tropical regions, heavy water blooms of cyanobacteria may occur also in oligotrophic lakes, where concentration of nitrate nitrogen does not exceed several $\mu g.L^{-1}$, while concentration of inorganic phosphorus reaches relatively high values and thus the Redfield ratio does not reach optimal values. Nitrogen limitation prevents development of phytoplankton assemblages and primary production remains very low. Transparency of such a lake can reach more than 10 m and concentration of chlorophyll can be only several $\mu g\ L^{-1}$. To our knowledge, only one species of cyanobacteria is able to explore such a niche. It is a filamentous oscillatorialean cyanobacterium *Limnoraphis robusta* Komárek et al., which forms rather large filaments, 18-22 µm wide and several cms long. Specialized portions of its filaments (diazocytes) are able to fix gaseous nitrogen and use it for fast growth when exploring available concentration of phosphorus. During last several years, *Limnoraphis* formed heavy blooms in an oligotrophic Lake Atitlán in Guatemala. Another finding of *Limnoraphis robusta* we registered in the net plankton of Puno Bay of the lake Titicaca as individual trichomes among other planktic species. Planktic form had many deep brown aerotopes. We also found individual filaments in periphyton taken at the edges of floating islands "Uros". The filaments were deep blue-green in colour and almost without aerotopes. The Puno Bay is heavily eutrophized and blooming with *Microcystis aeruginosa*. However, the main basin - Lago Mayor - is still very clear and might be endangered by apperance of blooming *Limnoraphis*. Genetical analyses proved identity of both clones of *Limnoraphis*. An inconvenient factor can be low temperature in the Lake Titicaca.

Poster

The Rocky Road Towards the Completion of a European *Cosmarium* Flora

Frans Kouwets

Rijkswaterstaat Laboratory, Netherlands

The treatment of the genus *Cosmarium* (Conjugatophyceae, Streptophyta) for a flora covering the Western Palaearctic Region was seriously hampered by a problematic taxonomy and complex nomenclature of many species. Force-fitting and taxonomic drift have confused the concepts of "good" species. In the present contribution a few examples are given from a total of over 700 treated species.

Talk

Correspondence between Morphology and Ecology: Morphological Variation of the *Frustulia crassinervia-saxonica* Species Complex Reflects the Ombro-minerotrophic Gradient

Jana Kulichová, Markéta Fialová

Charles University, Prague, Czech Republic

Two commonly reported *Frustulia* morphospecies from oligotrophic habitats, *F. crassinervia* and *F. saxonica*, showed overlapping morphological variation within natural populations and between clonal strains representing different genetic entities. Therefore, morphologies of natural populations of the *F. crassinervia-saxonica* complex were analyzed using geometric morphometric techniques regardless of species or genetic identity. The study showed that valve differences (allometric shape changes and valve sizes) were significantly correlated with different types of peatland habitats. It has been suggested that allometry probably acts as a constraint on morphological plasticity and is canalizing microevolutionary morphological differentiation within the *F. crassinervia-saxonica* complex.

Poster

New Discoveries at the Base of the Green Plant Lineage

Frederik Leliaert[1,2], Ana Tronholm[1], Claude Lemieux[3], Monique Turmel[3], Michael S. DePriest[1], Debashish Bhattacharya[4], Kenneth G. Karol[5], Suzanne Fredericq[6], Frederick W. Zechman[7], Juan M. Lopez-Bautista[1]

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We provide solid phylogenetic evidence that the enigmatic green seaweed order Palmophyllales together with the unicellular planktonic Prasinococcales form the deepest-branching clade of the Chlorophyta. Species of Palmophyllales typically grow in deep marine waters, and are characterized by a unique form of multicellularity, forming macroscopic plants that are composed of isolated and undifferentiated spherical cells embedded in an amorphous gelatinous matrix. Our phylogenetic results alter our understanding of morphological evolution in the green algae. Until present, the early-diverging lineages of the Chlorophyta (the prasinophytes) were only known to include unicellular planktonic algae. Our results point to an independent origin of macroscopic growth and multicellularity outside of the core Chlorophyta. Our study also contributes to a better understanding of plastid genome evolution in green plants. The small, compact and intronless chloroplast genome

of *Verdigellas peltata* (Palmophyllales) shows striking similarities in gene content and organization with the cpDNAs of Prasinococcales and the streptophyte *Mesostigma viride*, indicating that cpDNA architecture has been extremely well conserved in these deep-branching lineages of green plants. The phylogenetic distinctness of the Palmophyllales-Prasinococcales clade, characterized by unique ultrastructural features, warrants recognition of a new class of green plants, Palmophyllophyceae class. nov.

Talk

First Report from Algological Research in a New Ramsar Site, the Andakill Protected Habitat Area (Western Iceland)

Olga Lepšová-Skácelová

Czech Academy of Sciences, České Budějovice, Czech Republic

First data concerning microflora of a new Ramsar site, the Andakill Protected Habitat Area (western Iceland) were obtained during sampling in May 2016. Different areas were sampled: wet meadows under/without agricultural management, lake, sea basin, river aluvium with inlets and branches. Main features of algal assemblages composition were estimated.

Talk

Epiphytic Diatoms in the Ponds of the Czech Republic

Markéta Letáková, Petr Hašler, Martin Duchoslav, Aloisie Poulíčková

Palacký University, Olomouc, Czech Republic

Epiphyton samples were taken from 40 Czech ponds in order to investigate diatom diversity and distribution in relationship to biogeography and trophy. Altogether 67 genera and 361 species of diatoms were identified, the highest diversity was on the pond Novozámecký exceeding 70 species, the smallest diversity was in Špačkov with only 16 identified species. Fishponds classification established previously by Hašler et al. 2008 was used for DCA analysis. Diatom species distribution reflected gradient of trophy and strongly correlated with total phosphorus concentration, but did not reflect fully Hašler´s classification. Reasons are discussed.

Poster

Kryosestonní řasy - perspektiva pro biotechnologii

Jaromír Lukavský, Vladislav Cepák, Linda Nedbalová

Czech Academy of Sciences, Třeboň, Czech Republic

Snow algae are interesting organisms for taxonomy, ecology, genetics... and also for biotechnology. They are possessing unique metabolic pathways and produce specific compounds. Many of them produce haematochroms, PUFAs (polyunsaturated fatty acids), AFP (anti freeze proteins) etc. They also have effective DNA repair mechanisms agains uv damage. First product for cosmetics and dermatology has appeared in market. We have established working collection of strains from Bulgaria, Czech Republic, Spain etc., and we are screening them to prepare new possibilities for biotechnology.

Talk

Highly Divergent 16S rRNA Sequences in Operons of *Scytonema hyalinum* (Cyanobacteria).

Jeffrey R. Johansen[1], Jan Mareš[2], Nicole Pietrasiak[3], Markéta Bohunická[2], Jan Zima[2], Lenka Štenclová[1], Tomáš Hauer[2]

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A highly divergent 16S rRNA gene was found in one of the five operons belonging to a species complex currently circumscribed as *Scytonema hyalinum* (Nostocales, Cyanobacteria). If 16S rRNA sequence macroheterogeneity among ribosomal operons due to insertions, deletions or truncation is excluded, the sequence heterogeneity observed in *S. hyalinum* is the highest observed in any prokaryotic species thus far (7.3-9.0%). The secondary structure of the 16S rRNA molecules encoded by the two divergent operons was nearly identical, indicating full functionality. Horizontal gene transfer from another unknown heterocytous cyanobacterium is considered the most likely explanation for the origin of this molecule, but does not explain the ultimate origin of this sequence, which is very divergent from all 16S rRNA sequences found thus far in cyanobacteria. The divergent sequence is highly conserved among numerous strains of *S. hyalinum*, suggesting adaptive advantage and selective constraint of the divergent sequence.

Talk

Diversity and Community Structure of Microalgal Corticolous Biofilms

Anna Štifterová, Kateřina Procházková, Radka Zelená, Yvonne Němcová, Jana Kulichová, Pavel Škaloud, Jiří Neustupa

Charles University, Prague, Czech Republic

Despite its omnipresence, subaerial phototrophic biofilms undoubtedly represent one of the least known micro-algal communities. Our recent studies showed that corticolous microhabitats harbor relatively diversified assemblages, including several as yet unknown lineages of Trebouxiophyceae and Chlorophyceae. In addition, we showed that distribution patterns reflect anthropogenic air pollution, such as the NO_2 levels, pH, local irradiation and climate. However, besides these abiotic factors, host tree identity also proved to be a key determinant of the community. Within a single tree, we observed pronounced seasonal fluctuations in algal abundance, as well as the effects of microhabitats (bark fissures) on the microalgal diversity.

Talk

Molecular and Morphological Diversity of *Zygnema* and *Zygnemopsis* on Svalbard (High Arctic)

Martina Pichrtová[1], Jana Kulichová[1], David Ryšánek[1], Kateřina Trumhová[1], Tereza Šoljaková[1], Andreas Holzinger[2], Yvonne Němcová[1]

[1]Charles University, Prague, Czech Republic, [2]University of Innsbruck, Austria

Filamentous Zygnematophyceae belong to the most common eukaryotic algae in polar hydro-terrestrial environment. Taxonomy of this group is based on morphology of zygospores. As conjugation is a very rare event in the Arctic, their diversity remained unknown. Therefore, we applied methods of molecular phylogeny. We revealed surprisingly high diversity: 12 different *Zygnema* spp. were found that belong to separate lineages of the genus. In addition, one species of the genus *Zygnemopsis* was also identified. Finally, light and confocal laser scan-

ning microscopy was applied to characterize individual lineages based on their vegetative morphology.

Talk

Palaeoecological Reconstruction of Komořany Lake in Late Glacial Based on Diatom Analysis

Anna Poštulková[1], Linda Nedbalová[1], Tomáš Bešta[2]

[1]Charles University, Prague, Czech Republic, [2]Povodí Vltavy s.p., České Budějovice, Czech Republic

Sedimentary record of former Lake Komořany provides an opportunity to study development of lowland, large and very shallow basin during Late Glacial and Holocene. Diatom analysis of basal part of profile PK-1-L contributes to extensive multi-proxy research of samples taken before complete destruction of this locality. For the first time diatom-based reconstruction of Lake Komořany has been taken in Late Glacial and beginning of Holocene. The special attention has been paid to reconstruction of lake trophic state, in order to re-examine the traditionally cited conclusions that Lake Komořany was oligotrophic after its formation in Late Glacial. Diatom-inferred parameters of water quality actually indicate very stable meso-eutrophic to eutrophic state of lake since its origin.

Poster

***Phyllosiphon ari* sp. nov. (Watanabea Clade, Trebouxiophyceae), a New Parasitic Species Isolated from Leaves of *Arum italicum* (Araceae)**

Kateřina Procházková, Yvonne Němcová, Jiří Neustupa

Charles University, Prague, Czech Republic

The trebouxiophycean genus *Phyllosiphon* contains unique green algae that thrive as endophytic parasites in the leaves of various members of the Araceae. The DNA sequences of the parasitic populations were originally acquired from infected leaves of subtropical *Arisarum vulgare*. However, several previous studies showed that the members of the *Phyllosiphon* clade also occur as free-living algae on various subaerial substrates across Europe. *Phyllosiphon* infection was also observed on the leaves of the temperate genus Arum, but no molecular data was available for these parasites. We recently found these parasites at a single sub-Mediterranean locality. These algae were genetically different from those previously obtained from *Arisarum* leaves on the basis of their 18S rDNA and rbcL gene sequences. In the present study, we describe this organism as a new species, *Phyllosiphon ari*. Phylogenetic differentiation of *Phyllosiphon* taxa, correlated with host specificity to different genera of the Araceae, suggests concerted host-pathogen co-evolution driving species diversification within this peculiar green algal lineage.

Talk

Comparing Snow Algae from High Tatra Mountains vs. Austrian Alps: Morphology and Physiology in Relationship to Phylogenetic Affiliations

Lenka Procházková[1], Daniel Remias[2], Linda Nedbalová[1]

[1]Charles University, Prague, Czech Republic, [2]University of Applied Sciences, Upper Austria

The biodiversity of extremophilic microalgae thriving polar and alpine snow fields is still under investigation. Due to the lack of cultured strains from many regions and for

many species, field blooms of green algae causing reddish snow were collected at Tyrolean Alps (Austria) and High Tatra Mountains (Slovakia). In a polyphasic approach, populations are compared in terms of morphology, photosynthetic performance, secondary pigmentation and phylogeny. For the latter, genes like 18S rDNA, ITS2 and rbcL are used.

Talk

Elucidating the Evolution and Diversity of *Uroglena*-like Colonial Chrysophytes - Polyphyletic Origin of the Morphotype

Martin Pusztai, Pavel Škaloud

Charles University, Prague, Czech Republic

This research aims to revise traditionally defined genera and the species concept within the *Uroglena*-like morphotype group (*Uroglena, Uroglenopsis, Eusphaerella*). These common colonial chrysophytes are significantly involved in shaping phytoplankton communities of temperate oligo/mesotrophic lentic ecosystems. Despite their relative importance, the species and generic concepts of *Uroglena*-like golden algae are still based merely on morphological characters. Due to their fragility and difficult cultivation, there are only six sequences stored in the GenBank database to date. We have solved problematic cultivation and molecular characterization using parallel isolation of *Uroglena*-like colonies. This allowed us to overcome existing "fundamental" problems and to partly elucidate the evolutionary history and real diversity of the group in the light of a polyphasic approach. Current main research outputs demonstrate that the *Uroglena*-like morphotype evolved independently in several phylogenetic lineages, and thus *Uroglenopsis* should be rejected as a monophyletic genus.

Talk

Prostorová distribuce biomasy rozsivek v NPP Blanice

Nela Radová, Michal Bílý

Czech University of Life Sciences, Prague, Czech Republic

Studie se zabývá sledováním distribuce biomasy rozsivek ve oligotrofních tocích NPP Blanice (Šumava), metodou instalace umělých podkladů během jedné sezóny. Celkem bylo nalezeno 52 druhů, v nejvyšších početnostech byly zastoupeny *Achnanthes minutissima*, *Fragilaria capucina*, *Gomphonema parvulum, G.* cf. *productum* a *Planothidium lanceolatum*. Na složení rozsivkových společenstev měla průkazný vliv koncentrace TP a N-NH4+, množství biomasy se ukázalo být závislé na teplotě a pH vody. Některé ze zjištěných dominantních druhů indikují změny chemismu vody přísunem živin do vodního toku.

Talk

A Cosmopolite Snow Alga Turns out to be Local: Ecophysiology of *Chloromonas brevispina* (Chlorophyceae) from the Austrian Alps

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Coloured snow made by spores of *C. brevispina* was investigated in a polyphasic approach including morphology, photosynthetic performance, secondary pigments and molecular sequences (18S rDNA, ITS2). The formation of spike structures at the cell surface and the accumulation of the carotenoid astaxanthin are seen as a strategy for survival in harsh alpine habitats. The molecular

results indicate that this formerly as cosmopolitan regarded taxon of cryoflora has to be split into several morphologic similar but distinctive, most likely locally distributed species.

Talk

Enviromental Preferences of Photobionts Associating with Epigeic *Cladonia* communities

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Little is known about the ecology of lichen photobionts so far. However, some recent studies observed that physiological responses to abiotic factors, such as temperature and light, may differ even between closely related photobionts. Thus, to ensure high fitness of the whole lichen system, the mycobiont should find the suitable photobiont genotype flourishing in local conditions. We studied the diversity of photobionts in tericolous lichen communities growing in habitats differing especially by the character of substrate (e.g. heaths on sandy soils, limestone steppes, schist and serpentinite rocks). By ITS rDNA genotyping, we found several different lineages of green alga *Asterochloris* associating with 42 studied *Cladonia* species. In general, the results indicated the intensive sharing of photobionts among fungal taxa with similar ecology, i.e. different environmental requirements of individual photobiont lineages. Substrate pH and climate seemed to be the most important factors. Our results clearly showed that particular *Cladonia* communities associate with different combinations of photobionts, forming specific lichen guilds – communities of lichens growing in the same habitat and sharing the same photobiont pool.

Poster

Diversity and Taxonomy of Freshwater and Subaerial Members of Ulvales/Ulotrichales (Ulvophyceae, Chlorophyta)

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Phylogenetic position of some ulvophycean orders has been revised lately (Škaloud et al., 2013). Nevertheless, satisfying clarification of the phylogenetic position in majority of the taxa in the order Ulvales/Ulotrichales is still absent in the current state of knowledge. We focus on the extra-marine taxa of the Ulvales/Ulotrichales and carry out their detailed morphological as well as molecular revision. Hopefully, we will be able to reassess the boundaries between these two close orders and elucidate the phylogenetic position of their freshwater and terrestrial members.

Talk

Prevailing Chaos in the Taxonomy of Trentepohliales (Ulvophyceae, Chlorophyta) – a Challenging Task of Species Delimitation

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For more than 200 years, *Trentepohlia* species have been delimited using various morphological criteria. However, recent molecular studies showed inadequacies in this approach Therefore, a precise morphological

study of the European Trentepohlia species and the re-evaluation of their phylogenetic position was necessary. Fresh *Trentepohlia* thalli were molecularly characterized by cloning and rbcL gene sequencing, which revealed a common mixture of *Trentepohlia* species in what on a first sight appears to be a homogenous crust. Phylogenetic analyses based on the rbcL confirmed the ongoing inconsistencies among morphologically and molecularly delimited species.

Poster

Molecular and Automated Identification of the Diatom Genus *Frustulia* in Northern Europe

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Molecular-assisted alpha taxonomy, which combines molecular species delimitation with post-hoc morphological examinations, has been proven to be an effective tool for the classification of morphologically similar species. We used two molecular markers to delimit species within the genus *Frustulia* and then characterized their morphology. Subsequently, we employed machine-learning methods to identify valves in benthic diatom communities. We found that a semi-supervised approach that does not rely solely on morphology but also accounts for variation among valves from natural populations has superior performance. Based on valves from natural populations, we observed marked differences in species abundances and pH tolerances.

Talk

The Plastid Genome of Some Eustigmatophyte Algae Harbours a Bacteria-derived Six-gene Cluster for Biosynthesis of a Putative Novel Bioproduct

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Genes in plastid genomes (plastomes) have been primarily inherited from the cyanobacterial plastid ancestor, but genes acquired by horizontal gene transfer (HGT) have rarely been reported, too. We present a case of HGT-mediated acquisition of a six-gene operon revealed by sequencing plastomes of the eustigmatophyte algae *Monodopsis* sp. MarTras21 and *Vischeria* sp. CAUP 202. Phylogenetic analyses showed that the operon is derived from a bacterium belonging to Cytophagales. Based on sequence analyses we suggest that the newly detected operon encodes enzymes of a pathway synthesizing a prenylated cyclitol-containing compound with a possible protective or antimicrobial function. To our knowledge, this is the first report of an expansion of the metabolic capacity of a plastid mediated by HGT.

Talk

Co-operation with Three Algal Genera Leads to a Wide Ecological Amplitude of Lichen

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The *Stereocaulon* (Lecanorales, Ascomycota) is a genus of lichenized fungi with a broad ecology and an extensive geographical dis-

tribution. It ranks among the pioneer lichens growing in harsh conditions on newly formed substrates. In this study, we aimed to find a connection between the phycobiont diversity in Stereocaulon lichens and environmental conditions. Although a single algal genus, *Asterochloris* (Trebouxiophyceae), was associated with the most of sampled thalli, two additional genera were found within the lichen thalli, as well. First, the common free-living alga *Chloroidium* was recorded as a phycobiont in numerous thalli growing on volcanic or artificial substrates. Second, the recently described genus *Vulcanochloris* was found in several lichens growing on volcanic substrata. According to our data, particular phycobiont genera occur in different climatic conditions. *Asterochloris* prefers cold and humid climate, while *Vulcanochloris* tolerates warm and extremely dry conditions. Finally, *Chloroidium* tolerates wide range of humidity but prefers moderate or warm temperatures. The mycobiont can therefore choose the best adapted alga as phycobiont in each type of habitat.

Poster

Influence of Substrate and pH to Microalgal Diversity: A Potentially Important Factor for Sympatric Speciation

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Few investigations of protist speciation have been conducted, and therefore the drivers that influence the species diversity and richness of these microorganisms remain to be fully elucidated. Huge protist diversity could be caused by limited distribution and/or by different preference of habitats, but in the case of aeroterrestrial green alga *Klebsormidium* the diversity is not mainly influenced by limited distribution, but mostly by habitat preferences. In the present study, we investigated ecological speciation in the genus *Klebsormidium*. We collected 100 strains from sandstone, basalt, granite, and limestone, sampling 2-3 localities per substrate. The sequences yielded a total of 27 genotypes having strict habitat preferences on substrate. To investigate the ecophysiological differences among the strains isolated from sandstone and limestone, we examined 12 strains representing four different genotypes. The strains were cultivated at five different pH levels ranging from pH 4 to pH 8. We determined the responses of the strains to the experimental pH conditions by (1) measuring the effective quantum yield of photosystem II, and (2) determining the growth rates after cultivation at different pH levels. Our results clearly showed a strong ecological differentiation of *Klebsormidium* clades. Strains isolated from two limestone clades showed the highest growth rates at pH 7 and pH 8 and had significantly lower growth rates at pH 4 and pH 5. Strains isolated from sandstone exhibited two different growth responses. Strains from clade E13 showed the highest growth rate at pH 6, whereas strains belonging to clade E1 showed almost identical growth rates at all of the investigated pH levels. In addition, we determined distinct ecophysiological differentiation among distantly and closely related lineages, thereby corroborating our hypothesis that the sympatric speciation of terrestrial algae is driven by ecological divergence. We clearly showed that pH is a critical ecological factor that influences the diversity of autotrophic protists in terrestrial habitats.

Poster

Sex-searching in *Zygnema* Genus

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The traditional morphological concept of the genus *Zygnema*, based on features associated with the sexual process, has not been yet, due to the failed induction of sexual reproduction in the laboratory, related to modern phylogenetic data. Thus, we study fertile natural populations. First, the traditional morphological data will be linked to molecular data. Then, this newly tested morphological concept will be related to the other particular outcomes (reconstruction of plastid morphology and ontogeny, research on polyploidy) in order to develop a robust species concept of *Zygnema* and to define the particular species on the basis of features independent on the sexual process.

Talk

Seasonal and Spatial Variation in Red Seaweed Biochemical Composition and Bioactivity Profiles – 'Pro-SeaVeg': a Case Study from Ireland

Dagmar Stengel

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This presentation will provide a brief overview of recent research in Algal BioSciences at NUI Galway, focusing on environmental impacts on seaweed productivity and metabolites with applications in environmental monitoring and industry. As an example, the 'Pro-SeaVeg' project assessed seasonal and spatial variability in pigment, fatty acid and MAA profiles as well as in vitro bioactivity in selected species of red edible seaweeds, and used cultivation methods to enhance bioactive profiles.

Talk

Environmental Factors Affecting the Bloom Dynamics of the HAB Benthic Dinoflagellate *Ostreopsis* cf. *ovata*

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Intense blooms of the toxic benthic dinoflagellate *Ostreopsis* cf. *ovata* are a recurrent phenomenon along several Mediterranean coasts and are associated with both noxious effects on human health and mortality of marine organisms, due to the production of palytoxin-like compounds. *Ostreopsis* colonize a number of benthic substrata forming a brownish mucilaginous mat that can be easily resuspended in the water column. Blooms typically develop in sheltered coastal areas characterized by rocky bottom and shallow depth. The role of environmental factors on the *Ostreopsis* bloom dynamics has been studied in the northern Adriatic Sea since 2006. The synergic effects of hydrodynamics, temperature and N:P ratios drive the *Ostreopsis* blooms, and recently, an important contribution of mixotrophy was recognised especially during the bloom maintenance.

Talk

Diverzita druhového komplexu *Micrasterias papillifera / M. radiosa* (Desmidiales)

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Druhový komplex *Micrasterias papillifera/ M. radiosa* (Desmidiales) patří mezi obyvatele ohrožených rašelinných biotopů a oba druhy jsou také využívány v biomonitoringu.

Výsledky fylogenetických analýz ukázaly, že reálná diverzita je v případě druhu *Micrasterias papillifera* Brébisson ex Ralfs mnohem menší, než nakolik se dalo předpokládat na základě množství popsaných variet. Nalezená vnitrodruhová variabilita však nekoresponduje s morfologií variet tohoto druhu. Naopak v linii zástupců druhu *M. radiosa* Ralfs se nachází pouze několik málo izolátů a půjde spíše o vzácný druh s omezeným rozšířením. Oba druhy jsou vůči sobě dobře morfologicky vymezené a jsou od sebe dobře rozpoznatelné na základě několika znaků.

Talk

pH Preferences in a Diatom Species Complex

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Ecology of diatoms is based on observational studies that correlate the occurrence of taxa with environmental variables. Unfortunately, species identification based on morphology is problematic due to widespread cryptic diversity in diatoms. The number of cryptic species recovered by molecular methods in past 20 years elicited doubts, whether small genetic differences among cryptic species are translated into functional diversity. To address this question, we experimentally determined preferences of 15 species belonging to *Eunotia bilunaris/flexuosa* species complex toward pH, which is one of the most important factors structuring diatom communities in freshwater lentic habitats. 44 strains were grown in 9 different pH levels ranging from 3 to 9. The growth of strains was measured by PAM fluorometry and modeled as a function of pH. All calculated parameters - lower and upper pH limit, optimal pH - differed significantly between both strains and species. Moreover, all parameters were significantly correlated with the pH of the source habitat. In conclusion, our results showed the presence of both intra- and interspecific variation in pH preference. At least some species in this complex differ in their fundamental pH niche and this difference has a bearing on their distribution in nature. Clearly, recognizing species diversity in *Eunotia bilunaris/flexuosa* species complex would improve environmental reconstructions.

Poster

Molecular Characterization of Four Cyanobacterial Generitypes from their Type Localities in Scandinavia

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More than three hundred cyanobacterial genera have been described up to the present. For every valid genus a type species must be specified at the time of description. Even though we have entered a time in which sequencing has become practical and widespread, the basic molecular characterization (e.g., 16S rRNA gene sequence) of most cyanobacterial type species is still lacking. About fifteen genera were described from Scandinavia. Following a field excursion in which the type localities for the type species of these genera were visited and sampled, we succeeded in finding four type species from (or very near) their type localities: *Capsosira brebissonii, Paracapsa siderophila, Pulvinularia suecica*, and *Stigonema mamillosum*. Cells or filaments of these species were isolated and used for single-cell/-filament PCR amplification of the 16S rRNA

gene, and subsequent sequencing. This allows firm establishment of epitype sequences of these genera, to which morphologically similar taxa can now be compared.

Poster

Morphometric allometry of representatives of three naviculoid genera throughout their life cycle

Kateřina Woodard, Jana Kulichová, Tereza Poláčková, Jiří Neustupa

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The diatom frustule architecture and the nature of the vegetative phase of their life cycle constrain cell size and shape. For decades, diatomists have observed that size diminution is accompanied by valve shape changes. However, allometric shape changes have rarely been assessed using quantitative statistical tools. In the present study, we employed geometric morphometrics to examine the shape dynamics of raphid diatom frustules. It was explored whether shape characteristics, such as circularity or asymmetry, and variation of valve outline, increase with decreasing cell size. Four monoclonal strains (*Luticola dismutica* strain 1, *Luticola dismutica* strain 2, *Navicula cryptocephala*, *Sellaphora pupula*) were cultivated under stable conditions for two years in order to capture the complete range of cell sizes from initial to sexually competent cells. Shape changes and the pattern of shape change relative to size were quantified using geometric morphometrics. A quantitative shape analysis revealed similar allometric trends among the different strains and genera. With decreasing cell size, complexity of the valves decreased. However, shape variation of valves within the populations increased with decreasing cell size. The levels of asymmetry did not change consistently throughout the size diminution phase. In two out of four strains, horizontal (dorsiventral) asymmetry was significantly lower than vertical (heteropolar) and transversal (sigmoid) asymmetry. The increasing morphological variation in clonal strains was likely caused by an accumulation of structural deviations during morphogenesis.

Poster

Transcriptome Analysis of the Colorless Euglenophyte *Euglena longa* Reveals the Peculiar Features of its Non-photosynthetic Plastid

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Euglena longa, the closest relative of model photosynthetic *Euglena gracilis,* possesses a non-photosynthetic plastid. Although its genome sequence is known for 16 years, its metabolic role remains elusive. To investigate its function we sequenced the transcriptome of *E. longa* and searched for nucleus-encoded plastid-targeted proteins. We did not find traces of the photosynthetic electron transport chain (except for ferredoxin and ferredoxin-NADP oxidoreductase) and heme, isoprenoids and fatty acid II synthesis pathways. Surprisingly, an almost complete Calvin cycle and synthesis of galactolipids and sulfolipids of thylakoids are retained in this plastid. Thus, the *E. longa* plastid is very different from the apicoplast of apicomplexan parasites, the best-studied model for non-photosynthetic plastids in general.

Talk

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