

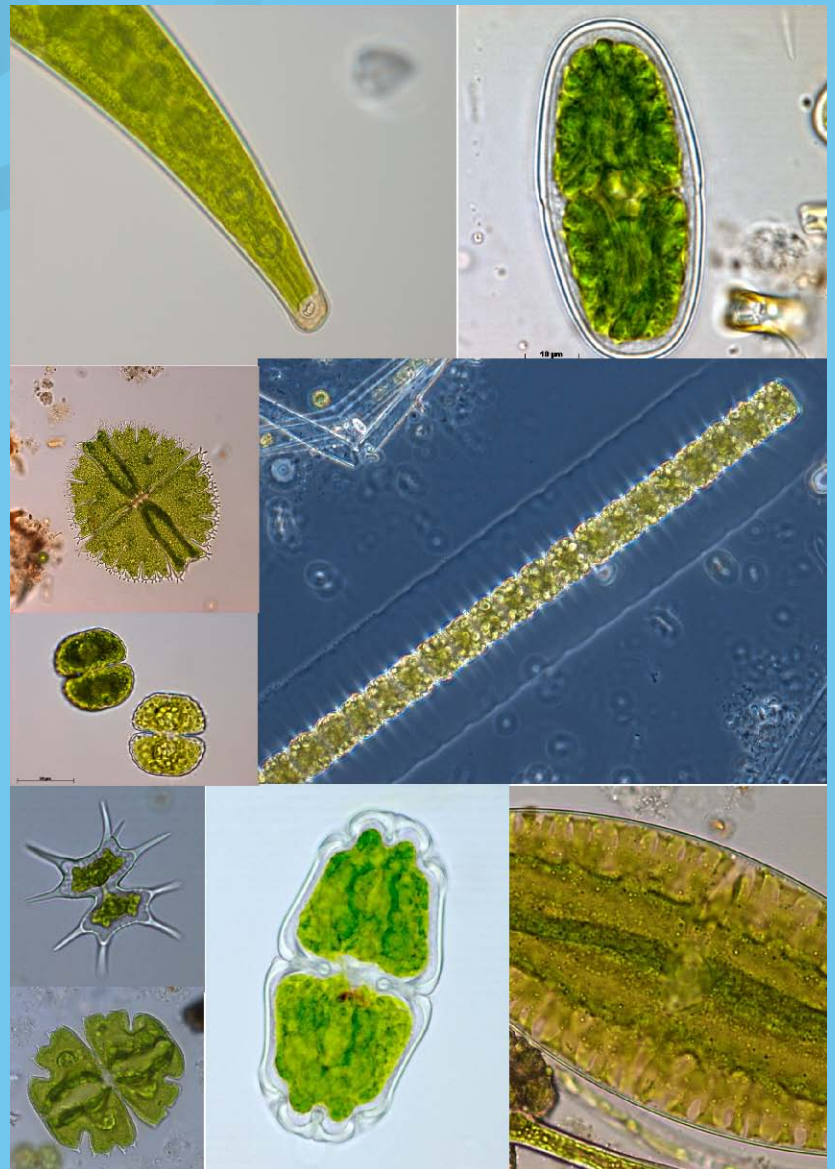
# The Phycologist

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# 2014 British Psychological Society

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**A** very warm welcome to everyone!

I hope 2014 will be a happy phycological year for you. To start us off we have a packed spring edition of *The Phycologist* for your enjoyment.

We detail expanding research and implications concerning toxicology of... diatoms. We detail a first record of a potentially invasive non-native green seaweed from the Arabian Gulf, and we have a vast number of varied reports from students who received bursaries from the British Phycological Society.

Please also note the call for nominations to Council – are you interested...??

...and if you are feeling poetic...we detail an analysis of medieval waka poetry – regarding seaweeds in Japanese culture!

Don't forget about our forthcoming Annual Meeting which will take place at the National University of Ireland Galway from 25 through 27 June 2014. Full details are posted on our website but remember that registration closes on 23 May 2014 and the final submission of abstracts in 13 June 2014. I hope to see you there!

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Remember - do keep sending in your contributions. Write to us with your phycological views, news, work events, or any matter you wish to share with readers of *The Phycologist*. YOUR input is required; all relevant material will be considered (job adverts, science reports, book reviews, news items of topical interest, meeting announcements, research news, and suggestions for future articles are always welcome). Without YOU the newsletter would not exist.

As a reminder, previous issues of *The Phycologist* can be downloaded at <http://www.brphycsoc.org/phycologist.lasso>

## THE TOXICOLOGY OF DIATOMS: EXPANDING RESEARCH AND IMPLICATIONS

So far, diatoms, in contrast to dinoflagellates, cyanobacteria and prymnesiophytes, have largely escaped identification as producers of potent toxins which can cause illness and death of animals, including humans. The known exception is the production of the neurotoxic amino acid, and cause of amnesic shellfish poisoning-, domoic acid, by species of the marine genus *Pseudo-nitzschia*. Whether domoic acid is produced by diatoms in freshwaters does not appear to have been investigated. At least 800 non-standard amino acids are known to be produced by higher plants and it would seem surprising if some of these were not also found to be synthesised by cyanobacteria and algae.

Three such amino acids, which are neurotoxic to different degrees, are produced by cyanobacteria from marine, freshwater and terrestrial environments:  $\beta$ -*N*-methylamino-L-alanine (BMAA), 2,4-diaminobutyric acid (DAB) and *N*-(2-aminoethyl)glycine (AEG). Research interest in BMAA in particular is continuing apace since: the neurotoxin occurs in food chains which include cyanobacteria as primary producers; BMAA is synthesised by axenic strains of cyanobacteria; BMAA is inserted erroneously into proteins potentially leading to protein folding errors; the toxin has been found in the brains of human victims of neurodegenerative diseases (motor neurone disease, also known as amyotrophic lateral sclerosis, and Alzheimers disease); and cyanobacterial blooms are being investigated as possible sources of BMAA in human exposures (Bradley et al., 2013).

The possibility that cyanobacteria are not the only source of BMAA in aquatic food chains has been raised by findings off Sweden's west coast of BMAA in mussels in regions where cyanobacterial populations were minimal and blooms of diatoms and dinoflagellates are dominant. Subsequently, BMAA was identified by validated methods in axenic monocultures of six marine diatoms after rigorous serial subculture: in isolates of *Achanthes* sp., *Navicula pelliculosa*, *Proboscia inermis*, two strains of *Skeletonema marinoi* and *Thalassiosira* sp. (Jiang et al., 2014). Research is needed, and will doubtless follow, on whether diatoms in other environments, not least in freshwaters, produce BMAA and other neurotoxic amino acids.

The formulation of risk management measures for the

health protection of drinking water sources and of recreational waterbodies in the freshwater sector has focussed on cyanobacterial mass populations and cyanotoxins over recent years. These measures have included- and continue to involve toxicity assessments, exposure assessments of potential at-risk groups (humans, animals, plants) and the identification and application of protective and, ideally, preventative procedures. Such measures may need to be extended to include diatoms in high resource marine environments, e.g. shellfish farms and certainly to natural and controlled freshwaters, if freshwater diatoms are found to produce BMAA or other toxic metabolites.

Diatoms are receiving intense attention for reasons other than their potential to produce toxic metabolites and a high percentage of the available human resources, skills and patience in phycology, is devoted to these micro-algae. This is especially so in the European Union where the imminent, obligatory implementation of the European Water Framework Directive requires the intensive environmental monitoring of diatoms in freshwaters, as indicators of trophic status and water quality. The contribution of diatoms to BMAA production in marine waters and whether they produce this and related neurotoxins in freshwaters will surely require that (some) diatom research and management resources are applied to the ecotoxicology of these fascinating organisms.

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## THE UK MARINE CLIMATE CHANGE IMPACTS PARTNERSHIP LAUNCHES THE 2013 ANNUAL REPORT CARD

The United Kingdom Marine Climate Change Impacts Partnership (MCCIP) brings together scientists and policy makers from universities, government, government agencies and non-governmental organisations to provide co-ordinated advice on the impacts of climate change in UK waters. One of the main

activities of the MCCIP is the production of an annual report card supported by scientific documents which have been peer-reviewed. This report card provides an update on the understanding of the impacts of climate change on the UK and Republic of Ireland (RoI) marine ecosystem and associated services.

The MCCIP has recently launched the 2013 annual report card. Peer reviewed scientific reports support the 33 topics considered which include temperature, salinity, ocean acidification, eutrophication, plankton, harmful algal blooms (HABs), non-native species, aquaculture and fisheries.

Plankton and HAB highlights from the supporting scientific reviews reveal a decrease in dinoflagellates in the north east Atlantic and North Sea areas as well as changes in the timing of some plankton production. HABs remain a concern in both the UK and RoI with blooms of *Karenia mikimotoi* continuing to impact areas with an Atlantic influence. Closures of shellfish harvesting areas are still enforced in both UK and RoI due to high concentrations of algal toxins in shellfish flesh. Since the previous report card in 2011, the first closures of shellfish

harvesting areas as a result of concentrations of azaspiracids (AZA) above the EU closure limit have also been enforced in Scottish waters. Prior to this, closures for AZA had only been enforced in the RoI. The MCCIP annual report card can be found at <http://www.mccip.org.uk/media/18758/mccip-arc2013.pdf>. The individual supporting scientific reviews can be found at <http://www.mccip.org.uk/annual-report-card/2013.aspx/#Supporting>. For further information about the MCCIP please contact [office@MCCIP.org](mailto:office@MCCIP.org).

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## **TRAINING –THE KEY TO SUSTAINABLE GROWTH OF THE ALGAL BIOTECHNOLOGY SECTOR**

Algae arguably form the most diverse group of organisms on earth and their importance in global biogeochemical cycles and as the “engines” that drive aquatic food webs will be fully appreciated by readers of the *Phycologist*. After all... “Algae are responsible for the oxygen in every second breath we take”. However, it is their biotechnological potential that has excited individuals, policy makers, industrialists etc well beyond the traditional constituency of the Phycological community. In the last 10 years hundreds of millions of Euros/Dollars/even pounds have been invested in the exploration and exploitation of these enigmatic organisms! We all know about the technical and commercial success of, as yet, a handful of cyanobacterial and protistan taxa (*Arthrospira/Spirulina*, *Chlorella*, *Dunaliella*, *Haematococcus*..), but these are purely the tip of the algal iceberg and there remains a wealth of potential to be exploited. The almost unbelievable amount of scientific and commercial interest has been primarily due to the potential of algal biofuels. The possibility of generating transport fuels, specifically aviation fuel, from algae has been the major factor in raising the profile of phycology from being a relatively niche sector into the scientific and commercial mainstream. Most workers and increasing commercial investors realise that the goal of large-scale renewable energy production is not a quick fix and may take decades to be achieved. However, on the journey to that objective a new commercial sector has evolved with hundreds of companies world-wide exploring and/or exploiting algae commercially. The development and growth of this new sector will soon be faced with the serious problem of lack of skilled professionals. Over the past years the Scottish Association for Marine Science (SAMS) has noticed and responded to international demand from both academia and companies for appropriately trained scientists and technicians by offering specialised courses for continuing professional development (CPD). The British Phycologi-

cal Society (BPS) and the International Society for Applied Phycology (ISAP) have reacted too by offering funding to students undertakings such as CPD events at SAMS and elsewhere. Taking training and education several steps further, this year SAMS is launching a master’s degree (MRes) in Algal Biotechnology, validated by Aberdeen University. The 12-month programme consists of one taught semester (September-December) followed by an extended research project and dissertation over nine months. The course will be delivered by a team of research-active scientists, working on multidisciplinary projects researching the application of algae in the development of: biofuels, functional foods, pigments and antioxidants, pollution control and bioremediation, bioprospecting for bioactives, and aquaculture. The aim of the programme is to equip students with transferable skills relevant to the burgeoning biofuels, aquaculture, environment and biotechnology industries. These are exciting times. There are so many avenues to investigate. So many outcomes yet to be found. So many solutions needed. Come and explore with us. For more detail see.. <http://www.sams.ac.uk/education/postgraduate/algal-biotechnology>

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# STUDENT BURSARY REPORTS

## 10th International Temperate Reefs Symposium: A Perth-Fect experience



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The International Temperate Reefs Symposium (ITRS) is the premier conference for marine scientists working on temperate hard-bottom habitats. The scope is broad, encompassing natural rocky reefs, man-made structures, and biogenic surfaces. Many world-leading scientists and practitioners comprise a committed ITRS family, and scientific collaboration and communication is a key focus.

I attended the 10th ITRS at the spectacular University of Western Australia, Perth, in January 2014. The overarching theme for the 2014 meeting was Ecological Transitions. The conference spanned 5 days and was partitioned into 7 themes, reflecting the diversity of interests of delegates. A post-conference symposium focused on KEEN: Kelp Ecosystem Ecology Network. Plenary sessions and theme keynotes were delivered by highly esteemed senior reefers, including Professor Steve Hawkins, Professor Tony Underwood, Dr Dan Reed and one of my own supervisory team, Dr Louise Firth. A personal highlight was listening to CSIRO's Dr Alistair Hobday discussing the importance of applied research and partnership with management agencies for

tackling the challenges of climate change. As a PhD student working on an applied ecological conservation project, this inspired and encouraged me to stick to my convictions about the value and potential impact of applied science, in a world where blue sky research often receives greater esteem. As part of the Human Impacts theme, I delivered an oral presentation entitled "Building-in beneficial features: an artificial rockpool case study". In the third year of my PhD study, this was a tremendous opportunity to present my research to experts in the field and to seek valuable feedback before entering the critical final stage of the project. A lively poster session and dynamic social programme also allowed me to meet a wide range of people at all stages of their careers. I have returned to work at Aberystwyth University with a renewed sense of excitement about my research and potential future career. Productivity evels are soaring and I am truly grateful to the BPS for their generous grant funding which allowed me to attend this conference.

# International Water Association Symposium

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Last year I was extremely fortunate to be awarded a BPS Student Bursary to help fund my attendance at the International Water Association symposium on Off-Flavours in the Aquatic Environment held from October 27th – November 1st 2013 at Tainan's National Cheng Kung University in Taiwan. The symposium, held every two years, unites academic institutions, water companies, research centers, fisheries and industry professionals from across the world with a common interest in taste and odours in the aquatic environment.

The first day began with a plenary session, followed by a session on off-flavours in source water. During this session, I presented my work on 'Cyanobacterial release of geosmin and the potential role of cyanophages'. The symposium was a great platform on which to present my PhD research and to introduce people to a previously overlooked potential role that viruses can play in taste and odour (T/O) outbreaks.

Sessions that followed included: biology and biomolecular methods, water treatment, analytical and monitoring methods, off-flavours in other media, management of T/O's and also a number of key note speeches from leading professionals in the field. A particular highlight for me was learning more about emerging molecular techniques for the rapid and specific detection of taste and odour producers and their potential use in advance warning systems. There was also an opportunity to attend a technical tour mid-way through the week to the Chen-Chin Lake and Waterworks in neighboring Kaohsiung to learn more about the advanced treatment techniques in use.

I would like to extend my gratitude to the British Phycological Society and also the University of Bristol Alumni Foundation for helping make this once in a lifetime trip a reality; it was an amazing opportunity to experience a culture so different to my own and network with key researchers in this field all at the same time. The symposium also gave me the opportunity to synthesise my ideas and draw from leading experts in other fields, in particular water treatment scientists, organic chemists and policy makers, before embarking on writing my thesis.

# BPS SMALL GRANTS SCHEME

## Ultrastructural and molecular study of compatible and incompatible interactions of the holocarpic, marine oomycete *Eurychasma dicksonii* with brown algal host species

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Dr Beakes G. (University of Newcastle), prof. Katsaros C. (University of Athens).

It's an honor that the Awards and Training Committee of the British Phycological Council considered and approved my application.

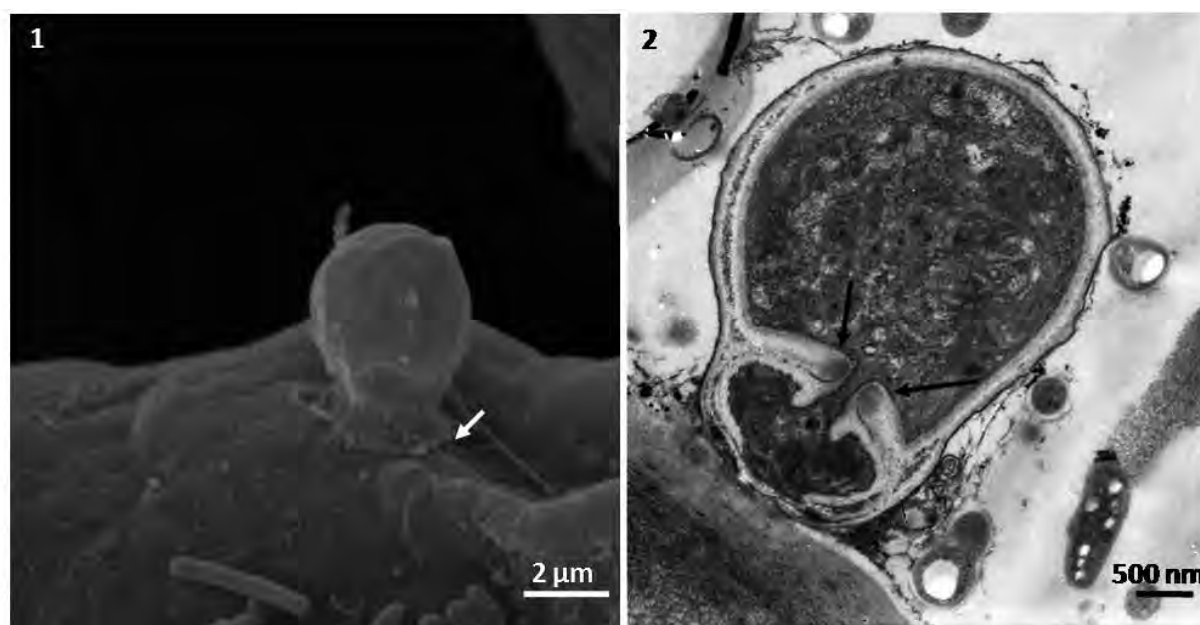
A few months after the positive answer, I visited Dr Beakes in Newcastle University for the ultrastructural study. There, I was enabled to use all the facilities of the fully-equipped EM lab of the university. At the same time, I received precious guidelines and ideas from Dr Beakes that helped me elaborate on the first encouraging results. The key findings of this work will be correlated with molecular studies accomplished in Oban by Dr Gachon and the preliminary results from Transmission Electron Microscopy and Scanning Electron Microscopy gained in Athens under Prof. Katsaros's supervision. The objective is to publish these results in a high-ranking peer-reviewed journal.

Once again, I'd like to express my gratitude to the British Phycological Society for giving me the chance to visit labs abroad and collaborate with renowned UK scientists. The

accomplishment of this scientific work would not have been possible without this grant.

When I started my PhD on brown algae infected by oomycetes in the National and Kapodistrian University of Athens three years ago, I was aware that the finding of funding sources for my research wouldn't be easy. However, I took the decision, despite the economic crisis that hits Greece, to undertake the research in my country. Having been a member of British Phycological Society for two years (BPS), I applied for a Project Award with a proposal that comprises a crucial part of my PhD: the study of the host-parasite interactions in the system of brown algae infected by the oomycete *Eurychasma dicksonii*.

There were two main reasons for me to apply for this grant. The first was that the accomplishment of the experiments required equipment that no longer exists in our home lab, due to the crisis. Apart from that, this project would be an ideal opportunity for collaboration between scientists working on the pathogenicity of brown algae from different aspects: Dr Gachon C. (S.A.M.S., Oban),



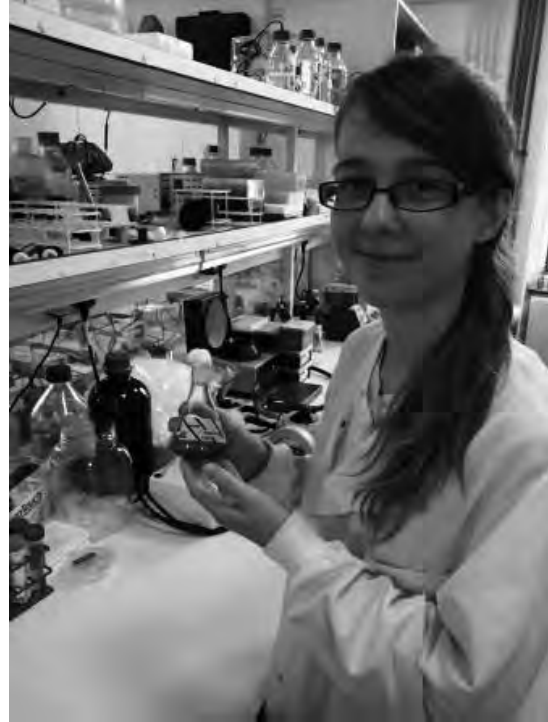
**Figures 1-2.** *Eurychasma dicksonii* spores attached to the host cell wall. **Fig. 1.** Scanning electron microscopy (SEM) image. Arrow shows fibrillar material that seems to stabilize the adhesion of the spore to the host surface. **Fig. 2.** Transmission electron microscopy image (TEM). Arrows show cell wall protrusions that form a channel through which a needle-like penetration tool passes in order to rupture the host cell wall.

# Lipid production in algal-bacterial co-cultures species

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Through the money kindly granted to me from the British Phycological Society, I was able to undertake a summer project between my 2nd and 3rd undergraduate years on algal-bacterial symbioses in the Plant Sciences Department at the University of Cambridge for 8 sunny weeks. I arrived on my first day in knots of nerves, but the friendliness and helpfulness of not just my supervisors, but of everyone in the lab, helped me feel welcome and at ease, and I am very sad to leave with so many ideas and further experiments buzzing around my head to be finished.

For the first week I was testing kits, problem-solving, making mistakes (and learning from them) and in no time at all I had my own experiment of algae in neat rows of flasks, incubating away. I began by carefully inoculating my alga, *Lobomonas rostrata*, either axenically, or in coculture with a bacterium, *Mesorhizobium loti*, into growth media. These two organisms happily form a symbiosis when the alga has limited access to vitamin B12, and I wanted to test if this interaction affected the ability of the alga to make storage lipids, which can be induced by nutrient-deficiency. The cultures were therefore left merrily swimming in nitrogen-rich or -poor media, I expected some remarkable data, and with a self-congratulatory pat on the back, went home for the day. Science is not all sunshine, however, and of course, at the end of 2 long weeks I had a mess of results. No matter! On careful repetition, my new results were again contradictory, yet interesting; all because of one (we thought unimportant) variable – light regime. Experiments before mine had previously shown lipid accumulation, yet such flasks had been left in 24 hour light, whereas mine were subject to a diurnal day/night cycle, and produced not a single oily drop. I'm delighted to have spawned new hypotheses based on my work to account for my data, and I hope I will be able to follow any further investigations into my project to their end, even if that might not be behind a bench with a pipette in hand as I'd like.



Doing this summer project has been invaluable for me in terms of knowledge. I attended symbiosis mini-meetings, listened to everyone's ideas, and read plenty of papers. I spent many an hour in computer rooms typing up data in frustration as I desperately tried to remember my statistics lectures from long ago. But knowledge is maybe not the most important thing I have built upon this summer; instead, it is my confidence, and my engagement with others. I am more grateful to the people in the lab for being friendly and accommodating than perhaps they realise.

Although I am sad to leave, I will be back in the department as a final year Plant Sciences student in no time; and, with luck, I will be better equipped to deal with my new upcoming project – thanks to everyone I've had the good fortune to work with this summer.

# International Phycology Congress

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The 10th edition of the International Phycology Congress titled “Algae in a changing world” was held in Orlando, Florida from 4 – 10 August, 2013. The opening ceremony was held on the 4th of August at the conference venue, Marriot’s Hotel, Orlando. The conference served as a platform for experts and young researchers in the field of phycology to interact and share opinions on challenges and new technological developments on the impact of algae (macro and micro) on our changing globe. Two congress excursion trips were made to Florida springs, India river lagoon and John Kennedy space center.

In general, the conference topics spanned across different areas of phycology such as evolution and algal biology, trends in applied phycology, algae and biogeochemical cycles freshwater and marine biodiversity, global change, algal genomics, physiological ecology, algal biodiversity, “omics” in phycology, bioreactor designs and applications, and aquaculture. Excellent oral and poster presentations were given by different speakers from the academia, research agencies and industry. Four plenary sessions were given over the whole conference and really captivating was the presenta-

tion titled “Dawn in the Age of Robotic Phycology” by O. M. Schofield, Rutgers University, USA.

I had the opportunity of making an oral presentation on my work titled “shaken micro-bioreactor platform for parallel evaluation of microalgae cultivation and implications for scale-up” under the session titled aquaculture, a continuation of a series on the trends in applied phycology. High throughput parallel evaluation of cultivation parameters become important for early understanding of the strains of interest and equally assessing suitability for purpose of interest. Several areas of applications were identified in presentations given by other attendees. Examples include; Enhancement of poly-unsaturated fatty acids (PUFAs), phycobilins and carotenoids in two Irish macroalgal species (*Palmaria palmata*, *Fucus serratus*) through optimised cultivation, by M. Schmid and D. B. Stengel, NUI Galway, Ireland; Diatoms from the Genus *Nitzschia* for large-scale cultivation for lipid and Omega-3 Fatty Acids (EPA and DHA) by A. Pinowska General Atomics, USA.

Attending this conference gave me the opportunity to interact with top leading phycologist and also create a functional network with many other faculty members and young researchers from various backgrounds and origins. My appreciation goes to British Phycological Society for supporting my attendance at such an important and unique conference.



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I am a second year PhD student in the algal research group of Dr. Dagmar Stengel at the National University of Ireland Galway. My research is part of NutraMara, the Marine Functional Food Research Initiative, which aims at an optimised utilisation of Ireland’s marine resource for use in Functional Foods. My research topic focuses on the effects of extrinsic factors (e.g. temperature, light and salinity) on the variation of key bioactive compounds (e.g. fatty acids, carotenoids and phycobilins) in marine macroalgae. I therefore investigate natural variability in field-collected samples as well as optimised culture conditions for seaweeds as a source of bioactive compounds. My PhD research has

already lead to quite interesting findings and I was eager to share these with a greater audience.

The 10th International Phycological Congress (IPC10) presented an excellent opportunity for this and so I was very happy to receive the travel bursary to support the attendance of this conference. The IPC10 drew scientists and companies from around the world to discuss and exchange knowledge of the state-of-art in algal research. The overarching theme of the IPC10 was “Algae in a changing world” and specifically focused on the effect of changing environmental conditions on seaweeds and microalgae. Hence the overall theme matched perfectly for my research project and gave me the opportunity to deepen my existing knowledge by listening to a great number of outstanding presentations and posters on novel findings in algal research. The attendance of IPC10 also gave me the opportunity to present my own work to specialists from around the world. My talk was entitled “Enhancement of PUFAs, phycobilins and carotenoids in two Irish macroalgal species (*Palmaria palmata*, *Fucus serratus*) through optimised cultivation, “and included results of field assessments as well as culture experiments. I believe the talk was well received and it represented an important stepping stone for many interesting conversations, which left me with many new ideas and great motivation for the remaining research in my project. In addition to the scientific programme, the conference also was a perfect opportunity to deepen existing friendships and make new ones with students from around the world. I am very grateful for receiving the travel award which gave me the opportunity to attend this excellent conference.

# 10th International Phycological Congress, Orlando, Florida 2013

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I am currently a PhD student at the University of New Brunswick, Canada, in the final year of my degree, studying the distribution of the kelp *Saccharina groenlandica* in the North Atlantic Ocean. I received funding from the British Phycological Society to attend the 10th International Phycological Congress (IPC 10).

The 10th International Phycological Congress was held in Orlando, Florida, USA from August 4-10, 2013. The meeting was held in conjunction with the Phycological Society of America (PSA). The theme of this year's meeting was Algae in a changing world, which recognized the roles algae play in a world where environmental changes are rapidly accelerating. The program for IPC 10 consisted of four plenary lectures, 12 symposia, 25 contributed oral sessions, and 130 posters. There were also four workshops held mid-week on teaching for understanding in phycology, the *Laurencia* complex, *Saccharina*, and managing microalgal cultures for practical applications.

Each morning started with a plenary lecture fitting the overarching theme of Algae in a changing world. The plenary speakers had a wide range of scientific backgrounds that were all tied together by the importance of algae in a changing world. The plenary speakers were Dr. David Schiel (University of Canterbury, New Zealand), Dr. Lynn Rothschild (NASA, USA), Dr. Martin Hagemann (Univer-

sity of Rostock, Germany) and Dr. Oscar Schofield (Rutgers University, USA).

The students competing for the Bold Award for best student talk presented in the afternoon on the first and second day. I presented my talk entitled "Observations on the abundance and distribution of the kelp *Saccharina groenlandica* in the Atlantic Ocean, emphasizing North America" on Monday afternoon. I had a full house for my talk and received very insightful questions. I also enjoyed discussing current kelp research with other principal investigators and students during the coffee breaks and poster sessions.

This conference provided me with the opportunity to present a chapter of my PhD thesis on the distribution of *S. groenlandica*. This was also my first time attending an IPC or a PSA meeting. This conference allowed me to present my research to an international audience and make connections with other researchers in my field. I also had the chance to network for a postdoctoral position. I am extremely grateful to the British Phycological Society for their financial support to attend this meeting by providing the funds to cover my airline ticket from New Brunswick, Canada to Orlando. I would also like to thank my supervisor, Dr. Gary Saunders, for his guidance and continuous support during my PhD.

# How divergent are the chloroplasts of *Karenia brevis*, *Karenia mikimotoi* and *Karlodinium veneficum* from each other?

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I have just finished my 2nd year at Cambridge University where I am reading Natural Sciences. At the start of this year my director of studies, at our termly meetings, asked me what I wanted to do once I had finished with University and I really wasn't too sure; up until that point I'd only really been focusing on trying to pass my degree!

This marked the beginning of a couple of months where I was plagued with thoughts about my future; I was clueless and just couldn't resolve it. Thankfully the solution came when one of my teachers, Richard Dorrell, told me that he was an evolutionary biologist who primarily studied serial endosymbiosis in algae and that he was open to having a summer student. I had vaguely touched on endosymbiosis in my lectures and had always found it interesting, the idea of two organisms over time becoming one always seemed surreal to me! Thankfully a summer studentship awarded to me by BPS enabled me to carry out a summer project supervised by Richard.

The project which Richard assigned me was largely focused on answering the question: How divergent are the chloroplasts of *Karenia brevis*, *Karenia mikimotoi* and *Karlodinium veneficum* from each other? These three species form a monophyletic group, and they theoretically all have the same chloroplasts derived from a haptophyte species during a serial endosymbiotic event which took place in one of their ancestors; However they could have speciated up to 250-300 Mya, which is obviously long enough ago for changes in the chloroplasts to accumulate.

There were four lines of investigation in my project, the first of which was to investigate the order of the chloroplast genome in *Karenia mikimotoi*. We performed PCRs against combinations of genes that were likely to be adjacent to one another in the *K. mikimotoi* chloroplast genome, predicted using publis-



hed chloroplast genome sequences for *Karlodinium veneficum*, and the model haptophyte species *Emiliania huxleyi*. However we were unable to pull out any products.

The next line of investigation was an RT-PCR. Richard had already carried out work which showed that chloroplast mRNAs in *K. mikimotoi* receive a 3' poly(U) tail. Poly(U) tails in other dinoflagellates are associated with the production of translationally functional chloroplast mRNAs. We wished to determine whether non-coding transcripts in *K. mikimotoi* likewise receive poly(U) tails. We performed RT-PCRs against non-coding regions of the *K. mikimotoi* chloroplast genome, and found that relatively few non-coding transcripts containing poly(U) tails were. In context of the broad question of my project, this provides evidence that transcript processing I have just finished my 2nd year at Cambridge University where I am reading Natural Sciences. At the start of this year my director of studies, at our termly meetings, asked me what I wanted to do once I had finished with University and I really wasn't too sure; up until that point I'd only really been focusing on trying to pass my degree!

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Richard also set me two bio-informatic tasks. The first of which was to work out how individual chloroplast genes in the *Karenia mikimotoi*, *Karenia brevis* and *Karlodinium veneficum* chloroplast genomes have diverged from free-living haptophytes, and from each other. To do this, chloroplast protein sequences were extracted for each species, single gene alignments were constructed, and I then manually tabulated

sequence insertions that had arisen in each species since endosymbiosis. I found that many of the insertions appeared to be ancient, which implies a relatively slow rate of gain. However there were also lots of very obvious differences between *Karenia* and *Karlodinium* and other algal chloroplast species. This may imply that the chloroplast gene sequences of each species have diverged progressively from free-living haptophytes.

The final part of my project was to create a phylogeny (Fig. 1), using the whole chloroplast transcriptome of each species. Previous studies based on smaller numbers of genes have firmly grouped fucoxanthin chloroplasts within the haptophytes, but have not been able to resolve a clear phylogenetic position. The tree that I produced placed the fucoxanthin chloroplasts within the haptophytes, but without a clear sister-group; more sampling within the haptophytes may be required to get the resolution of the tree that we desired and, furthermore, this may require species that are not even discovered yet!

I thoroughly enjoyed my summer research project. I felt that I had the true researching scientist's experience, performing experiments, getting non desired results, keeping a lab book, going to a conference and even giving a lab talk. It was an experience that I shall remember for the rest of my life and one of which I will turn to when the time comes to make a decision on the big scary thing that is my future.

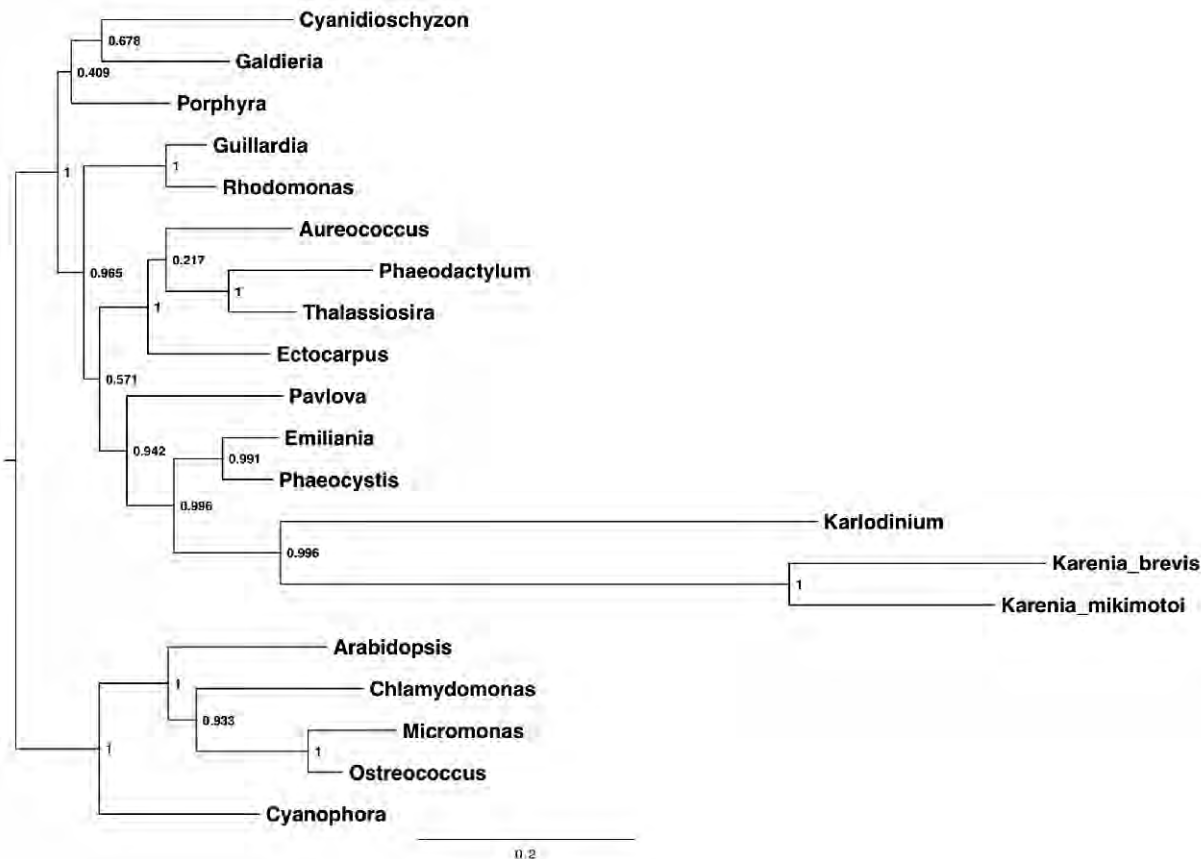


Fig. 1. 29 gene PhyML chloroplast phylogeny

# EMBO Workshop on the molecular life of diatoms in Paris, France: a three days summer tale from 25 – 28 june 2013

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The international EMBO Workshop on the Molecular Life of Diatoms (MLoD) took place in the heart of sunny Paris at the beautiful Collège de France, the intellectual home of French science since its foundation in 1530. Continuing in the great spirit of the first MLoD meeting in Atlanta (GA, US) in June 2011, the Paris meeting brought together 178 scientists, providing a great showcase for research on genomics and molecular genetics of diatoms worldwide and providing this active and growing research community with an important meeting point to share recent research findings, establish new collaborations and open up novel research directions.

**Topics of the meeting.** The outstanding programme included 19 invited talks, 38 short talks and 76 posters that were displayed throughout the workshop. It was truly inspiring that most members of the molecular diatom community are well connected and apply cross-disciplinary research approaches, taking advantage of sophisticated novel molecular tools to manipulate the diatom cell in order to study the molecular foundations of all aspects of diatom biology. Emerging insights from diatom genome and genetic manipulation projects have facilitated a step change in understanding of this globally important and fascinating group of algae.

There were talks and posters on cell biology, physiology, biotechnology, oceanography as well as evolution and ecology, which were presented in consecutive sessions and allowed MLoD 2013 participants to discuss topics ranging from oceanography to materials sciences. During the cell biology session, participants heard invited talks on silica structure formation, secretion of adhesive substances and molecular control of cell cycle in diatoms. Furthermore, they were intrigued by two short talks on small non-coding RNAs in diatoms, highlighting the novelty of this research topic. Next, there were talks and posters on physiology, which showed emerging insights from diatom genome projects. Here, talks on genome sequencing projects, including the coastal bloom-forming diatom *Pseudo-nitzschia* multiseriata, the oceanic diatom *Thalassiosira oceanica* and the psychrophilic diatom

*Fragilariopsis cylindrus* joined in. Additionally, presentations on light acclimation, sensing of environmental stress, metabolic ion fluxes and C4-metabolism in diatoms provided new insights into the molecular foundations of the success of diatoms in the natural environment. In the biotechnology session, genomics-enabled projects on lipid accumulation in diatoms as well as the use of diatoms as bioreactors to synthesise therapeutics and biopolymers fascinated the participants. Moreover, during the oceanography session, participants were captivated by talks on the role of diatoms in the world ocean silica cycle, global ocean models linking physiological traits to global biogeography and biogeographical insights into the complexity of marine diatom communities from the Tara Expeditions (<http://oceans.taraexpeditions.org/>). On the last day of the workshop, participants discussed the origin and evolutionary history of diatoms, including new insights from phylogenomic approaches. A pioneering project on the genetic and epigenetic bases of adaptation in the model diatom *Phaeodactylum tricornutum* aimed to link evolution and ecology. Finally, during the ecology/signalling session participants could hear talks on the identification and evolution of the sex locus in diatoms, a phytochrome photoreceptor and interactions between bacteria and diatoms. They also paid attention to what I had to say about a light-driven rhodopsin proton pump in the psychrophilic diatom *Fragilariopsis cylindrus*. Here, I presented the first direct experimental evidence for proton-pumping rhodopsins in marine eukaryotic phytoplankton, a process that may provide a trace metal-independent mechanism to enhance ATP production when photosynthesis is iron-limited. In summary, the presented science at MLoD 2013 emphasised the improved understanding of the molecular structure and function of diatoms, their role in ecology, and their use in biotechnology and synthetic biology.

Despite the packed scientific programme, there was time for participants to interact informally during the welcome reception at the fascinating “En Vie – Alive” exhibition at the Électricité de France Foundation (<http://thisisalive.com/>), coffee breaks, buffet lunches, and the social activities including a traditional game of boules and a conference dinner/dance at the famous Parisian Brasserie La Coupole, where participants proved that they look as good on an Art Deco dance floor as they do on the speaker’s podium.

**Future perspectives of MLoD.** All participants agreed that MLoD 2013 in Paris presented the best research at the forefront of molecular diatom research and built upon the great success of the first MLoD meeting in 2011. MLoD now seems to become a biennial event and future meetings are scheduled for 2015 in Seattle (WA, US) and 2017 in Norwich (UK).

**Acknowledgements.** I am grateful to the British Phycological Society for supporting my attendance. It allowed me to take part in a stimulating meeting and to shine in the limelight during my 15-minute short talk. I left Paris with the exhilarating feeling of being a member of a great and collaborative research community.

# NOTE ON *CAULERPA RAMOSA* VAR. *LAMOUREUXII* F. *REQUIENII*: THE FIRST RECORD OF A POTENTIALLY INVASIVE NON-NATIVE GREEN SEAWEED FROM THE ARABIAN GULF

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There are eight species of *Caulerpa* Lamouroux (Caulerpales, Chlorophyta) and two infraspecific taxa known from the 'Gulf' (Arabian/Persian Gulf) of which *Caulerpa sertularioides* (S.G. Gmelin) M. Howe (including forma/ *ecadfarlowii* (Weber-van Bosse) Børgesen), *C. Mexicana* Sonder ex Kützing and *C. nummularia* Harvey ex J. Agardh are recorded from the Southern Gulf (Arabian side). *Caulerpa racemosa* was discovered in the Southern Gulf in September 2010 during a survey by a diving team of the Emirates Marine Environmental Group of the seaweeds and seagrasses within an artificial peninsula known as Palm Jebel Ali, the largest and most recently completed (2008) of three similar constructions along the coast of Dubai, United Arab Emirates (UAE). All these so-called 'Palms' consist of a crescent-shaped outer breakwater surrounding a central causeway ('trunk') bearing side arms or 'fronds' (see Fig. 1).

The recently discovered *Caulerpa* has spherical or slightly compressed, unconstricted or slightly constricted, simple or occasionally distichously divided upright branches arising from creeping, stoloniferous branches anchored by pillar-like rhizoidal extensions (see Fig. 2A-D). Photographs and samples of the material collected in Dubai were sent by Laurence Vanneyre (LV) to the third author (DMJ) who discovered that it did not correspond to any of the *Caulerpa*'s reported from the Gulf. A sample sent to Willem Prud'homme van Reine was identified as *Caulerpa racemosa* var. *lamourouxii*. *requienii*, a species only recorded previously from Iran in the Gulf but as variety *macrophysa* (Sonder ex Kützing) W.R. Taylor (see John and Al Thani 2014)

This short communication summarises the current state of our knowledge of this non-native in Dubai, provides information on its spread over the past four years, and speculates on the possible source of the introduction and the vector involved.

***Caulerpa racemosa* (Forsskål) J. Agardh var. *lamourouxii* f. *requienii* (Montagne) Weber-van Bosse**

Originally described from Suez in the Red Sea by Montagne (1856, p. 454) as *Herpochaeta requienii*, later transferred by Agardh (1873) to the genus *Caulerpa* and

then relegated by Weber-van Bosse (1898) to a form of *C. racemosa* under var. *lamourouxii*. It differs from the type form in having simple or irregularly divided uprights rather than dichotomously divided ones and is not known to produce vesicular side branches. Doubt attaches to the status and molecular identity of form *requienii* from the Red Sea (Olivier De Clerck and Thomas Sauvage, pers. comm.). Ongoing molecular sequencing of the Dubai material and comparison to Red Sea *Caulerpa* species should shed further light on its taxonomic identity. Besides *requienii* there are two other forms of *C. racemosa* in the Mediterranean of which one is considered by Verlaque et al. (2000, 2003) to be 'invasive'. Morphological and molecular-genetic studies (see Klein and Verlaque 2008, Verlaque et al. 2003, Renoncourt and Meinesz 2002) on this invasive form have shown it to be *C. racemosavar. cylindracea* (Sonder) Verlaque, Huisman and Boudouresque, an endemic from south-western Australia.

The form is widely distributed in the Indian and Pacific Ocean (e.g. New Guinea, Friendly Islands, Indonesia, Guadeloupe, Hawaii, Marshall Islands), several countries in the Levantine basin of the Eastern Mediterranean (e.g. Greece, Turkey, Syria, Israel, Cyprus) and the Red Sea, including the 'bitter lakes' in the Suez Canal (Al-eem 1980). It seems to be one of several varieties/forms of *C. racemosa* that have migrated from the Red Sea (i.e. Lessepsian migrant) following the opening of the Suez Canal in 1869.

## Distribution and Spread within Palm Jebel Ali

The ecological survey of Palm Jebel Ali (Fig. 1) by the Emirates Marine Environmental Group was carried out between July 2010 and March 2012 and involved determining the mean percentage cover of all benthic plants by visually estimating their percentage cover in 1m<sup>2</sup> quadrats sampled at 25 m intervals along 250 m transect lines at depths ranging from 3-7 m. Three transect lines were surveyed on each occasion although only two of the frond channels (A-B, C-D) were revisited. Three species of seagrasses were encountered, covering until almost 18% of seabed in each of the channels. The new *Caulerpa* was not observed between July and August in 2010 along the west side of the main 'trunk' of Palm Jebel Ali and was first discovered in September 2010 in the channel between fronds 0 and P (see Fig. 1) where its cover was estimated to be almost 1%. It was not discovered in the channel between fronds A and B when surveyed a month later although by July 2011 the *Caulerpa* covered about 3% of the floor of this channel and the seagrass *Halophilastipulacea* was not recorded despite having an almost 7% cover in November 2010. The cover

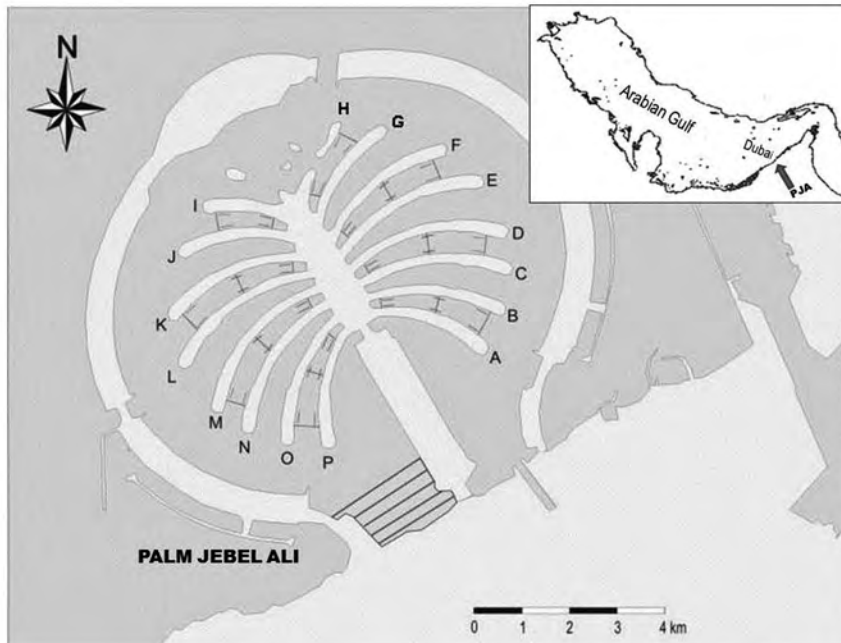


Fig. 1. Map of Palm Jebel Ali and letters refer to the side arms ('frond') mentioned in the text and the dive transects conducted during underwater surveys. The inset shows the position of Dubai Emirate within the Arabian Gulf.

of *Caulerpa* in the channel between fronds C and D was about 0.5% in December 2011 and a month later cover was about 5%. Cover estimates varied from about 0.3-9% in other channels sampled during 2011 and in one channels (M-N) it was estimated to be about 77% in March 2012 (Laurence Vanneyre, pers. observ.). During this month seagrass cover within the outer breakwater in the palm was estimated to be about 0.25% and little and or other marine life were recorded unlike earlier surveys when live fan clams, pearl oysters and some fishes were noted.

In summary, the introduction first appeared in Palm Jebel Ali in September 2010 and spread rapidly to cover about 5% of the seabed by March 2012, with density highest in channels on the north-eastern side. There is some evidence to suggest that when *Caulerpa* is very abundant it has a negative impact on seagrass.

### Further Spread

Submarine surveys carried out during 2012 failed to detect any spread outside the semi-enclosed Palm Jebel Ali complex of this potentially 'harmful invasive' green alga. The first record outside of Palm Jebel Ali was made by the second author (KW), who discovered a small localised area of *Caulerparacemosa* var. *lamourouxii* during completion of a marine ecological baseline study, growing in an open sea location at Ghantoot (co-ordinates: 24.934092°, 54.916505°). The green alga was growing on deep mud which had accumulated over the past six years following the construction of the first of the five proposed islands making up the Dubai 'Waterfront Islands Development'. The colony was located about 700 m offshore and about 200 m west of the

causeway connecting Waterfront Island 1 to the mainland. The area had accumulated deep mud over a former coral-rich area due to the lack of flushing cause by the construction and presence of the causeway.

### Source of Introduction

There is a wide geographical discontinuity between Dubai and the distribution of this *Caulerpa* along the East African coast (see Silva *et al.* 1996) and the Red Sea. It is only possible to speculate on its possible origin without carrying out an examination of molecular markers (see Booth *et al.* 2007) of material from suspected source populations. Marine aquaria are known to be the source of *Caulerpa taxifolia* and *C. racemosa* var. *cylindracea* into the Mediterranean Sea; these attractive seaweeds (also *C. sertularioides*) are commonly distributed through the aquarium trade. This is not the case with this form of *Caulerpa racemosa* and therefore other possibly human-mediated vectors have to be sought, including ballast from the extensive fleet of barges, workboats, cutters and trailer-hopper-suction-dredgers used in the construction of Palm Jebel Ali and the neighbouring 'Waterfront Islands' development. Of possible significance is the common practice of leaving 'borrowed' material (usually sand) in the suction dredgers during navigation at sea and that form *requienii* of *Caulerpa racemosa* occurs in Indonesia from where most of the dredging fleet in Dubai had been winning material used to reclaim land in Singapore (Mieke Fordeyn, pers. comm.) before travelling to the Gulf.

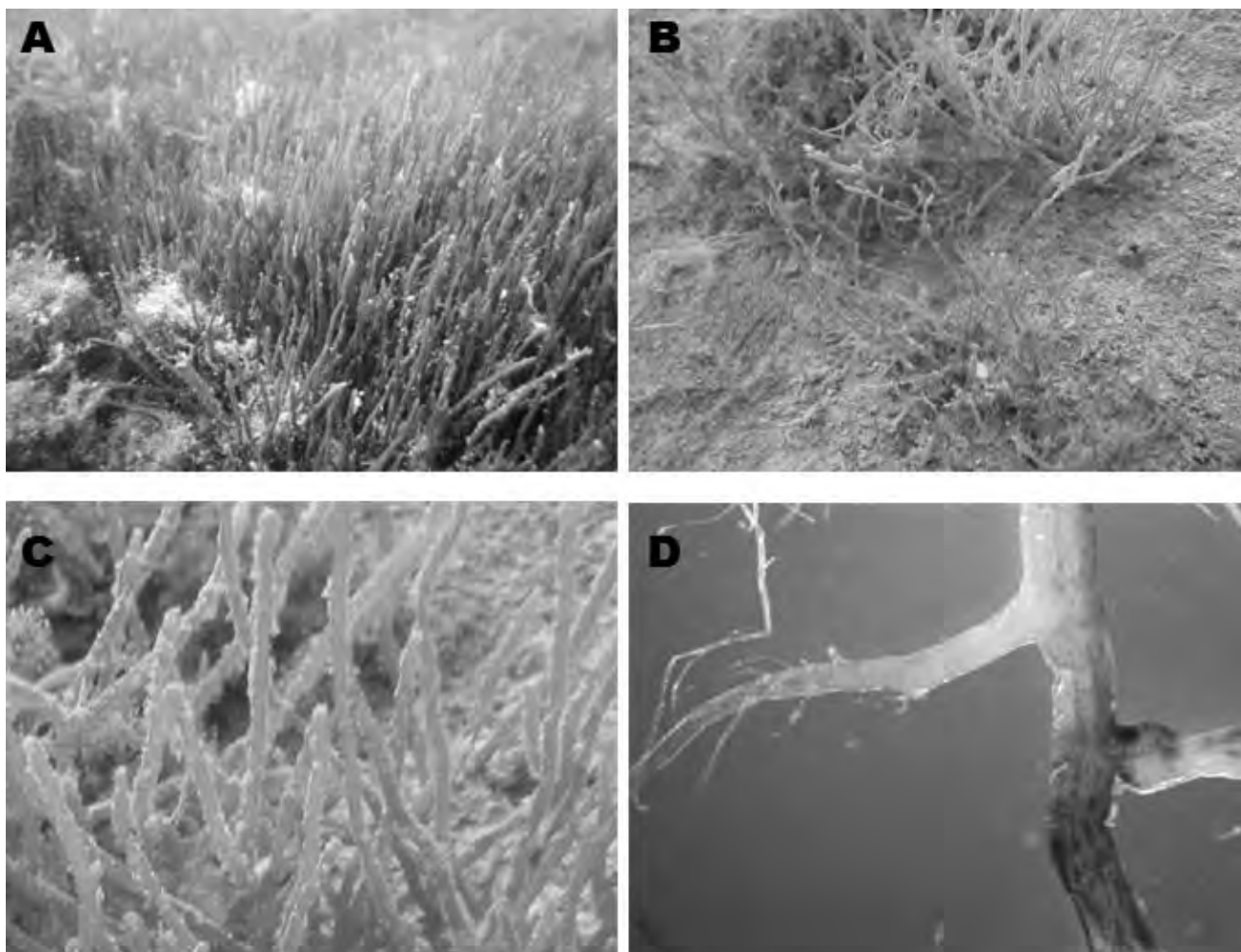


Fig. 2A-D. *Caulerpa racemosa* var. *lamourouxii* f. *requienii* A. Photograph taken in March 2012 showing a dense stand growing on the floor of a channel in Palm Jebel Ali; B. Dense clump showing the branched uprights arising from creeping stoloniferous axes; C. Close view of the slightly constricted upright and occasionally distichously branched axes. (A-C photos by Laurence Vanneyre). D. Close view of the downwardly-growing and rhizoid-bearing extensions of the creeping axes (photo by Akila Kagadi).

### Ecological Impact

The new introduction fulfils many of Madland Yip's (2005) criteria for an invasive species: colonizing a new area, a geographical discontinuity existing between the new area and its native area, human vector probably involved in range extension and forms well-established, spreading and self-sustaining populations. Other definitions consider a species to be invasive only if there is good evidence that it is threatening biodiversity and/or resulting in economic damage, otherwise it is regarded as 'an alien or non-indigenous species' (see Shine *et al.* 2000). There are well-documented cases of the invasive spread of other *Caulerpa*'s, including the notorious *Caulerpa taxifolia* whose dense carpets out-compete native seaweeds and seagrasses, displace invertebrates and have caused devastating ecological and economic impacts in the Mediterranean Sea as well as in other regions where it is non-native (see Madland Yip 2005, Meinesz 2001). So far the only indication of any impact of the introduction in Dubai is on the cover of the seagrass

*Halodule stipulacea*. As far as we are aware, there are no reports of this form of *Caulerpa racemosa* causing a negative impact on seagrass beds in other parts of its geographical range. One of the reasons put forwards to account for the success of the invasive *Caulerpa taxifolia* was the absence of any control by grazers or browsers because containing a high concentration of caulerpenyne (Box *et al.* 2010, Dumayet *et al.* 2002), a toxin that acts as a repellent against herbivores and therefore increases its competitive advantage against other species. Concentrations are lower in *C. racemosa* (see Dumayet *et al.* 2002) and it is possible that the new introduction might be less grazer-resistant although caulerpenyne levels have yet to be measured in form *requienii*.

Many green turtles (*Cheloniemydas*) and dugongs were encountered feeding almost exclusively on seagrasses within Palm Jebel Ali. Dugongs were not known to occur in Dubai before construction of Palm Jebel Ali although are commonly recorded in neighbouring Abu Dhabi. A one-year old dugong was floating in the sea adjacent to Palm Jebel Ali breakwater by the EMEG team in May

2011. Seems they are attracted to feed on the seagrass beds associated with the 'Palm' developments, with feeding tracks and excreta found just outside Palm Jebel Ali. Any loss of the seagrass beds associated with Palm Jebel Ali would make it a less attractive habitat for dugongs.

In conclusion, the new introduction has spread rapidly spread to become well-established within the semi-enclosed environment of Palm Jebel Ali and has spread west along the Dubai coast three years after its discovery in September 2010. A possible source is ballast from suction hopper sand-dredgers formerly employed to win sand in a country where the introduced *Caulerpa* is common. Its established populations need monitoring and further surveys are required to establish its rate of spread along the UAE coast now that it known from Ghantoot, a site close to the border with the neighbouring Emirate of Abu Dhabi. Requiring further investigation is the impact of this 'potentially' harmful introduction upon seagrass beds since the very extensive seagrass-dominated ecosystems along the Southern Gulf are crucially-important as foraging and nursery grounds for fish, crustaceans, green turtles and marine mammals such as dugongs.

### Acknowledgements

Thanks go to the following: Emirates Marine Environmental Group (UAE) for the field survey, Dr Willem Prud'homme van Reine (National Herbarium of Netherlands, University of Leiden) for identifying the *Caulerpa*, Prof. Alexandre Meinesz (University of Nice Sophia Antipolis, France) for confirming its identity, Prof. Olivier de Clerck (Biology Department, University of Ghent, Brussels) and Dr Thomas Sauvage (University of Louisiana, Lafayette, USA) for advice and/or carrying out a genomic investigation of the Dubai material, Akila Kagadi (Marine Environmental Laboratory of EHS Trakhees) for some of the photographs, Prof. Michael Guiry (Ryan Institute, National University of Ireland, Galway) for forwarding images to DMJ, and Mieke Fordeyn (Jan de Nul Group, The Netherlands) for information on the fleet of vessels used to construct Palm Jebel Ali. Finally, thanks go to the Life Science Department at the NHM for providing facilities and support to DMJ during the course of this research.

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# Announcements

## INTRODUCTION TO FRESHWATER ALGAL IDENTIFICATION

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and

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**Van Mildert College and School of Biological and Biomedical Sciences,  
Durham University, UK**

**Sunday 6 July – Friday 11 July 2014**

**AIM** To train staff from Environment Agency, SEPA, water plcs, consultancies, research students and overseas visitors in the identification of the more widespread and environmentally important microscopic and macroscopic freshwater algae. Topics introduced include monitoring, harmful and nuisance algae and implications of the European Water Framework Directive.

**COURSE LEADERS** Prof. David John and Prof. Brian Whitton. Dr Gordon Beakes (University of Newcastle), Dr Alan Donaldson (consultant) and Dr Martyn Kelly (Bowburn Consultancy) also contribute.

**WHERE** Accommodation in Van Mildert College and the course in School of Biological and Biomedical Sciences. Breakfast and dinner are in the College and lunch in the departmental building. The College is about half a mile from the department and, as evening lectures are in the department, this means making two return trips to the department each day. Parking near the College will be available for anyone bringing a car, but it is essential to reserve this in advance..

**LECTURES** and/or practicals run until 2120 each evening, including the Sunday. Most study is in the laboratory, but there is at one field visit.

**COSTS** The inclusive cost for all participants other than full-time research students is £980 (no VAT charge) for those making a firm reservation by 1 April. The discounted price for full-time students is £800. Participants from overseas (whether or not a student) may stay one night in advance of the course free of charge. Students who have been members of the British Phycological Society for at least three months (essential!) may apply directly to the Society for some support, but any decision rests with the Society. Details are on BPS website, but it is recommended that an application is submitted as early as possible.

Van Mildert College can provide accommodation for anyone wanting to stay an extra night at the beginning or end of the course (cost £34 for B & B). Payment can be included in the main invoice, provided organizers know well in advance, but otherwise it can be paid directly to the college after arrival. Dinner on Friday (but not B & B) will be provided free to those wanting to stay the extra night.

**BOOKING** Provisional and firm reservations for one of 15 places should be made by email to [b.a.whitton@durham.ac.uk](mailto:b.a.whitton@durham.ac.uk), to be followed by an official order OR a deposit of £50 to B.A.Whitton Algal Training, 74 Archery Rise, Durham DH1 4LA, UK. (This deposit need not be paid by overseas people.) Payment is required by the end of May. A full refund (excluding deposit) will be made to anyone cancelling before 31 May, while 50% refund will be made to anyone cancelling by 27 June.

**WHAT TO BRING** Members are encouraged to bring boots for a short field visit and (preferably) fresh samples from their local waters. There is no need to bring a laboratory coat, as this will be loaned for any practical where needed. Everything else is provided, including access to the new edition of The Freshwater Algal Flora of the British Isles and associated DVD. Some people may find it useful to bring their own portable computer, but the risk of loss must be covered by their own insurance. The training manual will be distributed in advance; if you have booked, but not received a copy by 30 May, please inform the organisers. Overseas members need not bring clothes for the field visit - these will be loaned. The College has a room with computers for accessing the internet.

**TRAVEL** Durham is on the main rail line between London King's Cross and Edinburgh. Trains are about once an hour and the journey from London (260 miles) takes three hours (sometimes longer on a Sunday). Overseas members should contact the organizers for advice on buying their ticket. (Advance booking is essential to get the cheapest.) A taxi from the station to Van Mildert College (about 1.5 miles, but a moderate hill for walkers) costs about £4.00 The nearest airport is Newcastle-upon-Tyne. Avoid Teesside and Durham airport, unless this provides the only suitable flight. There is a rail route from Newcastle airport to Durham, though this involves changing at Newcastle main rail station and the overall journey can take anything from 1.5 to 2 hours, depending on the connection at Newcastle. A taxi from Newcastle airport to Durham (26 miles) takes 35-45 minutes and costs about £46. The organizers can almost always collect members at the airport, but it may not be possible to help with the return journey.

### PROGRAMME

The course (which has run without a break since 1992) is a mixture of lectures and practicals, together with an afternoon field trip. Members should arrive by 1700 on the Sunday (though they can take their room earlier in the day), while the daily programme runs from 0900 to 2120. It ends formally after lunch on Friday, though there is an optional trip to sites along the River Wear in the afternoon. There is no formal test, but the course ends with a slide-show quiz and a prize for the winner.

David John and Brian Whitton give the majority of lectu-

res. Gordon Beakes helps on the Tuesday; Alan Donaldson (special expertise blue-green algae/cyanobacteria) helps on several days; Martyn Kelly gives lectures and practicals on the Tuesday evening and Wednesday morning and afternoon. All participants are expected to have read the Manual before joining the course

### Provisional Schedule

#### Sunday

Introduction to freshwater algae  
Optimizing your skills at identifying algae

#### Monday

Cyanobacteria 1 and 2  
Use of interactive identification CDs  
Overview of other phyla 1  
Practicals: Range of cyanobacteria; mixed samples

#### Tuesday

Microscopy techniques  
Green algae 1 and 2  
Practicals Range of green algae  
Field visit to Cassop Vale National Nature Reserve, followed by microscopy of samples  
Diatoms 1

#### Wednesday

Diatoms (mixed lectures and practical, including use of diatom CD)  
Diatoms: taxonomy and techniques  
Other phyla 2

#### Thursday

Red algae, flagellates and charophytes  
Cyanobacterial blooms  
Ecology of river algae  
Practicals Reds, flagellates and charophytes

#### Friday

Preservation methods  
Algal nuisances and their control  
Class revision  
Slide-show quiz  
General discussion, followed (after lunch) by optional tour to River Wear sites

#### CONTACT DETAILS

Anyone wanting further information is welcome to contact Brian Whitton [b.a.whitton@durham.ac.uk](mailto:b.a.whitton@durham.ac.uk) phone 0191-386-7504 David John [d.john@nhm.ac.uk](mailto:d.john@nhm.ac.uk) or [d\\_m\\_john@ntlworld.com](mailto:d_m_john@ntlworld.com) phone 0208-464-6367



Introductory Course - 2013



Advanced Course – field excursion - 2013

## **The BPS needs your help!**

*Nominations are invited for two Ordinary Members of Council to replace those whose terms of office come to an end at the AGM in June 2014. These posts, which are for three years, are open to all members of the Society. There are three Council meetings each year. Council membership is a great way to find out how the Society is run and is also an opportunity to influence the future direction of the Society. There will also be opportunities to join one of the committees if you are interested in serving in a specific area, e.g. Awards and Training Committee, Biodiversity and Conservation Committee, Outreach and Education Committee.*

*If you would like to nominate someone please ask them before forwarding their name along with a brief outline of their psychological interests/research area, stating which position they are being nominated for, to the BPS Secretary, Jane Pottas, by April 25th 2014. Members may of course nominate themselves. You should also ask someone to second each nomination. If more nominations than positions are received a vote will be organised. The outcome will be announced at the AGM at the Annual Meeting in Galway (24th to 27th June 2014).*

**Jane Pottas**

**British Psychological Society Secretary**



**Dr Jane Pottas**  
**Union Place**  
**9 Uppang Lane**  
**Whitby**  
**North Yorkshire**  
**YO21 3DT**  
**UK**

**secretary@brphycsoc.org**

## **1ST INTERNATIONAL MARINE SCIENCE COMMUNICATION CONFERENCE NEW TOOLS AND PRACTICES" - IMSCC 2014**

**8 – 9 September 2014 – Porto (Portugal)**

The "1st International Marine Science Communication Conference – New tools and practices" is an interdisciplinary and international marine science communication meeting jointly organized by the CIIMAR (Interdisciplinary Centre of Marine and Environmental Research of the University of Porto); the European Marine Board Communications Panel (EMBCP) and Ciência Viva (National Agency for Scientific and Technological Culture).

This conference aims to delineate challenges for scientists and marine science communicators and to highlight new tools and practices in this field, in order to set up a more efficient dialogue with journalists, decision-makers, and the general public.

The conference will be a great opportunity for all marine science communicators and researchers to:

- Understand the power of marine science outreach: objectives, motivations, relevance and audiences
- Develop key messages related in marine science communication
- Promote a dialogue on the role of marine science and technology in society
- Discuss new projects and actions to be undertaken to involve different audiences
- Showcase the latest advances in marine science communication
- Study current and new tools for communicating marine science, including social media and new opportunities of the Internet era

**More information at:**

**<http://www.ciimar.up.pt/IMSCC2014/>**  
**[imsc2014@ciimar.up.pt](mailto:imsc2014@ciimar.up.pt)**

**Facebook: <https://www.facebook.com/IMSCC2014>**

**Twitter: <https://twitter.com/IMSCC2014>**

For the Organizing Committee: Vítor Vasconcelos, Joana Saiote & Agnès Marhadour

# FRESHWATER ALGAE COURSE 2013

## Where and when?

Kindrogan Field Centre, Enochdhu, Blairgowrie, Perthshire, Scotland (near the tourist area of Pitlochry), Friday, 20 June – Friday, 27 June, 2013. This is the 19th year that the course has been offered.

## Kindrogan Field Centre

The Kindrogan Field Centre is a self-contained and fully equipped field station set in wooded grounds on the banks of the River Ardlie in the picturesque Scottish Highlands. It lies within easy reach of some of the remotest areas of the UK with inspiring landforms and a rich range of wildlife habitats. There is accommodation for 113 persons. The Centre has been modernized and has a common room, library, dining room, drying room, five classrooms / laboratories, conference room and bar. Take a virtual tour inside the centre and the surrounding area at: <http://www.field-studies-council.org/kindrogan/>

## What is the course about?

The course takes full advantage of the excellent range of relatively unspoiled aquatic and terrestrial habitats in this beautiful area of Highland Perthshire to provide a sound introduction to the recognition, identification and ecology of freshwater algae. Emphasis will be placed on the use of the microscope and taxonomic keys (print and electronic) for identification to generic and species level, but also broader aspects of algal morphology, structure, reproduction, and classification (morphological and molecular). We normally see live examples of all major algal groups, including freshwater reds and browns.

For those with some prior knowledge of the algae, we hope that the opportunity to study samples from a range of habitats will broaden their knowledge and/or allow them to focus on particular groups.

Field trips, on foot or by vehicle, will be varied, but not strenuous and will be complemented by laboratory work, illustrated talks and class discussion. An all-day field trip will sample numerous lochs, streams, rivers and marshes, including a whisky distillery tour.

The last evening we assemble in the bar for our world-famous “algal charades”.

## Who are the course tutors?

The Course Tutors, **Dr Eileen Cox** and **Prof Elliot Shubert**, have taught this course for the past 18 years and they have a wide-ranging expertise on freshwater algae. Eileen and Elliot specialise in diatoms and green algae respectively. Eileen is Head of Post Graduate Studies at The Natural History Museum, London. She has published a key to live diatoms. Eileen is currently an Associate Editor for *Diatom Research* and on the Editorial Board of *Fottea*. Elliot is Editor-in-Chief of *Systematics and Biodiversity* at

The Natural History Museum. He has published a key to the non-motile coccoid and colonial green algae and is an Associate Editor for the *European Journal of Phycology*. We will be joined for part of the course by Guest Tutor, **Dr Laurence Carvalho**, Centre for Ecology and Hydrology, who will give a presentation on the EU Water Framework Directive with special reference to lakes and will describe their counting methods, and Guest Lecturer, **Prof Emeritus Geoff Codd**, University of Dundee, who will give a presentation on cyanobacterial toxins.

## Who are the participants?

The course is open to individuals with different backgrounds ranging from beginners to those who would like to refresh their knowledge of particular groups of algae or experience collecting in a different region of the world. Previous participants have come from over 35 different countries.

## What is the full cost of the course?

The course costs £420 per person (approx. 520€ or \$670), which includes shared occupancy accommodation (sole occupancy accommodation is £490) + all meals (please notify the Centre if you have any special dietary needs) + transport from/to Pitlochry and to field sites + use of the library and internet + tuition. This is excellent value for money and costs significantly less than other freshwater algal courses on offer.

**Is there support for students?** Yes, support for a student stipend is available. Do not delay, apply today!

1. The British Phycological Society:  
<http://www.brphycdoc.org>

The deadlines for applications are: 1 March, 1 June, 1 October, & 1 December. The sooner you apply, the better are your chances of receiving a stipend. Please note that you have to be a bona fide student member of BPS for at least three-months prior to making an application for financial support. [http://www.brphycsoc.org/documents/BPS\\_A&TForm\\_%20Student\\_Bursary\\_2011.doc](http://www.brphycsoc.org/documents/BPS_A&TForm_%20Student_Bursary_2011.doc)  
2. Phycological Society of America:  
<http://www.psaalgae.org>

Graduate students who are members of the are eligible for financial support to attend a phycology course at a field station from the Hannah T. Croasdale Fellowship. <http://www.psaalgae.org/website/opportunities/grants/croasdale.html>

The Hannah T. Croasdale Fellowships are designed to encourage graduate students to broaden their phycological training by defraying the costs of attending phycology courses at biological field stations. The purpose of the award is to broaden phycological training and not necessarily to further research goals. Proposals to study

at field stations associated with universities other than the student's own are especially encouraged. Awards are made directly to the student in amounts up to \$1000 each. Completed application should be sent to: Amy Carlile (acarlile@newhaven.edu) by March 1st.

3. The British Ecological Society:

<http://www.britishecologicalsociety.org>

Specialist Course Grants available for BES members only (undergraduate and graduate) allocated on a first-come-first-served basis. The grant covers the course fee, which includes accommodation but not travel. Application is by form, available from the BES office and downloadable from this webpage. <http://www.britishecologicalsociety.org/grants/education/scg.php>

### **How do you get to Kindrogan?**

Edinburgh and Glasgow have international airports. The airports have a coach connection to the main railway station in the respective cities.

The nearest mainline railway station is Pitlochry, which is on the London Kings Cross-Edinburgh-Inverness route. Participants will be met at Pitlochry by Kindrogan staff.

### **Where can I find more information?**

- For detailed information about the Kindrogan Field Centre:

<http://www.field-studies-council.org/centres/kindrogan.aspx>

- For information on the Field Studies Council:

<http://www.field-studies-council.org/>

- Course information for 2014:

<http://www.field-studies-council.org/individuals-and-families/courses/2013/kd/freshwater-algae-40578.aspx>

- Booking information and form:

<http://www.field-studies-council.org/individuals-and-families/booking-information.aspx>

- Detailed information about the course, including the daily schedule:

[http://www.field-studies-council.org/media/521020/freshwater\\_algae.pdf](http://www.field-studies-council.org/media/521020/freshwater_algae.pdf)

If you have any other queries, please contact:

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# SEAWEEDS IN JAPANESE CULTURE: AN ANALYSIS OF MEDIEVAL WAKA POETRY

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No civilizations exist in which seaweeds are so much integrated into gastronomy, culture and literature as in Japan, either medieval or modern. Japanese have practiced edible seaweed (Kaiso) farming since time immemorial, for at least 2000 years as evident in the ancient manuscripts and archeological artifacts. Seaweed is not just a vegetable for the Japanese; it stood as an imagery and metaphor to express meanings from “love” to “compassion”, “truth” and “sensuality”!

What follows is a curated list of waka (a form of short poetry)-translated from the original Japanese texts that deal with seaweeds. Translations were originally done by Prof. McAuley at University of Sheffield, UK, and most of the contents to be followed in this discussion is credited to the excellent works that he published at <http://www.temcauley.staff.shef.ac.uk/poems.shtml>. Contents from unrelated sections have been concatenated for the general interests of phycologists keeping in mind.

One of the earliest Japanese poetry collections, Manyôshû-compiled in 7<sup>th</sup> CE, compares the love of one’s wife to “bending seaweed.”

*“Alas, she is no more,  
whose soul was bent to mine  
like the bending seaweed”*

This kind of metaphor usage is very typical of the Japanese and it reflects the aesthetic consideration and reverence for the seaweeds in that society. A number of references to the seaweeds can be recited from classical *haiku* texts as well, such as the following

Genji Monogatari by Murasaki Shikibu, early 11<sup>th</sup> Century

*The world of fisher folk:  
Might I hear it from afar?  
On the beach at Suma,  
Seaweed-salt droplets fell,  
For who, if not you...*

(Author unknown)

*Harvested jeweled seaweed  
At Minume; passed on,  
Lush as summer grasses,  
To the point at Noshima,  
My boat draws near.*

A note on “Jeweled seaweed” expression:

As per my understanding, this expression is used to refer green Ulvophyceae seaweed *Monostroma kuroshiensis* (Yendo) Bast et al. Most probably derived from the typical iridescent sheen that the seaweed produces upon drying. To test this hypothesis, I have done sampling expeditions to almost all places where this expression had been used in waka, as part of my phylogeography studies. *M. kuroshiensis* was observed growing luxuriantly in majority of these places (Bast 2011). Alternately, as discussed in the section of “*Makura Kotoba*”, this expression could also indicate *Sanuki*, i.e., present day Kagawa Prefecture, in *wakas* by Tamamo Yosi, a Japanese court poet.

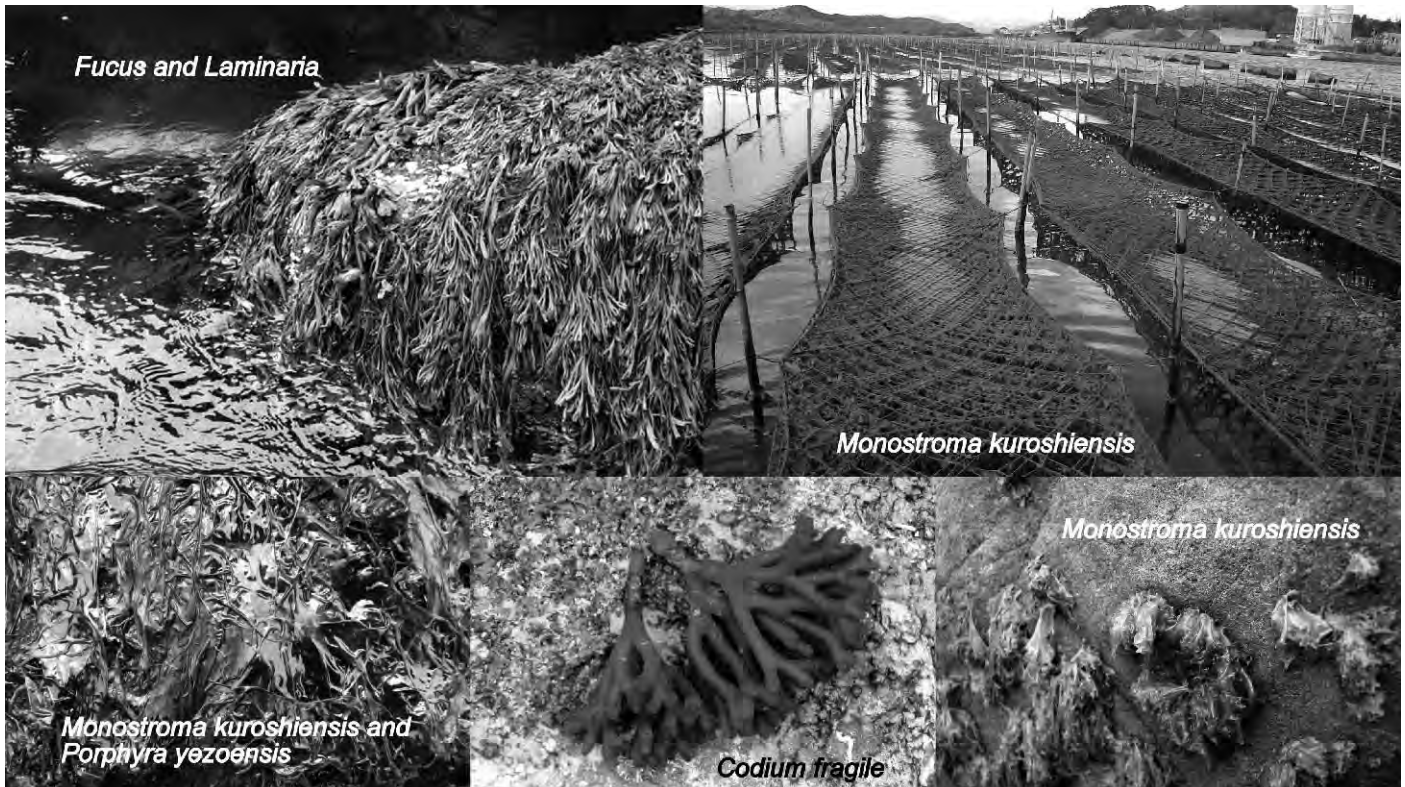
(Author unknown)

*As a mat of creepers,  
Is the sea at Iwami;  
Amongst the mangled words of  
Kara Point,  
Upon the reefs  
Grows the algae thickly;  
On the rocky shoreline,  
Grows the jeweled seaweed;  
Soft as jeweled seaweed  
Trembling, lay my girl;  
Lush as thick (miru) green algae*

Rather than the generic ‘algae’ the poem refers specifically to *miru*, or ‘thick-haired *Codium*’ as it is in English, which grows in deep pools along rocky coasts. The individual filaments, which can be as long as 30 centimetres, often grow together to form a velvety mat.

*From Nakizumi  
The river port I see  
The Isle of Awaji  
In the Bay of Matsuho:  
In the calm at dawn  
Harvesting jeweled seaweed;  
In the evening calm  
Drying seaweed salt*

A poem, with *tanka*, composed by Kanamura, Lord Kasa, on the occasion of an Imperial visit to the district of Inami in the province of Harima in the autumn, 3<sup>rd</sup> Year of Jingi



(726), Ninth Month, 15th day.

*And with the ebbing of the tide,  
They go cutting jeweled seaweed:  
From the age of gods  
An awesome,  
Jeweled mountain isle.*

From *Ogura Hyakunin Isshu* by Fujiwara no Teika (or Sa-daie, 1162 – 1241)

*For one who fails to come,  
I pine; within the bay of Matsuo  
In the evening calm,  
Burns seaweed salt,  
As does my breast with longing.*

From the *Shinkokinshû* Love poems By Minamoto no Toshiyori (1055-1129)

*In the bay of Naniwa  
Seaweed-covered  
Gemstone rocks  
Appear-just so  
Does my love for her*

A lament, with *tanka* (Author unknown)

*As the jeweled seaweed,  
She, trembling, laid her down;*

Old Kanto-area folk song (Author unknown)

*In Hitagata  
On the beach the wakame  
Starts up in confusion  
Is that how she waits for me,  
Tonight and the night before?*

Note: Wakame is brown seaweed *Undaria pinnatifida*.

From *Genji Monogatari* by Murasaki Shikibu, early 11<sup>th</sup> Century

*The world of fisher folk:  
Might I hear it from afar?  
On the beach at Suma,  
Seaweed-salt droplets fell,  
For who, if not you...*

From the *Shinkokinshû* Love poems By Fujiwara no Hideyoshi (1184-1240)

*Seaweed-salt burning,  
From fisher-folks' huts upon the rocky shore  
In the evening smoke*

*Rises-painful to lose my good name, yet  
I cannot bear this longing.*

#### Examples from *Makura kotoba*

Makura kotoba or 'pillow words' were one of the primary poetic resources for poets of the Man'yō period and earlier. Single words or phrases, usually of five syllables, associated in poems with certain other fixed words or phrases, makura kotoba formed links in terms of meaning, association or sound and provided a means by which a poet could add depth to his/her poems or heighten the tone of his rhetorical style.

While makura kotoba do appear in the early songs in the Kojiki and Nihongi, their use was primarily established by Hitomaro in the Man'yō period. It is estimated that he coined approximately half of the makura kotoba he used, handing down an important resource to future generations of poets. Over time, the true meanings of many makura kotoba became lost, and their use became mere convention, but they continued to be coined and used by Japanese poets well into the twentieth century.

References to seaweeds oftentimes comes in Makura kotoba, partly owing to the romantic image associated with seaweeds in Japanese culture and folklore. The list below is by no means exhaustive, but should give an indication of the types of expressions related to seaweeds used as makura kotoba and the words to which they were applied.

Tamamo Yosi-Japanese court poet:

*'Good jeweled seaweed'. Used to modify  
the province Sanuki.  
Sanuki is modern day Kagawa prefecture*

*Pukamiru nō  
'Like long haired Codium . Used to modify  
pukamu 'be deep', miru 'see', etc.*

From Man'yōshū, by Lord Kakinomoto no Hitomaro (662-710)

*Jeweled seaweed,  
Province of Sanuki:  
Is it your nature that  
The sight of you will never sate?*

(Author unknown)

*Harvested jeweled seaweed  
At Minume; passed on,  
Lush as summer grasses,  
To the point at Noshima,  
My boat draws near.*

On Seaweed (Author unknown)

*When the tide is high,  
Covering the beach,  
As sea-grass, perhaps,  
Scarcely seen and  
Greatly loved.*

Yamabe Akahito, on visit to imperial province of Ki (AD 724)

*And with the ebbing of the tide,  
They go cutting jeweled seaweed:*

Lord Mino Isomori (AD 730)

*My friend,  
I pine and from this field  
Gaze out upon  
The diver girls  
Seeing them cutting  
Jeweled seaweed.*

Manyo poem, anonymous

*Today again  
Will the jeweled seaweed offshore  
Atop the breakers'  
Eightfold layers  
Be thrown into confusion?*

Sei Shōnagon (c. 966-1017)

When the governor of Michinoku, [Tachibana no] Norimitsu was a Chamberlain, and she wanted to let him know that they were finished, she retired to her home, saying, 'If people ask, don't tell them where I am.' When he sent back to her, saying, 'What am I to do if people demand to know-as your husband I should know, surely?' she bundled up some seaweed and sent it to him. Norimitsu didn't understand and came to her, asking, 'What on earth do you think you are doing?'. So she composed this poem.

*When beneath the waves,  
The fisher-folk may be found  
At the bottom there!  
Tell no one at all-  
Eat the seaweed-will you see the signs, I wonder!  
(ku-wa-seken)*

One could, perhaps, forgive Norimitsu for not immediately understanding what Sei Shōnagon meant with her gift of me 'seaweed'. Of course, she is making a complicated play-on-words: me kuFasu 'eat seaweed' at the time would have been written identically to mekubasu 'wink at someone to give them a sign'. So, with the seaweed and the poem she was saying, "I'm giving you a sign (that we're through)!"

Apparently, Norimitsu's response was to say, "Has my lady composed a poem? Well, I won't read it now!", give Sei Shōnagon back her fan and depart in high dudgeon; after which, he gained the reputation as a hater of poetry.

Lord Kasa Kanamura on the occasion of an Imperial visit to the district of Inami in the province of Harima in the autumn, 3<sup>rd</sup> Year of Jingi (726), Ninth Month, 15th day.

From Nakizumi  
 The river port I see  
 The Isle of Awaji  
 In the Bay of Matsuho:  
 In the calm at dawn  
 Harvesting jeweled seaweed;  
 In the evening calm  
 Drying seaweed salt  
 (mo sipo yakitsutsu 藻塩焼き)  
 The diver maids  
 Are there, I hear, yet,  
 To go and see them  
 I've no reason, so  
 A strong man's  
 Heart I do not have,  
 As a tender maid  
 I feel daunted  
 Circling around  
 Fondly feeling  
 Lacking boat and oars.

Poems by Lord Kakinomoto Hitomaro, when he had parted from his wife and come up to the capital from the province of Iwami

By the sea in Iwami,  
 On the shore at Tsuno,  
 There is no beach,  
 For folk to see;  
 No shallow water,  
 For folk to see;  
 Yet even so,  
 Though there be no beach;  
 Yet even so,  
 Though there be no shallow water:  
 On the whale hunting  
 Seashore  
 At Nikitazu,  
 On the rocky shoreline,  
 The blue, blue  
 Jeweled seaweed, just offshore, (tamamo)  
 With the wings of morning,  
 Will the wind bring closer;  
 With the wings of dusk,  
 Will the waves draw closer;  
 And with the waves,  
 Moving forth and back,  
 As the jeweled seaweed, (tamamo)  
 My darling, once cuddled close,

As a mat of creepers,  
 Is the sea at Iwami;  
 Amongst the mangled words of  
 Kara Point,  
 Upon the reefs  
 Grows the algae thickly; (pukamiru)  
 On the rocky shoreline,  
 Grows the jeweled seaweed; (tamamo)

Soft as jeweled seaweed (tamamo)  
 Trembling, lay my girl;  
 Lush as thick green algae, (pukamiru)  
 The love within my heart, but  
 The nights when we slept thus  
 Were not so very many;

Codium in Mirume naki

Medieval poet Komachi played with "miru me" and "miru", with each other being frequently interchanged in his *waka*. Miru is Codium (with its characteristic "thick hair"). "Miru me" could also mean "seeing through eyes", in addition to the seaweed, and by implication a meeting between lovers, as one had to be very close to someone to see their eyes in the darkness of an old Japanese dwelling. So the poem asks 'Why does the fisherman keep coming this beach? Doesn't he know there's no mirume growing here?' and also 'Why does my lover keep coming when there's no chance of a meeting?'

Gosenshu Waka

Ariwara no Narihira (825-880)

In the sea at Ise  
 A frolicking fisherman is what  
 I would become, for then  
 I'd plunge between the waves  
 To harvest algae-and a glimpse of you.

Ise (939)

Could such a mediocre  
 Fisherman harvest? I think not!  
 The sea at Ise  
 Sends waves high upon the shore  
 Where the algae grows!

Author unknown

Harvesting jeweled seaweed  
 The diver maids  
 To go and see  
 I long for a boat,  
 Though higher rise the waves.

From Man'yōshū (759 AD)

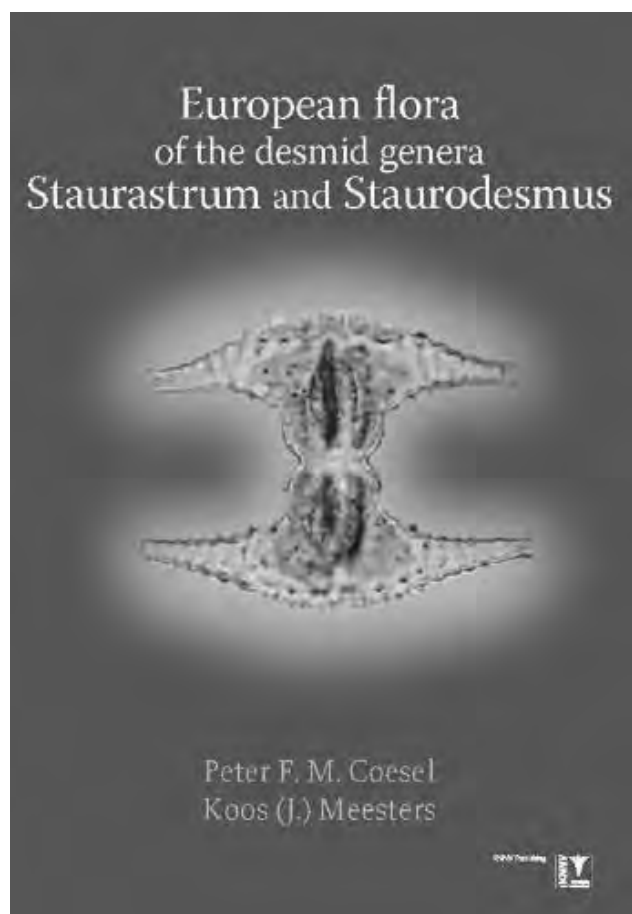
In Katsushika,  
 At Mama inlet  
 The drifting  
 Jeweled seaweed cutting:  
 Maid Tegona, I remember you.

**Bast F** 2011 Monostroma: the Jeweled  
 Seaweed for Future. LAP LAMBERT Aca-  
 demic Publishing GmbH & Co. KG, 66121,  
 Saarbrücken, Germany

## Book Review

European flora of the desmid genera *Staurastrum* and *Stauroidesmus* (2013)

P.F.M. Coesel and K.J. Meesters. KNNV Publishing, Netherlands. 120 plates (line drawings). 357pp. ISBN: 978-90-5011-458-5. Hardback price €99,95 (approx. £85)



For the amateur enthusiast or the professional phyco-  
logist this hardback print edition of Coesel and Meesters' up-to-date *Staurastrum* and *Stauroidesmus* flora is a valuable printed resource for identifying two of the notoriously polymorphic genera of desmid algae. This book builds upon the previous offering by the authors - *Desmids of the Lowlands: Mesotaeniaceae and Desmidiaceae of the European Lowlands* (2007) - covering approximately three times the number of taxa, within these genera.

Species descriptions are concise with clear reference being made to the original description and the basionym—a new feature in this text. This provides a useful anchor for any reader wanting to trace historic records and interrogate species descriptions further. A dichotomous key is included prior to detailed descriptions for each of the genera. I personally have never found keys very accessible but the ones presented here seem to work well. Descriptions are given alphabetically by species name and cover not only morphology but offer some detail of species ecology and

European distribution. This extra information can be useful when trying to decide between two morphologically similar species. However, some of the ecological descriptions in this version do differ from those presented in 'Desmids of the Lowlands' and it is unclear whether this is due to expanded recent sampling across Europe or a more thorough examination of historical records.

The written descriptions are accompanied by 120 plates of line-drawn illustrations collected from original descriptions, where possible, and re-drawn to present a cohesive style and easier comparison between taxa. Illustrations are drawn to the same scale which gives a good overview of the variation in size within (where multiple individuals are illustrated) and between taxa. Personally I think further illustrations would have been welcome to enhance the descriptions and practical application of the work. For example species distribution maps, habitat photographs and groups of commonly associated taxa, or even some photomicrographs of challenging features would have further enhanced the accessibility of the book.

The preface to the book does highlight the challenges and shortcomings of morphological identification in the age of genetic sequencing. There are worryingly few taxonomists globally working on the Desmidiaceae and with the general decline in the application of traditional taxonomy you wonder whether this will be the final taxonomical work on the desmids to be published, certainly in print. I personally have found the first version of the author's desmid flora invaluable in my studies and a breeze to leaf through and make fast identifications. The additions made in this flora will no doubt make species-level identifications within these difficult genera slightly less painstaking.

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### References

Coesel, P.F.M., and Meesters, K.J., (2007) *Desmids of the Lowlands: Mesotaeniaceae and Desmidiaceae of the European Lowlands*. KNNV Publishing, Netherlands.

# Obituaries

## GEORGE RUSSELL

31 August 1933 - 2 December 2013

Many among us will be greatly saddened by the unexpected passing of George Russell and will remember him fondly as the wily Scot with a dry sense of humour and a glint in his eye.

George was born and grew up in Falkirk, Stirlingshire Scotland. He was educated at George Watson's College, Edinburgh, where his interest in algae was ignited during a school trip to the Institute of Seaweed Research at Inveresk. After leaving school he spent a year working as an assistant chemist with Imperial Chemical Industries at Grangemouth. He was awarded the Spence Bursary and went on to read Biology at the University of St Andrews (1952-56). Still with a keen interest in chemistry and physics, he graduated with a 1st Class BSc Honours in Botany, and was awarded the Class Medal and Margaret Laing Bell Prize. At this time his interest in algae was furthered by the lectures, and interactions, with Helen Blackler and David Irvine. He was awarded a Carnegie Post-Graduate Research Scholarship for his postgraduate studies into algae at St Andrews (1956-59). In 1993 he was awarded a DSc for his contribution to marine science from St Andrews University.

After the award of his PhD he took up a post as Assistant Lecturer at the University, Keele (1959-1960). He then moved to the University of Liverpool as a Lecturer where he stayed until he retired. His first 5 years were based on the Isle of Man at the Port Erin Marine Laboratory, before moving to the main university campus in Liverpool where for several years he worked alongside his friend Elsie Burrows. He was appointed as Reader (1986-1992), and on his retirement he became an Honorary Senior Research Fellow (1992-2003).

After his retirement he was appointed Honorary Curator of marine algae at World Museum, National Museums Liverpool. He was an active member of the department until his death. Georges' collections are held in the algae herbarium at World Museum (LIV).

George's primary research interest was the evolution of plants through variation and natural selection, with a focus on benthic marine algae. His research led to the identification of environmentally determined characteristics, and genetic variation, in a number of algal species. He demonstrated the adaptive value of plant populations and species in terms of their biological interactions and physico-chemical environments.

George had an insatiable curiosity for ecological conundrums and he was interested in the role of biological selection



pressures such as the complex relationships between algal epiphytes and their host plants. He showed that consistently successful epiphytes possess growth and reproductive characteristics that enable them to persist, in spite of the various defences of the host species. He studied the evolutionary selection pressures arising from physico-chemical factors, in particular, those caused by changes in salinity. His research led to the discovery of estuarine and other ecotypes of several species with distinctive salt-tolerance profiles. The ecological and evolutionary importance of salinity for marine algae was one of Georges most sustained research interests, and included an experimental programme that was the first to demonstrate competitive interactions between species of marine macroalgae *in vitro*.

George used his applied knowledge of biological selection when tackling the problem of ship fouling. Sea-going vessels are normally treated with antifouling paints that can contain high concentrations of copper. His investigations of algae from fouled ships resulted in the discovery of copper-tolerant ecotypes, the first such cases to be reported in algae.

Georges interest in benthic algal community ecology sparked an enthusiasm in the Liverpool Docks - in particular the restoration of derelict dock basins. As a consequence of the decline in Britain's maritime trade, and of changes both in shipping and in the methods of ship-handling, many 19th and 20th Century docks stand idle. His research (much of it with Steve Hawkins) on a Liverpool dock has shown that these have considerable powers for ecosystem recovery, leading to much improved water quality and the formation of a diverse natural community. Georges' research interests in the docks spanned more than 30 years with him regularly visiting to

collect samples right up until his death. His stories of being chased by security guards, and having to cycle away at speed, were valuable information for choosing sampling sites for the latest sampling visits.

George loved his fieldwork and it was an inspiration to work with him in the field with his deep knowledge of the British flora. He travelled extensively collecting algae working on the shores of Britain, France, Germany, Sweden, Finland, S. California, New England, Hawaii and Canada. In 1972-73 he was the scientist in the Joint Services Expedition to the Egmont Islands (Indian Ocean). His stories of stripping off to collect algae, and scare the service men, gave us all much amusement.

George was an active member of the British Phycological Society, and a regular attendee of the winter meetings. He served on the council in various roles: Council Member (1967-70, 1981-85, 1985-87); Vice President (1981-83); President (1983-85); Flora Committee (1960-1987); Chairman Flora Committee (1983-1987) & Editor of the Newsletter (1985-1988). He was elected as an Honorary Member in 2000. At a meeting when all of the Flora Committee were all on board a boat he dryly remarked that "if the boat were to sink now phycological research would be advanced by 20 years".

George was a life member of the Isle of Man Natural History Society, and he had fond memories of whizzing around the island on his motor bike to visit his sampling sites. In later years he would often pop over to his favourite sites to get material for the next days lab practical in Liverpool. However, on these trips he was restricted to hitching a lift on the back of the lab technicians' bike.

George had a long-standing interest in the Baltic Sea and was a frequent visitor to the Tvärminne Zoological Station of the University of Helsinki. He was elected an Honorary Member of Societas pro Fauna et Flora Fennica (2003). He was Awarded University of Helsinki Medal (1992). He was a member of the Linnaean Society, the Systematics Association (Council Member 1970-73), the International Phycological

Society, the Institute of Biology and the Marine Biological Association of the UK.

George would always find time to help people and stimulate their interest in marine life. On a one-to-one basis, with both his undergraduate and postgraduate students, he was highly successful in instilling a lasting interest in phycology and marine science. Partly his success as a teacher was his enthusiasm for taking his students into the field. It is a lasting testimony to his prowess as a teacher and mentor that many of his students play prominent roles in phycology and marine biology in widely-scattered parts of the world. Amongst his PhD students are Peter Morris, Alan Fielding, John Bolton, Rob Reed, David Garbury, Andrew Young, David Thomas, Saara Bäck and Alan Jemmett.

George possessed a sharp mind and remarkable scientific intuition, qualities that made him an excellent naturalist with wide-ranging insight. Even though George suffered a stroke in the early 2000s he remained active and fit, and one of my fondest memories is of him jumping over railings to save the time of walking round them. He was a keen cyclist, and he had a great love of gardening. It is only recently that he gave up his allotment, after first moving many of his plants to his garden. However, for his colleagues and friends it is his dry wit which we will miss most. George leaves behind his wife Hilary, and their three children Jean, Kate and Duncan and three grandchildren Helena, Seamus and Calum.

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## GRETHE HASLE

### Taken from Algae-L

Grethe Hasle died peacefully in her sleep on November 9 2013, aged 93.

"Her funeral took place in Oslo on November 20. Condolences should be sent to her son Jon Hasle at jrhas@statoil.com: Her family is always very pleased to know how Grethe's work influenced other people's work and how much people appreciated her."

## SHIRLEY JEFFREY (HERON)

### Taken from Algae-L

Shirley Jeffrey (Heron) passed away peacefully at 2 am on 04 January following a battle with cancer. She left behind a life full of achievements and legacies for future scientists and students. Shirley, born in Townsville in 1930, was a leader of her generation.

Shirley graduated from the University of Sydney with a B.Sc in 1952 and an M.Sc in 1954, which she followed with a Ph.D. from King's College Hospital Medical School in London. She returned to Australia in 1961 to a job offered by Dr George Humphrey, then Chief of the CSIRO Division of Fisheries and Oceanography. This position started Shirley on a lifetime career in phytoplankton pigment research.

Shirley won a Kaiser Foundation funded sabbatical at the University of California, Berkeley, from 1962 – 1964 where she led the discovery of two new chlorophyll c pigments. She was invited to join the maiden voyage of the Scripps Institution of Oceanography's new vessel Alpha Helix in 1965 to study the pigment composition of the micro-algae of the Great Barrier Reef. The 10-week voyage broadened Shirley's knowledge of marine micro-algae beyond just pigment composition. The publications resulting from Shirley's work aboard the Alpha Helix brought her an invitation from Professor Andrew Benson at Scripps to take a sabbatical in his laboratory, where she met her future husband, Dr Andy Heron, an Australian scientist also on sabbatical studying zooplankton population biology. Shirley and Andy Heron were together until Andy's death in 1989.

Dr Humphrey's group, while remaining a part of CSIRO, was housed at the University of Sydney during the 1970s and it was there that Shirley started the Algal Culture Collection (now the Australian National Algal Culture Collection). The collection then comprised about 30 strains. The collection moved back to CSIRO in 1978 and continues within CMAR today, housing over 1000 strains.

The CSIRO Division of Fisheries and Oceanography was split into two Divisions in 1981 and Shirley was asked to be Acting Chief of the Division of Fisheries. This was a busy time for Shirley as it covered the relocation of the two divisions from Cronulla, NSW to Hobart. Shirley returned to the laboratory in 1984 and accomplished many major achievements in pigment research before formally retiring in 1995.

Shirley's long standing passion for pigment research never retired, however, and she continued to research and publish as an Honorary Research Fellow with CSIRO until her death. Several of Shirley's colleagues recognised her achievements in 2012 in the article Tribute to Shirley Jeffrey: 50 years of research on chlorophyll c published in *Phycologia* (Volume 51, 2: 123–125). Shirley received many awards throughout her career, including the 1988 Inaugural Jubilee Award from the Australian Marine Science Association. She was elected a Fellow of the Australian Academy of Science (FAA) in 1991 and in 1992 she was appointed a member of the Order

of Australia (OA). She received the Gilbert Morgan Smith Medal from the United States National Academy of Science in 1993, the first person outside the United States to receive that Medal. She was later elected as a foreign associate of the US National Academy of Science. She was awarded the Australian Centenary Medal in 2003 and received the Shinkishi Hatai Medal at the 21st Pacific Science Congress in Okinawa, Japan, in 2007.

Shirley's contribution to micro-algal pigment research has been extensive and influential and numerous scientists and students have benefitted from her knowledge and experience. Research Shirley initiated in CSIRO is continued today by staff Shirley employed – Sue Blackburn, Ian Jameson, and Malcolm Brown.

Shirley was a Fellow and a Council member at Jane Franklin Hall (UTAS) and an office bearer of the Royal Society of Tasmania, often hosting events for the Society in the CMAR auditorium. Shirley's passion for science was complemented by a lively passion for tennis, which she played socially until her early 70s. She also was an accomplished violinist.

Shirley is survived by two sisters, Ann and Elizabeth, and a brother, Tom.

# INSTRUCTIONS FOR CONTRIBUTORS

Copy which is submitted for publication in *The Phycologist* should be concise and informative. Articles should be scientifically sound, as jargon free as possible and written in a readable scientific magazine style. Unless absolutely essential references should not be included. All types of relevant material will be considered, these include job advertisements, scientific reports, book reviews, news items of topical interest, meeting announcements, grant awards, promotions, appointments, profiles of eminent phycologists and obituaries. If you are interested in submitting material that does not fall within any of these broad categories, or you are unsure of the appropriateness of a potential article, then contact the editor. Suggestions for future articles or a series of articles are welcomed.

Copy should be submitted, preferably as attachments to email or on disc (MS Word for Windows or Rich Text Format). **Illustrations and photos to accompany copy are welcomed and should be supplied as JPEG or TIFF file-format no less than 600 dpi resolution.** The editor reserves the right to edit the material before final publication.

## Submission of Copy and Deadlines

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