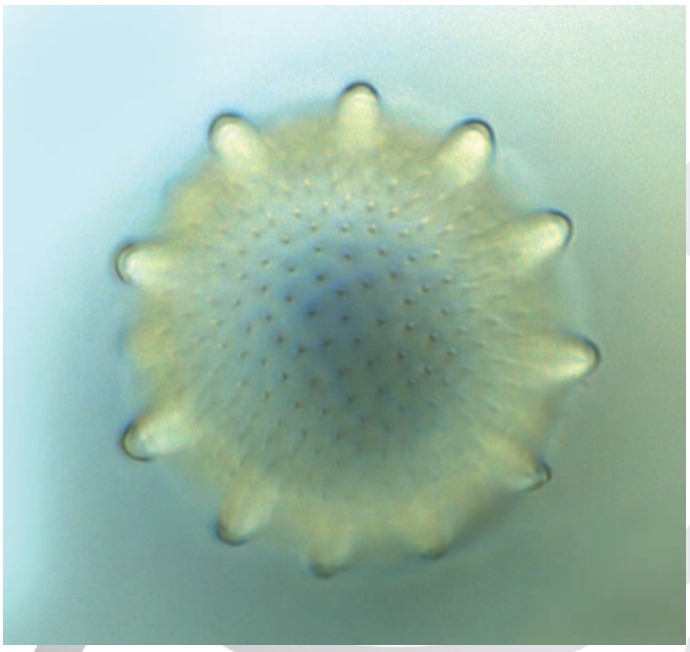
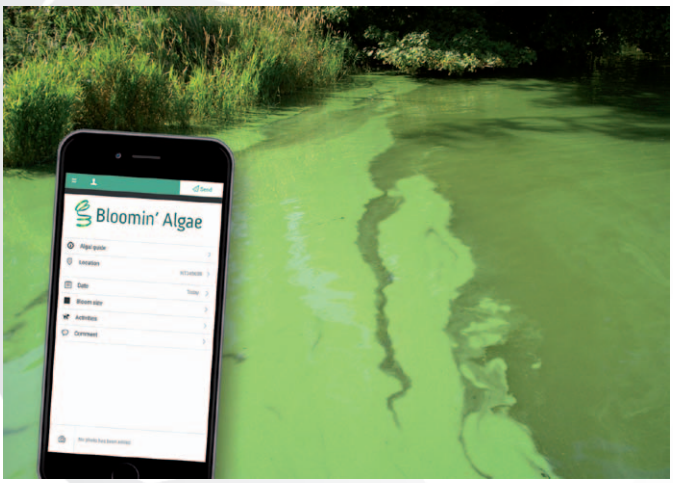
The Phycologist

The Newsletter of the British Phycological Society
Editor: Dr Jan Krokowski
Homepage: http://www.brphycsoc.org/





Hilda Canter-Lund competition

Bloomin' Algae app

Harry Powel Bequest

Number 93 - Autumn 2017

The British Phycological Society is a registered Charity no. 246707 - *The Phycologist* is a registered publication - ISSN 0965-5301

2017
British Phycological Society

Council Officers

President
Dr Gill Malin (2015-2018)

President Elect
Professor Graham J.C. Underwood (2015-2018)

Immediate Past President
Professor Christine Maggs (2015-2018)

Vice President Overseas
Professor Dr Koen Sabbe (2015-2018)

Secretary[1]
Dr Jane Pottas (2009-2018)

Treasurer[2]
Dr Maeve Edwards (2013-2022)

Membership Secretary[3]
Dr Hilary Redden (2016-2020)

Joint Editor in Chief of the European Journal of Phycology
Professor Juliet Brodie
Professor Christine Maggs

Editor of The Phycologist[4]
Dr Jan Krokowski

Ordinary Members of Council
(3-year term of office)

Dr Gary Caldwell (2014-2018)
Francis Bunker (2017-2020)
Jo Wilbraham (2017-2020)

Dr Rupert Perkins (2015-2019)
Dr Claire Gachon, Meetings Secretary (2015-2019)

Dr Saul Purton (2014-2018)
Dr Martyn Kelly (2015-2020)

Webmaster[5]
Dr Andrew Davies

Student Representative[6]
Paul Cherry (2015-2018)

Federation of European Phycological Societies (FEPS) Representative
Professor Geoffrey Codd

Federation of European Microbiological Societies (FEMS) Representative
Professor Paul Hayes

Secretary[1]

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

secretary@brphycsoc.org
Tel: +44 (0)1947605501

Treasurer[2]

Dr Maeve Edwards
Carna Research Station
Ryan Institute
National University of Ireland, Galway
Muigh Inis
Co. Galway, Ireland

treasurer@brphycsoc.org
Tel: +353 (0)9532201

Membership Secretary[3]

Dr Hilary Redden
University of Durham
Department of Chemistry/
Earth Sciences
South Road
Durham
DH1 3LE

membership@brphycsoc.org

Editor of The Phycologist[4]

Dr Jan Krokowski
Scottish Environment Protection Agency
(SEPA),
Angus Smith Building
Ecology
6 Parklands Avenue, Eurocentral
Holytown, North Lanarkshire
ML1 4WQ

jan.krokowski@sepa.org.uk
Tel: +44 (0)1698839000

Webmaster[5]

Dr Andrew Davies
School of Ocean Sciences
Bangor University
Menai Bridge
Anglesey LL59 5AB
UK

webmaster@brphycsoc.org
Tel: +44 (0)1248382842

Student Representative[6]

Paul Cherry
Northern Ireland Centre for
Food and Health
Biomedical Sciences Research Institute
Ulster University, Coleraine Campus
Cromore Road
Coleraine BT52 1SA
Northern Ireland

student.rep@brphycsoc.org
Tel: +44 (0)7914 029545

Editorial

A lot to read in this issue with many reports from student members.

Don't forget about the next BPS meeting at Southend, which will be our 66th Annual Meeting. The Meeting will be held from Tuesday 9th to Thursday 11th January 2018 (arrivals from Monday 8th). Further details will be posted on the BPS website and emailed to the BPS Membership as the programme is developed. BPS Council look forward to seeing many of you there in 2018!

Congratulations too, to our Treasurer - Maeve – who gave birth to a baby boy at 3.15am on 9th July. Maeve and Rowan are home and both doing really well. Many congratulations Maeve and family!

John Dodge <johndodge@waitrose.com> has informed me that he has available lots of algal books and journals and boxes of reprints, and long runs of the three main algal journals plus the JMBA. John is prepared to make a list of what he has available to anyone interested. We may also consider auctioning some of the books and journals, with proceeds going to BPS to help fund further student bursaries.

We also pay tribute to Hilary Belcher who died on 18th January 2017 with special *In Memoriam* obituary.

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.

CONTENTS

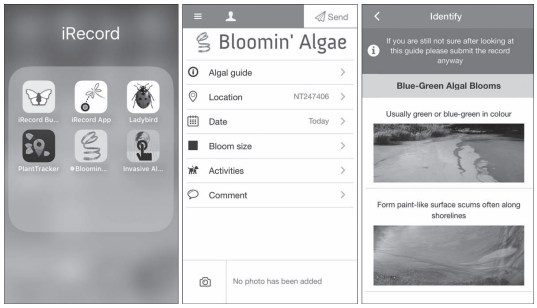
Council meeting London

The BPS Council met in July this year at the Linnean Society in London. A big turnout with 17 Council members in attendance. An impromptu fire alarm gave us the opportunity to go outside, to cool down, and have a photo taken in the court yard of the Linnean Society Burlington House Building. From Left to Right Council present were: Graham Underwood, Jane Pottas, Geoffrey Codd, Juliet Brodie, Christine Maggs, Andrew Davies, Gill Malin, Martin Wilkinson, Gary Caldwell, Koen Sabbe, Saul Purton, Francis Bunker, Hilary Redden, Jo Wilbraham, Paul Hayes, Anne Jungblut, and Jan Krokowski.

"Bloomin' Algae!"

– a new app for monitoring harmful algal blooms in freshwaters

Laurence Carvalho, CEH, Edinburgh



If you're out on fieldwork, or just a leisurely stroll, and spot a bloom of blue-green algae (cyanobacteria) at a lake, local pond, or canal, you can now record its presence with a new app, called "Bloomin' Algae". Blooms of blue-green algae (cyanobacteria) are a major health hazard as they commonly produce potent toxins that can result in people experiencing skin rashes, eye irritations, fever, muscle pain and worse. They have also caused the deaths of dogs, cattle, birds and fish across the UK. The app allows more rapid alert service to SEPA, EA, local authorities and Health Protection Boards to put up warning signs to minimise risks to the public.

The app, which has been developed by Laurence Carvalho and colleagues at the Centre for Ecology & Hydrology (CEH), with inputs from Jan Krokowski and Pauline Lang at SEPA, enables users to submit a photo of the bloom and state what activity takes place at the location so that the potential risks to people and animals can be gauged. The app will also be used to understand the environmental drivers of blooms and scum formation, particularly the role of short-term weather events.

Blue-green algae are of greatest hazard when they rise to the surface, and form surface scums when numbers are very large. The app contains a photo guide with images of harmful algal blooms and also images of other species often confused with algal blooms, such as duckweeds (*Lemna*), water fern (*Azolla*) and filamentous green algae (e.g. *Cladophora*).

You can download the app from Android and Apple app stores and if you then come across an algal bloom, use the app to send CEH a photo and details of its location. CEH will then alert the UK environment agencies so they can take action. Please add any useful comments, for example, if warning signs are already in place or not.

Before using the app in the field we do recommend that you set up an iRecord account with the Biological Records Centre and validate your email address with this account. This then allows us to send you feedback and contact you if we have any queries. You do need to have an iRecord account to submit a record, but this is the same account if you already use the general iRecord app to submit records of seaweeds, stoneworts, or any other algae.

Please do not touch anything that you suspect is a bloom or allow children or pets to come into contact with, or swallow, the water. Dogs are at particular risk as they can ingest large quantities when cleaning their coats after swimming in the water.

To download the app: http://www.brc.ac.uk/app/bloomin-algae-app

To register an iRecord account: https://www.brc.ac.uk/irecord/

Hilda Canter-Lund photography competition winner

The 2017 winner of the Hilda Canter-Lund photography competition is Chris Carter, for his image of the desmid *Pleurotaenium coronatum* var. *robustum*.

http://www.brphycsoc.org/Canter_Lund_2017/index.lasso

Chris also won the competition in 2013 and you can read more about him at http://www.brphycsoc.org/canter-lund/Winner_2013.lasso.

Do not be fooled by the elegant simplicity of this image: Chris has managed to present the apical view of a cylinidrical desmid, which requires a huge amount of skill and patience. In his own words:

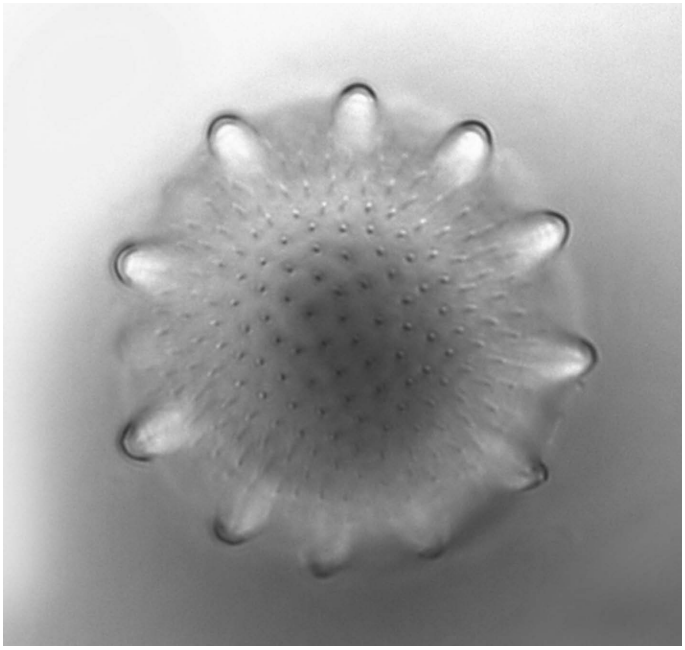
"It was David Williamson who pointed out this desmid in material brought back from a Newfoundland holiday: it was he who emphasised the importance of non-plane views and always showed pores on his own drawings. Because the focus length of a X100 oil objective is so small it was necessary for this apical view to suspend the cell in dilute jelly in a cavity tank not much deeper than its length; this done, the cell was agitated with a length of fine wire and when once away from horizontal it could then be manipulated by gently sliding the coverslip relative to the cell. Things move very 'fast' at high magnification however and many fraught tries were needed: the cell is probably a degree or so away from vertical even here but I thought the lighting was actually quite attractive with the bronze hue of the preserved wall contrasting with a blue tinge from the light source; even the very slight tilt perhaps suggests a monster (or a something) rising out of the deep."

The BPS now award two prizes – to ensure that the best of both micro- and macroalgal photographs are rewarded and the second prize in this year's Hilda Canter-Lund competition for algal photography is awarded to Tiff Stephens for her photograph "Cystocarp Central" showing a close-up of the red alga *Bonnemaisonia clavata*.

Tiff's biography can also be seen at http://www.brphycsoc.org/Canter_Lund_2016/index.lasso.

Congratulations to Chris, to Tiff, and well done to the other shortlisted photographers. Many thanks to everyone who submitted images this year.

Martyn Kelly



David Williamson Award for Botanica

The Linnaean Society of London have recently recognized David Williamson's exceptional talent as an illustrator by awarding him the Jill Smythies Prize for Botanical Illustration. He was nominated by Prof. David John and seconded by Prof. Juliet Brodie, with the former collecting the medal and prize on David's behalf at a ceremony held at Burlington House, Piccadilly on 16th June 2017. David is the 29th recipient of the award and the first to receive the prize for illustrating microscopic plants.

David Williamson is an exceptionally gifted illustrator who has spent the past 35 years researching and illustrating desmids, a group of green algae exhibiting a remarkable degree of complexity whose symmetry, elegance of form and ornamentation make them one of the most aesthetically pleasing groups. It is very difficult to adequately describe the more morphologically complex forms so drawings and photographs are essential for correctly interpreting key diagnostic characters.

The need for illustrations was appreciated by the earliest investigators of these fascinating algae and therefore their publications contained many plates of line drawings and sometimes in colour. David has followed in the footsteps of earlier desmidologists and produced thousands of line drawings, often using several illustrations to show different aspects of more bizarrely-shaped 3-dimensional species and the morphological variation displayed by a species. His talent as a botanical illustrator was first appreciated by the late Prof. Allan Brook with whom he wrote a monograph in which each species was illustrated by many drawings. David is now a leading authority on desmids having published papers on the desmids of countries besides the British Isles, including Canada, Chile, South Africa, Sulawesi, South Orkneys, Malaysia and New Zealand. Of special significance are his desmid posters that are designed to aid the rapid identification of the commoner British species. Almost 50 new species and forms have been described by David who continues to examine and illustrate desmids from many parts of the world in a small, book-lined study at the back of his garage in Oadby, Leicestershire.

David's lasting legacy will be the thousands of desmids illustrations in his more than 40 papers and the following major works on the desmids of Britain and Ireland: 'A Monogra-

led the Jill Smythies Prize
l Illustration

ph on some British Desmids' (2010) with Allan Brook, chapters in 'The Freshwater Algal Flora of the British Isles' (2011) and the 'New Survey of Clare Island Volume 6: The Freshwater and Terrestrial Algae', 'A Practical Guide to the Desmids of the West of Ireland' (2007) with David John.

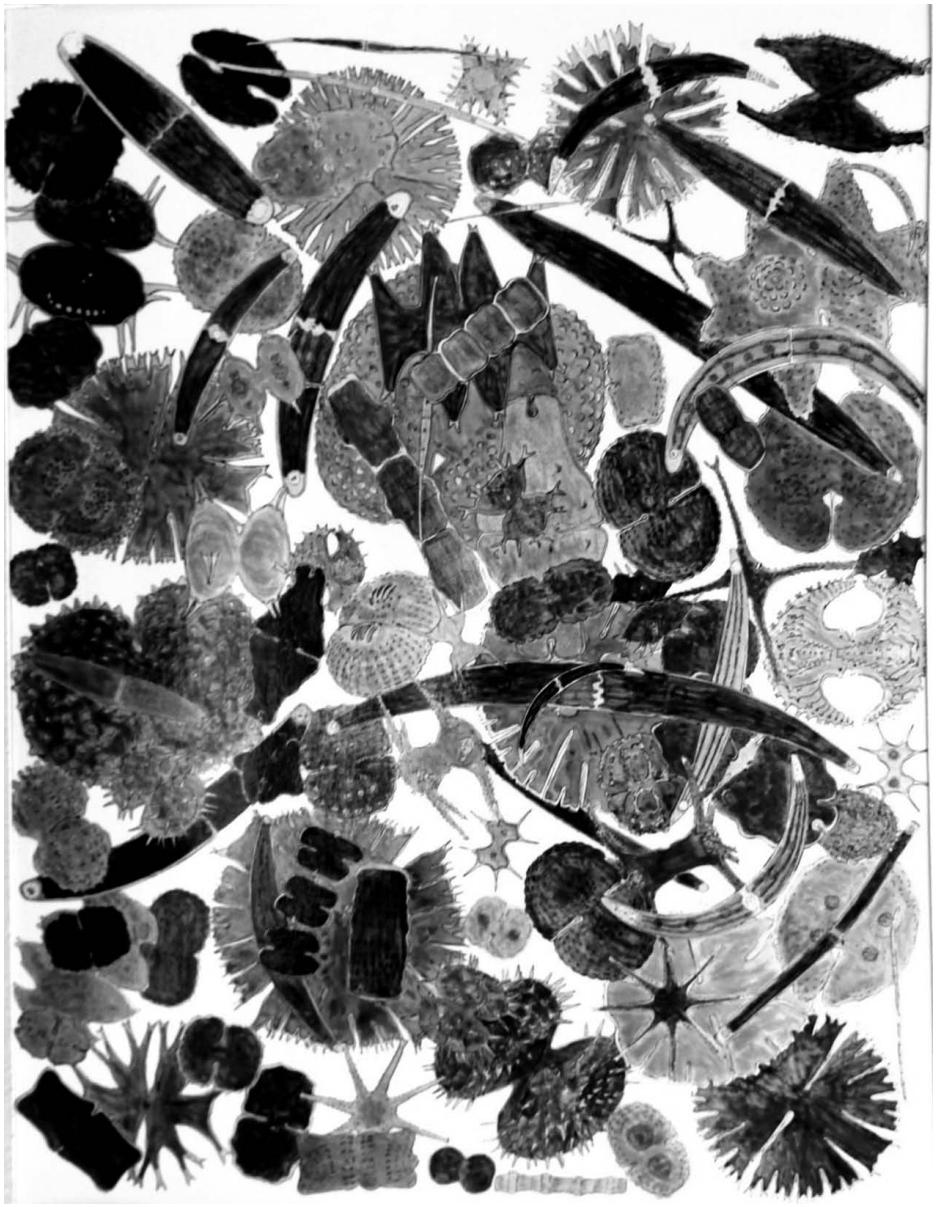
David has produced notelets of colour illustrations of desmids for sale to support 'The Fritsch Collection of Illustrations of Freshwater Algae' (www.fba.org.uk/fritsch-collection). Thanks to a recommendation by the late Allan Brook he was the major illustrator and editor of the illustrations submitted for publication in the 1st and 2nd edn of The Freshwater Algal Flora of the British Isles. A framed copy of David's poster of line drawings of 'The Desmids of Clare Island, Co. Mayo' was presented to him by the Royal Irish Academy and is now in the Herbarium in the Department of Life Sciences at the Natural History Museum.

Captions

1. David Williamson in his study at Oadby;

2. David's colour drawings of desmids used by him to produce montages, a mouse mat, fridge magnets and to cover boxes;

3. A montage by David of colour drawings of desmids



Student Bursary Awards

A Warm Wellcome – an Introduction to NGS at the European Bioinformatics Institute

Alexander THOMSON, Scottish Association for Marine Science, Scottish Marine Institute, PA37 1QA Oban, United Kingdom. alexander.thomson@sams.ac.uk

The Wellcome Genome Campus was an impressive sight as we jumped off the bus. Acres of green country park interspersed with space-age buildings and beautifully manicured walkways and plant beds. The whole place could well have been the headquarters of some Google or Tesla or Apple type corporation, or Hank Scorpio, as Jamie suggested. The group of us that had disembarked, there were around 40 of us in total, had come to the European Bioinformatics institute for a four day crash course on Next Generation Sequencing. Folks had come from all over; Greece, Quwait, China, Australia. It made my travelling down from Oban seemingly short. And highlighted how well renowned the EMBL-EBI was for bioinformatics and NGS technologies.

The course, entitled An Introduction to Next Generation Technologies, covered a wide range of NGS techniques, workflows and approaches. It consisted of an initial introduction to NGS technology and bioinformatics followed by three principle workshops covering RNAseq and gene building, resequencing and variant calling, and de-novo assembly. Each workshop commenced with a presentation and introduction to the area before launching into the practical exercise. These workshops were then interspersed with talks and presentations on a wider range of NGS topics such as database searching and data archiving, and talks from NGS users such as HipSci and the 1000 Genome Project.

It became clear early on that the level of experience and NGS exposure varied between the attendees. Some had worked with NGS data or technology before, and even had working datasets with them to apply their newly acquired skills to, whilst others, myself included, had very little previous experience. The fact that the Linux based systems used for the majority of the bioinformatics was new to many also slowed progress for some and I was glad to have put in the hours in the weeks leading up to get over that initial hurdle of how to navigate and operate a Linux terminal. We persevered, sometimes working together and sharing suggestions, other times forging ahead, alone with the data. As the week went on the terminal and the formats of data and analysis techniques became more familiar allowing more time to consider the true context of the data.

In all the course was a constructive one offering a broad but effective introduction to NGS technology, data and approaches. Some felt less enthusiastic having only had a brief overview of each sector and indeed not all of the course was applicable or relevant to every attendee, I don't think I will be using the 1000 Genomes database any time soon. But it was a useful first step in the otherwise daunting task of getting to grips with next generation sequencing and one I was glad to have attended. My thanks go to the British Phycological Society and the University of the Highlands and Islands for making that possible. The task remains now to put those lessons into action and apply the power of next generation sequencing to my research. I'm looking forward to it.

I actually attended a second NGS workshop a month later, this time focussing solely on the use RADSeq in population genomics. For those interested in population genomics have a look at the Population Variation Genomics workshop hosted by the Earlham Institute. A much more in depth and specific look into RadSeq and population data and an excellent course.

Global Seaweed 2017 Workshop

Adibi M. Nor, School of Marine Science and Technology, Newcastle University, Ridley Building, Claremont Road, Newcastle upon Tyne, NE1 7RU, UK, a.md-nor@newcastle.ac.uk

The Global Seaweed 2017 workshop, which took place during 8-12 May 2017, focused on macroalgae or seaweed farming covering the following topics: global seaweed aquaculture and wild harvesting scenarios, seaweed breeding, genetic improvement of seaweed crops, and the biotechnological potential of natural seaweed diversity. This third Global Seaweed Workshop was organised by the Scottish Association for Marine Science (SAMS) in Oban, Scotland, led by Drs Claire Gachon and Yacine Badis, who specialise in algal diseases, genetics and genomics. The workshop was designed for postgraduate, early career researchers and practitioners interested in the burgeoning European seaweed industry.

The workshop had a busy schedule throughout its five days period. For some of the participants this was their first visit to Oban or Scotland. Dr Claire Gachon welcomed all participants and briefed us on the workshop's schedule and housekeeping. During the first day's proceedings, a variety of questions were raised by the speakers, including the future of the global seaweed aquaculture industry (Dr Elizabeth Cottier-Cook), and seaweed aquaculture development in the UK (Dr Phil Kerrison), South Africa/Namibia (Prof. John Bolton), Tanzania (Dr Flower E Msuya) and South America (Pedro Murua).

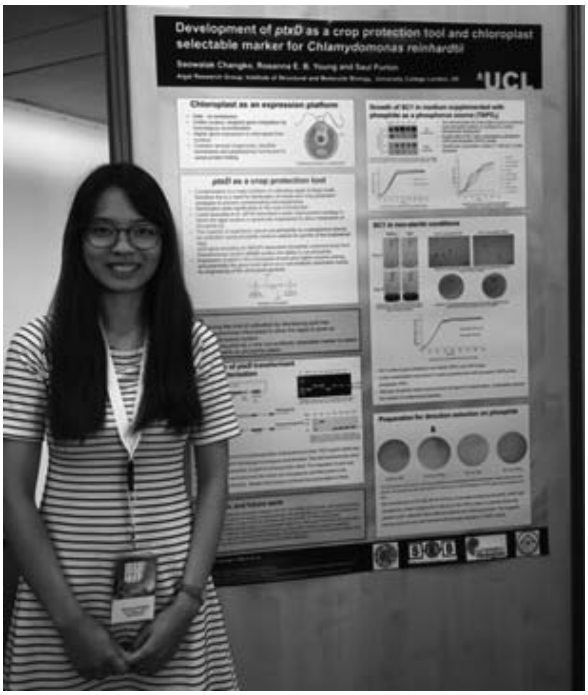
The theme on the second day was seaweed policy and its socio-ecological challenges, on which there were some excellent presentations, including those on worldwide kelp genetic diversity (Dr Ester Serrao), interactions between seaweed farming and the environment (Dr Adrian McLeod), the risk of seaweed as an invasive species (Dr Claire Gachon), and seaweed monitoring and assessment (Dr Clare Scanlan).

The third day was the most exciting day because the organisers had arranged a visit to SAMSs' seaweed farm with hands-on training on seaweed pathogens at SAMSs' laboratory. Participants enjoyed these events, and on the fourth day a lecture was delivered on the socio-ecological challenges theme, focusing on pathogens in algae. The fourth day ended with a networking dinner at The Waterfront Fishouse Restaurant. Participants got to know each other while enjoying the delicious food served (Oban is claimed to be the Seafood Capital of Scotland!).

The fifth day was filled with numerous presentations on the theme of innovative approaches to seaweed breeding – seaweed genomics. The morning session started with seaweed genetics (Dr Yacine Badis), followed by genetic maps using modelling approaches (Dr Komlan Avia), seaweed breeding (Dr Bertrand Jacquemin) and phenomics (Drs Ronan Sulpice and Claire Gachon). The day ended with a demonstration of the use of nephelometry (Dr Claire Gachon) and a final wrap up.

I am very thankful for being awarded a BPS student bursary which enabled me to participate in the Global Seaweed 2017 Workshop. This workshop has given me an opportunity to discuss about my research project with other participants and sparked several ideas in my mind for potential international collaboration with other attendees. It was a valuable networking opportunity where I have established new contacts with Dr Flower Msuya, which I plan to work with in the future. Thank you very much, BPS, for the financial support and the fruitful experience.

International Society of Applied Phycology (ISAP) Congress



Saowalak Changko, University College London, saowalak.changko.16@ucl.ac.uk

The International Society of Applied Phycology (ISAP) Congress happens every three years and this year it took place at historic Nantes in France. Several well-known and leading phycological institutions were located nearby. Therefore, they were excellent for hosting the international congress. The five-day conference was focused on studies in both microalgae and macroalgae with the full schedule of talks ranging from Biology, Process, Industry and Application perspectives. Most of the talks were very informative and great quality. All the keynotes by experts in the field were inspiring and broaden my view in the phycological application. This meeting was not only for academics but also for finding the right research partnerships.

I am currently a first-year PhD student and this was my first international conference. Therefore, I decided to present a poster. My work is focused on developing new tools to reduce bacterial contamination in microalgal culture. The conference provided students with two 30-minutes slots to present the poster. I had the opportunity to discuss my work with other delegates, which I gained a number of useful feedback and fresh idea for future experiments. Presenting poster was not the only way I obtained new knowledge, but the oral presentation of other research groups also introduced me to a wide diversity of phycological application that I could apply to my project in the future.

In this conference, the team organized many social events, for example, ice-breaking cocktail where I made new friends at all stage of their careers and from around the world such as Belgium, France, Australia, Malesia and Indonesia. I found this event very useful to know new people and make a connection. As a part of the program, there were coffee breaks and lunch during the day for a great opportunity to share an opinion. Also, they had a free Wednesday morning for excursions, which people could go to wine tasting, cruise or wander around Nantes historic center. These activities helped people to build a network in the relaxing environment.

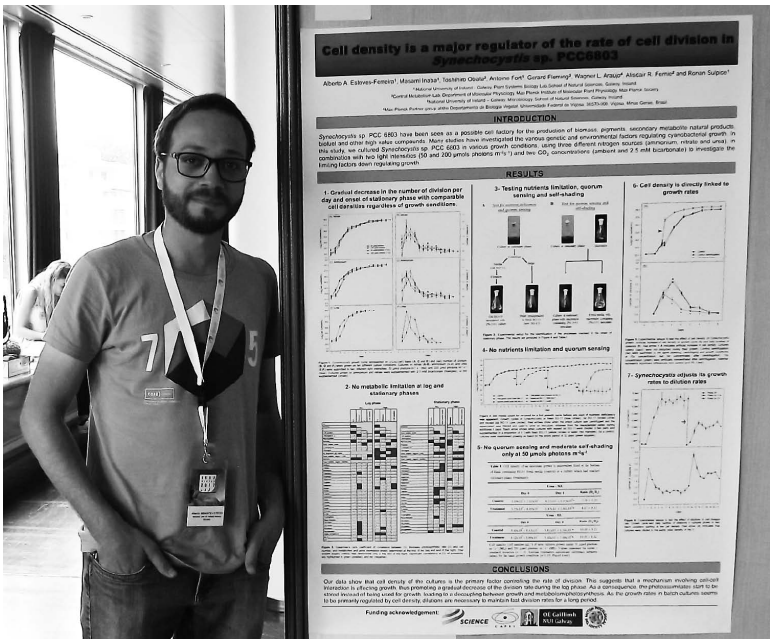
I would like to thank the conference team for organizing this excellent congress and all the feedback I gained during the poster presentation. I am truly grateful to the British Phycological Society for funding me to attend and present the poster at the fantastic meeting.

Alberto Abrantes, A.ABRANTES1@nuigalway.ie

From 18th to 23rd June 2017 the 6th congress of the International Society for Applied Phycology (6th ISAP) took place in Nantes, France. The congress happens each three years and this time the aim of the organizing committee was to allow the participants to appreciate the huge phycological biodiversity and the diversity of its biotechnological applications. More than 500 participants joined the congress presenting their research in areas related to biology, process, application and industry. I'm a final year Ph D student in Botany and Plant Science at the National University of Ireland – Galway, and due to the financial support of the British Phycological Society I had the opportunity to join the 6th ISAP and present a poster about one of the chapters of my Ph D research. As the paper related to this chapter was accepted for publication during the period of the conference (DOI: 10.1104/pp.17.00729), I could discuss our findings with researchers from different universities and companies during the poster section, and take their contact to establish further collaborations.

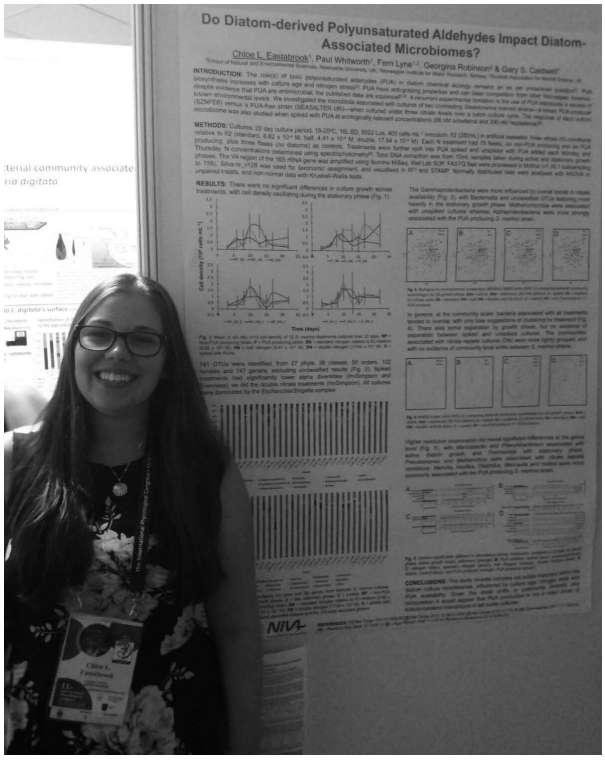
In the opening ceremony Dr. Chris Bowler gave a very interesting talk about the Tara Oceans project and the data they have been obtaining about microalgal diversity in the oceans. Hence, during the event I could enjoy talks about different subjects such as growth strategies and comparisons among different culturing methods in photoreactors; identification and production of cyanobacteria and microalgae bioproducts (e.g. antioxidants and phycocyanin); methods for identification of genes related with the control of metabolic pathways (e.g. photosynthesis); strategies and methods to select cyanobacteria and microalgae strains with desirable phenotypes for industries (e.g. high division rates at higher cell density); the use of flocculation to decrease the cost of biomass harvesting; use of algal extract as a fertilizer for agricultural purposes; use of pH to control contamination of microalgae cultures; the application of random mutagenesis to generate non GMO strains with improved production of lipids; and utilization of wastewaters from pig farms to culture microalgae. Among the works presented there I would like to highlight three of them. First, the talk given by Dr. Maria Barbosa. She com-

pared the costs of cyanobacteria and microalgae biomass production using heterotrophic and autotrophic conditions, and gave us an idea of how much the production cost should be to achieve economic viability (i.e. less than 1 euro kg-1). Second, the talk given by Dr. Aga Pinowska from Global Algae Innovations (http://www.globalgae.com/). She presented some of their strategies to culture algae in large/industrial scale raceway ponds by using fertilizers and recycling media, and also showed how they harvest and dry the biomass for lipids extraction or food supplement production. Finally, the talk given by Dr. Rui Gomes from ALGAFARM showed that heterotrophic and autotrophic growth lead to similar growth rates and biomass production, although heterotrophic conditions are more efficient for inoculum production. Thus, their strategy to decrease the cost of cyanobacteria and microalgae production is to produce the inoculum heterotrophically and then grow the culture outdoor autotrophically.



I would like to congratulate the organizing committee of the 6th ISAP for the organization and quality of this conference, which allowed me to be updated with subjects from the different areas of the applied phycology. I also would like to thank the British Phycological Society for the kind attention and the financial support to participate in the conference.

11th International Phycological Congress, Szczecin, Poland, 13-18 August 2017



Chloe Eastabrook, Newcastle University, School of Natural and Environmental Sciences, c.l.eastabrook1@newcastle.ac.uk

The 11th International Phycological Congress (IPC) took place in Szczecin, Poland, between Sunday 13th and Friday 19th August 2017. This was my first international conference and, alongside a fellow undergraduate, two postgraduates and our supervisor, we travelled from Newcastle International airport on Saturday evening, landing in Berlin airport and arriving in Szczecin by private shuttle service.

The congress began on the Sunday evening, allowing us some time to explore the local area. The opening ceremony was led by the organising committee convener, Andrzej Witkowski. After a warm welcome the delegates (from 46 countries at many different stages of their careers or studies) congregated for a lively icebreaker, accompanied by live shanty music.

Monday morning began with a plenary from Professor Georg Pohnert from the University of Jena, titled 'Chemical communication in microalgae – how unicellular organisms shape and perceive their environment' – this was particularly interesting for me as it embraced my own research interests. Following the first coffee break the invited and contributed symposia began in four parallel sessions that delivered many interesting and inspiring talks. Poster sessions ended the day, allowing authors to converse about their research with curious delegates in a more informal manner. For me, it was Tuesday afternoon

that held the greatest interest as now I had the opportunity to present my poster. Sharing my undergraduate project with researchers renowned in my field (that of diatom-derived polyunsaturated aldehydes) was a fully enjoyable and educational experience, with my particular take on the science (the response of algal microbiomes to aldehydes) prompting plenty of challenging questions. The time slot flew by, with conversations continuing afterwards during the open night.

The following days of the conference followed this structure, except for Wednesday, when mid-week excursions or workshops were undertaken. This provided some additional time for informal conversations with fellow students and researchers, as well as getting to experience more of the Polish culture and local sights, depending on the chosen excursion. Every excursion finished at a bonfire barbeque event, where dinner and drinks were provided, with a local accordion and dance act for entertainment. For the rest of the week plenary talks were delivered by Zoe Finkel from Mount Alison University, Nils Kroger from Technische Universität Dresden and Christine A. Maggs from JNCC, while the symposia and contributed sessions discussed more aspects of the conference theme. Overall, there was a wide range of topics, ensuring that all delegates were fully engaged.

As an undergraduate student attending my first conference I was unsure what to expect; however, the IPC exceeded my expectations and allowed me to expand my interest into new topics that I will carry forward into my MPhil research. In addition, the opportunity to network with phycologists from all over the world was priceless and I now have many new friends. I am extremely thankful to the BPS for providing me with the opportunity to attend the 11th IPC and present my research, helping to cement my desire to continue along my journey as a young and enthused phycologist.

Fatemeh Ghaderiardakani, University of Birmingham, fxg433@student.bham.ac.uk

I am currently a third-year PhD student in the University of Birmingham under the supervision of Dr. Juliet Coates. With the support of the BPS, I was fortunate enough to attend 11th International Phycological Congress held by Szczecin University, which was the first phycological congress to take place in Poland. The event started early afternoon on Sunday 13th and the theme designed for congress was "the challenges and opportunities of the molecular era for algal research and bioprospecting".

Four great keynote speakers had been invited to this meeting to review diverse aspects of cutting edge phycology. One of the most insightful talks was the last plenary presentation by Dr. Christine Maggs (Bournemouth University) on "Linnaean systematics in the age of Big Data" in which she described the controversy over Ulva species identification (*Ulva compressa* and *Ulva mutabilis*) as a part of her talk. Considering this point that one of *Ulva* species that I used for my experiment was *U. mutabilis*, this talk was very important for me. About 14 special symposia had been selected and three or four of these were running in parallel each day throughout the 5-day conference covering different issues including "Algal microbiomes in ecology, physiology, development and evolution", which was the most relevant one to my presentation.

I had the opportunity to present a talk entitled "The cross-kingdom interaction in the marine macroalgae Ulva: revisiting the lottery theory through cross-testing of bacteria". Giving this presentation allowed me to have discussions with a number of researchers in this field and to get valuable feedback and comments from other attendees. I also received a request for specimen that I identified as *Ulva laetevirens*, an Australian invasive species, collected from South Wales, UK. In addition, I made a number of international contacts with whom I hope to be able to collaborate with in future.

Attending this great congress gave me this chance to share my research, be inspired by fellow scientists and forge new collaborations and friendships. I am very grateful to the British Phycological Society for their financial support and would like to thank everyone involved for making this congress such a unique experience.

11th International Phycological Congress, Szczecin, Poland, 13-18 August 2017

Paul Whitworth, Newcastle University, School of Natural and Environmental Sciences, p.whitworth@ncl.ac.uk

On Saturday August 12th I began the trip to my first International Phycological Congress. As a group of five we travelled from Newcastle, UK to Szczecin, Poland via Berlin airport. Arriving late at night the day before the congress allowed us to take in the local sights and explore the bustling city.

Sunday evening began with the official opening ceremony which was introduced by Andrzej Witkowski and his organising team. Prof. Juliet Brodie, President of IPS and Prof. Edward Włodarczyk, Rector of the University of Szczecin, completed the opening with inspiring talks before allowing the delegates to congregate and join in the ice-breaker. Shanty music was a low hum in the background as chatter and introductions from new and old colleagues took over the hall. The range of delegate experience varied considerably, from esteemed professors to undergraduates and even one forward thinking A-level student attending prior to beginning his undergraduate studies!

An 8am pickup transported the eager phycologists to Szczecin University of Humanities just outside Szczecin centrum. The day began with a plenary by Prof. Georg Pohnert, University of Jena, Germany on chemical communication in microalgae. After a short break the invited symposia split the crowd of over 400 delegates into four theatres, ranging from systematics and evolution of macroalgae to biotechnology and bioprospecting. After the invited symposia and some local culinary treats, the contributed sessions began. The speakers throughout the day addressed questions on many topics and were well received by all. The day finished off with a poster session where delegates were able to interact with some of the data and discuss matters on a more one-to-one basis.

Tuesday, Thursday and Friday followed a similar structure with plenaries from Zoe Finkel, Mount Allison University, Canada; Nils Kröger, Technische Universität Dresden, Germany; and Christine A. Maggs, JNCC, UK. Tuesday was my day to present (on the microbome associated with anaerobic digestion of seaweed). As time drew on, growing familiarity with the speakers helped ease my nerves. After, the aspect of being approached by professors and experienced phycologists alike, was unexpected and eye opening and helped deepen my experience.

Wednesday had options of a mid-week excursion or participating in one of a number of workshops. The excursions finished with a bonfire barbeque at 6pm where conversation flowed as plentifully as the beer. The food was exquisite and a local accordion and dance troop enthralled us all.

As an MPhil student at the start of my research journey, having the opportunity to formally present my findings and network with the world's phycological community, was a precious opportunity. Alongside the professionalism that was obvious throughout the congress, the mid-week excursion and evening congregations revealed a more relaxed side to academics, enabling the fun and adventure to show through. I am indebted to the BPS for this opportunity; the 11th International Phycological Congress will long remain in my memory.

Arctic Field Course on Greenland

Arctic Station – founded 1906. (69°15'N, 53°34'W).

Sam Black

'Nuannaarpoq' is an old inuit word which describes the sensation of extravagant pleasure of being alive. It's also the exact same sensation I found whilst on a recent Arctic field course in Greenland with Copenhagen University where I was studying the structure and composition of the macroalgae communities on Disko Island. The reason you are reading this in the Autumn issue of *The Phycologist* is because my studies on Greenland would not have been possible had I not been granted a student bursary from the British Phycological Society. Therefore, it is with joy, gratitude and nuannarrpoq that I write about my two weeks spent on Greenland this year in July.

As a Scot moving from the picturesque town of Oban to the city of Copenhagen in Denmark to start my MSc studies in Climate Change, I thought my days of studying beside the mountains and the rocky seashore were over for the time being. However, I soon found out that not all of Denmark is synonymous with agricultural land, pastries and well-designed furniture – there's Greenland! Shortly after arrival in Copenhagen I set about applying and preparing a project for the field course which would attempt to describe the intertidal macroalgal community structure on southern Disko Island and discuss how it may be influenced by climate change now and in the future. After receiving my grant from the BPS in February the months rolled by and soon enough I was boarding an Air-Greenland flight from Copenhagen to Ilulissat. Once in Ilulissat the group of 12 students boarded a boat and sailed out amongst the icebergs across to Qeqertarsuaq on Disko Island, the location of Copenhagen Universities historic 'Arctic Station'.

Working in pairs, each team spent the following 9 days carrying out their respective field and labwork, ranging from terrestrial projects examining the effects of snow cover on plant diversity to marine projects considering the behaviour of humpbacks whales in response to boat traffic. My colleague and I set to work quickly, outlining 6 previously studied sample locations where we aimed to carry out two 10m transects at each site. The first few days brought about the usual teething issues and heated species identification discussions however soon enough we had developed a rigorous sampling protocol that not even the 4°C water could upset.

Some of our sampling locations lay further afield than the rocky shores nearby the station which therefore required a short boat trip upon the stations ship 'Porslid'. Expertly captained by a crew of locals our journeys upon the vessel to some of the more remote shorelines of the island were always filled with excitement thanks to the appearance of hunting humpback whales and overturning ice-bergs. Although distracting at the time, the notion of looking up from a quadrat too see a cathedral sized iceberg floating just off-shore is a sensation that I will never grow tired of!

Thanks to a period of rather settled and pleasant weather, Marc and I finished our sampling ahead of schedule, giving us a spare day to sit in the lab, revisit our species identification disagreements and begin to tabulate our data. Although confined to a strict 9-day field work window we did manage to find time to enjoy many of the other wonderful things the area had to offer through a variety of short hiking and fishing trips, a trip to the museum, a live band at the local pub and many locally foraged delicious evening meals.

However sadly and all too soon it was time that the group left the station in order to make room for the forthcoming Arctic field course of geographers arriving the following week. It was with a heavy heart that I boarded the boat back to Ilulissat however I couldn't have wished for the trip to have gone any better. Unlike the majority of the other students I was lucky as I had a further week of work scheduled in Ilulissat volunteering for a guiding company in return for a place to sleep, three meals a day and the occasional boat trip. The following week was enjoyed almost as much as the first two.

Currently I am back in Copenhagen and beginning to work on my report. Whilst I've yet to examine the results in any great detail it does appear that the limited number of red algal species present on Disko Bay may less abundant now than they appear to have been in previous studies. Whether that is pure speculation or the result of enhanced UV damage resulting from decreasing winter sea ice remains to be seen. And speaking of

my report, I should probably get back to it! Once again, I'd like to thank all of the members and staff of the BPS for the financial support that made such an unforgettable experience a reality. Lastly, if you are interested, whilst out on Greenland I put together a short video with some highlights from the trip: find here using the link below: https://vimeo.com/228067315?utm_source=email&utm_medium=vimeo-cliptranscode-201504&utm_campaign=29220

Myself taking a quick 'breather' when sampling the lowermost quadrat of a transect at a depth of 2.5m.

Arctic Field Course 2017 Staff and Students. I am on the lower right.

BPS Field Meeting, Orkney, 26th-28th July 2017

Clare Scanlan and Martin Wilkinson, martin.wilkinson8@btinternet.com; clare.scanlan55@btinternet.com

Following the re-introduction of field meetings to collect seaweed records, it was decided to visit Orkney this year. Orkney is a group of islands off the north coast of Scotland with a population of only about 19000 people. It has relatively clean seawater and a tremendous range of shore habitat diversity giving a very rich seaweed flora. Of approximately 630 species in the seaweed flora of Great Britain, no less than 265 of them were recorded in Orkney during the 20th century.

The BPS first visited Orkney in 1973 and published records in Wilkinson (1975). That field meeting was attended by about 12 experts, who visited 9 sites for seaweed recording. This year's meeting reflected the growing interest in marine biological recording by naturalists and by environmental staff having a combination of such people with rather fewer experts. This meant that we had beginners and those with varying degrees of knowledge. Part of the remit of the revived field meetings is to raise the profile of algae generally, and to draw new people into learning more about seaweeds. So we formed a mixed group in accordance with this aim. Additionally, several Ph.D. students from Swansea, comparing the attributes of brown seaweeds on a geographical basis, shared the lab with us and came on our field outings.

The meeting was based at the Heriot-Watt University Orkney campus at the Old Academy in Stromness, with laboratory space kindly provided free of charge. We thank Heriot-Watt for this, particularly Dr. Jo Porter and Dr. Andrew Want who were our main local contacts. Everyone was very welcoming, even inviting us to a barbecue on the Friday sponsored by local environmental consultancy Aquatera. The barbecue formed part of Stromness's "Per Mare" week, a celebration of the town's 200 years as a Burgh of Barony. "Per Mare" means "by the sea", so our surveys fitted in very well with the maritime theme of the week. So much so that we were interviewed by Radio Orkney for their morning news magazine and a version of this was also played on national Radio Scotland. In this broadcast Martin Wilkinson and Clare Scanlan talked about the BPS field meetings and why Orkney was such a special place to hold one because of its very rich flora and referred to the value of our surveys because of the Scottish Government's wish to expand the seaweed industry.

We visited three sites in total, ones which had been visited previously so there were records for comparison: These were Roeberry Taing on South Ronaldsay, Skaill Bay (west Mainland) and Birsay (north-west Mainland). The totals of taxa recorded are given in Table 1.

The years from which totals are shown are as follows:

· 1973 is the previous BPS field meeting from which records were published in Wilkinson, M. 1975. The Marine Algae of Orkney. *British Phycological Journal*, 10, 387-397.

· 1998 gives unpublished recordings from a survey by Martin Wilkinson, Clare Scanlan and Ian Tittley on the 25th anniversary of the BPS 1973 meeting.

· 2000 gives recordings from Ph. D. field work at Heriot-Watt University carried out by Emma Wells with Martin Wilkinson.

· 2017 gives recordings from this year's BPS field meeting

The species totals are high for individual shores and show the richness of Orkney. The consistency of the totals between different dates shows that this richness has not declined. Although we did not find any startling new records for this area it was gratifying to find that the northern fucoid species *Fucus distichus* still had extensive meadows on shores exposed to the incredibly strong open Atlantic wave action. This species is common further north on shores of various degrees of wave action, e.g. around Iceland, but in Britain only occurs on a few northern shores with extreme wave action. It has been suggested by the conservation agencies as a sentinel for changes due to sea temperature rise. One of us (MW) remem-

Table 1. Totals of seaweed species recorded at three sites during the BPS field meeting in Orkney in 2017 in comparison with numbers found at those sites in earlier surveys.

Bay of Skaill			
	1998	2000	2017
Green seaweeds	25	26	24
Brown seaweeds	42	31	31
Red seaweeds	43	44	47
Total taxa	**110**	**101**	**102**
Roeberry Taing			
	1998	2000	2017
Green	18	23	19
Brown	26	32	36
Red	36	39	44
Total	**80**	**94**	**99**
Birsay			
	1973	1998	2017
Green	22	24	29
Brown	35	30	30
Red	45	43	35
Total	**102**	**97**	**94**

Ph.D. students from Swansea sampling *Fucus distichus* - taking advantage of the chance to add something different to the brown algae whose attributes they were studying.

bers a search for this species, which members were desperate to see at the 1973 BPS meeting, led by former president, Trevor Norton, which involved negotiating several electric fences, fields with bulls and then climbing down a steep cliff. Since then we have learnt a much easier to get to it!

Apart from a couple of fierce downfalls of rain we were lucky with the weather. In particular the lack of strong wind made possible the sampling of exposed shores with *Fucus distichus* which are not accessible when there are winds. We successfully surveyed several sites producing high quality records. The beginners and improvers were happy with their progress, and explaining the value of seaweeds on radio was an unexpected bonus. Watch the BPS website and the next *Phycologist* for details of another seaweed field meeting in 2018 which is likely to be in south-east Scotland, rather more easily accessible than Orkney, revisiting the sites studied in the BPS 1972 meeting on the shores between Edinburgh and the English/ Scottish border at Berwick-upon-Tweed.

References

Wilkinson, M. 1975. The marine algae of Orkney. B*ritish Phycological Journal*, 10(4), 387-397. DOI: 10.1080/00071617500650411

To link to this article: http://dx.doi.org/10.1080/00071617500650411

A stand of *Fucus distichus*, the rare (for Britain) arctic fucoid

Harry Powell Bequest

Clare Scanlan, RBGE Volunteer c.scanlan@rbge.ac.uk

As BPS members know, Harry Powell, one of the founding members of the society, died in early January 2016 (Obituary, *The Phycologist* No.90 Spring 2016). He was active well into his eighties, as shown here. Following his death, his family discovered a large collection of algae-related materials in his basement, and offered these to SAMS (Scottish Association for Marine Science) at Dunstaffnage, Oban, where Harry had worked. SAMS accepted the bequest, but on the grounds it would be more appropriate for it to go the Royal Botanic Gardens Edinburgh (RBGE), where it is being assessed.

So when I retired from SEPA (Scottish Environment Protection Agency) in late spring last year, and wrote to RBGE wondering if there was anything to do with marine algae that I could help with, my offer was readily accepted. To say we were all a bit surprised by the quantity and variety of stuff which arrived is probably an understatement. Various people at SAMS have been very generous with their own time in clearing the materials from Harry's basement, sorting things and bringing them down to Edinburgh. Peter Lamont in particular has given time and effort, but also Linda Robb, Christine Campbell and Robin Harvey.

So what do we have? Well, there are specimens that Harry himself collected from various places, unsurprisingly with a focus on fucoids (especially ecological morphotypes) but by no means only fucoids. He seemed to have a particular fondness for *Desmarestia dudresnayi*, with many specimens dredged from round about Dunstaffnage.

There are specimens from other collectors and herbaria, though unfortunately it's not always clear who collected some specimens. There are some overseas algae, for example *Sargassum* samples from the Red Sea collected by Plymouth Marine Laboratory, some specimens from East Africa, others from the Middle East, as well as small samples of herbarium specimens from various countries. Most of the foreign samples were sent to Harry for verification, reflecting his status in the field of phycology. I am gradually working through these samples to enter them into the Garden's herbarium collection. There is also a set of specimens collected by Harry's wife Grace when she was a student.

Much paperwork - I never worked with Harry, but I will bear out his reputation for not throwing things out. There are collections of correspondence with other workers, all the paper trail of his publications on *Fucus*, many field notebooks, photocopies of papers, posters, training materials, rolls of film and much more. These have not yet all been gone through to determine what should be kept, and how those should be dealt with.

Some of the materials Harry rescued from Millport Marine Station when the Scottish Marine Biological Association moved to Oban in 1967 are interesting. There is a collection of mid-19th century algal pressings. Frustratingly many have no collector names, dates or locations, so are not useful in terms of usable records, but are attractive specimens nonetheless. However quite a number are useful records, and some are definitely from the Rev. David Landsborough, a well-known Victorian naturalist, who collected in the Clyde area and published "A Popular History of British Seaweeds" in 1857. These will be entered into the herbarium collection.

Desmarestia dudresnay

Fucus distichus subsp *edentatus*

All will be digitised in due course, so images will be available online.

There are catalogues of information rescued from the old Scottish Seaweed Research Association plus the odd report from F.T.Walker's work on seaweed distributions. Walker's work is currently of interest in relation to a Marine Scotland consultation on the harvesting of seaweeds, so there is contemporary relevance in some of the materials.

There are numerous rolls of film negatives, and an original film copy of "Between the Tides", a short film produced in 1958 by British Transport Films. This can also be viewed on YouTube at https://www.youtube.com/watch?v=d1oDHp0KB84, though the quality is not great. I could go on, but this gives some idea of the collection. Getting specimens into the RBGE collection means the records, and specimens, will be available to all, and this is the priority at the moment. The other materials will be dealt with in time.

The bad news is that Harry's basement was not wholly damp-proof, and some items have suffered from damp or been partially chomped by insects. The paper used for pressing was not all archival quality, and with some of the fucoids the original muslin had not been removed since first placed on the alga, so it was stuck to the plant and paper and specimens partially disintegrated as muslin was very carefully peeled off. Some specimens and books will require careful treatment with a museum vacuum. There are lessons here for all of us who collect and keep specimens. I hope we can deal with the notebooks, as the ones I've already looked at are amusing at times with asides from Harry about the perils of some of his sampling sites. This was clearly before the days of formal site risk assessments, although he did judge some sites as too dangerous for students.

The RBGE uses many volunteers to carry out a wide range of tasks in the four gardens and the Edinburgh herbarium. This complements the work of the permanent staff and increases the Garden's ability to carry out outreach activities. The work of the volunteers is much appreciated, and I was one of several volunteers to take the opportunity to make a short presentation to the annual staff conference on 26th January, attended by well over a hundred staff and volunteers as well as the Regius Keeper and Chairman of the Board of Trustees.

The RBGE is grateful to Harry's family for donating his collection, and I for the opportunity to work on it. Herbarium collections are being used more and more for various purposes, so it's useful to be able to add to them. If anyone would like to know more, please get in touch.

In Memoriam

Dr Hilary Belcher FLS, FIBiol (1929 - 2017)

These memories and observations have been collated and edited by Jennifer Bryant, Scientific Associate, Life Sciences, Natural History Museum, Cromwell Road, London, SW7 5BD. j.bryant@nhm.ac.uk

When attempting to bring together remembrances of Dr Hilary Belcher I was aware that I was the least likely editor of the contributions, as I had only met Dr Belcher once back in the early 1970's. She had come to the Natural History Museum (NHM) to examine the collections of W. and G. S. West and I was the curatorial assistant in the Freshwater Algae Section at the time. In that role I soon became aware of the importance of the work of Hilary and her lifelong partner in both her scientific and domestic life, Erica Swale. Collating this tribute has led me to conclude that Hilary Belcher was talented, creative, ingenious and industrious.

I am grateful to a number of contributors who have informed the following text – Dr Chris Carter, Dr David Hibberd, Dr Martyn Kelly, Dr Alison Love, Philip Oswald, Dr Chris Preston, Dr Jane Renfrew, and Roy Vickery. In particular, I would like to thank Professor David John for invaluable assistance.

Hilary Belcher was born on 19th November 1929 and educated in London, becoming research assistant to Professor G. E. (Tony) Fogg at University College (UCL) in the early 1950's. A degree from Birkbeck College (1953) and PhD from UCL (1958) followed (Renfrew 2017). In the late 1950's she was encouraged in her work on Bangia by Dr Kathleen M. Drew Baker, who tutored her in identification and culturing (Belcher 1960). By 1960 she was at the Freshwater Biological Association, Windermere (FBA), working on the taxonomy of freshwater algae with Dr John W. G. Lund. Erica was also on the staff and the couple spent ten enjoyable years in the Lake District. In 1967 they spent some time at Leeds University having been invited by Professor Irene Manton to learn electron microscopy techniques. This collaboration led to the production of a number of important papers on the fine structure of flagellates.

Hilary was awarded a DSc from the University of London in 1969 and, in 1970, Eric George asked Hilary and Erica to help him set up the NERC (Natural Environment Research Council) laboratory in Cambridge to be known as the Culture Centre of Algae and Protozoa (CCAP). Hilary became a Principal Scientific Officer in charge of the cultures of marine microalgae and was deputy to the director Eric George.

Dr David Hibberd was a colleague at CCAP and recalls –

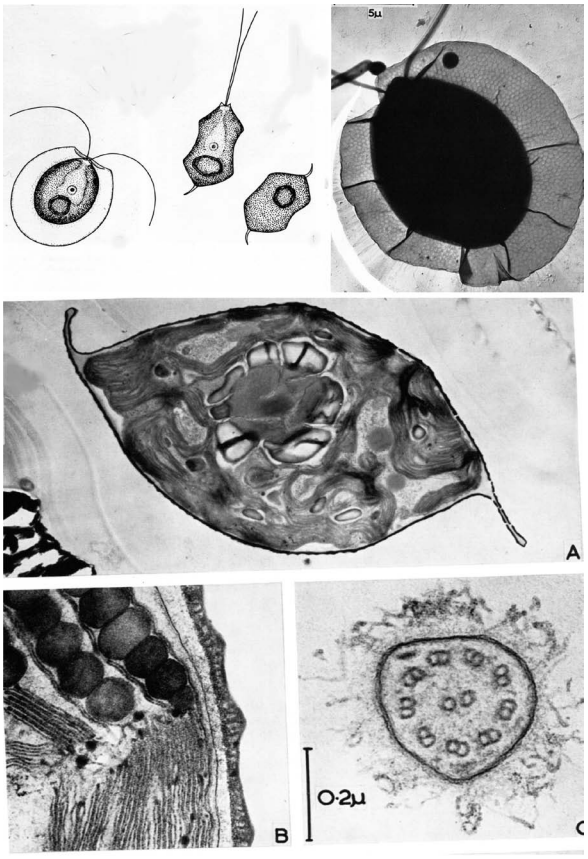
> "Hilary and Erica always functioned very much as a team and, although I occupied an adjacent office, my own work didn't really overlap with theirs. My work concentrated on the detailed ultrastructure of a relatively small number of taxa, while their studies had an infinitely broader overview of the algal world. On many occasions I remember hearing the sounds of great excitement emanating from their office when they had just discovered something new or rare, though there were also forceful comments of great disquiet when a clearly unsatisfactory paper sent for review was being read! Hilary and Erica's work was always detailed and meticulous and they were intolerant of sloppiness in others, either in the quality of observation or in the writing.
>
> Until her retirement Hilary's research concentrated on freshwater unicellular plankton. Everything was of interest but, such was the breadth of her knowledge, that any rare or hitherto undescribed organism would be noticed and investigated. While she was at CCAP, the majority of Hilary's publications were on chlorophytes and chrysophytes, though interest sometimes extended beyond the algae when working with Erica. For example, they described three new species of *Cyathobodo*, the genus previously only being known from a single species (Swale & Belcher 1975). These minute (< 5 µm) colourless scaly flagellates occupy an isolated position among the protozoa and had hitherto been neglected by both protozoologists – too small – and phycologists – too small and not algae!"

It was around this time that Hilary was invited to join Lucy Cavendish College, Cambridge, eventually becoming Senior Member of the Combination Room. She became FLS in 1972 and FIBiol in 1978.

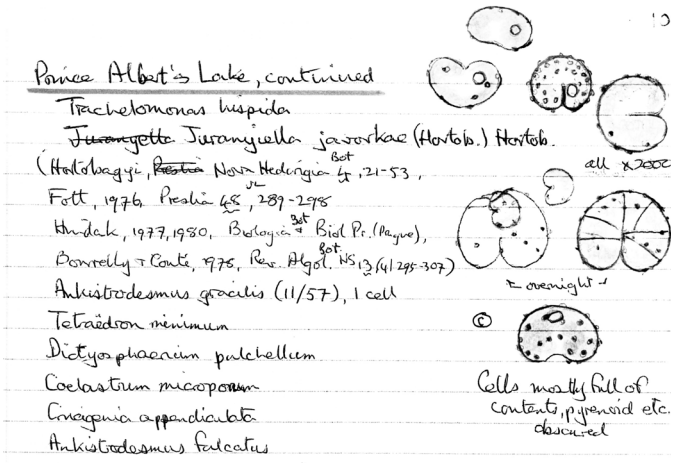
Hilary and Erica took early retirement and left CCAP in 1981 which allowed Hilary more time to research her other interests whilst they both maintained their serious study of the algae, often with Erica taking the lead. Hilary became Suffolk County Recorder of Freshwater Algae.

One field of interest led Hilary to join the Folklore Society, and she became a regular contributor to the society's newsletter, *FLS News*, and to P*lant-lore Notes & News*. Roy Vickery remembers that she was "one of the six people who consistently supplied information and support over many years" whilst he was writing *Garland, Conkers and Mother-die* (Vickery 2010). The more than 100 source notes that inform their joint paper on the folklore of 'Star Jelly' (and its link to *Nostoc* and amphibians) demonstrate the width of intellect and depth of knowledge shared by Hilary and Erica (Belcher & Swale 1984).

Hilary was accumulating material for a study of the folklore associated with small mammals, mainly mice, and interest in other 'objects of curiosity' prompted a number of contributions to *FLS News*, with titles such as 'Suckling Frog' and 'Treacle Wells'. Other topics were published in *Nature in Cambridgeshire* where, between 1980 and 2013, Hilary and Erica wrote on subjects as varied as invasive alien aquatic flowering plants and the local melanistic grey squirrels (Oswald 2018, in preparation). An article on water blooms discussed, amongst other phenomena, the occurrence of 'water red as blood', quoting from biblical and other literary sources (Belcher & Swale 1983).



Images of the single-celled flagellate *Pteromonas angulosa* (Carter) Lemmermann adapted from Belcher & Swale, 1967: freehand sketches of lateral view, optical longitudinal section and transverse section (top left); shadow cast electron micrograph (EM) of whole cell (top right), EM transverse section of whole cell (A centre); EM section through cell wall, part of stigma and chromatophore (B bottom left); EM transverse section of a flagellum (C bottom right). For magnifications see publication. Scans courtesy of D.M. John



A page from one of Hilary Belcher's record books. Photo D.M. John

Hilary Belcher was an excellent and supportive mentor to those who had an interest in the algae. Whilst studying for his PhD at Leeds, David Hibberd recalls that, when they discovered that he did not have the facilities to take photographs using phase-contrast flash, Hilary and Erica generously invited him to stay with them so that he could have access to their own microscope at the FBA. This allowed David to capture images of unusual zoospores from a group of algae that were later to be described as eustigmatophytes.

Dr Alison Love spent two weeks learning to identify phytoplankton with Hilary, first staying with Hilary and Erica and then when Hilary came to stay with her. Dr Love recalls "Hilary taught me to identify phytoplankton. Both Hilary and Erica were so supportive, knowledgeable and fun at all times. Great role models with their strong, positive love of life and continual learning. Plus an excellent grasp of the rules of grammar when editing my MSc thesis."

Dr Martyn Kelly points out that –

> "Many phycologists made their first forays into the world of algae via two booklets written by Hilary and Erica, *A Beginner's Guide to Freshwater Algae* and *An Illustrated Guide to River Phytoplankton* (Belcher & Swale 1976, 1979). These booklets, with their clear drawings of the most common species and accompanying notes, made naming the huge range of shapes and body forms (some spinning across the field of view at dizzying speed) somehow manageable compared to the thick, impenetrable volumes that constituted the bulk of the identification literature."

The following tribute from another of Hilary's 'students', Chris Carter, demonstrates Hilary's (and Erica's) supportive and knowledgeable kindness –

> "In the aftermath of a course on the identification of algae held at Durham University in 2007, Professor Brian Whitton suggested that an introduction to Hilary and Erica would assist my learning. It was with much trepidation that I knocked on the door at the suggested time (so that I didn't interrupt *The Archers*) and we were straight into the subject – after a bit of time finding a small space for me to sit down (two visitors would apparently need to give much more notice so that a second chair could be cleared). Their knowledge was amazing and any gap was filled by referring to their substantial library. Sometimes Hilary remembered something of note, dashed upstairs and, after some fearful clattering from the upper regions, soon appeared

with the requisite notebook.

Some weeks later I showed Hilary a distorted specimen of the diatom *Surirella* from a fountain at Castle Ashby and, as a result, I was ordered (no arguments allowed) to the next meeting of the British Diatom Group where my first algal poster was well received. Hilary knew a location for the rare red alga *Thorea* and springs (in unlikely places) with *Batrachospermum* (Belcher & Swale 1991). They searched garden centre plants for *Audouinella* and enjoyed recounting their time looking for *Balbiania* in the Lake District. I did once find a red alga-like growth in my tropical freshwater aquarium and sent samples and photographs. The next day the 'phone rang and I was greeted by a loud, excited squeal from Hilary "It's *Ectocarpus*!" Within two days she had contacted the brown algae experts at the Plymouth Marine Laboratory and had sent a sample to Roscoff Marine Station in France. Roscoff did the sequencing and concluded that it was an unknown species (Belcher et al., 2009). It remains undescribed and is in culture at CCAP.

My first serious paper, written jointly with Hilary, discussed the rare diatom *Entomoneis ornata* which had turned up in the Oxford canal, previously having been known only from the Humber Estuary (Carter & Belcher 2010). Hilary, of course, had already found a different *Entomoneis* from a puddle under a motorway bridge. Indeed she and Erica seemed to know every puddle, pond, ditch and lake near Cambridge and had written about their finds in *Nature in Cambridgeshire*. Hilary's best advice (said, I think, with a smile) "Don't even think about trying to identify a *Chlamydomonas*". I owe Hilary a great deal."

Prof. David John was the driving force behind the *Freshwater Algal Flora of the British Isles* (John et al. 2002, 2011) and he recalls both the importance of Hilary's expertise to the project as well as fond memories of her enthusiasm, kindness and support –

A group photograph of some of the participants of the Flora Project taken at Cassop Vale National Nature Reserve, Durham, in 1999. From left to right - Hilary Belcher, John Dodge, Jørgen Kristiansen, David John, Konrad Wołowski, Brian Whitton, David Williamson. (Photographer unknown)

"With the passing of Hilary we have lost one of the UK's most accomplished freshwater algal experts. She was not only capable of identifying species belonging to all algal groups but had also published on colourless protists. The breadth of her knowledge was apparent when she identified almost 70 microscopic forms, including many small flagellates, over 30 diatoms and several non-algal protists and cyanobacteria in a single sample from the pond of the NHM's wildlife garden.

My first meeting with Hilary and her companion Erica Swale was in 1965 when, as a student at Durham University, I attended a field course at the FBA, Windermere, organized by Prof. Brian Whitton. We students were greatly impressed by the erudite trio of Hilary, Erica and John Lund as they readily named most of the algae in our samples. My next encounter was on a visit to CCAP in 1980 after I had been appointed researcher in freshwater algae at the NHM. I received a most warm welcome from Hilary and Erica who, besides giving me much invaluable advice and many reprints, showed me some superb models of desmids that they had made for a forthcoming display. But I did not really come to know Hilary until I accompanied Brian to Erica and Hilary's home in Cambridge to seek their support, advice and possible co-operation in producing a comprehensive account of British freshwater algae which became known as the '*British Freshwater Algal Flora Project*' (Flora Project). They were two of the leading UK experts on freshwater algae, having described over 25 new species* and published two authoritatively written modern identification guides to the commoner algae (*Taxa associated with Hilary Belcher are listed in the Appendix). *A Beginner's Guide to Freshwater Algae* and *An Illustrated Guide to River Phytoplankton* were designed to appeal to those interested in freshwater biology, but who possessed little prior knowledge of the organisms. Approximately 100 kinds of algae are described using few technical terms and illustrated by beautifully executed line drawings that have been described as 'a remarkable blend of accuracy and artistic skill'.

Hilary gave her wholehearted support to the Flora Project and,

with her typical generosity, promised to give us every assistance – short of writing a chapter. I fondly remember many visits to Hilary and Erica's home, spending hours discussing algae in their cluttered front room with Hilary's microscope table in the corner where algae were identified and drawn. Over the course of the Flora Project both Hilary and Erica provided new records, line drawings, photo micrographs and ecological information and they also edited text and revised the xanthophyte entries. In July 1999 Hilary attended a five day BPS-sponsored workshop at Durham University where progress on the Flora Project was reviewed, identification keys tested and participants were able to identify samples together. I do recall her saying, in a somewhat strident tone, 'you silly man' every time someone had misidentified an alga, especially if they had professed to specialise in the group. Hilary expressed her views quite forcefully on occasions, as at a BPS meeting when someone suggested there were no true river phytoplankton despite the fact that Hilary and Erica had published a guide to these!

Hilary kindly allowed me to copy her many notebooks in which she listed all the microscopic organisms in each of her samples, these often accompanied by finely detailed line drawings showing the key characters needed to confirm identification. Many of these records were included in a series of articles intended to be the basis of a revision of G. S. West's account of the algal flora of Cambridge (West 1899). The accounts were co-authored with Erica and Eric George and published in volumes 48 to 55 of *Nature in Cambridgeshire* between 2006 and 2013. Any new records for the British Isles, as well as ecological information for other species, were also published in T*he Freshwater Algal Flora of the British Isles*, along with many original line drawings.

Hilary was a much gifted, dedicated and conscientious algal researcher who, with Erica, tackled some of the more challenging groups of freshwater microalgae. She will be greatly missed by all those she so generously assisted and mentored, and those of us who organized the Flora Project owe Hilary and Erica a great debt of gratitude for contributing many new records, original illustrations, ecological data, and showing great patience in revising and reviewing manuscripts."

Ingenious and creative, in her teens Hilary (with her brother's help) made a camera out of an old tin and used it for taking micro photographs. Much later, she invented an easily assembled centrifuge handy for the amateur microscopist (Belcher 1993). She was an able model maker and a skilled needlewoman, once making a full crinoline, complete with bonnet. Her larger-than-life models of microalgae have been on display at Monks Wood Experimental Station and at the FBA (Renfrew 2017).

Hilary's long association with Lucy Cavendish College (LCC) demonstrates her philanthropy and her skill as a horticulturalist. She and Erica made important contributions to two main areas – in financial support for student hardship and in the college gardens. In 1993 they supported a Bosnian student to finish her degree at LCC when her studies had been disrupted by the Balkan war. They gave a tulip tree (*Liriodendron tulipifera*) for the College House lawn and funded winter flowering cyclamen and the labelling of the plants in the Anglo Saxon Herb Garden. Their quiet support for the college over nearly 50 years has played an important part in its growth and prosperity (Renfrew 2017).

Hilary Belcher died on 18th January this year and left a unique legacy. From 1956 to 2013 she wrote more than 60 papers on algae (the majority jointly with Erica) and 37 articles appeared in *Nature in Cambridgeshire*. It should be noted that many papers are authored with both her initials, 'J. H.', and others with only the initial 'H' (See Endnote after the Appendix).

References:

N. B. For a more comprehensive list of Hilary Belcher's publications see the bibliography in John et al. (2002, 2011).

Belcher, J. H. (1960) Culture studies of *Bangia atropurpurea* (Roth) Ag. *The New Phytologist* **59**: 367-373

Belcher, H. (1993) An inexpensive and easily made battery-powered centrifuge. *Bulletin of the Quekett Microscopical Club* **21**: 12–13

Belcher, J. H., Carter, C. F. & Peters, A. F. (2009) An unknown filamentous brown alga (Phaeophyceae) from a domestic freshwater aquarium in Northampton UK. *The Phycologist* **77**: 13

Belcher, J. H. & Swale, E. M. F. (1967). Observations on *Pteromonas tenuis* sp. nov. and *P. angulosa* (Carter) Lemmermann (Chlorophyceae, Volvocales) by light and electron microscopy. *Nova Hedwigia* **13**: 353-359.

Belcher, H. & Swale, E. (1976) *A Beginner's Guide to Freshwater Algae*. HMSO, London. 48 pp.

Belcher, H. & Swale, E. (1979) *An Illustrated Guide to River Phytoplankton*. HMSO, London. 64 pp.

Belcher, H. & Swale, E. (1983) Water-blooms in Cambridgeshire. *Nature in Cambridgeshire* **26**: 17-19

Belcher, H. & Swale, E. (1984) Catch a Falling Star. *Folklore* **95**: 210–220

Belcher, H. & Swale, E. (1991) *Thorea*, *Bangia* and other freshwater red algae in Cambridgeshire. *Nature in Cambridgeshire* **33**: 42-45

Carter, C. F. & Belcher, H. (2010) A UK record of *Entomoneis ornata* (J.W.Bailey) Reimer in R.M. Patrick et Reimer 1975. *Diatom Research* **25** (1): 217-222

Guiry, M. D. & Guiry, G. M. (2017) *AlgaeBase. World-wide electronic publication, National University of Ireland, Galway*. http://www.algaebase.org; searched on 10th August 2017.

John, D. M., Whitton, B. A. & Brook, A. J. (eds) (2002) *The Freshwater Algal Flora of the British Isle*s. Cambridge University Press, Cambridge. 702 pp.

John, D. M., Whitton, B. A. & Brook, A. J. (eds) (2011) *The Freshwater Algal Flora of the British Isles*, 2nd edition. Cambridge University Press, Cambridge. 878 pp

Oswald, P. H. (2018 in preparation) Hilary Belcher (1929-2017). *Nature in Cambridgeshire* 60

Renfrew, J. M. (Autumn 2017) Dr Hilary Belcher 1929-2017. L*ucy Cavendish College Annual Review for 2016-2017*

Swale, E. M. F. & Belcher, J. H. (1975) A study of 3 new species of the colourless scaly flagellate *Cyathobodo* Petersen and Hansen: *C. reticulatus*, *C. crucifer* and *C. umbraculum*. *Archiv für Protistenkunde* **117**: 269-275

Vickery, R. (2010) *Garlands, Conkers and Mother-die*. Bloomsbury, London, 226 pp

West, G. S. (1899) The algal-flora of Cambridge. *Journal of Botany* **37**: 6, 49-58, 106-116, 216-225, 262-268, 291-294.

Appendix of new taxa associated with Hilary Belcher.

The new species or combination is followed by the currently accepted name in parentheses. Data source Guiry & Guiry (2017).

Ankistrodesmus cucumiformis J.H.Belcher & Swale
Ankistrodesmus curvulus J.H.Belcher & Swale (now *Monoraphidium convolutum* (Corda) Komárková-Legnerová)
Ankistrodesmus lunulatus J.H.Belcher & Swale (now *Monoraphidium minutum* (Nägeli) Komárková-Legnerová)
Ankistrodesmus pseudobraunii J.H.Belcher & Swale (now *Monoraphidium pseudobraunii* (J.H.Belcher & Swale) Heynig)
Ankistrodesmus sabrinensis J.H.Belcher & Swale (now *Ankistrodesmus arcuatus* Korschikov)
Chlamydomonas mirabilis var. *minor* J.H.Belcher
Chlamydomonas similis var. *curta* J.H.Belcher (now *Rhysamphichloris curta* (J.H.Belcher) Nakada)
Chromulina placentula J.H.Belcher & Swale
Chrysosphaera magna J.H.Belcher (now *Hibberdia magna* (J.H.Belcher) R.A.Andersen)
Closteriopsis acicularis (Chodat) J.H.Belcher & Swale
Cyathobodo crucifer Swale & J.H.Belcher
Cyathobodo reticulatus Swale & J.H.Belcher
Cyathobodo umbraculum Swale & J.H.Belcher
Diplostauron elephas J.H.Belcher
Diplostauron panduriforme J.H.Belcher (now *Lobomonas panduriformis* (J.H.Belcher) Makovinská & Hindák)
Diplostauron platyrrhynchum J.H.Belcher
Gyromitus limax Swale & J.H.Belcher (now *Peregrinia limax* (J.H.Belcher & Swale) Cavalier-Smith)
Kirchneriella incurvata J.H.Belcher & Swale
Luffisphaera cucumiformis J.H.Belcher & Swale
Luffisphaera myosurus J.H.Belcher & Swale
Microglena butcheri J.H.Belcher
Myochloris collorhynchus J.H.Belcher & Swale
Ochromonas ostreaeformis Swale & J.H.Belcher
Prasinochloris sessilis J.H.Belcher
Pteromonas tenuis J.H.Belcher & Swale
Pyramimonas tetrarhynchus var. *lobata* J.H.Belcher
Rhodochorton investiens (Lenormand ex Kützing) Swale & J.H.Belcher (now *Balbiania investiens* (Lenormand ex Kützing) Sirodot
Scourfieldia caeca (Korschikov) J.H.Belcher & Swale
Sphaerellopsis spiralis J.H.Belcher & Swale
Spumella elongata (Stokes) J.H.Belcher & Swale

Endnote: Hilary grew up as John Hilary but, after gender reassignment in the 1970s, used her middle name. Eventually she dropped the initial J entirely. For the purposes of this tribute her early life has been rendered in the gender with which she later identified.

Jack Talling, Aquatic Scientist

(taken from Yorkshire Post)

Jack Talling, who died at age 88, was an outstanding aquatic scientist and fellow of the Royal Society, who undertook pioneering research on the large and small lakes of the African Rift Valley and in the English Lake District. A pioneer in the study of phytoplankton, photosynthesis and of freshwater ecology, he led studies in the River Nile, and made major contributions to our understanding of the functioning of our own temperate lakes, by developing mathematical models that have been applied worldwide. He produced more than 100 research papers over a 64 year period, the last just two years ago. Dr Talling was born in Grangetown, in what was then the North Riding, and began to develop his interest in nature on family holidays to a farm in mid-Swaledale. At Cotham School, he studied the sciences, and the availability of two microscopes passed on by his amateur-microscopist father, triggered a fascination with the microscopic life of ponds. Several boys in his sixth form shared his interests - none more so than Peter Dixon, who later became a world authority. His interest in plant science flourished during his three years at Leeds University, and a field trip to Wray Castle on the shores of Windermere led to the publication of his first scientific paper.

In 1953, armed with a PhD from Leeds, he took a job at the University of Khartoum, in Sudan, where a newly created hydrobiological research unit allowed the scientific exploration of the Upper Nile, and he was able to demonstrate how the river between Lake Victoria and Khartoum was affected by its different constituents. He moved in 1957 the Scripps Institute of Oceanography in California to take up a post-doctoral fellowship. There he plunged into oceanography and also met his wife, the Icelandic scientist, Ida Bjornsson.

He later worked in Jinja, Uganda, during which time he and Ida undertook a remarkable time and space study of Lake Victoria and other east African lakes. His studies on African lakes and rivers helped lay the foundation of our knowledge of African aquatic science. He continued to support research in Africa by training scientists for the International Biological Programme in Uganda, and co-wrote a book on the ecological dynamics of tropical inland waters. Among his many innovations was a method for assessing water colour in Africa using a standard of diluted whisky. The importance of his work as a master limnologist was recognised with his election to the Royal Society in 1978 and the award by the International Society of Limnology of the Naumann-Thienemann medal, in 1989. In the late eighties, he undertook surveys of rivers with sources in the high Pennines, and produced an assessment of the upland Malham Tarn, a project that enabled him to return to the Yorkshire Dales he had known as a boy.

In retirement, he continued as an honorary research fellow with the Freshwater Biological Association, and revelled in the opportunity to take visiting scientists on tours of his beloved Yorkshire. He is survived by Ida and by their children, Thora and Peter.

IN REMEMBRANCE OF JOANNA JONES (10 MARCH 1930 – 20 JULY 2017), A REMARKABLE LIFETIME OF ALGAL RESEARCH, AND MUCH MORE

Richard G. Hartnoll

Valla Veg, 11 Lime Street, Port St Mary, Isle of Man IM9 5ED

hartnoll@manx.net

In July this year Joanna Jones died peacefully at her home in Canberra with her reading glasses on and her iPad by her side. Organisation was always a key feature of Jo, in death as in life. It was the end of a lengthy and determined battle with terminal cancer. Her family, friends, colleagues and fellow algologists will all miss her greatly.

In 1930 Jo was born in Christchurch, New Zealand, to an English mother and a New Zealander father: they moved to London in 1932, but Jo always remained proud of her New Zealand heritage. Her house in the Isle of Man was named Waitara. Regarding names, Jo was named Dorothy by her father, without consulting her mother, who always called her Anne. In an early demonstration of her willpower and independence, Jo tired of this confusion, and at age ten renamed herself Joanna after a favourite doll. So as Joanna Kain she entered the world of science, and although known after marriage as Jo Jones for most purposes, continued to publish as J. M. Kain until her final paper in 2015.

After the relocation to London the family moved around considerably, and Jo attended twelve different schools. They also took up sailing, and excursions around the English Channel provided opportunities for snorkelling expeditions (complete with ping-pong ball on snorkel!), leading to a lifetime fascination with the underwater world. In 1949 Jo entered University College London as an undergraduate, and an initial interest in Zoology was soon replaced by one in botany, particularly algae, under the influence of Tony Fogg: the die was cast. Her undergraduate project on intertidal algal zonation around the Isle of Wight was published in JMBA. Jo continued as a postgraduate under the supervision of Tony Fogg, but her desire to study subtidal macroalgae was constrained by the less imaginative funding concepts of the Institute of Seaweed Research: her thesis (Kain, 1957) was on the culture of phytoplankton!

However, the hiatus was brief. In 1956 Jo was appointed "Algologist" at the Marine Biological Station in Port Erin on the Isle of Man, an outpost of Liverpool University (later known as the Port Erin Marine Laboratory, PEML, until its closure in 2006). The aqualung (as then known, the alien name SCUBA came later) was in its infancy, but Jo embraced the new technology, diving on a line in a rather primitive dry (a flattering term) suit. The first phase of Jo's sublittoral studies centred on the major kelp species in the NE Atlantic, *Laminaria hyperborea*, resulting in

a seminal series of 10 papers published between 1962 and 1977. Jo's influence extended beyond her research – she was a founder member, and the first Diving Officer, of the IOM branch of the British Sub-Aqua Club. She qualified as a first-class BSAC diver, one of a select band. A cohort of diving marine biologists learnt their trade under her instruction: together we assembled wet suits from sheets of neoprene and solvents which would now be considered illegal. Equipment was simple, suits tended to disintegrate spontaneously, but the scientific rewards compensated. Many of us dived with Jo: a major collaborative exercise was the study of Echinus grazing on kelp, when many hundreds of urchins were relocated (Jones & Kain, 1967; Kain, 1975). Jo's involvement with kelps continued through the eighties, predominantly in relation to their cultivation potential for biomass and industrial use. Terry Holt and Chris Dawes were major collaborators in this phase. "Kelp Crunchies", seaweed based crisps, was a commercial venture – sadly with a short shelf life.

But by the eighties Jo's personal research had shifted to subtidal reds, concentrating on their phenology in response to environmental variables. This resulted in a substantial output of 15 papers between 1982 and 2006.

Throughout this subtidal era in Port Erin Jo was not only a very effective research scientist, but much more besides.

In 1962 she married Norman Jones, a fellow staff member at Port Erin, and a benthic ecologist. Norman also dived, and they collaborated on several ventures, notably the Echinus exclusion mentioned above. They had two children, Martin and Bidda. Jo, with her passion for the truth, told them at an early age that there was no Father Christmas: nevertheless, they were instructed never to reveal this to their friends! Jo and Norman had a very effective domestic division of labour – Norman was an excellent cook, and Jo was universally practical: everything ran smoothly. Together they supervised the building of Waitara on the sea front at Port St Mary, the site of their legendary hospitality. Many of us remember, or in some cases fail to remember, these occasions.

Initially the Port Erin staff carried out only research, but from the early 1970s there was an increasing undergraduate teaching involvement, where Jo demonstrated her customary care and dedication. Jo also supervised 18 Ph.D. students who all graduated successfully. As a student Jo joined the British Phycological Society, remaining a member for her lifetime. She attended 44 annual meetings, was Honorary Secretary for 7 years from 1977, and from 1985-88 Vice-President and then President. In 2000 she was made an Honorary Fellow. Jo also attended an unbroken run of 14 Seaweed Symposia, and in the 1980s and 90s was UK representative on the EEC Management Committee for COST 48 and 49, encouraging co-operation in marine algal biomass production.

In 1991 Jo retired from Liverpool University, but continued experimental studies on red algae at PEML. Sadly, in 1997 her husband Norman died, in his chair, newspaper in hand: orderly departure runs in the family. Jo considered various options, and in 2000 emigrated to Canberra in Australia, to be nearer to her daughter and family. She had given up diving, but continued research in the upper intertidal on the south coast of New South Wales as a Visiting Fellow of the Australian National University. She had a beach house at Guerilla Bay to stay in during fieldwork. Her interests reverted to the browns, but mainly crustose forms, rather smaller than the kelps of her early days. As usual a sequence of papers resulted, the last published in 2015. As before, her interests and involvement were not limited to research. She was a local fire warden, a necessary post where bush fires are a feature of life: her back hedge was alight on one occasion. She was greatly concerned by the problems of climate change, and was a very active member of the ACT Greens party. To the last Jo was unsparing in the devotion of her time and energy to others, and to the causes she believed in.

I will leave the final words to others, some of the tributes presented at the wake for Jo in Canberra. There was no funeral, Jo dedicated her body to science, as well as her life.

Everything in Jo's life was carefully planned, researched and considered, from her practical clothing to her astonishing luggage contents - no one else would think to bring a miniature rotary clothes drier (complete with pegs) on a trip to Chile. (Judy Leden, friend).

That she died with her reading glasses on shows the perseverance to the end not to be beaten by inconvenience and to remain in charge of her own direction. My memory of whenever I popped into her room for some advice was of her reading and when I asked the question it was fingers straight to the cards in a box file to find the reference which gave the location of the box with the paper in which lead to the paragraph of text which supported her suggestion - and then the surprised expression when I invariably said " how do you always do that?" (Chris Dawes, ex research student).

Granny was a source of amazement for me in my childhood. I would brag to my friends about all the things she could do that other grannies could not – build bunk beds, use iPhones – and all her marvellous and ingenious inventions to make every minor task of the upmost convenience in her daily life. (Jay Davies, grand-daughter).

ACKNOWLEDGEMENTS

A number of people have made this tribute possible, by providing their recollections of Jo, and forwarding information. Firstly I thank Jo herself, who left for posterity a recent autobiographical outline, and a meticulously drafted list of publications. They would almost have constituted this obituary without my intervention. Bidda, Jo's daughter, forwarded Jo's files to me, and also drafts of the eulogies delivered at the wake in Canberra: invaluable material. To those who delivered, or featured in the eulogies, my thanks. I have been a student, colleague and friend of Jo for nearly 60 years, but I am not a phycologist: for any errors or omissions with regard to algae I apologise.

PUBLICATIONS BY JOANNA JONES (KAIN), 1958-2015

Kain, J.M. 1957. Studies on the growth of microscopic marine algae. Ph.D. thesis. University College, London.

Kain, J.M. & Fogg, G.E. 1958. Studies on the growth of marine phytoplankton. I. *Asterionella japonica* Gran. *J. mar. biol. Ass. U.K*. 37: 397-413.

Kain, J.M. 1958. Observations on the littoral algae of the Isle of Wight. *J. mar. biol. Ass.U.K*. 37: 769-780.

Kain, J.M. & Fogg, G.E. 1958. Studies on the growth of marine phytoplankton. II. *Isochrysis galbana* Parke. *J. mar. biol. Ass. U.K*. 37: 781-788.

Kain, J.M. & Fogg, G.E. 1960. Studies on the growth of marine phytoplankton. III. *Prorocentrum micans* Ehrenberg. *J. mar. biol. Ass. U.K.* 39: 33-50.

Kain, J.M. 1960. Direct observations on some Manx sublittoral algae. *J. mar. biol. Ass. U.K*. 39: 609-630.

Kain, J.M. 1961. Algal species lists : some sublittoral records. *Br. phycol. Bull.*, 2, 80-86.

Kain, J.M. 1962. Aspects of the biology of *Laminaria hyperborea*. I. Vertical distribution. *J. mar. biol. Ass. U.K.* 42: 377-385.

Kain, J.M. 1963. Aspects of the biology of *Laminaria hyperborea*. II. Age, weight and length. *J. mar. biol. Ass. U.K.* 43: 129-151.

Kain, J.M. 1964. A study on the ecology of *Laminaria hyperborea* (Gunn.) Fosl. Int. Seaweed Symp. 4, Biarritz, 1961, 207-214.

Kain, J.M. 1964. Aspects of the biology of *Laminaria hyperborea*. III. Survival and growth of gametophytes. *J. mar. biol. Ass. U.K.* 44: 415-433.

Jones, N.S. & Kain, J.M. 1964. The numbers of O-Group plaice in Port Erin Bay in August 1963 observed by diving. *Rep. mar. biol. Stn. Port Erin* 76: 19-25.

Kain, J.M. 1965. Aspects of the biology of *Laminaria hyperborea*. IV. Growth of early sporophytes. *J. mar. biol. Ass. U.K.* 45: 129-143.

Jones, N. S., Kain, J.M. & Stride, A.H. 1965. The movement of sand waves on Warts Bank, Isle of Man. *Mar. Geol.* 3: 329-336.

Kain, J.M. 1966. The role of light in the ecology of *Laminaria hyperborea*. In *Light as an Ecological Factor*, ed. R. Bainbridge, G.C. Evans and O. Rackham, 319-334, Oxford: Blackwell.

Jones, N.S. & Kain, J.M. 1967. Subtidal algal colonization following the removal of *Echinus. Helgolander wiss. Meeresunters*. 15: 460-466.

Kain, J.M. 1967. Populations of *Laminaria hyperborea* at various latitudes. *Helgolander wiss. Meeresunters*. 15: 489-499.

Kain, J.M. 1969. The biology of *Laminaria hyperborea*. V. Comparison with early stages of competitors. *J. mar. biol. Ass. U.K.* 49: 455-473.

Kain, J.M. & Svendsen, P. 1969. A note on the behaviour of *Patina pellucida* in Britain and Norway. *Sarsia* 38: 25-30.

Kain, J.M. 1971. Continuous recording of underwater light in relation to *Laminaria distribution*. In *Proceedings of the IVth European Marine Biology Symposium* (ed. D.J.Crisp) pp. 335-346. Cambridge: University Press.

Kain, J.M. 1971. Measurement of underwater light. In *IPB Handbook No.16, Methods for the Study of Marine Benthos* (ed. N.A. Holme & A.D. McIntyre) 53-58. Oxford & Edinburgh: Blackwell.

Kain, J.M. 1971. The biology of *Laminaria hyperborea*. VI. Some Norwegian populations. *J. mar. biol. Ass. U.K.* 51: 387-408.

Kain, J.M. 1971. Synopsis of biological data on *Laminaria hyperborea*. *FAO fish. Synops*. 87: 74pp.

Hopkin, R. & Kain, J.M. 1971. A preliminary report on the effect of marine pollutants on *Laminaria hyperborea. Mar. Pollut. Bull.* 2: 75-77.

Svendsen, P. & Kain, J.M. 1971. The taxonomic status, distribution and morphology of *Laminaria cucullata* sensu Jorde and Klavestad. *Sarsia* 46: 1-22.

Kain, J.M. 1975. The biology of *Laminaria hyperborea.* VII. Reproduction of the sporophyte. *J. mar. biol. Ass*. U.K. 55: 567-582.

Kain, J.M. 1975. Algal recolonization of some cleared subtidal areas. *J. Ecol.* 63: 739-765.

Kain, J.M. 1976. The biology of *Laminaria hyperborea.* VIII. Growth on cleared areas. *J. mar. biol. Ass. U.K*. 56: 267-290.

Kain,J.M. 1976. The biology of L*aminaria hyperborea*. IX. Growth pattern of fronds. *J. mar. biol. Ass U.K.* 56: 603-628.

Kain, J.M. 1976. New and interesting algae from the Shetland Isles II. Hollow and solid stiped *Laminaria* (Simplices). *Br. phycol.* J. 11: 1-11.

Kain, J.M., Drew, E.A. & Jupp, B.P. 1976. Light and the ecology of *Laminaria hyperborea* II. In *Light as an Ecological Factor: II* (ed. G.C. Evans, R. Bainbridge and O. Rackham) 63-92, Oxford: Blackwell.

Prentice, S.A. & Kain, J.M. 1976. Numerical analysis of subtidal communities on rocky shores. *Estuar. cstl. mar. Sci.* 4: 65-70.

Kain, J.M. 1977. The biology of *Laminaria hyperborea* X. The effect of depth on some populations. *J. mar. biol. Ass. U.K.* 57: 587-607.

Hopkin, R.D. & Kain, J.M. 1978. The effects of some pollutants on the survival, growth and respiration of *Laminaria hyperborea. Estuar. cstl. mar. Sci.* 7: 531-553.

Kain, J.M. 1979. A view of the genus *Laminaria. Oceanogr. mar. Biol. ann. Rev.* 17: 101-161.

Jones, J.M. & Holt, T.J. 1981. Biomass from offshore sea areas. In: *Solar Energy R & D in the European Community, Series E: Energy from Biomass 1* (ed. P. Chartier & W. Palz, Reidel) Holland, 85-89.

Morley, J.G. & Jones, J.M. 1981. Growth of marine biomass on artificial structures as a renewable energy source. In: *Energy from Biomass, 1st E.C. Conference* (ed. W. Palz, P. Chartier & D.O. Hall) Applied Science Publishers, 681-68.

Kain, J.M. 1982. Morphology and growth of the giant kelp *Macrocystis pyrifera* in New Zealand and California. *Mar. Biol.* 67: 143-157.

Kain, J.M. 1982. The reproductive phenology of nine species of Rhodophyta in the subtidal region of the Isle of Man. *Br. phycol.* J. 17: 321-331.

Kain, J.M. & Holt, T.J. 1982. Biomass from offshore sea areas. In: *Solar Energy R & D. in the European Community, Series E: Energy from Biomass 3* (ed. G. Grassi & W. Palz, Reidel) Holland, 120-125.

Holt, T.J. and Kain (Jones), J.M. 1983. The cultivation of large brown algae as an energy crop. In: *Energy from Biomass. Proceedings of the International Conference on Biomass held in Berlin, Federal Republic of Germany, 20-23 September 1982*. (eds A. Strub, P. Chartier and G. Schleser), Applied Science Publishers, London and New York, 319-323.

Kain, J.M. 1984. Seasonal growth of two subtidal species of Rhodophyta off the Isle of Man. *J. exp. mar. Biol. Ecol.* 82: 207-220.

Kain (Jones), J.M. & Holt, T.J. 1984. Biomass from offshore sea areas. In: *Solar Energy R & D in the European Community, Series E: Energy from Biomass 5* (ed. W. Palz & D. Pirrwitz) Reidel, Holland, 168-176.

Jones, J.M. & Holt, T.J. 1985. The cultivation of large brown algae as an energy crop. *Comm. Eur. Commun., Dir.-Gen. Sci. Res. Devel. Rep.*, EUR 9990 EN, 78pp.

Kain, J.M. 1986. Plant size and reproductive phenology of six species of Rhodophyta in subtidal Isle of Man. *Br. phycol.* J. 21: 129-138.

Kain, J.M. 1986. Seasonal growth of *Plocamium cartilagineum* and inhibition by high light. *Br. phycol. J.* 21: 331. (Abstract)

Kain, J.M., Dawes, C.P. & Holt, T.J. 1986. Kelp farming off the Isle of Man. *British Phycological Society Newsletter.* Dec., 2-3. (Abstract)

Kain, J.M. 1987. Seasonal growth and photoinhibition of *Plocamium cartilagineum* (Rhodophyta) off the Isle of Man. *Phycologia* 26: 88-99.

Kain, J.M. 1987. Photoperiod and temperature as triggers in the seasonality of *Delesseria sanguinea*. *Helgoländer Meeresunters*. 41: 355-70.

Kain, J.M. 1987. Patterns of relative growth in *Nereocystis luetkeana* (Phaeophyta). *J. Phycol.* 23, 181-187.

Kain, J.M. & Dawes, C.P. (1987). Useful European seaweeds: past hopes and present cultivation. In *Proceedings of the Twelfth International Seaweed Symposium*. (ed. M.A. Ragan & C.J. Bird) pp. 173-81. Dordrecht: Junk.

Kain, J.M., Norton, T.A. & Montegut, A.E. 1987. Growth of blades of *Nereocystis luetkeana* in darkness. *J. Phycol.* 23: 464-9.

Kain, J.M., Dawes, C.P. & Holt, T.J. 1988. Cultivation of kelps in the British Isles and the potential in Europe. *Proc. 2nd Workshop COST 48 Subgroup 3* (ed J. de Waart & P.H. Nienhuis) 16-19.

Kain, J.M. 1989. The seasons in the subtidal. *Br. phycol. J.* 24: 203-15.

Kain J.M., Holt T.J. and Dawes C.P. 1989. Cultivating kelps off the Isle of Man. *Marinetech Research* 13: 9-11.

Sohn C.H. & Kain J.M. 1989. *Undaria*, *Laminaria* and *Enteromorpha* cultivation in Korea. In *Outdoor Seaweed Cultivation, Proceedings of the Second Workshop of COST 48 Subgroup 1.* (eds J.M. Kain, J.W. Andrews & B.J. McGregor) pp. 42-5. Brussels: European Economic Community.

Sohn C.H. & Kain J.M. 1989. *Porphyra* cultivation in Korea. In *Outdoor Seaweed Cultivation, Proceedings of the Second Workshop of COST 48* (eds J.M. Kain, J.W. Andrews & B.J. McGregor) pp. 106-9. Brussels: European Economic Community.

Kain J.M., Holt T.J. and Dawes C.P. 1990. European Laminariales and their cultivation. In *Economically Important Marine Plants of the Atlantic: Their Biology and Cultivation* (eds C. Yarish, C.A. Penniman and P. Van Patten), Groton: Connecticut Sea Grant College Program, 95-111.

Savidge, G. & Kain, J.M. 1990. Productivity of the Irish Sea. In: *Irish Sea Study Group Report Part 3 Exploitable Living Resources* (ed. T.A. Norton & A.J. Geffen. Liverpool: University Press, 9-43.

Kain, J.M. & Norton, T.A. 1990. Marine ecology. In: *Biology of the Red Algae* (ed. K. Cole & R. Sheath) Cambridge University Press, 377-422.

Kain, J.M. 1991. Cultivation of attached seaweeds. In: *Seaweed Resources in Europe: Uses and Potential* (ed. M.D. Guiry & G. Blunden) John Wiley & Sons, 309-77.

Kain, J.M. 1991. Why does *Delesseria sanguinea* stop growing in the summer? *Oebalia* 17 (2 Suppl.) 485-92.

Han, T. & Kain, J.M. 1992. Blue light sensitivity of UV-irradiated young sporophytes of *Laminaria hyperborea*. *J. exp. mar. Biol. Ecol.* 158: 219-230.

Hawkins, S.J., Hartnoll, R.G., Kain, J.M. & Norton, T.A. 1992. Plant-animal interactions on hard substrata in the north-east Atlantic. In *Plant-Animal Interactions in the Marine Benthos* (ed. D.M. John, S.J. Hawkins & J.H. Price) Systematics Association Special Volume No. 46, pp. 1-32. Oxford: Clarendon Press.

Han, T. & Kain, J.M. 1993. Blue light photoreactivation in ultraviolet-irradiated young sporophytes of *Alaria esculenta* and *Laminaria saccharina* (Phaeophyta). *J. Phycol.* 29: 79-81.

Kain, J.M. & Bates, M.J. 1993. The reproductive phenology of *Delesseria sanguinea* and *Odonthalia dentata* off the Isle of Man. *Eur. J. Phycol.* 28: 173-182.

Kain, J.M. 1993. Growth strategies of various members of the Laminariales in relation to their habitat. *Revista de Investigaciones Cientificas y Tecnologicas, Serie: Ciencias del Mar* 3: 99-114.

Kain, J.M. & Destombe, C. 1995. A review of the life history, reproduction and phenology of Gracilaria. *J. appl. Phycol.* 7: 269-281.

Kain, J.M. 1996. Photoperiodism in *Delesseria sanguinea* (Ceramiales, Rhodophyta) 1. The phases and sexes differ. *Phycologia* 35: 446-455.

Figueiredo, M.A. de O, Kain, J.M. & Norton, T.A. 1996. Biotic interactions in the colonization of crustose coralline algae by epiphytes. *J. exp. Mar. Biol. Ecol.* 199: 303-318.

Figueiredo, M.A. de O, Norton, T.A. & Kain, J.M. 1997. Settlement and survival of epiphytes on two intertidal crustose coralline algae. *J. exp. Mar. Biol. Ecol.* 213: 247-260.

Creed, J.C., Norton, T.A. & Kain, J.M. 1997. Intraspecific competition in *Fucus serratus* germlings: the interaction of light, nutrients and density. *J. exp. Mar. Biol.* Ecol. 212: 211-223.

Creed, J.C., Kain, J.M. & Norton, T.A. 1998. An experimental evaluation of density and plant size in two large brown seaweeds. *J. Phycol.* 34: 39-52.

Kain, J.M. 2003a. Control of blade growth rate in *Delesseria sanguinea* (Rhodophyta). In (Chapman, A.R.O., R.J. Anderson, V.J. Vreeland & I.R. Davison eds) *Seventeenth International Seaweed Symposium*. Oxford University press pp. 403-409.

Kain, J.M. 2003b. Seaweed cultivation in the West is retarded. In (Norton, T.A. eds) *Out of the Past*. The British Phycological Society pp. 163-180.

Kain, J.M. 2006. Photoperiodism in *Delesseria sanguinea* (Ceramiales, Rhodophyta) 2. Daylengths are shorter underwater. *Phycologia* 45: 624-631.

Kain, J.M. 2008. Winter favours growth and survival of *Ralfsia verrucosa* (Phaeophyceae) in high intertidal rockpools in southeast Australia. *Phycologia* 47: 498-509.

Kain, J.M., J. Buchanan, S.M. Boo and K.M. Lee. 2010. *Colpomenia bullosa* crust masquerading as *Ralfsia verrucosa* (Phaeophyceae) in southeast Australia. *Phycologia* 49: 617-627.

Lee, K.M., S.M. Boo, J.M. Kain, A.R. Sherwood. 2013. Cryptic diversity and biogeography of the widespread brown alga *Colpomenia sinuosa* (Ectocarpales, Phaeophyceae). *Bot. mar.* 56: 15-25.

Kain, J.M. 2013. *Colpomenia bullosa* crust (Phaeophyceae) stressed less by grazing than by abiotic factors in high intertidal rockpools in southeast Australia. *Bot. mar.* 56: 441-450.

Kain, J.M. 2015. *Hormosira banksii*: a tough survivor in the harsh conditions of high intertidal pools in southeast Australia. *Eur. J. Phycol.* 50: 408-421.

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.

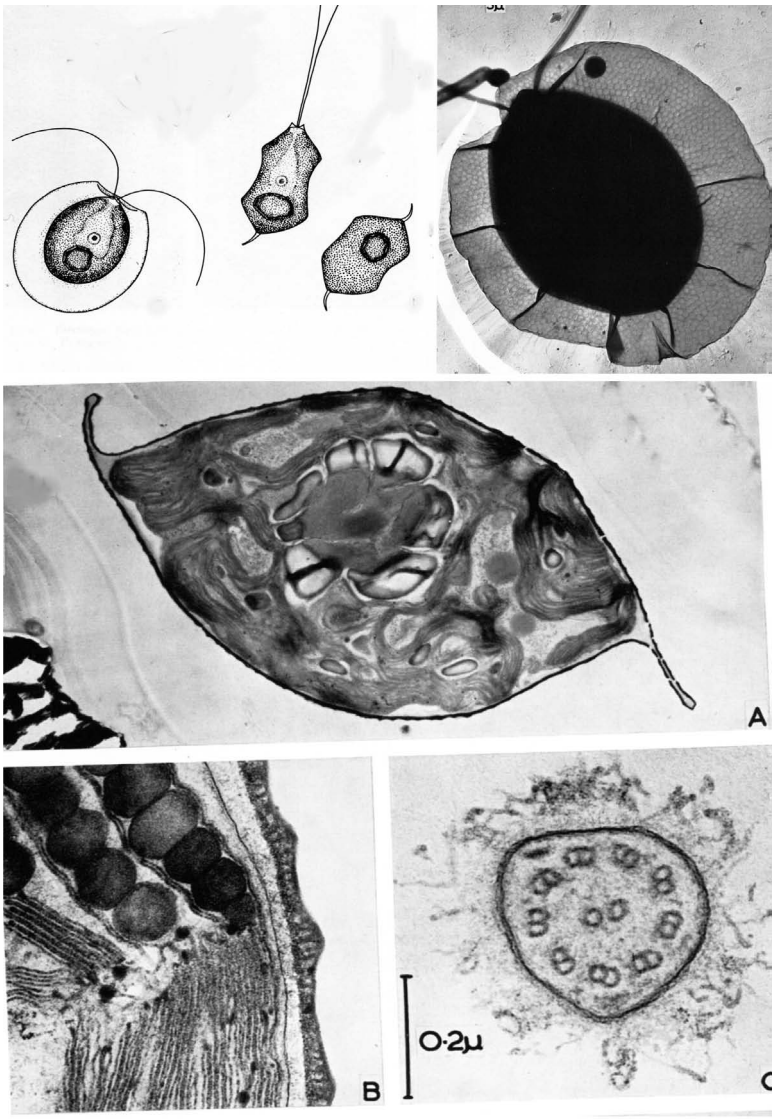
Submission of Copy and Deadlines

Copy should be submitted to:

Dr Jan Krokowski,
Scottish Environment Protection Agency (SEPA),
Angus Smith Building
Ecology
6 Parklands Avenue, Eurocentral
Holytown, North Lanarkshire
ML1 4WQ

Tel. +44 (0)1698839000
E-mail: jan.krokowski@sepa.org.uk

Deadlines are **March 1st** for the April issue, **September 1st** for the October issue.



Typesetting by Agnès Marhadour
Printed by Monument Press, Stirling, UK