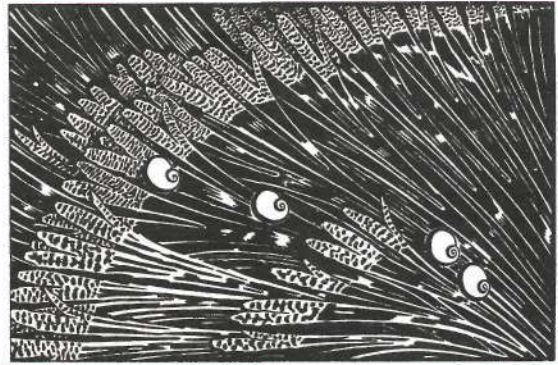


# British Phycological Society Newsletter



## Editorial

The first and second contributions to this Newsletter are both concerned with utilitarian properties of algae. Though different in subject matter, they share one aim; that of maximising algal production on artificial structures (if on somewhat different scales). The technical difficulties involved in each investigation and the ingenuity with which they have been overcome make fascinating reading.

The growth in applied phycology is evident also in Jack McLachlan's account of the Sao Paulo Seaweed Symposium, and will be demonstrated once again in the special session at this winter's B.P.S. meeting. It is tempting to ascribe this growth simply to shifting fashions in research funding or to the harsh demands of present economic forces. However, it is perhaps also the case that we are now more conscious of the intellectual satisfaction to be had from introducing technical innovations that enable us to exploit our plants more effectively.

If applied phycology is to prosper in Britain it is

essential that we maintain a decent national culture collection. Members will be relieved and pleased to read in the article by Drs Heaney and Turner that the C.C.A.P. still lives. We hope that up-to-date reports on the collection will appear in future Newsletters but, meanwhile, shall continue to give C.C.A.P. our most vocal support.

I am grateful to all contributors to the 1986 Newsletters, and hope that 1987 will see still more members coming forward with articles, ideas, news items, comments and criticisms. The Editor's potable prize will again be awarded at the January meeting for the first correct identification of the masthead illustration of this issue (name of artist and publication containing the figure). Only identifications made in person at Durham shall be considered. The name of the winner with his/her correct answer will be published in the next issue. Best wishes for Christmas and the New Year.

Editor

## The Use of Periphyton for Nutrient Removal from waters

One possibility for lowering nutrient loads in aquatic environments is the utilization of naturally growing periphyton communities on artificial substrata. The experiments on periphyton community efficiency have been carried out in laboratory as well as field continuous-flow troughs.

The laboratory continuous-flow trough (100 x 30 x 15 cm) was made of plastic and illuminated from above by fluorescent tubes. Irradiance was  $170 \mu\text{E}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$ , measured at the water surface. Fine mesh silon screens (synthetical fibre net, holes area ca.  $1\text{mm}^2$ ) held vertically, perpendicular to the direction of flow, were used as artificial substrata for periphyton growth. The maximum capacity of the trough was 10 screens (30 x 15 cm). As a medium natural water from the Vltava River was used and the flow was provided by a small pump using two 50l reservoirs. Laboratory experiments were aimed at the evaluations of the optimum retention time, nutrient removal course and periphyton community structure and biomass. Nutrient removal efficiency was monitored with nitrate, nitrite, ammonium-nitrogen and orthophosphate analyses and expressed as decrease in concentration in % (elimination). In order to find out the change in trophic state of water the algal growth potential was used.

The field continuous-flow trough was made of wood and was 5 m long, 0.5 m wide and 0.7 m deep. The inside walls and the bottom on the trough were laminated. Silon screens (50 x 50 cm), made of the same material as those used in the laboratory, were fixed in plastic frames and placed perpendicular to the direction of flow. Screens were held in place by grooves on the side walls of the trough 10 cm apart - that gives full capacity of 40 screens (50 cm areas in inflow and outflow parts of the trough were not furnished with screens). Vltava River water was used for all experiments in the field trough. The retention time in the trough was 4 hours based on the

results of laboratory experiments. The flow was  $312.5 \text{ l}\cdot\text{h}^{-1}$  (total volume of water in the trough was 1250 l). The field experiments were primarily aimed at examining nutrient elimination with time, periphyton community growth and composition, elimination of organics and trophic state changes.

The laboratory experiments proved nutrient elimination to be significantly dependent on the retention time of water in the trough. A four hour retention time was assessed as optimal for efficient nutrient elimination under conditions studied. A marked uptake of nutrients was demonstrated during the laboratory experiments, primarily for ammonium nitrogen and orthophosphate. Elimination of nitrate was lower and appeared only in the presence of filamentous green algal species. It was observed that in response to changing water quality in the trough, the periphyton community structure also changed during the experiment.

Results of the field experiments confirmed suggestions based on the laboratory observations. The periphyton community growing on artificial substrata has proven to be a very useful means of nutrient removal from polluted waters. Nutrient elimination in the field was similar to that in laboratory, but the maximum levels of elimination were much higher - for ammonium-nitrogen and orthophosphate, up to 80% and 70%, respectively. Similar to laboratory experiments, elimination stabilized after certain operation period in spite of the fact that periphyton biomass increased. For practical applications, these results indicate that it would be best to allow biofilm formation only during a limited period, before replacing the highly colonized screens with new ones. Field experiments also showed a high efficiency of organic removal. The decrease in  $\text{B.O.D.}_5$  values in flowing water reached almost 55%. The trophic state decreased significantly; the growth response of the test alga *Scenedesmus quadricauda* was

about 61% lower in the effluent versus the influent. During the experiments an interesting community succession was observed. The periphyton structure changed, first of all, in response to changing water quality. The changes within the community were in a close agreement with those in inorganic and organic nutrients in the trough. The composition of periphyton communities in inflow and outflow parts of the trough was monitored and evaluated using saprobic index and similarity coefficient. The saprobic index of the outflow community decreased from 2.1 to 1.5 after 25 days of operation and similarity coefficient for inflow versus communities decreased gradually up to 0.254. The periphyton community was formed primarily by phycoperiphyton (more than 40 algal species recorded at the end of the experiment) and dominated by diatoms (more than 30 species recorded). The communities

included also a great number of mechanically held planktonic species; Rotatoria and Ciliata were lower in abundance.

Periphyton growth could be utilized either in waterworks pre-treatment, especially in small eutrophied tributaries to drinking water reservoirs, or in the tertiary treatment process. Before use, however, it would be necessary to check the periphyton response under different environmental conditions such as current velocity, influent concentrations of nutrients, size and composition of artificial substrata or position of the substrata in the trough. More detailed results of this study will appear in "Hydrobiologia" and "Acta hydrochimica et hydrobiologica".

J. Vymazal, Water Research Institute, Department 232, Podbabska 30, 160 62 Praha 6, Czechoslovakia.

## Kelp Farming off the Isle of Man

After the oil crisis of the mid-1970s a Nottingham University physicist/engineer had the idea that a renewable source of energy could be seaweeded and that this could be grown in coastal sea areas, less valued by the British than agricultural land which could grow other forms of biomass. He telephoned a number of phycologists and the only one mad enough to take him seriously was one of us (JMK). A few months later the Commission of the European Communities called for projects on 'Energy from Biomass', particularly mentioning marine algae. It was thus relatively easy to get support. Now that oil is cheaper the urgency has gone out of the quest for renewable energy sources but seasonal biological research has to be a long-term business and clearly should be begun well ahead of economic need. However, the acquisition of know-how on the cultivation of natural species can be a benefit in itself when there are a number of uses to which the species can be put. Thence our aims have progressed from producing energy (through biogas) to predictable quality alginate and possible human food.

Of course the Chinese were over 30 years ahead but we knew of few details of their techniques and none of the mistakes they must have made developing them. We therefore probably made the same mistakes.

The species chosen were *Laminaria saccharina* (the closest, morphologically, to *L. japonica* grown off China) *Alaria esculenta* and *Saccorhiza polyschides*. The substratum was rope and the first structure developed consisted of a horizontal rope held at a chosen depth with a series of buoyed and weighted short lengths of line, the whole being shackled to a buoyed and anchored vertical rope at each end. The horizontal rope had to be 'seeded' with the appropriate plants. For this gametophytes and early sporophytes were cultured (in the laboratory) on string wound tidily around a frame. Our first mistake was to wind this string in a spiral around the rope to be

seeded. The inevitable wave action collected all of the turns of the spiral at one end of the rope and left the rest as a grand loop far away from the rope. Our second mistake was the use of shackles. Every sailor knows that on the sea shackle pins undo themselves unless you wire them up so that they cannot turn. What we did not know was that in the sea the threads dissolve (electrolysis presumably) and disappear, allowing the pin to fall out. The eventual answer was the splicing of rope connections (new skills for phycologists).

The main site, off Bay Fine, 1 km southwest of Port Erin, is quite exposed to the wind and waves which has caused some problems and losses. It is also exposed to tidal streams which run for most of the time and are probably important in nutrient replenishment, particularly in the summer when nitrate drops to about  $1 \mu\text{mol dm}^{-3}$ . The fact that it never drops to nil makes the Irish Sea preferable to the Yellow Sea for kelp farming: the Chinese have to spray their ropes with ammonium nitrate. A second site, Derbyhaven, faces southeast instead of northwest (Bay Fine) but is also subjected to tidal streams.

After the first three years of work it was apparent that *Saccorhiza*, although it grows fast, does not attach well to ropes being easily swept off, making it unsuitable. *Alaria* grew fast and in high numbers but stopped by the end of June. *L. saccharina* continued growth until September and produced a greater biomass. The best times for seeding were between December and February. Seeding in April allowed diatoms to flourish, smothering the young sporophytes. The best depth for the horizontal rope was around 3m below the sea surface. There was some evidence for photoinhibition of young sporophytes near the surface. With April seeding the diatom problem could be solved by starting the ropes off at 9 or 10m depth, at which there was enough light for sporophyte but not diatom growth, and later raising them to 3m.

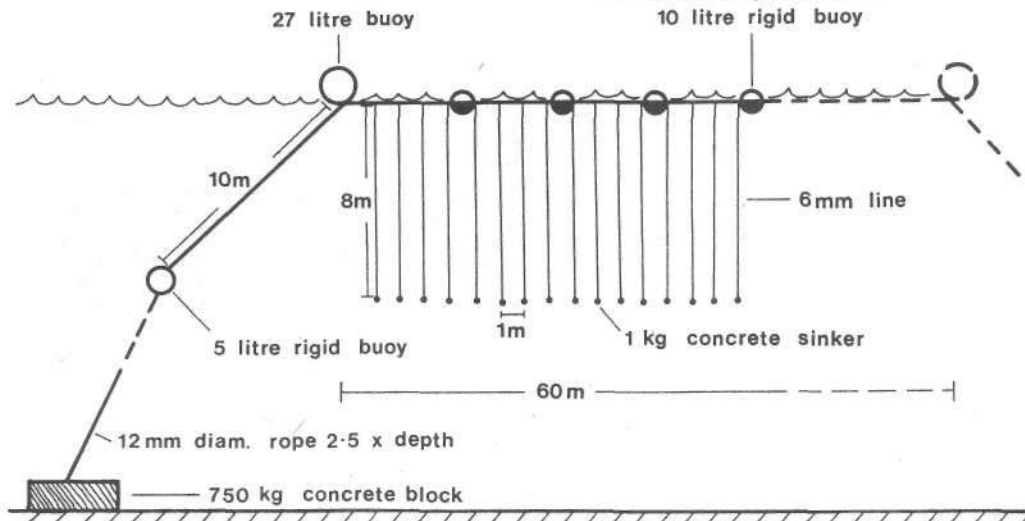


Fig. 1: Rope system deploying directly seeded vertical 'cords' (6mm line).

Horizontal ropes do not make the most of the sea area: the biomass per hectare is limited. The Chinese use vertical length of rope hanging from a buoyed horizontal. As each length only has to support the weight of algae on itself it does not need to be as thick as a horizontal rope. Also, as labour is so costly in the West we have tried to cut corners in the techniques. So we compromised between rope and string and seeded 'cord' of 6mm diameter, using this directly for the verticals (Fig.1). We made mistakes here too: we tried 3mm cord at first. The plants grew well and completely enclosed the cord with their holdfasts but the surface area of the cord was too little for adequate adhesion and it slipped through the tube of holdfasts. Eventually, too, the cord broke with the strain of the plants pulled by the tidal stream.

The present system is reasonably successful. The cord is wound around wooden frames and laid flat for the settlement of zoospores. The frames are then slung vertically in a tank of recirculating enclosed seawater and exposed to daylight (which is free). There is a coarse temperature control through an outer tank

receiving seawater from the Department's supply, running to waste. After about 3 weeks the frames are taken to sea and 8m lengths of the cord are attached to a buoyed horizontal rope. The knot used for this attachment we learnt from a visiting Japanese phycologist. Each cord is weighted with a small (sand castle size) bucket of set concrete. Although only 1m apart these cords only occasionally get tangled and they form an impressive curtain of weed by the summer (Fig.2).

We will have problems of course. Severe storms can leave an aftermath of knitting needing to be unravelled. When vertical ropes come adrift concrete blocks are difficult to find again, so the 'farm' area is now littered with them. The buoys we use are rather attractive and tend to 'walk'. However, this year's harvest of *Laminaria* has given us a record yield of about 50kg (fresh)  $m^{-1}$  of horizontal rope. Scaled up this would be 50 tonnes per hectare.

Joanna M. Kain (Jones), C.P. Dawes & T.J. Holt,  
Department of Marine Biology (University of Liverpool),  
Port Erin, Isle of Man, U.K.

Fig. 2: *Laminaria saccharina* on vertical cords after 65 days growth in the sea. Photo: M.J. Bates.



## XIIth International Seaweed Symposium

Sao Paulo

27 July — 1 August 1986

The 1st International Seaweed Symposium was inaugurated in Scotland (Edinburgh) thirty four years ago, with subsequent Symposia having been held in Norway, Ireland, France, Canada, Spain, Japan, Wales (Bangor), United States, Sweden and China. It was thus fitting that the twelfth symposium in this series should take place in Brasil, as this was the first time that the Symposium has been hosted in South America or the Southern Hemisphere. Brasil is a large country with a lengthy and extremely varied coastline, and there is considerable interest in the utilisation of its seaweed resources, complemented by the large number of active Brazilian phycologists. Traditionally, work with seaweeds in Brasil has been centred in Sao Paulo so this was the logical site for the Symposium. Even though it was mid-winter in Brasil, the weather was an improvement over that some of us from the Northern Hemisphere were experiencing during our summer.

The XIIth ISS was hosted under the auspices of the International Seaweed Association, the Brazilian Phycological Society and the University of Sao Paulo.

The chairman of the national committee was Eurico C. de Oliveira F. with Yumiko Ugadim and Yocie Yanoshigue as vice chairman. The site of the Symposium was the Centro de Convenções Rebocças, associated, significantly (?), with the Cardiac Institute, and provided relatively easy access to the central hotels where most of the participants were accommodated. The three lecture theatres were adjacent one to another so it was easy to move among sessions.

The participants represented 34 countries with about 250 registered, nine of whom were from Britain. It is significant that 20% of those registered were students, indicating a strong interest in seaweeds by the forthcoming generation. The largest group of participants were Brazilians, with a considerable number from Chile and Argentina. A major delegation from Japan was present, and, although the sizeable ethnic Japanese community in Sao Paulo and Sao Paulo State may have been a contributing factor, the main Brazilian export of seaweeds and seaweed products is to Japan.

Registration occurred on Sunday afternoon, at the Centro, followed by a reception where the participants were able to relax before the first day of sessions. The Symposium was officially opened on Monday morning by Arne Jensen, Chairman of the International Seaweed Association, and Eurico de Oliveira. Welcome was also extended by officials of the University and the City. The Opening Ceremony was followed with the first plenary lecture, prepared jointly by H. Noda and K.

Nisizawa, in which the numerous species of seaweeds in Japan that are consumed as food or condiments were discussed and their uses richly illustrated. A second plenary lecture, delivered by M. Glicksman on Tuesday morning, identified many uses of seaweed products by the food industry, including some recent new innovations.

Four mini-symposia were convened, one of which, the genetics of marine algae, was sponsored by the International Phycological Society. In the session on seaweed cultivation, Joanna Kain discussed her work with kelps on the Isle of Man. The session on biotechnology, attracting considerable attention, focussed on some of the new directions being pursued in seaweed research and possible applications of these results. Not all algae utilised are necessarily seaweeds, and this was highlighted in the session on *Spirulina* (an alga?), species of which are being cultivated in many parts of the world. The mini-symposium on polysaccharides was cancelled, because of the recent death of its convener, Wilfred Yaphe, but an *ad hoc* discussion was held on this topic.

Contributed papers were separated into sessions, usually with three running concurrently, on cultivation, resources, ecology, taxonomy, chemistry, management and pharmacology, reflecting the broad interests within the Seaweed Symposia. Agarophytes, among the seaweeds utilised, were discussed extensively, and this is the major group of seaweeds exploited in South America. It is also noteworthy that a number of reports on gelidoid algae were delivered at this Symposium, more so than previously, and this may signal a forthcoming emphasis on this group of agarophytes. Uses of biochemical techniques as taxonomic aids were considered by several contributors, and of special interest was the paper read by J.H. Price and co-authors on protein "signatures". Plenary lectures, mini-symposia and contributed papers will be published (Dr. W. Junk) as the PROCEEDINGS OF THE INTERNATIONAL SEAWEED SYMPOSIUM, and will, once again, be edited by M.A. Ragan and C.J. Bird.

There were 65 posters listed, separated into groups, similar to contributed papers, and these were of generally good quality. One of the posters, on *Sargassum*, was contributed by the Portsmouth group of phycologists.

Because of the exploitation and utilisation of seaweeds and their resources, industrialists have been attracted to these Symposia and contribute to the sessions, and several representatives from British firms were in attendance. A round table discussion, convened by Marinaig International, considered interactions among industry, government and academia. This session was of general interest, and it seems that when the industry is healthy and prospering, support funds for research on seaweeds are considerably easier to obtain.

A banquet, on Thursday evening, hosted by the local organisers and Marinaig, was held in the city at a private club. The participants thoroughly enjoyed the refreshments, food, music and Brazilian hospitality. The "flower boys" provided special attraction.

Most of the participants took part in the mid-symposium bus tour to the coast, about 100km from Sao Paulo. The high-point of the tour was when, for several hours, one of the buses became stuck in the sand; it was, to everyone's enjoyment, a delightful beach on a warm, sunny afternoon.

Pre- and post-symposium excursions were available, with a variety of opportunities both for sightseeing and collecting. These included trips along the coast of Sao Paulo state, Rio de Janeiro, Salvador (Bahia), the Amazon and Igacu Falls.

At the closing session on Friday afternoon, an invitation was extended to attend the XIIth International Seaweed Symposium at Vancouver in August of 1989; it was also announced that the XIVth ISS will move to France in 1992.

J. McLachlan, National Research Council, 1411 Oxford Street, Halifax, Canada, B3H 3Z1

## Polar Diatom Colloquium

During the Eighth International Symposium on Living and Fossil Diatoms in Paris in 1984, about 30 investigators participated in a Polar Diatom Workshop. A recommendation was made to hold a Polar Diatom Colloquium in 1986. As a result, 19 scientists from 10 countries attended the First Polar Diatom Colloquium at the University of Bristol, August 11-22. The Colloquium was organized by an international group of co-conveners ably headed by Dr. Greta Fryxell with Dr. Linda Medlin as the local organizer. Other conveners present were: Ken Furuya, Japan; Rainer Gersonde, FRG; Grethe Hasle, Norway; Rita Horner, USA; Michel Poulin, Canada; and Julian Priddle, UK. Lloyd Burckle, USA, was absent.

The participants spent 10 days intensively studying antarctic and arctic diatoms. The schedule included morning speakers-of-the-day who covered subjects ranging from specific groups of diatoms to floras about particular polar regions or habitats. Each day, microscopic study was based principally on slides and samples brought by the speakers and augmented by other collections. One or two short seminars on topics ranging from sampling techniques to the importance of taxonomy, demonstrations of special slide-making techniques, or talks and slide shows on working in polar regions occupied the late afternoons.

In addition, there were small group meetings on standardizing terminology used for ice algal assemblages, use of computer programs, and the preparation of a manual on polar diatoms. The terminology group prepared a poster for the Ninth International Diatom Symposium and is working on a paper for publication. The handbook will be edited by Drs. Julian Priddle and Linda Medlin.

The participants also enjoyed a one-day trip to Cambridge to visit the Scott Polar Research Institute, including a tour of the excellent library there, and to the British Antarctic Survey (BAS). A video on research being carried out in polar regions by BAS investigators was shown. We also toured the BAS facilities and learned about the data bases being developed to collate data collected during international polar sampling programs.

Although our time was mostly occupied with diatoms, we did learn about pub lunches and there was time for evening "conferences" at the pubs and a chance to enjoy Bristol's restaurants.

The Second Polar Diatom Colloquium is scheduled for 1988 at a site to be announced. The co-conveners of this second Colloquium invite anyone working on polar marine diatoms, regardless of habitat (sea ice, water column, or sediments), who is interested in attending, to contact Dr. Dean Stockwell, Graduate School of Oceanography, University of Rhode Island, Narragansett, RI 02882-1197, USA before 30 June 1987. Please include a copy of your curriculum vitae and a statement of your special interests and requirements.

Rita A. Homer, 4211 N.E. 88th St., Seattle, WA 98115, U.S.A.

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## Letter to the Editor

Dear Sir

I am exploring the possibility of a faculty exchange during Academic Year 1987-88 through the USIA Teacher Exchange. If one of the members of our society would be interested in teaching general botany, cryptogamic botany, and marine phycology at a small university situated on a rugged and remote coast, amongst some of nature's most splendid marine and terrestrial flora, we should correspond about the possibilities. House, automobile, and job are available on a swap basis. I prefer Great Britain but will consider any northern European situation.

Sincerely

Robert Rasmussen, Professor of Botany, Humboldt State University, Arcata, California 95521, U.S.A.

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# S.I.L. Workshop "Flagellates in Freshwater Ecosystems"

Lammi Biological Station, University of Helsinki

2 — 6 June 1986

This fascinating workshop was organised by Veijo Ilmavirta, University of Helsinki and Roger Jones, University of Loughborough, under the auspices of S.I.L. with financial assistance from the Tor Nessling Foundation and the Finnish Academy of Sciences. The venue was the field station of the University of Helsinki, situated at Lammi, ca. 125 km north west of Helsinki. A total of twenty-two scientists with varied interests in freshwater flagellates attended. These included representatives of eight countries, Australia (1), Austria (2), Canada (1), Denmark (1), Finland (10), Great Britain (3), Sweden (1) and West Germany (3).

In the five days of the workshop, three days were devoted to scientific papers covering topics ranging from the taxonomy of scale-bearing flagellates, aspects of the ecology of *Ceratium*, migration-movements in planktonic and epipelagic flagellates, form(size)-function relationships in planktonic flagellates, grazing, heterotrophic growth, the importance of flagellates in relation to studies of water quality and their use as a palaeolimnological indicators.

One and a half days were spent in the field. The first half day involved sampling the lakes in the Evo Forest Region close to the field station. The middle day of the meeting was a longer excursion visiting a wide range of lakes from extremely acidic, sheltered

oligotrophic meromictic lakes to extremely eutrophic lakes, recently improved by dredging, in the Tampere region some 90km north of Lammi. These excursions provided an excellent range of planktonic samples, but time was perhaps a little short to fully appreciate the variety of flagellates present in such a wide spectrum of lake-types. This was particularly true if one took full advantage of Finnish hospitality, such as boat-trips, barbecues and saunas!

The final afternoon was spent in an informal discussion "What else do we need to find out about flagellates?". Perhaps more ideas and problems were raised than had already been discussed during the previous four days. It was concluded by the wish for a second similar "flagellate workshop" to be arranged, perhaps in association with the third Phycological Congress in Australia in 1988.

The two organisers, for S.I.L., and the staff of the Lammi Biological Station should be congratulated on an informative, stimulating and most enjoyable meeting with superb arrangements, excellent accommodation, generous hospitality and efficient transport. Only the Finnish mosquitoes must be treated with care!

Chris Happey-Wood, School of Plant Biology, U.C.N.W., Bangor, Gwynedd LL57 2UW, Wales.

## Third International Workshop on Biogeography of Seaweeds

For those interested in algal evolution, these are interesting times. The occasion of the third international workshop on "Biogeography of Seaweeds" at Helgoland from 17-20 March 1986 brought together some twenty scientists from Britain, Canada, Germany, Ireland, Netherlands and U.S.A. - and probably as many different opinions on the nature of evolutionary change. Spatial distributions of algae, and the evolutionary implications of these, formed the workshop theme, but the differences in approach, interpretation and technique evident among those present were fascinating to observe.

The virtues of cladistics in elucidating phyletic relationships were argued (D.J. Garbary, S. Lindstrom). The existence of phytogeographic clusters of taxa was demonstrated using ordination and classification techniques (A.M.T. Joosten, C. van den Hoek), while molecular aspects of genetic divergence were examined in relation to the geographical distribution of *Cladophora* species (P.V.M. Bot, W.T. Stam). Evolutionary implications of N. Atlantic brown algal distribution were discussed (G.R. South), as were those of diverse members of the Chordariales (A. Peters). On a more local scale (Cape Verde and other E. Atlantic islands), the importance of algal migrations was stressed (W. Prudhomme van Reine). The question of species dispersal was further illuminated by two papers dealing respectively with gastropods (K. Baudel) and algae (C. van den Hoek). Rounding off this group of contributions was a magisterial account of oceanic paleogeography and bathymetry (J. Thiede).

The remaining papers dealt principally with the evolutionary importance of ecological pressures, but the

essential elements of evolutionary change were illustrated by accounts of reproductive isolation and sexual compatibility among populations of individual species (D.G. Muller, M.D. Guiry). The impact of environmental parameters, extremes as much as means, upon local populations was examined (A.M. Breeman, J.M. Jones, G. Russell). Differences in temperature tolerance and/or in photoperiodic response, both between and within species, were discussed (M. Cambridge, I tom Dieck, K. Luning, A. Peters, C. Yarish).

Two memories remain. One is of our arrival at Helgoland when we assembled in the laboratory to listen to an account of characteristically elegant culture studies from P. Kornmann, and to eat delicious cakes baked by Mrs Kornmann. For some of the older participants this meeting with the Kornmanns and P.-H. Sahling was one of great nostalgia. The second is of the immense hospitality and unflagging energy of our host Klaus Luning. The meeting could not have been more efficiently run.

Editor.

## Culture Collection of Algae and Protozoa

At the end of September the Cambridge laboratory of the Culture Centre of Algae and Protozoa was closed. The cultures and associated activities are now relocated at the Freshwater Biological Association (FBA) (freshwater algae and all protozoa) and the Scottish Marine Biological Association (SMBA) (marine algae). As there are now two centres the name has been changed to the Culture Collection of Algae and Protozoa but the acronym remains the same, CCAP.

Over the past year a great deal of work has been undertaken at both FBA and SMBA to accommodate the change and to agree with the Natural Environment Research Council (NERC) the policy whereby the

activities will continue. NERC recognises that CCAP is an important national and international resource for taxonomic, biological and genetic research and for potential commercial exploitation by NERC and industry. The scientific objectives of the Collection are stated as:

- (a) The Culture Collection will be developed within the framework of scientific programmes, in particular the ecological, physiological and taxonomic research activities of the two Associations.
- (b) The major objective is to maintain and supply selected cultures of free-living algae and protozoa to the research community.
- (c) The collection is to be improved and extended by the acquisition, isolation and maintenance of selected new strains axenic where possible.
- (d) Where possible the development of new methods of isolation, cultivation and maintenance will be undertaken, including cryopreservation.
- (e) Research, including inter-disciplinary research, on micro-organisms held in the Collection will be stimulated by providing the necessary ancillary services (enhanced electron microscopy, strain documentation and access to library resources, the Fritsch Collection of Algal Illustrations and other taxonomic resources).
- (f) The Collection and ancillary services will be used to attract visiting research and to form the basis of collaborative research, including biotechnology and industrial applications.
- (g) The information system and bibliography associated with the Collection shall be incorporated into the existing library at FBA and linked to the Fritsch Collection.

It is believed that these objectives will provide a sound basis for the development and well-being of the Collection.

The Collection is recognized as an International Depository Authority regulated by the Budapest Treaty for patent deposits. Information on strain data, culture techniques and taxonomic advice, where appropriate will be provided.

Communications have been established with other culture collections and as a result of an initiative of Dr John Baker the algal collections at Gottingen and Innsbruck have been visited.

Considerable internal reconstruction of the buildings at FBA and SMBA has been necessary to accept the cultures and some of this is outlined for the individual laboratories below. The cultures were successfully transferred from Cambridge over the summer months amidst builders, joiners, plumbers etc making the new laboratories. Nine new members of staff had to be appointed (4 part-timers) as Ken Clarke is the only member of staff moving with the Collection. By the end of October all the staff will have taken up their positions and we are grateful to them, and the Cambridge staff, for coping so well over this difficult period.

#### Freshwater algae and protozoa

The freshwater algal and protozoan cultures have been located on the first floor of the Ferry House and integrated with present FBA microbiological (Bacteriological, botanical and zoological) activities. Four new full-time staff have been appointed for four years to take care of the fresh water algal and protozoan cultures. There is also Ken Clarke to provide the expertise in electron microscopy (including marine algae) and Mrs Jane Rhode the part-time clerical officer. Mrs Ann Thompson has been appointed as an information scientist for one year to undertake the relocation of the CCAP library.

The freshwater algal cultures are maintained in a

large room subdivided to provide an illuminated constant temperature room, two transfer and isolation rooms and a small amount of laboratory and office space. A back-up collection of the cultures is maintained in a small separate room. A pair of rooms are being combined to provide a large research laboratory with a mixture of incubation cabinets and two walk-in temperature controlled rooms. A further room is being converted to a cell-biology/cryopreservation laboratory with on line liquid nitrogen facilities. Washup, sterilization and media preparation are provided in nearby rooms and shared with protozoological and microbiological activities. Amidst all of this are the office and computing facilities. Not all of the rooms are finished yet and it will probably be Christmas before the major conversions are complete.

#### Marine algae

Preparations for taking charge of the marine and brackish algae were initiated on site at SMBA, Dunstaffnage, near Oban, at the beginning of 1986. Space for the Collection and its ancillary maintenance facilities was made from two rooms, though in all a total of five rooms were the subject of major or minor alterations, as it was necessary to provide alternative suitable working areas for ongoing research. A new electricity supply to these rooms was installed to cope with increased demand from air conditioning units and other pieces of equipment having a heavy power demand. A room with north facing windows was partitioned so that the smaller portion could serve as a constant temperature room to operate at 15°C. Two air conditioning units were installed here in such a way that if the primary units failed, a second would be switched on automatically and an alarm triggered. The larger portion of the divided room was designed to provide space for subculturing and for temperature controlled, illuminated incubators. The room itself is maintained at 20°C ( $\pm 2^\circ\text{C}$ ), thus providing containment within containment as far as temperature is concerned for those algae kept in the incubators.

Two four year posts were made available for staff to assist with maintenance and improvement of the Collection and these posts were filled in mid-July 1986.

At present all cryopreservation facilities are at Windermere, but we hope in the near future to have a holding capability at Dunstaffnage. In collaboration with our colleagues at FBA we hope to increase the comparatively small number of marine strains currently cryopreserved. This method of holding cultures would be particularly useful in prolonging the shelf life of diatoms.

Representatives of most of the currently recognized algal classes are present among the Collection but because of its history, some groups are less well represented than others. It is our intention to gradually remedy this, subject to the perceived demand of the scientific community. Diatoms and some flagellates including dinoflagellates are poorly represented and this will, in part, be improved as a result of the ongoing research of the two Associations. Among ecologically important organisms we would consider that picoplankton, prokaryotes and eukaryotes, would be of considerable interest if more were available in culture.

It is our hope that the Collection and facilities at both Associations will become foci for research both among existing staff and visiting researchers. Although the main emphasis has traditionally been orientated towards taxonomy and physiological/ecological studies, new lines of interest are welcome and to be encouraged.

We would be pleased to hear from members of the BPS or other readers of this Journal who have views as to how the Collection and its services might be developed. All your suggestions will be considered as it is you, the users, who make the keeping of collections of this kind a worthwhile exercise.

Finally, we should mention ordering, depositing of cultures and the catalogue. As a result of the upheaval caused by the relocation of the cultures, their formal supply from FBA and SMBA has been delayed until 1 January 1987. During the hiatus we have endeavoured to

supply cultures as we have been able. All cultures can be ordered from CCAP at FBA although marine cultures may also be ordered from SMBA. Both Associations communicate daily by electronic mail. Acceptance of new cultures for deposit in the Collection is at the discretion of the respective curators who should be contacted directly - freshwater algae, S.I. Heaney (FBA); marine algae, M.F. Turner (SMBA); protozoa, B.J. Finlay (FBA). The curators should also be contacted directly for further information on each of the Sections. A new catalogue is in preparation and will be produced as quickly as possible.

S.I. Heaney, F.B.A.  
M.F. Turner, S.M.B.A.

#### Acknowledgements

We would like to thank all those without whose help and co-operation the whole exercise would have been impossible. These include the previous staff at the Cambridge laboratory and those at the two Associations. Particular mention should be made of the unstinting help of John Baker, John Leftley, David Kinsman, Bill Heal, George Jaworski, Ray Ohnstad, Peter Allen and the cleaners.

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## Phycomycology — Underwater Puffball on Seaweed

Various marine fungi are known, and some of these occur on or in algae. I have recently collected material of the common red alga *Dilsea carnosa* from the sublittoral fringe which has clearly been infected by a fungus causing circular necrotic lesions on the blades. These lesions are easily observed in the field (1-2 cm in diameter) and are characterised by having a greenish zone of algal tissue surrounding a whitish inner region. The central area of this is usually torn away forming an irregular hole. The fungal lesions are easily distinguishable from the frequent perforations in the *Dilsea* frond caused by grazing molluscs. These holes are not associated with any unhealthy-looking algal tissue and the exposed inner region (medulla) of the *Dilsea* frond is quickly recovered by cortex.

Dr David Porter (on sabbatical leave at Portsmouth Polytechnic from the University of Georgia) has been investigating the fungus and has shown the presence of dolipore septa in the hyphae. These are diagnostic of a basidiomycete fungus. The fruiting bodies are small, hemispherical structures occurring on the surface of the whitish zone of the lesion. Although their general appearance is similar to an ascomycete perithecium, distinctive basidiospores, produced by a hymenial layer of basidia and extruded through a central ostiole, have been demonstrated. Thus, this fungus is an underwater version of the common puffballs on land and is only the fourth marine homobasidiomycete known.

What seems to be the same species, involving the same host and identical pathology, was described by Maire & Chemin in 1922 from France and was called *Mycaureola dilseae*. If this is the case then they misinterpreted the reproductive structures and classified the fungus as an ascomycete. *M. dilseae* has not to our knowledge been reported since its original description over 60 years ago. It has now been found on both sides of the Channel, occurring at least during summer and autumn.

We would be grateful for any further observations on *Mycaureola* to resolve the following questions. Does its distribution correspond with that of its host? Does it occur throughout the year? How common is it and what effect does it have on its host?

We should be grateful to receive any "grotty" plants of *Dilsea* with suspected fungal lesions. These can be fixed in 5% formal in S.W. Perhaps those with access to herbaria collections would also look through any *Dilsea* collections, although no sign of *M. dilseae* was seen in over 200 *Dilsea* specimens at the British Museum, presumably because phycologists choose to press nice, healthy specimens.

W. Farnham, Marine Laboratory, Portsmouth Polytechnic, Ferry Road, Hayling Island, PO11 ODG, England.

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## Third International Phycological Congress

14 — 20 August 1988



The International Organizing Committee for the Third International Phycological Congress met at Harlow, Essex (England) from 27 to 28th August 1986. Sixteen members from eleven countries attended the meeting which was chaired by Robin South. The meeting selected plenary speakers and the major symposium topics for the Congress. The symposium topics selected include: "Cell and tissue culture in algae", "Gene transfer and cloning techniques", "Structure and assembly of cell surfaces", "Picoplankton", "Phylogeny of phytoflagellates",

"Phytoplankton ecology in frontal and upwelling systems", "Molecular biology of sexuality in algae", "Photophysiology of algae", "Physiological implications of salinity in algae", "Determinants of community structure in the intertidal and subtidal zones", "Heavy metals and algae", "Phenology of algae". The plenary speakers will be P. Broady, J.T. Kirk, F.R.J. Taylor, and D. Walker. In addition, contributed papers and posters concerning all aspects of research involving algae are welcome. These will be grouped into sessions according to topic.

Pre- and Post-Congress Excursions will include field trips to Heron Island (Great Barrier Reef), the southern Australian coast, Shark Bay and Rottnest Island (Western Australia), and diving in Victoria.

Further information about the Congress is given in the first circular, due out in December 1986. This will be sent automatically to all members of the International Phycological Society, those who attended the Congress in Copenhagen, and the International Seaweed Association. Copies of the first circular may be obtained by writing to: The Secretariat, Botany Department, Monash University, Clayton 3168, Victoria, Australia.

Margaret Clayton, Bill Woelkerling (Co-conveners)

# News and Announcements

## Underwater Association Annual Symposium

"Twenty one years of underwater science": The 21st symposium will be held at the Zoological Society of London, Regents Park on 20/21 March 1987. Further details from the Convener, Dr W.F. Farnham, Marine Laboratory, Ferry Road, Hayling Island, Hants. PO11 ODG.

## Charophytes

Members will be interested to learn that a new illustrated guide to these beautiful and neglected plants has recently been published. The details are: Charophytes of Great Britain and Ireland by Jenny A. Moore, published by the Botanical Society of the British Isles (B.S.B.I. Handbook No.5), £6.75.

## Third International Desmid Symposium

It is proposed that the 3rd symposium (to address filamentous conjugate algae as well as desmids) be held in Tasmania, Australia, immediately preceding or immediately following the 3rd International Phycological Congress in Melbourne, Australia, in August 1988. Please contact conveners:

Dr Peter A. Tyler  
Department of Botany  
University of Tasmania  
Box 252C, G.P.O.  
Hobart, Tasmania, 7001 Australia

Dr Dieter Mollenhauer  
Forschungsinstitut Senckenberg  
Aussenstelle Lochmuehle  
D-6465 Biebergemuend-Bieber  
Federal Republic of Germany ("West Germany")

## Handbook of Phycological Methods, Vol.2 -

### Biochemical and Physiological Methods

(Eds. J.A. Hellebust & J.S. Craigie) 1978.

Have you always thought you ought to have your own copy of this important reference manual? Now's your chance! The Society has been offered a quantity of remaindered copies of the book, and has bought 25 copies. These will be available (for personal collection only) at a knock-down price of £15 per copy at the winter meeting in Durham. You can reserve a copy by dropping me a note before the Durham meeting. Please do not send any money, or ask for copies to be posted to you. If it looks as though the demand will exceed the current supply, I'll twist the Treasurer's arm and try to get some extra copies in time for the meeting. All profits from the sale will go to the Scientific Meetings Fund.

M.J. Dring, Hon. Secretary, British Phycological Society,  
Department of Botany, Queen's University, Belfast BT7  
1NN, Northern Ireland

## An Atlas of the Marine Algae of Britain and Ireland

The Natural Environment Research Council has just published an atlas of the distribution of seaweeds around the British Isles. The atlas contains 156 maps displaying the geographical distribution of 23 species of Chlorophyta, 46 species of Phaeophyta and 86 species of Rhodophyta. Each map is accompanied by a brief explanatory paragraph.

The maps are derived from well over 100,000 original records of seaweeds from sites covering almost 80% of the coastline around the British Isles.

The species selected include some that are ubiquitous, but mostly those that display distinctive distribution patterns. Common species are much in evidence, but many rarities are also displayed.

The Atlas should be of interest to anyone concerned with the ecology and distribution of seaweeds. It is available to members of the British Phycological Society at a slightly reduced price: £3 including postage and packing within the British Isles, and £4 for abroad. Cheques should be made out to Professor T.A. Norton at the Department of Marine Biology, University of Liverpool, Port Erin, Isle of Man, British Isles.

Phycological Society of America

## Announcement of the Gerald W. Prescott Award for 1987

The Phycological Society of America will accept nominations for an award to be presented at the Annual Meeting of the Society at the Ohio State University, Columbus in August 1987. The Award will recognize the author(s) of a scholarly work devoted to phycology in the form of a book or monograph published in English. Edited volumes, individual book chapters, typical journal articles and the like will not be considered. Publications must have copyright dates of 1985 or 1986. Authors need not be members of the Phycological Society of America to have their publications nominated for the Award. The value of the Award for 1987 is expected to be \$500.

Nominations may be made by any member or non-member of the Phycological Society of America by submitting a brief letter stating the strong points of the scholarly work and a copy of the book or monograph to be considered. It is acceptable and in fact strongly encouraged that authors nominate their own publications. Separate publications by the same author(s) may be nominated. Nominations for the 1987 Award should be sent to the Chairman of the Gerald W. Prescott Award Committee, Dr. Linda E. Graham, Department of Botany, 430 Lincoln Drive, University of Wisconsin, Madison, WI 53706, U.S.A., and to be considered must be postmarked not later than April 1, 1987. For further information write the Chairman or phone her at (608) 262-2640.

## The Luigi Provasoli Award

The first Luigi Provasoli Award was announced at the 40th Anniversary Meeting of the Phycological Society of America held at the University of Rhode Island, Kingston. The Provasoli Award is offered biennially in recognition of an outstanding research paper in the Journal of Phycology and published during the preceding two-year period. Recipients of the 1986 award were Lynda J. Goff of the University of California, Santa Cruz and Annette W. Coleman of Brown University, who were honored for their 1985 paper on "The Role of Secondary Pit Connections in Red Algal Parasitism." Professor Provasoli, first Editor of the Journal, was present to make the Award along with Johan A. Hellebust, current Editor.

Submitted by: Robert W. Hoshaw, Department of Ecology & Evolutionary Biology, University of Arizona, Tucson, Arizona 85721

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