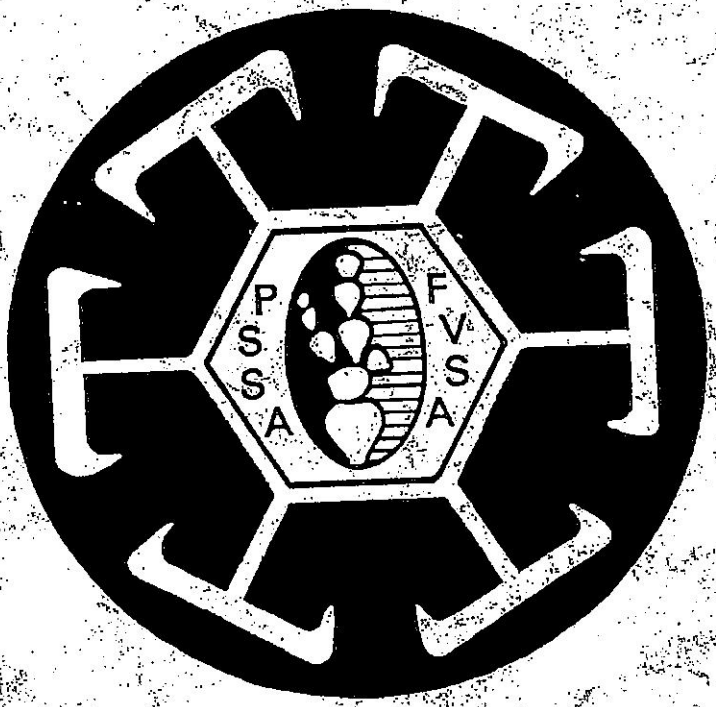

PHYCOLOGICAL SOCIETY OF SOUTHERN AFRICA

FIKOLOGIESE VERENINGING VAN SUIDELIKE AFRIKA

NEWSLETTER
NUUSBRIEF

NO. 47
DECEMBER 1998

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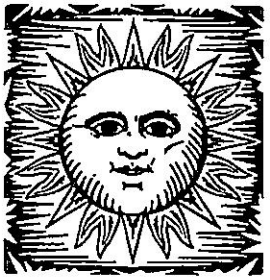


Letter from the editor

Dear all

This is the last newsletter that I will be involved with.
I've enjoyed my time as editor and thank all members who have given their support and input. I wish the next editor the best of luck and I'm sure we can look forward to a fresh new approach.

As the year draws to an end I hope all members are frantically preparing for the 1999 PSSA Congress in Swakopmund.

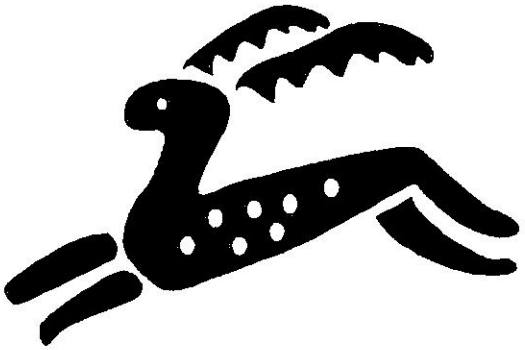
1999 Congress News

Dr Fergus Molloy from the Biology Department, University of Namibia is organising the Congress. According to Fergus there will be 45 delegates. Guest scientist is Prof Michael Friedlander from Israel Oceanographic and Limnological Research who will give a talk on *"Recent developments in seaweed pond cultivation"*. Namibia Breweries will sponsor the Congress banquet and Taurus the opening function. There will be transport available from Windhoek to Swakopmund, Dr Molloy will confirm this with the individuals involved.

Lastly a blessed and happy festive season to you all.

Regards

Janine
xxxxxx



Report on the visit to the 15th International Diatom Symposium Curtin University Perth, Western Australia

Johan van der Molen, Botany Department, University of Port Elizabeth.

Venue

The 15th international diatom symposium was held at Curtin University, Western Australia between 28 September and 2 October 1998. The host of this symposium was professor Jacob John and his colleagues at the school of environmental biology at Curtin university. The theme of the symposium was: "Conservation of biodiversity and aquatic ecosystems". The symposium was attended by 140 diatomists from 31 different countries.

South African contribution

The South African delegation consisted of Eileen Campbell, Derek Du Preez and myself, all from UPE. Eileen gave a poster during the morphology session on the surf zone diatom Entopyla australis. Derek's poster was on the sexual reproduction of another (well known) surf zone diatom: Anaulus australis. I gave an oral presentation on my (and co-authors') work on the relation between epilithic diatoms and water quality in three Western and Eastern Cape rivers.

Topics of interest

A large variety of papers were presented dealing with diatoms in palaeolimnology, biodiversity, biomonitoring and systematics. During these sessions, the delegates learned about the extensive research done in the Swan estuary. The Swan river is the largest river in South Western Australia and the estuary has a large urban influence, since the cities of Perth and Freemantle developed on its banks. Regular phytoplankton blooms occur in the estuary, including an outbreak of toxic cyanobacteria in 1994. The city of Perth is concerned with this problem and spends up to A$ 6 million a year to manage the catchment area, modify the river such to reduce algal blooms and to monitor the river health.

Paleolimnological research in lakes, estuaries and marine waters concentrates on diatom remains in sediment layers to reconstruct past climate and water quality conditions. The research done by the 'Environmental History and Climate department' in Copenhagen, Denmark, tries to correlate diatom assemblages to recent (50 years) climatic changes. The assemblages, which are preserved in sediment layers in lakes, are analysed for their relation to known climatic changes. In future it will be possible to use this knowledge to reconstruct climatic conditions further into the past.

Professor Lange-Bertalot (a well known German diatomist) described the result of a diatom study on the island of New

Caledonia. The oligotrophic rivers on this island contained a large number of endemic species. He showed that anthropogenic influences result in a larger abundance of cosmopolitan species. In a talk by Dr Poulin (Canada), it became clear that there are about 10.000 to 12.000 recognised diatom species out of an estimated 10 million species globally.

Professor Jacob John (Curtin University, Australia) explained to the delegates how his team of researchers aims to use diatoms as indicators of water quality in Australian rivers. From his talk and later discussions I got the impression that the rivers in Western Australia do have a lot in common with some South African river systems as far as climate, size, flow patterns and the occurrence of diatom species are concerned.

A large number of posters (87) were presented and in the afternoons parallel session were held in which the delegates could present their posters individually. Due to the lack of appropriate space, this was not a great success. Other than that, the organising committee had done everything to keep the atmosphere as pleasant as possible. Even the rain during the mid-conference excursion could not keep the delegates away from hugging the indigenous wildlife. All in all the conference was a great success.

Future plans

During the last day the plans for the next International Diatom Symposium were unfolded. It is to be held in Greece and the organisers are contemplating the idea to hire a ship as a conference venue, which will take the delegates along the Greek isles. Maybe it is time that you also get involved in diatom research!

The Sixteenth International seaweed symposium in Cebu, Philippines, 12-17 April and a visit to Bali

Rob Anderson, Seaweed Unit, Sea Fisheries

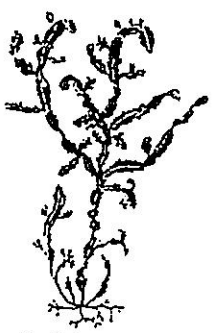
Venue

In the fine tradition of holding conferences in exotic or interesting places, the 16th ISS took place in the Philippines earlier this year. The venue was the large and luxurious Cebu Plaza Hotel, which overlook Cebu from the foothills of a ridge of mountains. The symposium was attended by almost 400 delegates, and had the usual structure of starting the day with a plenary lecture, followed by 3-4 parallel oral sessions, of poster sessions. There were also various specialst workshops in the evenings.

Lectures and presentations of interest:

The commercial prospects for seaweed colloids

In one of the plenary lectures, Hans Porse, a leading seaweed industrialist, outlined the commercial prospects for seaweed colloids – these remain optimistic. Seaweed colloids are currently worth about US $ 500 million per year, with a predicted expansion of 2-5% p.a. over the next 5 years. Demand for agar-producing seaweeds still exceeds supply. *Gracilaria* remains the only species that is cultivated to any extent, while attempts to cultivate the more valuable *Gelidium* spp. have not yet proven economically (or even technically) successful.



Gelidium pristoides

Gracilaria beckeri

Warm-water carrageenophytes are cultivated on a large scale in the east and Tanzania, and although there is room for expansion, this market is competitive. On the other hand, cold-water carrageenophytes are still in short supply, despite recent research efforts to cultivate them (a lot of work is going into this in Chile). The market for alginates (which are derived from kelps) is expected to grow by about 3% p.a. However, in order to keep extraction operations economically viable, plants should be built in "low-cost" areas.

Cultivation of cold-water carrageenophytes

Cold-water carrageenophytes remain one group of seaweeds that cannot yet be cultivated commercially. Chilean phycologists are systematically investigating the cultivation of likely carrageenophytes, as we are attempting to do here (Sea Fisheries and UCT projects), but they have several advantages over us.

Buschmann *et al.* reported on the biological basis for cultivation of *Gigartina skottsbergii* (which is similar to several of our *Gigartina* spp). They have been successful in test cultivation from spores and more importantly, from vegetative fragments of plants: this is encouraging in our work, which lags behind the Chileans.

Avila *et al.* performed an economic analysis of a pilot cultivation study of *Sarcothalia* (a genus with a good candidate species in SA as well). Using techniques to grow out spores settled on nylon line in the laboratory, and a suspended system for the small plants in the sea, the economic analysis predicted that the operation would be viable, but required refinements.

Particularly interesting was a paper by Santelices and Aedo (Chile) describing tests of several synthetic adhesives, one of which (polylysine) shows excellent potential for increasing spore-attachment rates in mariculture as well as for ecological spore-distribution studies. It has the further advantage that it increases germination rates.

Polyculture

Polyculture was dealt with in several papers and posters, most notably that of Troell and co-authors, during a minisymposium on cultivation. They reviewed in particular the cultivation of seaweeds in conjunction with salmonids (both caged and in tanks on shore), and provided incontrovertible evidence of the advantages, both from the point of view of improved water quality and increased profits (from selling the seaweed).

Klaus Rotmann (Taurus Seaweeds, South Africa) described a scheme for optimal utilisation of kelp resources in the Western Cape.

Policy issues

Few presentations dealt with policy issues. However, Zemke-White *et al.* discussed the situation in New Zealand, where policy has severely affected commercial seaweed developments. An extremely restrictive approach to the issuing of licences for the harvesting of wild stocks, combined with an obsession with privatisation of research on harvesting and mariculture has caused a 75% decrease in exports, while imports have increased by 400% in the last 10 years. This illustrates that a national research effort, and a progressive attitude on the part of the authorities are required to stimulate a seaweed industry or keep it healthy.

Farming of seaweed in the Philippines

Seaweed is farmed on a massive scale in the Philippines, and this is a particularly important economic activity among poor coastal dwellers. I therefore took the opportunity to look at how things are done there, to try and

get ideas for our attempts to promote seaweed mariculture back home (albeit on a limited scale).

In the Philippines, more than 10 000 people are involved in the cultivation of seaweed in about 8 000 ha of coastal shallows, and the total annual yield is more than 50 000 tonnes (dry wt). Seaweeds and seaweed products are their third largest fishery export, and were worth more than US $ 40 million in 1996. *Eucheuma* and *Kappaphycus*, the carrageenan-producing mainstays of this industry, are grown in the shallows around the numerous islands. We were also taken on a mid-symposium trip to a *Caulerpa* farm.

We then visited the University of San Carlos Research Station on Mactan Island. The station proved to be a very simple, wooden, double-storey building in an outstanding "tropical paradise" setting . Apparently most of the research done there is on the adjacent coral reefs or in the seagrass beds. Mark it for a sabbatical if you like the tropics!

A trip to Bali...

After the symposium I flew to Bali to meet my wife and enjoy a real "tropical paradise" holiday. Bali is simply unique – I can't recommend it highly enough. If you avoid Kuta and one or two other towns that have been colonised by Australian tourists, it's a beautiful island of jungle, rice paddies on terraced hills, volcanic peaks and really friendly people. It is literally an island of ancient Hindu culture in the otherwise Moslem Indonesia, and must be one of the few places in the world where the majority of people are involved in some sort of art, whether its sculpture, painting, dancing or whatever. I have no vested interest in this, but I must finally point out that it must be one of the cheapest places on earth to visit (which is also clean and fairly organised) – so don't waste your Rands in the Maldives or Mauritius.....

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We took a boat from Bali to the neighbouring island of Nusa Lembongan, to have a look at the biggest seaweed farming operation in Indonesia. Here *Eucheuma* and *Kappaphycus* are grown in about 40 ha of reef flats (inside the coral reefs) on the north of the island. Seaweed farming is probably the mainstay of this small island's economy: tourism is very limited, and there is little agriculture.

Here the seaweed is also grown on monofilament or rope lines suspended between mangrove stakes at a height of 20-60 cm from the sand, to keep it submerged but out of reach of benthic grazers. With the recent political upheavals in Indonesia having severely reduced tourism, the seaweed farming on Nusa Lembongan, which would have been unaffected, must have assumed enormous economic importance to the island.

Nusa Lembongan also has several excellent surf breaks, one of which lay off our bungalow (accommodation cost US $4 per day for two of us), and for about $5 we could hire a large canoe-like boat with motor, sun-cover and guide to take us to a neighbouring island or snorkelling anywhere on miles of shallow coral reefs. Of course the weather is very hot and humid so you tend to spend the daylight hours in the sea. After the whole visit to the Philippines and Bali I have to face the fact that the next International Seaweed Symposium is to be held in Cape Town - no exotic travel for the local organisers.

Interesting articles from the Internet

Australians ready to fight the toxic blues

Friday, September 4, 1998

Australia's water made headlines over the past few months as polluted water was pumped throughout the city of Sydney. In an effort to prevent further defamation of the nation's water supply, Australian government scientists are planning to go to war against toxic blue-green algae, one of the most widespread threats to the health of the environment and community. During the summer months, which the southern hemisphere is about to enter, algal blooms spread their poison in many of Australia's city water supplies, rivers, irrigation and farm dams.

The knowledge gained through six years of research at Australia's federal science agency, CSIRO, is yielding an armory of tactics to control harmful algal blooms.

CSIRO Land and Water program leader Dr. Richard Davis stated that until now blue-green algae have posed constant problems in the warm months for urban water storages in Brisbane and Adelaide as well as regional cities which has cost the community millions of dollars to keep the water supply clean Large irrigation supply dams and weir pools in major rivers turn blue-green every summer, and there is a risk of water containing algal toxins going onto crops and even into the food chain. Davis believes that they now have a toolkit of methods that can tackle the problem of algal blooms in a wide range of circumstances, and they are keen to put them to work in real life settings to see if this problem can be fixed.

The ecology of the water can be altered. For example, one reason for algal blooms is that small fish eat the tiny creatures which normally keep the blooms in check. Introducing large predatory fish can reduce numbers of small fish, and so allow the tiny water creatures to survive and eat down the algae.

The balance of nutrients in the water can be shifted to favor diatoms and other microscopic life in preference to blue-green algae. Water weeds can be used to soak up the nutrients which blue-green algae depend on.

There is also quite a lot that can be done about catchment management to prevent fresh phosphorus from entering the water body and triggering algal blooms.

http://www.enn.com/snap/1998/09/090498/algae4.asp

Timing is the key to seaweed reproduction

Monday, March 2, 1998

Sensitivity to water motion and salinity is the key to reproduction for aquatic organisms such as seaweed, according to research by a University of Maine marine biologist.

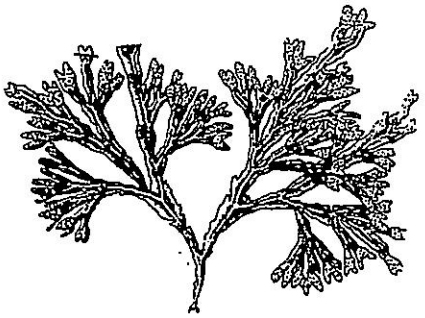
Fertilization rate of seaweeds

Susan Brawley, who presented the results of several years' research at the annual meeting of the American Association for the Advancement of Science in Philadelphia, refutes a long held belief that seaweed has a low rate of fertilization because it releases reproductive cells, or gametes, when water is turbulent. Under such conditions the seeds of reproduction would be widely scattered and miss their targets.

But the work of Brawley and her associates reveals that these aquatic organisms have a biochemical mechanism that makes them "exquisitely sensitive" to environmental cues such as water motion and salinity, and as a result are actually quite successful in their reproductive efforts.

The organisms in question are those which reproduce in the water by external fertilization - some species of fish, corals, and plants such as seaweeds.

The evolutionary success of seaweed led Brawley to find the belief in seaweed's low rate of reproduction as odd. "Selection pressure should act quickly on any characteristic that allows an organism to have fertilization success," she says. The hypothesis of an extremely low success rate doesn't meet this evolutionary test.



Fucus vesiculosis

Fucus response to environmental cues

Brawley first became interested in Fucus, a globally common family of brown seaweeds, on a 1990 sabbatical on the Isle of Man. Fucus species were the only seaweed known to thrive equally well in saline waters as well as low salinity environments such as the Baltic Sea. During her research she noticed that Fucus didn't release its gametes until slack high tide and hypothesized that the plants were responding to water motion and accompanying changes in salinity.

Back at the University of Maine in Orono, Brawley worked with Gareth Pearson, a post-doctoral researcher, and Esther Serrao, a graduate student, to study this possibility in earnest. They used Baltic specimens Brawley had brought from Scandinavia, and they collected plants from tide pools along the Maine coast. They also received plants from researchers in California.

"We were able to simulate in the laboratory that high salinity is one of the cues for the release of gametes, and all of that was done under calm conditions," says Brawley. "In the back of my mind, I kept thinking about the affect of water motion. Nearly every introductory biology book you read will have some statement that organisms that use external fertilization have to release lots and lots of gametes because fertilization

success is low. Now with five different fucoid algae in California, the Baltic and here in Maine, we've found that the adults were waiting to release their gametes under conditions that were less turbulent. When the gametes are not diluted, fertilization success is high. I think that's going to stand in most cases."

Carbon deficit as chemical cue

In a subsequent series of experiments, Brawley, Pearson and Serrao delved into the biochemical mechanism underlying gamete release. Levels of dissolved inorganic carbon such as carbon dioxide and bicarbonate, they hypothesized, might provide a key. While the sun is shining, plants take up carbon as they carry out photosynthesis. Brawley and her team reasoned that when water is being churned by waves or tidal currents, the plants are constantly receiving new supplies of carbon. Gametes are not released under such circumstances.

That changes, however, when the water is calm. Without turbulence, the carbon supply begins to run out. The researchers' experiments have shown that the carbon deficit is the chemical signal for plants to release their gametes. It is the green light which tells the plants that the water is calm and the time is right for reproduction.

"Many cells have a mechanical response to pushing, bending, something like that, but this is chemical sensing," Brawley says. "What I expect is that external fertilization is going to be found to be very successful in these organisms. The caveat is that we always have to remember that we're looking at a snapshot of evolution and that not every species is at its heyday. It may be a species that is on its way out, or it may be one that is recent. We have to keep in mind where it is relative to selective mechanisms or how well adapted it is to the community it lives in."

For more information, contact Nick Houtma, (207)581-3777, email: nick.houtman@umaine.edu.

http://www.enn.com/ENN-News-Archive/1998/03/030298/reprod.asp

Seaweed may help protect coral reefs

Friday, September 4, 1998

Scientists with the Australian Institute of Marine Science have recently completed an 18-month study of coral bleaching with some surprising results.

Many inshore reefs of the Great Barrier Reef region have abundant beds of large brown seaweed or macroalgae on the reef flat, often dominated by species of *Sargassum*. The abundance of the seaweed could be a result or even a cause of reef degradation; scientists aren't quite sure which. The increased runoff from land as a result of floods could make reef waters less suitable for corals and more suitable for algae. Or these conditions may allow algae to outcompete corals, causing reef decline.

In order to test whether the seaweed beds had any effect on coral reefs, the AIMS scientists established and maintained several large seaplots at Cannon Bay and Gould Reef. In some seaplots, the *Sargassum* was removed for about 18 months and in others it was left in place, forming a thick canopy often 1-2 meters thick, with 100 percent cover. Despite this

Sargassum canopy, the plots had quite high cover of live corals (up to 50 percent).

In the middle of February, more than a month after major flooding, scientists found extensive bleaching of corals at the two sites. The likely causes of the coral bleaching include low salinity, high temperature and high ultra violet light intensity. Both the *Sargassum* canopy and removal plots were assessed and the condition of the coral measured.

At both reefs, the average percentage of corals bleached was significantly higher in plots that had had the Sargassum canopy removed than in plots with an intact canopy of the macroalgae. Overall, 19.6 percent of corals were bleached under "normal" conditions for these reefs, but 36.4 percent were bleached when the Sargassum canopy had been removed.

AIMS scientists have concluded that it seems likely that the seaweed canopy reduces damage to the corals by decreasing exposure to high temperatures, high UV light intensities, or perhaps by reducing mixing of low-salinity waters. Evidence is available for similar effects of algal canopies from temperate areas: Such canopies can dramatically reduce thermal stress and water movement. The significance of this result is considerable, since it raises the possibility that algal canopies could actually provide protection to corals, instead of, or as well as, competing with them.

"Although the results by no means disprove the possibilities that corals are inhibited by macroalgae, they certainly provide further evidence that abundant macroalgae should not be assumed to be detrimental to inshore reefs without much more information," said Dr. Laurence McCook, chief AIMS researcher on the project.

For further information contact Dr. Laurence McCook, Australian Institute of Marine Science, email: l.mccook@aims.gov.au, telephone: +61-7-47534362

http:/www.enn.com/snap/1998/09/090498/seaweed.asp