Phycological Society of Southern Africa

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From the Editor

We have come to the end of yet another year; one that I hope has been productive for all of you. There certainly has, to this extent, also been a tremendous contribution by the PSSA members to the newsletter editions for 2003. A special thanks goes to all members who took of their time to put pen to paper (and fingers to keyboard) to keep us all informed of the happenings in and around their labs and at other research gatherings and conferences. Student participation has also been particularly good this year, as you would no doubt have seen from the many inclusions in this and past editions. I am confident that this is a sign of the good things to come. As you must have noticed by now (seeing from the cover of this edition of the newsletter) we are celebrating 21 years as a society. The 20th PSSA conference is also coming up in January and it seems appropriate that the very institute that hosted our first formal gathering some 21 years ago is hosting this conference. Here's wishing everyone another 21 years and best wishes for the festive season.

Please remember to send us your contributions. Your regional collators are listed below. **Also, copies of the newsletter will be available for download from the website for those wishing to see the images in colour.**

Northern Areas
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Southern Areas
Enrico Tronchin
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Sincerely
Gavin

Synarthrophyton patena
epiphytic on *Gelidium capense*

Attention All

1. Contact Details and Research Areas

This is yet another reminder! Please check your particulars on the website

(http://www.botany.uwc.ac.za/pssa/)

for omissions or incorrect details. New members especially should let me have their details for inclusion on the website. We would like to know your specific research areas and not that you are just simply interested in *Phycology*. Also, for those members who have opted to describe their research interests in one or two key words, would you be so kind as to give the rest of us some greater insight into your area(s) of expertise.

2. The History of PSSA: The first 21 years

At the 6th Annual Congress of the South African Association of Botanists (SAAB) held in Pietermaritzburg in January 1980, 21 papers were presented in the special symposium entitled "Phycological Research in South Africa". Owing to all this interest, it was proposed that a Phycological Society be established and Prof. Richard Pienaar was given the mandate to set the wheels in motion. Progress on this venture was discussed the following year at the 7th Annual Congress of SAAB held in Port Elizabeth and a working group consisting of Prof. Pienaar, Prof. Richard Norris and Dr. Jenny Buzer was elected to steer the formation of the society. By March 1981, Prof. Norris and Dr. Buzer had drawn up a draft constitution based on those of the British Phycological Society, the Phycological Society of America and the Australasian Society for Phycology and Aquatic Botany.

Prof. Pienaar was elected by postal ballot (there were 52 replies) as the Interim President of the Society in September 1981. The other members of this Interim Council invited by Prof. Piennar were Prof. Norris (Vice President), Dr. Buzer (Secretary/Treasurer), Prof. Braam Pieterse (Newsletter Editor) and Mr. Richard Simons (Additional Member). The first council meeting was held on 22nd February 1982 in

Pietermaritzburg. At this meeting the name of the society was finalised as the "*Phycological Society of Southern Africa*" (PSSA) rather than the "South African Phycological Society" as this acronym was too similar to the "South African Police School". Subscriptions were set at R5 for Ordinary Members and a logo was chosen after a competition where only two entries were submitted.

The Inaugural Meeting and 1st Annual Congress of PSSA were held on Saturday 15th January 1983 at the University of Witwatersrand, Johannesburg. This was a one-day affair run just prior to SAAB where 18 papers were presented. At this 1st AGM lasting 70 minutes, the draft constitution was accepted and so PSSA founded with a balance of R538.32. Prof. Pienaar was elected as the 1st PSSA President (Table 1). Of the 31 members present at this meeting, a number are still current members. These include Dr. Rob Anderson, Dr. Alan Critchley, Prof. Pienaar, Prof. Pieterse, Mr Simons, Dr. Stuart Sym and Prof. Ted Steinke sent his apologies. In 1997, Prof. Pienaar was made an Honorary Life Member in appreciation of his efforts on behalf of PSSA.

The first newsletter edited by Prof. Pienaar, was sent out in February 1981. Since then, 54 newsletters have been compiled. Some of the early articles included a series of short bibliographies of the PSSA Council Members and other prominent Phycologists associated with South Africa such as George Frederick Papenfuss, Béla Jenö Cholnoky, Mary Agard Pocock, Stan Seagrief and Ferdi Schoeman. A series on the phycological research at the various Universities and Institutes was also run as well as many short informative research articles and abstracts from all the PSSA Congresses.

Since PSSA's inauguration in 1983, 19 congresses (Table 2) have been hosted either independently or jointly with other societies. The first PSSA workshop, organised by Prof. Pienaar, was a two-day "Phycological Foray" in August 1981 with collecting trips to Tiger Rocks near Isipingo Beach and to Rocky Bay, both on the Natal South Coast. Other workshops included "Electron Microscope Techniques for the Study of Microalgae" organised by Prof. Pienaar in September 1982, and "Structure and Reproduction in the Rhodophyceae with Special Reference to the Cryptonemiales and the Ceramiales" organised by Prof. Norris and Dr. Michael Wynne in March 1983.

From these early beginnings PSSA continued to grow. In the first three years, membership reached 106 before stabilizing at a constant level between 60-80 members. The congresses continue to be well attended and presentations of high standards reflect the active programme of phycological research in southern Africa. In the 21 years of its history, PSSA has become established as a successful forum for southern African phycologists. It maintains a core group of members serving to keep the discipline of Phycology alive and to ensure a further 21 years of productive and successful Phycological research.

Table 1. Past Presidents of PSSA since its inauguration.

President	Term of office
Prof. Richard Pienaar	1981-1983 (Interim President)
Prof. Richard Pienaar	1983-1985
Prof. Richard Norris	1985-1987
Dr. Jenny Buzer	1987-1989
Prof. John Bolton	1989-1991
Prof. Braam Pieterse	1991-1994
Dr. Rob Anderson	1994-1997
Prof. Bruce Robertson	1997-1999
Dr. Stuart Sym	1999-2002
Dr. Grant Pitcher	2002-2004

Table 2. Congresses hosted by PSSA.

Congress	Venue & Date	Dates	No. papers and posters	Guest speaker	Joint meetings
1st	Wits Univ.	15 Jan. 1983	18 papers	Prof. Michael Wynne (Univ. of Michigan, USA)	Day before SAAB
2nd	Univ. of Cape Town	21 Jan. 1984	19 papers	Prof. John Bolton (Univ. of Cape Town, SA)	Day before SAAB
3rd	Univ. of Port Elizabeth	19-22 Jan. 1985	22 papers		
4th	Univ. of Natal (PMB)	27-28 Jan. 1986	33 papers		SAAB
5th	Univ. of Natal (Durban)	12-16 Jan. 1987	30 papers + 6 posters	Prof. Richard Pienaar (Univ. of Natal, SA)	SAAB
6th	Univ. of Cape Town	18-20 Jan. 1988	31 papers + 5 posters		SAAB
7th	Luderitz, Namibia	23-26 Jan. 1989	20 papers	Dr. Jan Jurgens (Director of Sea Fisheries, Namibia)	
8th	Univ. of Port Elizabeth	Jan. 1990	39 papers		
9th	Univ. of Natal (PMB)	14-17 Jan. 1991	24 papers		SAAB
10th	Univ. of Cape Town	7-10 July 1992	31 papers + 3 posters		SASAQS
11th	Wits Univ., 10-14.01.94	10-14 Jan. 1994	33 papers	Prof. Russell Chapman (Louisiana State Univ., USA)	SAAB
12th	Univ. of the Orange Free State	Jan. 1995	13 papers		SAAB
13th	Meerensee Resort, Hermanus	22-24 Jan. 1996	25 papers + 12 posters	Dr. David John (British Museum of National History)	
14th	Port Alfred	20-22 Jan. 1997	20 papers + 18 posters	Dr. Richard Crawford (Alfred Wagener Institute for Polar and Marine Research, Germany)	
15th	Oaklands, Simon's Town	18-21 Jan. 1998	27 papers + 20 posters	Prof. Michael Guiry (National University of Ireland, Galway)	
16th	Swakopmund, Namibia	17-21Jan. 1999	24 papers + 10 posters	Dr. Michael Friedlander (Israel)	
17th	Mtunzini, Natal	4-8 July 2000	25 papers	Prof. David Mann (Royal Botanic Gardens, Edinburgh)	
18th	MCM Aquarium, Sea Point	21-22 Jan. 2002		Prof. Stephan Bates (Fisheries and Oceans, Canada)	
19th	Mpekweni Sun, Eastern Cape	19-21 Jan 2003	16 papers + 6 posters	Dr. Graham Underwood (Univ. of Essex, UK)	

3. 8th International Phycology Congress

PSSA is hosting the Eighth International Phycological Congress (IPC8) at the International Convention Centre (ICC) in Durban in 2005. Each IPC has two International Organising Committee (IOC) meetings, one at the end of the previous IPC and the other, two years later (there are four years between IPCs). The second meeting is usually held at the venue of the impending IPC, so that members can evaluate the venue and make suitable suggestions to the Local Organising Committee. The Chair of the IOC, Margaret Clayton, was not convinced that attendance would be meaningful if it was held in Durban, so this IOC meeting was linked to the third European Phycological Congress (EPC3) in Northen Ireland to increase attendance. Margaret and John Beardall (the incoming Chair of the IOC) flew into Durban on their way to Belfast so that they could provide some outsider evaluation of the venue to the IOC.

We have selected Turners Conferences as the professional conference organisers, although they still need to be ratified by the IOC. This is more than likely a formality as they proved themselves well equipped to handle the event and really went out of their way to make Margaret and John=s stay in Durban pleasant. They also provided a slick presentation for them, which was taken over to Belfast for later presentation to the IOC. The management of ICC impressed our visitors with a superb demonstration of the flexibility of the venue.

The IOC in Belfast, attended by 19 members, was held over two days, just before EPC3, and considered both our preparations/suggestions and the scientific programme. The details of the planned plenary sessions and symposia will be advertised in the near future on the IPC8 website (www.ipc8.wits.ac.za) and it promises to be an interesting event. So remember to commit your diaries to IPC8 in the week of the 13 - 19 August 2005!

Stuart Sym
Chairperson of the
local organising committee

4. 11th International Conference on Harmful Algae – HAB2004

The first notice for the HAB2004 conference was posted electronically at the end of November. If you have not received the first notice and would particularly like to receive a hard copy, please contact the secretariat at aecon.e@mweb.co.za with your postal address. All the information in the 1st notice will be on the web site very soon. Please follow the web site (http://www.botany.uwc.ac.za/pssa/hab2004/) to keep abreast of developments.

5. PSSA is well represented at EPC3

The Third European Phycological Congress was for me one of the most enjoyable Congresses, not only because of a particularly interesting scientific programme, but also because of some really rather spectacular social events. It was additionally special because PSSA managed to be represented by no less than 6 members (John Bolton, Alan Critchley, Gavin Maneveldt, Richard Pienaar, Wendy (Stirk) Burnett and myself). In addition, the setting was awesome too ... the Queens University Buildings are something to behold!

The Congress had five plenary sessions, three of which in my opinion deserved special mention. Annette Coleman gave a low down on how DNA sequencing, used until now quite successfully to unravel phylogenetic relationships, can be extended to answer other questions like sexual compatibility, degree of relatedness, and the identification of life-cycle stages and cryptic species (biogeographically and genetically isolated and yet visually indistinguishable). The conserved regions of the ITS2 transcript can also be used at a

higher taxonomic level (greater than generic level) to help reveal developmental facets of related organisms that characterise deep divisions in their phylogeny.

E. Greenbaum gave a rivetting account of how his laboratory is showing the ways in which algal photosynthesis can be harnessed for outlandish uses. He provided three examples: to provide, via photolysis, a renewable source of hydrogen for fuel or chemical production; to use fluorescence of the naturally-occurring algal pigments as a measure of water quality; and, most interestingly, using artificially implanted Photosystem I reaction centres to restore firing in the optic nerve of patients blinded by retinitis pigmentosa or macular degeneration.

PSSA members who attended the EPC3: left to right (standing) Stuart Sym, Alan Critchley; (seated) Richard Pienaar, Wendy Burnett, Gavin Maneveldt.

John Bolton.

E. Armbrust gave a fascinating account of how a large, international co-operative of scientists have applied the knowledge of (almost) the complete genome sequence of an organism (in this case, the diatom *Thalassiosira pseudonana*), from unravelling endosymbiotic genome chimaeras to proteonomics. The latter has been used to identify potential silica precipitating enzymes, chitin synthetases, cytoplasmic carbonic anhydrase (in support of the hypothesis of C_4 -like photosynthesis in diatoms) but lacking the plastidial malic enzyme (unlike C_4 plants). It has also been used to identify putative components of iron uptake, such as siderophores, reductases and permeases, whose identification would help us to understand why diatoms are always the first organisms to bloom after Fe fertilization.

Many of the papers in the symposia and mini-symposia were also extremely interesting and I even had the opportunity of having a pre-view of our speaker for PSSA 2004, Alan Millar, who provided a very entertaining presentation of the problems that phycologists encounter when dealing with non-scientists in the entrenchment of new legislation.

From the social side, the two highlights were the Congress Banquet, which was held in one of the banqueting halls in the Town Hall of Belfast and was preceded by a free bar in the OTT marbled and domed foyer. This is the first banquet I have ever attended where the courses were served at the table (talk about precision timing!) and where the meal was genuinely excellent and there was wine in excess (South African wine too was in evidence!). I also got my first taste of real Irish whiskey (being the pleb that I am, I forget its name ...Black something or other... forgive me John, Rob and other Ire-ophiles!). Of course, I don=t want to give you the impression that I=m a drinker..... The banquet was rounded off by a great display of Irish dancing by a group of youngsters, ranging in age, it appeared, from about 4 to the late teens. They wowed the entire audience for about 30 minutes. We are grateful to the organisers for spontaneously providing Richard Pienaar with the opportunity at the banquet to verbally advertise IPC8 in South Africa.

The mid-congress tour that I (and, from what I could see, most other delegates) attended was the one to the Giant=s Causeway. I enjoyed the opportunity to see the countryside and I was impressed by the scale of the lava formations, although others were disappointed. The cliffs in the area alone are well worth the visit and Ireland is not called the Emerald Isle for nothing ... it was painfully green! One thing that really shattered me was that you could actually see Scotland from the top right corner of Ireland.

Finally, I had a true Belfast farewell, as several marching bands had taken to the streets and were strutting their stuff. I was quite amazed at the enormous turnout of spectators (who were obviously local rather than tourist and who MUST surely have had their fill after the big annual event) and felt quite guilty as I wheeled my bag through them on my way to the bus for the airport.

Contributions by our members:

- **Bolton, J**. Diversity, discontinuity, endemism and conservation of the South African seaweed flora.(Paper)
- **Critchley, A.T.** World-wide carageenophyte cultivation: recent successes and challenges. (Paper)
- **Maneveldt, G.W.**, Biggs, C., Ras, C. & Keats, D.W. Antifouling effects of epithallial shedding in two common encrusting coralline red algae. (Paper)
- Ördög, V., van Staden, J., **Stirk, W.A.** & Strnad, M. Plant growth regulators from microalgae - occurrence and practical use in modern and safe agriculture. (Paper)
- **Stirk, W**. Seaweeds as agricultural stimulants useful secondary metabolites. (Paper)
- **Sym, S.D.** On the distinction between *Mamiella* and *Dolichomastix* (Poster)
- Trespoey, A., Piffaut, B., Picot, V., Boulenguer, P & **Critchley, A.T.** Production of high molecular weight carrageenan (Poster)

Stuart Sym
University of the Witwatersrand

Featured Article

Invasive Alien Species and the Global Invasive Species Programme (GISP)

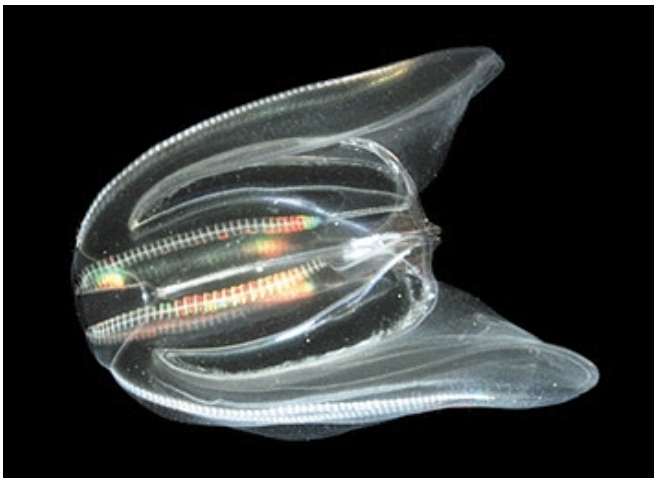
Both managed and natural ecosystems throughout the world are under siege by a growing number of harmful invasive species - disease organisms, agricultural weeds, destructive insects and others that threaten economic productivity, ecological stability and biodiversity. This problem is growing in severity and geographic extent as global trade and travel accelerate and as ecosystems are disrupted by fragmentation and by global climate change. In spite of the serious impacts of invasives, national and international leaders remain underinformed regarding the scope and gravity of the invasive species problem, and no effective strategy has been developed to enable appropriate solutions.

In recent years there has been increased, and focused attention on the magnitude and impact of biological invasions. It is quite clear that the ecological, economic, and human health consequences of invasives are often staggering. The crisis must be addressed proactively in a holistic context that will provide a strong foundation for international protection from potentially alien invasive species.

Invasive alien species (IAS) are non-native organisms that cause, or have the potential to cause, harm to the environment, economies, or human health. IAS are one of the most significant drivers of environmental change worldwide. They contribute to social instability and economic hardship, placing constraints on sustainable development, economic growth, and environmental conservation. The direct costs of IAS to a single country can be in the billions of dollars annually. However, the costs to society greatly exceed those that can be measured in currency. They can also include unemployment, impacts on infrastructure, food and water shortages, environmental degradation, loss of biodiversity, increased rates and severity of natural disasters, illness, and lost lives. The globalization of trade, travel, and transport, is greatly increasing the number and diversity of harmful organisms

being moved around the world, as well as the rate at which they are moving. At the same time, human-driven changes in land use and climate are rendering some habitats more susceptible to invasion. IAS are thus a growing problem, and one that we will have to manage in perpetuity.

The American grey squirrel (*Sciurus carolinensis*), introduced into the British Isles and Italy as a pet species, has caused severe damage to forests and commercial tree plantations by bark-stripping. It is replacing the native red squirrel (*S. vulgaris*) through competitive exclusion and is also suspected of being a source of parapoxvirus, lethal to the red squirrel.



The Atlantic comb jelly (*Mnemiopsis leidyi*) transported via ballast water from the east coast of the USA to the Black Sea has caused a sharp decrease in all life forms, most notably pelagic fish and zooplankton, the result collapsing the fisheries in that region.

Failure to address the underlying causes of biological invasion and mitigate the impacts of IAS will result in both losses and gains. We will, for example, lose numerous species, genetic resources, and quite possibly the entire concept of "protected" areas. Poverty, malnourishment, human migration, and disease epidemics will, on the other hand, increase. Thus far, national and international responses to the IAS problem have been insufficient to counter their increasing toll on our natural resources and society. Most countries have only recently begun to recognize the scope and significance of the IAS problem. While a few governments are investing in national policies and programmes to address the problem, many are prevented from doing so by a lack of scientific, technological, and financial resources. Efforts of most governments to limit the spread of IAS are so poorly coordinated that ministries within a single government, trading partners, and neighboring countries are often unaware of each other's policies and practices. Non-governmental and intergovernmental organizations face similar challenges and have few mechanisms to develop a holistic approach to the problem.

In 1996, concern that globalization was having negative consequences on the environment led the United Nations and the Government of Norway to convene the first international meeting on IAS in Trondheim, Norway. Participants in the conference concluded that IAS had become one of the most significant threats to biodiversity worldwide and recommended that a global strategy and mechanism to address the problem be created immediately. In 1997 GISP was established.

In the first phase of GISP (1997-2000), an international team of scientists, environmentalists, lawyers, natural resource managers, policy makers, and other IAS experts volunteered their time to execute a specific programme of work. The Scientific Committee on Problems of the Environment (SCOPE), the World Conservation Union (IUCN), and the Centre for Agriculture and Biosciences International (CAB International) co-administered the effort. This collaboration resulted in a series of global assessments of the problem, as well as a global strategy, a toolkit of best prevention and management practices, and an initial pilot database coordinated by partner, IUCN led by the Invasive Species Specialist Group.

Water hyacinth (*Eichhornia crassipes*), native to South America, has become an environmental and social menace throughout the world. Its potential to grow rapidly and produce enormous amounts of biomass, leads to it covering extensive areas of naturally open water.

The Japanese seaweed, *Sargassum muticum*, was introduced on oyster shells to the Pacific coast of North America. From here it was introduced to Britain, France, the Netherlands and the Mediterranean Sea. Its fast growth, and fertility within the first year of its life, will probably make this seaweed out-compete local seaweed species in Europe.

Since 1997, the demand for GISP's productive, multi-disciplinary approach has grown dramatically, necessitating its evolution into a programme that openly engages the expertise and capacity of an even wider variety of stakeholders. At a March 2001 meeting of the Convention on Biological Diversity's (CBD) Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA), GISP released a Call to Action, inviting all stakeholders to become members of a "GISP Partnership Network". More than 50 governments, as well as numerous industries, scientific institutes, non-governmental organizations, and intergovernmental organizations have signed the Call to Action, making GISP a truly co-operative programme of global-scale.

The development of a Phase II implementation Plan was initiated at the GISP Phase I Synthesis Conference held in Cape Town, South Africa in September 2000. At the meeting, representatives from 42 governments, 17 intergovernmental institutions (including key Conventions, scientific institutes and development assistance agencies) and 17 national and non-governmental organizations provided input to establish priorities for Phase II. GISP presented these priorities at the sixth meeting of the CBD SBSTTA and incorporated feedback from the Parties and other bodies.

Presently, an international team of biologists, natural resource managers, economists, lawyers and policy makers are developing a global strategy to address the invasive species problem. The team's goal is to enable local, national, and multi-national communities to draw on the best available tools to immediately improve pest prevention and control systems, and to identify priorities for the development of new tools needed to achieve longer-term success. Further, the program will contribute to the capacity of nation's to fulfill Article 8h of the Convention on Biological Diversity that prescribes that each contracting party should, as far as possible, …

"prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species".

With these facts in mind, GISP will 1) draw together the best management approaches for pest prevention and control and make these readily accessible to all nations, and, 2) lay the groundwork for new tools in science, information management, education, and policy that must be developed through collaborative international action. In addition this program will assess the current status of the science dealing with invasive species. The results of this work will be disseminated via published reports, international meetings, and, especially, through a new network

of information exchange and training to be developed as part of the project.

GISP Phase I resulted in a variety of international projects and publications, including the significant international Toolkit for Invasive Species. While planning Phase II, a growing number of key partner organisations and members felt that the time was ripe for a dedicated global Secretariat to coordinate and promote IAS activities under the GISP umbrella. Core funding for such an institution was generously granted by the World Bank on the basis that the Secretariat would be established in a developing country. On invitation from the National Botanical Institute (NBI) of South Africa, the GISP Board agreed to establish the Secretariat at the NBI offices in Cape Town. The NBI is currently supporting GISP in administrative matters. An additional motivating factor for housing GISP in South Africa was the strategic link GISP had, and still has, with Working for Water and the Santam / Cape Argus Ukuvuka Campaign, the two South African flagship IAS programmes. Support from these two programmes enabled GISP to qualify for the core funding provided by the World Bank.

Did You Know!

In the U.S. in 1989, 32 people died and 20,000 were hospitalized from allergic reactions to fire ants, an alien import from South America.

Eurasian zebra mussels, a leading cause of industrial damage in Canada and the United States, blanket the walls of water treatment plants.

Indian farmers spend countless hours cutting back Mikania, an invasive South American weed also known as "mile a minute".

The Global Invasive Species Programme website: http://www.gisp.org/

Kobie Brandt
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Popular Student Articles

Two newly described dinoflagellate species on the south coast of South Africa

Lizeth Botes
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University of Cape Town

In 1988 and 1989, an undescribed gymnodinioid dinoflagellate species turned the waters False Bay a dirty olive-green colour. The bloom was accompanied by extensive mortalities of abalone, *Haliotis midae* Linnaeus, and noxious gases causing eye, nose, skin and throat irritations in humans. In 1995, another undescribed gymnodinioid species bloomed in the same bay but with no adverse effects to either marine fauna or humans.

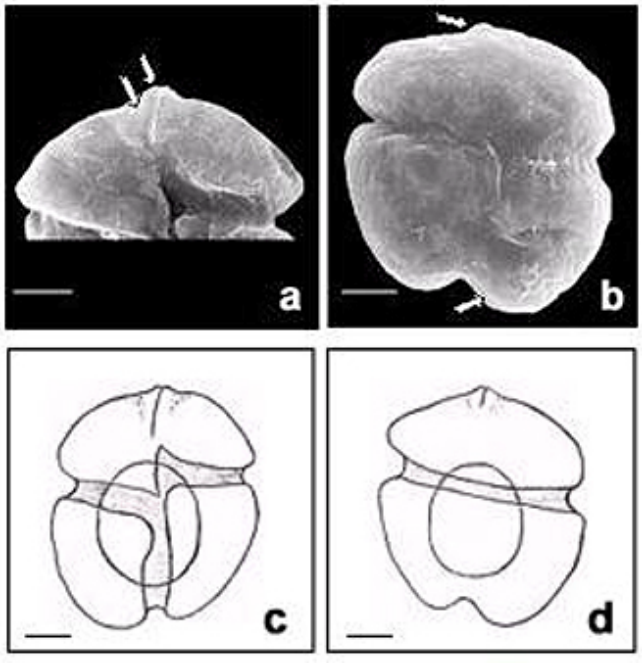

Figure 1. a-b SEM micrographs and c-d line drawings of *Karenia cristata* sp.nov. Scale bar = 5µm. Fig 1a. Ventral view of the apical crest (bottom arrow) with the apical groove (top arrow). Fig. 1b. Dorsal view of the apical crest (top arrow) and eccentric hypocone (bottom arrow). Fig. 1c. Ventral surface. Fig 1d. Dorsal surface.

These two species both form an established component of the phytoplankton assemblage on the south coast of South Africa. The first was described as *Karenia cristata* Botes, Sym & Pitcher and the latter as *Karenia bicuneiformis*

Botes, Sym & Pitcher (Botes *et al*. in press). Characteristic features of *K. cristata* are its straight apical groove which is elevated into an apical crest that extends down immediately to the right of the sulcal extension on the ventral side (Fig. 1), the hypocone which is asymmetric with the right lobe is larger and more rounded than the left, and the central nucleus which has the bulk of the nucleus situated in the hypocone. Its pigment content is similar to that of *K. mikimotoi* and *K. brevis*. Other than *K. brevis*, *K. bicuneiformis* is significantly larger than the other *Karenia* species and is distinctly dorso-ventrally flattened (Fig. 2). The hypocone is w-shaped and the epicone is conical, giving the cell a distinctly angular outline. Pairwise distance comparisons of partial large subunit (28S) rDNA sequences indicate that these two species are clearly different to the other species within the genus.

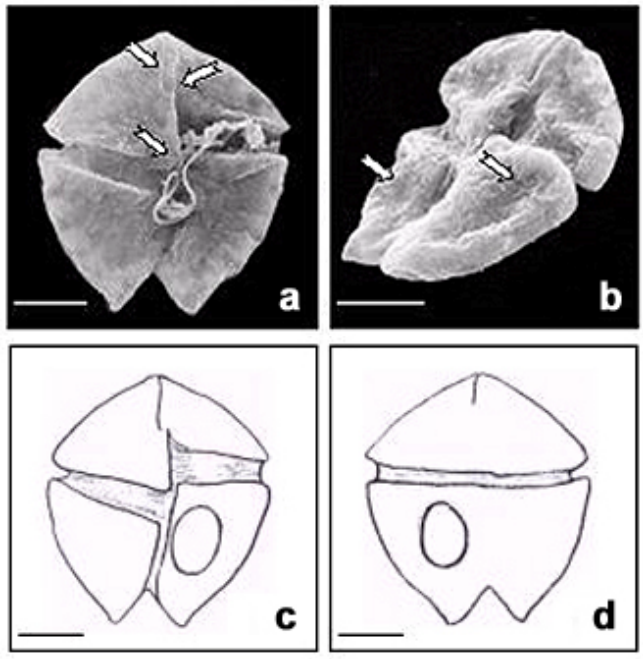

Figure 2. a-b SEM micrographs and c-d line drawings of *Karenia bicuneiformis* sp.nov. Scale bar = 10µm. Fig. 2a Typical cell shape in ventral view showing straight apical groove (top arrow), sulcal extension (middle arrow) and the cingulum displacement (bottom arrow). Fig. 2b. Ventral view of the indentations in the left and right lobes of hypocone (arrows). Fig. 2c. Ventral surface Fig. 2d. Dorsal surface.

These two newly described species are not confined to South African waters but are also found in New Zealand. In 1993, *K. cristata* was responsible for negative impacts similar to those attributed to the South African isolate (e.g. Chang et al. 1995) and in 1995 *K. bicuneiformis* was isolated from Hawke's Bay in the North island of New Zealand (Haywood et al. 1996). As in the case of South Africa, these two species both form an established component of the phytoplankton assemblage on the coasts of New Zealand.

Seaweeds in Drug Development

Denise Saravanahkumar
Dept. of Pharmacology, University of Cape Town

The demand for new drugs to treat diseases we previously considered easily curable is steadily increasing. This is particularly true of infectious illnesses as pathogenic microorganisms continue to develop mechanisms of resistance to our current drug supply. In addition, in recent years, Aids has sown havoc in southern Africa and other parts of the world. The methods by which we search for drugs has changed greatly in the last few decades with the progress in genomics, combinatorial chemistry and the knowledge of how bacteria develop drug resistance.

Despite these changes, natural products continue to play a major role in drug discovery, as the diversity of the compounds they harbour and their role in the living environment continue to invite scientists to embark on new chemical discoveries. Although much has been done in this regard, Harvey (2000) reminds us that the past accomplishments were merely a drop in the ocean of the world's biodiversity. He noted that only 10% of our 250 000 plants has been investigated for biological activity and our current drugs from micro-organisms stem from a small percentage of the world microbial diversity. As 70% of the earth's surface is ocean and home to more than 300 000 described species of marine fauna and flora, it is naturally the new frontier in drug discovery. In recent years, many publications have featured the discovery of bioactive compounds isolated from marine organisms such as tunicates, sponges, soft corals, sea hares, nudibranches, bryozoans, sea slugs, and marine micro-organisms (e.g. Donia and Hamann, 2003; Haefner, 2003). Marine algae have received

comparatively less bioassay attention. Nonetheless, the red alga, *Sphaerococcus coronopifolius* was shown to have antibacterial activity (Donia and Hamann, 2003), the green alga, *Ulva lactuca* was shown to posses an anti-inflammatory compound, and an anti-tumor compound was isolated from *Porteirra hornemannii* (Faulkner, 2002).

Plocamium corallorhiza has proven to be a good candidate for antimicrobial activity.

When we consider our own rich marine biodiversity, its pharmaceutical potential is infinite and will remain undiscovered unless research into drug development establishes the medicinal value of the chemical compounds they hold. We have the advantage of having a seaweed industry consisting of two kelps, three *Gelidium* species and a *Gracilaria* / *Gracilariopsis* species (Anderson et al., 2003). In addition, there are a number of seaweeds with economic potential (Critchley et al., 1998). It will be of great significance if these species could be the major role players in drug development. Alternatively, findings from academic laboratories could result in new cultivation initiatives. Recently Vlachos et al. (1997) investigated the antimicrobial activities of a few southern African algae and identified a few candidate species for antibiotic research. Bearing in mind that we have about 800 marine floral species (Stegenga et al., 1997), many more seaweeds could be investigated for bioactivities.

Phytochemists, microbiologists, botanists, and others are joining forces to advance the process of drug discovery. Recently, a national research and development platform for novel drug development from indigenous medicinal plants was established with support from the NRF involving institutions that have significantly contributed to the research of medicinal plants. The consortium seeks to develop treatments for tuberculosis, malaria, diabetes, mellitus and immune modulation (including immunosuppressive agents) under the leadership of Prof. Folb from the Division of Pharmacology at the University of Cape Town. Prof Folb has motivated for the inclusion of seaweeds for their potential anti-tuberculosis compounds and thus far, many have produced promising results. The seaweed community, well aware of the wonders of marine organisms as a whole, needs to follow suit to address the questions regarding marine algae and their pharmaceutical application, and to quantify the value that this information could add to the current industry, putting seaweeds on par with terrestrial plants in future drug development initiatives.

The ultrastructural study of *Lepidodinium viride* and its endosymbiont

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Dinophyceans are mostly unicellular, eukaryotic, flagellate organisms that have both photosynthetic and non-photosynthetic members. Photosynthetic dinoflagellates usually have a brown pigmentation, therefore the discovery of a green marine dinoflagellate, *Lepidodinium viride* (Fig. 1), caused much excitement in the late 1900's. The pigmentation of this organism is due to an endosymbiont harboured within *Lepidodinium*, which many generations before had been acquired by phagocytosis (the ingestion of particles). The endosymbiont is now a permanent feature within the cell. Here, phagocytosis resulted in transferring a photosynthetic ability into a previously heterotrophic lineage.

The cell size of *L. viride* ranges between 18-30µm. It has a slightly conical epicone and a slightly rounded hypocone (Fig. 2). A transverse flagellum and a longitudinal flagellum lie within

the cingulum (a groove that girdles the cell), and within the sulcus (a groove that extends from the cingulum to the antapical end of the cell) respectively. Together, the flagella provide a rotatory and forward thrust to the swimming cell. There is an apical groove that extends, superficially, from the cingulum and circumvents the cell apex in a counter-clockwise direction. *L.viride* is referred to as athecate, because the amphiesma is made up of empty thecal vesicles.

Figure 1. Light micrograph of a pigmented cell.

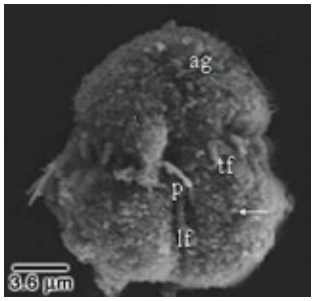

Figure 2. SEM of *L. viride* in ventral view showing apical groove (ag), peduncle (p), transverse flagellum (tf), longitudinal flagellum (lf) and scale (arrow).

Gymnodinium chlorophorum, another green dinoflagellate, was found subsequent to *L.viride*, and appears to be similar to *L.viride* with the exception of two structures. The two structures characterizing *L.viride* are the unusual hand-basket-like scales found in a single layer on the surface of the cell (Figs 2 & 3), and the peduncle (Figs 2 & 4).

The scales are complex structures and are unusual to dinoflagellates. The scales of *L.viride* have square bases, which are bisected into four quadrants (Fig. 3). Each quadrant has a network of fine stellate-like material which is less electron dense that the frame of the scale. Two opposite bow-like arches each arise from two adjacent corners of the bases, and a curved bar interconnects the summit of the arches and forms the handle of the hand-basket structure. A net-like matrix connects the rods arising from the corners of the base to produce the perpendicular sides of the basket. These scales are formed in the Golgi bodies and are transferred via vesicles to the flagellar insertion region, where the scales are passed to the exterior of the cell.

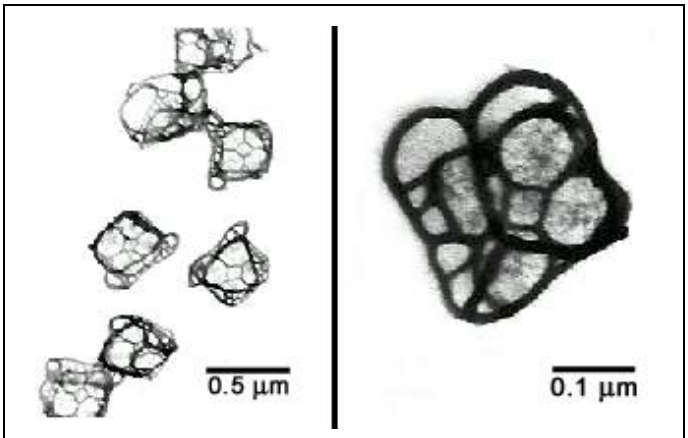

Figure 3. Whole mount scales showing hand-basket-like structure.

The club-shaped peduncle is a projection situated at the junction of the sulcus and cingulum, on the ventral side of the cell. The peduncle of *L.viride* is structurally unique. It has a distal and a proximal part delineated by a membranous structure (Fig. 4). There is a single layer of several microtubules that extend from the vicinity of the flagellar bases into the distal part of the peduncle. The peduncle has been shown to function as a feeding organelle in some heterotrophic dinoflagellates.

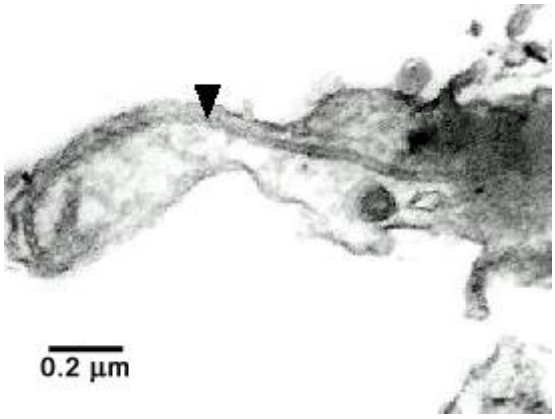

Figure 4. Longitudinal section of the peduncle showing single layer of microtubules (arrowhead).

Dinoflagellates usually have chlorophyll a, c_2 and peridinin. *Lepidodinium viride* is unusual in that chlorophyll b is present instead of chlorophyll c_2, and prasinoxanthin instead of peridinin. The cells therefore have a bright-green appearance as opposed to the usual brown pigmentation of dinoflagellates. The presence of both chlorophyll b and prasinoxanthin leads to the assumption that the endosymbiont may be of prasinophytic origin.

The chloroplasts of *L.viride* are situated peripherally and their ultrastructure is also similar to those of prasinophytes.

Some unpigmented cells are also encountered in aging cultures. In these forms the chloroplasts aggregate at the hypocone where they are broken down. Therefore the cells eventually appear colourless.

You are what you eat!
Natural vs. artificial diets

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Abalone (perlemoen) is an animal in great demand. Thought to be an aphrodisiac, it has become a sought after delicacy in the East. Its consumers in the East argue that abalone flesh tastes better when grown on a natural seaweed diet as opposed to an artificial diet. Evidently the diets contribute to the colour of the abalone shell and flesh, and to the taste of the abalone meat. Abalone fed on a natural seaweed diet, have a richer and more pronounced colouration not only evident in the shell (Fig. 1), but also in the flesh (Fig. 2).

Figure 1. The distinctive shell colouration of spat – abalone in their first year of growth – fed on diatoms.

Artificial feeds are generally composed of cheap protein, lipid and carbohydrate sources, and contain mainly animal by-products. They are generally also more expensive, and because of the high fish protein content, there is an increase in pest infestation, such as the sabellid worm. Seaweeds on the other hand, generally have a high water content and relatively lower protein content in comparison to artificial feeds. However, research is showing that a diet containing a mixture of different seaweeds gives good growth because of the variation in nutritional content of the seaweeds (Fig. 2). Natural diets may become more popular in the future, with investigations into the growth of abalone grown on natural diets versus artificial diets continuing.

Figure 2. Abalone grown on a natural seaweed diet (left) and on an artificial diet (right). Note the difference in colour and size of the abalone meat and individuals.

Although natural diets may be economically viable, it will eventually put pressure on the local seaweed biodiversity. A concept called 'Integrated Aquaculture' (the mass cultivation of two or more species on the same farm) is gaining momentum in the aquaculture industry. Growing seaweeds together with abalone on the same farm could place less stress on our biodiversity while improving the growth, quality and turnover rate of abalone produced on South African abalone farms.

Popular Student Articles – References

Anderson RJ, Bolton JJ, Molloy FJ & Rothmann KWG. 2003. Commercial seaweeds in southern Africa. In: Proceedings of the 17th International Seaweed Symposium, Cape Town, 2001. Ed. Chapman RO, Anderson RJ, Vreeland, Davison IR. Oxford University Press, Oxford.

Botes L, Sym SD & GC Pitcher (in press) *Karenia cristata* sp. nov. and *Karenia bicuneiformis* sp. nov. (Gymnodiniales, Dinophyceae): two new *Karenia* species from the South African coast. *Phycologia* 42.

Chang FH, Mackenzie L, Till D, Hannah D & Rhodes L. 1995. The first toxic shellfish outbreaks and the associated phytoplankton blooms in early 1993 in New Zealand. In. *Harmful Marine Algal Blooms*. (Ed. by P. Lassus, G. Arzul, E. Erard, P Gentien and C. Marcaillau), pp 145 – 150. Lavoisier Intercept Ltd., Andover, England.

Critchley AT, Gillespie RD & Rotmann KWG. 1998. Seaweed resources of South Africa. In Critchley AT, Ohno M (eds), Seaweed resources of the world. Japan International Cooperation Agency, Japan: 413-425.

Donia M & Hamann MT. 2003. Marine natural products and their potential applications as anti-infective agents. The Lancet 3: 338 – 348.

Faulkner DJ. 2002. Marine natural products. Natural Product Reports 19: 1 – 48.

Haefner, B. 2003 Drugs from the Deep. Drug Discovery Today 8(12): 536.

Harvey A. 2000. Strategies for discovering drugs from previously unexplored natural products. Drug Discovery Today 5(7): 294.

Haywood A, Mackenzie L, Garthwaite I & Towers N. 1996. *Gymnodinium breve* 'look alikes': Three *Gymnodinium* isolates from New Zealand In: *Harmful and Toxic Algal Blooms* (Ed. by T. Yasumoto, Y. Oshima and Y. Fukuyo), pp. 227-230. Intergovernmental Oceanographic Commission of Unesco, Paris.

Stegenga H, Bolton JJ & Anderson RJ. 1997. Seaweeds of the South African West Coast. Contributions from the Bolus Herbarium, Number 18.

Vlachos V, Critchley AT & Von Holy A. 1997. Antimicrobial activity of extracts from selected southern African marine macroalgae. South African Journal of Science 93: 328-332.

Conference Countdown

The School of Animal, Plant & Environmental Sciences at the University of the Witwatersrand, is hosting PSSA 2004. The conference is to be held at the Magaliesburg Conference Centre (www.magalies.co.za) from 28 - 30 January. The cost of the conference is R1150 for students and R1250 for ordinary members. This price is inclusive of all meals, accommodation and conference registration. The following deadlines apply.

Registration: 1 November 2003
Transport request; 21 November 2003
Application for student support: 1 December 2003
Payments: 15 December 2003
Abstracts: 9 January 2004

We are very fortunate this year to have Dr Alan Millar as our invited speaker. Alan is a Senior Research Scientist at the Royal Botanic Gardens in Sydney, Australia. He specializes in red algal systematics, floristics and biogeography, and is very involved in the formulation of marine and coastal legislation. Alan is a very active researcher, having supervised many postgraduate students. He is also a very entertaining speaker!

Claudio Marangoni (claudio@biology.biol.wits.ac.za) is the conference administrator. He has reserved a website for the conference – http://www.pssa2004.wits.ac.za. Please also note that the Society is hosting two international conferences namely the HAB (2004) and the IPC8 (2005) conferences (see the PSSA website for details).

Calendar of Events for 2004

A. Upcoming Conferences

1. The 4th Southern Connections Conference, 19-23 January 2004. Website: http://web.uct.ac.za/conferences/sc2004/

2. The 20th PSSA Conference, 28-30 January 2004. Website: http://www.pssa2004.wits.ac.za

3. The XVIII International Seaweed Symposium, 20-25 June 2004. Website: http://www.niva.no/iss2004/

4. ECSA 37 - ERF 2004 Conference: "Estuaries and Change", 20-25 June 2004. Website: http://www.scu.edu.au/ecsa37erf2004conference

5. HAB 2004, 15-19 November 2004. Website: http://www.botany.uwc.ac.za/pssa/hab2004/