The Phycological Society of Southern Africa

Newsletter
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Phycological Society of Southern Africa
for 2003

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From the Editor

We are quickly moving into the second half of the year and pretty soon it will be time to meet at the annual PSSA conference in 2004. This issue of the newsletter has some exciting articles and inclusions from both within and outside the Society. In future, I envisage a newsletter package rather than simply a newsletter. Of course, this still depends on the submissions from all of **you**.

Beside the regular featured article, there are two student articles included in this issue of the newsletter. A special thanks goes to Anita Ballantyne and Claudio Marangoni for their submissions. If all goes well, the December issue of the newsletter should have an additional three articles. Things certainly are looking up with respect to membership involvement in the newsletter. Supervisors and students please remember that students need to be registered (and paid up) PSSA members to qualify for the prize; the registration fee is only R20 per annum. This, however, does not mean that we do not want your submissions. On the contrary, please send them.

In addition to the student submissions, I have included a *Members' Corner*. This is where you as a member can send virtually anything you think may be of interest to the general membership. So, if you have any contributions to the newsletter, anything you think the members should be aware of or may be interested to know, please do not hesitate to send them to me. Better still, give your regional collators some work and send it on to them.

Northern Areas	*Southern Areas*
Stuart Sym	Enrico Tronchin
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Sincerely
Gavin

Attention All

1. Student Submissions and Prizes

To promote written submissions for the newsletter, R400 is made available annually for the best student article. There have been five submissions for 2003, two of which appear in this issue of the newsletter. Thank you to all those students who have taken of their valuable time to enrich us all in this endeavour. The prize for 2003 will be awarded at the following general meeting to be held at the 2004 conference.

Guidelines: See the website! Just follow the *Featured Articles* navigational link. Judging will be by an independent panel (authors of featured articles) that may have very little phycological background. It is therefore imperative that your articles be simple, yet informative. Try to avoid jargon wherever possible.

2. 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.

3. Membership

The membership list has *shrunk*! We have had to start removing unpaid members from the mailing list and the website. It is simply too costly to keep sending them info when they are no longer active or simply just not interested any longer. If, however, your name has mistakenly been removed from the membership list (check the website), please inform both Wendy (stirk@nu.ac.za) and myself (gmaneveldt@uwc.ac.za) so that we can make the necessary corrections.

4. Members' Corner/Announcements

4.1. Please read and forward on the GEOHAB circular included in the newsletter package to any interested parties. Alternatively display it in your department or institute. For any information pertaining to the circular, please contact Grant Pitcher (gpitcher@mcm.wcape.gov.za).

4.2. National Biodiversity Legislation: The New Biodiversity Bill

Rob Anderson, Grant Pitcher and John Bolton were mandated by the PSSA to make sure that algae do not continue to be left out in government biodiversity considerations. In this light, and after consultation with Grant and Rob, John attended a meeting at Kirstenbosch in February, as PSSA representative, as part of public consultation on the Draft Biodiversity Bill. Part of this Bill is to make the current National Botanical Institute, into the National Biodiversity Institute. John made written representation on our behalf in the letter attached. The new revised Bill has just gone to parliament, and is very much better, in lots of ways, than the original draft. Some of the comments in the letter have been acted upon, but there were, of course, many other people who commented! Other comments were ignored – there is still no definition of 'plant' (perhaps impossible), and no specific mention of algae, but there is at least no inbuilt bias against algae. They are clearly included in the brief of the new NBI (as are all other organisms).
John has appended (see attached handout) the letter and a couple of paragraphs from the Bill that is now before Parliament. If anyone wants a copy of the current version, John will e-mail it to you on request.

John Bolton (Bolton@botzoo.uct.ac.za)

4.3. For those interested, a *Phytoplankton Identification Catalogue* (Botes 2003) is available on the Global Ballast Water Management Programme website (http://globallast.imo.org/) under the navigational link "*Publications*". The publication is lengthy (88 pp) and in pdf format. Alternatively, contact Lizeth Botes (Lbotes@mcm.wcape.gov.za) for a copy.

Reference:

Botes, L. 2003. Phytoplankton Identification Catalogue - Saldanha Bay, South Africa, April 2001. GloBallast Monograph Series No. 7. IMO London.

4.4. Two students have graduated with phycological MSc's from UPE.

4.4.1 Gillian Taylor. 2003. An ecophysiological approach to the management of macroalgal blooms at a solar saltworks. Supervisors: Derek Richard du Preez and Eileen Elaine Campbell.

4.4.2 Anita Doreen Ballantyne. 2003. Morphological and anatomical adaptations of *Gelidium pristoides* (Turner) Kuetzing (Gelidiales: Rhodophyta) to the intertidal environmental gradient. Supervisor: Derek Richard du Preez.

Featured Article

The Global Ballast Water Management Programme (GloBallast) in Africa

The International Maritime Organization (IMO) and the United Nations Development Programme (UNDP) are working together on a global initiative aiming to reduce aquatic species transfers through ships' ballast water. Ballast water has been blamed for the introduction of numerous invasive species, leading to serious ecological and economic problems around the world. The most notorious aquatic invaders have been species such as the European Zebra Mussel (*Dreissena polymorpa*) and the comb jelly *Mnemiopsis leidyi*, each having impacts assessed in the hundreds of millions of dollars. Increasingly, however, much attention is being directed toward the biogeography and impacts associated with microscopic algae and their ship-facilitated introduction to new environments. Several studies have already demonstrated the potential for such species to be transferred via ballast water, in either resting or blooming stages, raising fears of the threats posed by toxic species to port and coastal communities.

The Global Ballast Water Management Programme (GloBallast) has been operational since March 2000, with funding provided by the Global Environment Facility (GEF). Efforts are being channeled through six pilot countries including Brazil, China, India, Iran, South Africa and Ukraine, each representing a developing region of the world. Activities being carried out at demonstration sites in each country are ultimately to be replicated at major ports throughout each of these regions. A global Programme Coordination Unit, based at IMO headquarters in London, has been instrumental in developing and implementing standardized approaches to port surveys, ballast water risk assessments and comprehensive national-level training. Efforts are also well underway toward streamlining legislation with the developing IMO convention on ballast water management, due for adoption in early 2004.

In South Africa, GloBallast has been working through the demonstration site of Saldanha Bay where approximately 8 million tones of ballast water are received from international sources annually. The threat posed by ballast water is especially apparent in Saldanha given the proximity of the port to sensitive resources such as the West Coast National Park, mariculture facilities, commercial fisheries and growing tourism. A port survey conducted by GloBallast in April 2001 demonstrated the presence of eight alien species in the bay. While only two of these species are considered invasive (Mussel - *Mytilus galloprovincialis* and Crab - *Carcinus maenas*), four new introductions were discovered (Ascidian - *Botrylloides leachi*, Bryozoan - *Bugula neritina*, Bryozoan - *Membranipora membranacea* and Starfish - *Pateriella regularis*). Two phytoplankton species were noted in the samples as cryptogenic species (*Spatulodinium* cf. *pseudonoctiluca* and *Protoperidinium sp*.). One new fish species from the family Clinidae was also discovered and is currently being described.

Although not detected during the 2001 survey, the brown tide-causing phytoplankton *Aureococcus anophagefferens* has bloomed inside Saldanha Bay with some regularity over recent years. It has not yet been determined if this species is native or if it was introduced through ballast water. The GloBallast Programme is currently investigating the origin of this species, and aiming to determine the extent of its impact, in order to help raise awareness of potential invasions in South Africa.

Replicate surveys are continuing around South Africa through the National Ports Authority, with fieldwork already complete at the Ports of Richard's Bay and Coega. GloBallast intends to extend port survey efforts into Southern and East Africa in the near future, as planning has already been initiated for a survey at the Port of Mombasa in Kenya. GloBallast is also working with countries of the West African sub-region to provide the necessary technical support for replication of similar activities.

Obtaining the data from the surveys is, however, only the first step in the process of raising awareness and ultimately affecting change with respect to management of aquatic alien species. Through the development of semi-quantitative risk assessment systems and the drafting of new national policy on ballast water management, the GloBallast Programme has continued its momentum towards reducing the threat associated with foreign species introductions into South Africa. The Programme is currently developing port-specific regulations that will help lay the groundwork for the local implementation of the IMO convention, once it is adopted.

Recently, the focus of the GloBallast Programme has started shifting towards the rest of the African region. A regional task force has been assembled to advise on the process and pathways to be taken towards helping replicate these activities and ensure maximum collaboration with other institutions and programmes. The GloBallast Programme is confident that the enthusiasm and support already apparent throughout the region will transform into on-the-ground success, and that the African region will ultimately work together to help minimize ballast water introductions. The GloBallast Programme, however, is aware that ballast water is merely one of a few important vectors responsible for aquatic species introductions. The general concept of biosecurity is thus fast becoming a priority in countries around the world. GloBallast will continue to play an important role in biosecurity matters, and will aim to encourage support for more comprehensive aquatic alien species management.

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Global website: http://globallast.imo.org/.
National website: http://www.ballastwater-sa.org.

Popular Student Articles

A proposed new mechanism of secondary pit plug formation found in *Gelidium pristoides* (Turner) Kuetzing

Anita Ballantyne
Botany Department, University of Port Elizabeth

Pit plugs (connections occurring between the cells of rhodophytes) consist of a proteinaceous core that is bordered at each end by a polysaccharide cap layer and a cap membrane. They can be primary or secondary in nature. Primary pit plugs form as a result of incomplete cytokinesis in dividing apical cells. The cytoplasmic connection between the daughter cells later becomes occluded by protein to form the plug core.

Secondary pit plugs occur in the lateral cell walls of adjacent, non-sister cells i.e. between filaments. Two mechanisms of secondary pit plug formation are currently known; the conjunctor cell mechanism (Fig. 1a) and the plugged perforation mechanism (Fig. 1b). The conjunctor cell mechanism is characterised by an unequal division, resulting in two daughter cells of different sizes. The smaller, conjunctor cell fuses with an adjacent non-sister cell, forming a cytoplasmic connection. The conjunctor's nucleus migrates into the other cell, rendering it multinucleate. The connection becomes occluded to form a secondary pit plug. This mechanism is presumed to occur in the Gelidiales (Pueschel, 1988) and its function is to facilitate the exchange of genetic material between unrelated cells (Goff & Coleman, 1990). In the plugged perforation mechanism, a perforation develops in the wall between adjacent, non-sister cells, allowing a short-lived cytoplasmic connection (Cabioch, 1971). The connection then becomes occluded by a pit plug.

The assumption that the conjunctor cell mechanism is responsible for secondary pit plug formation in the Gelidiales, implies that multinuclearity and cytoplasmic continuity between connected cells are features of secondary pit plug formation in *Gelidium pristoides*.

Fluorescence microscopy and transmission electron microscopy, however, suggests otherwise. It appears that plug core halves develop from both cells and grow toward each other through the cell walls, meeting and fusing to form a complete pit plug, without any nuclear transfer or cytoplasmic continuity between the cells (Fig. 1c).

Nuclear fluorescence was used to determine nuclear number. All cells proved to be uninuclear. This was the first clue to suggest that the conjunctor cell mechanism may not be responsible for secondary pit plug formation in *Gelidium pristoides*.

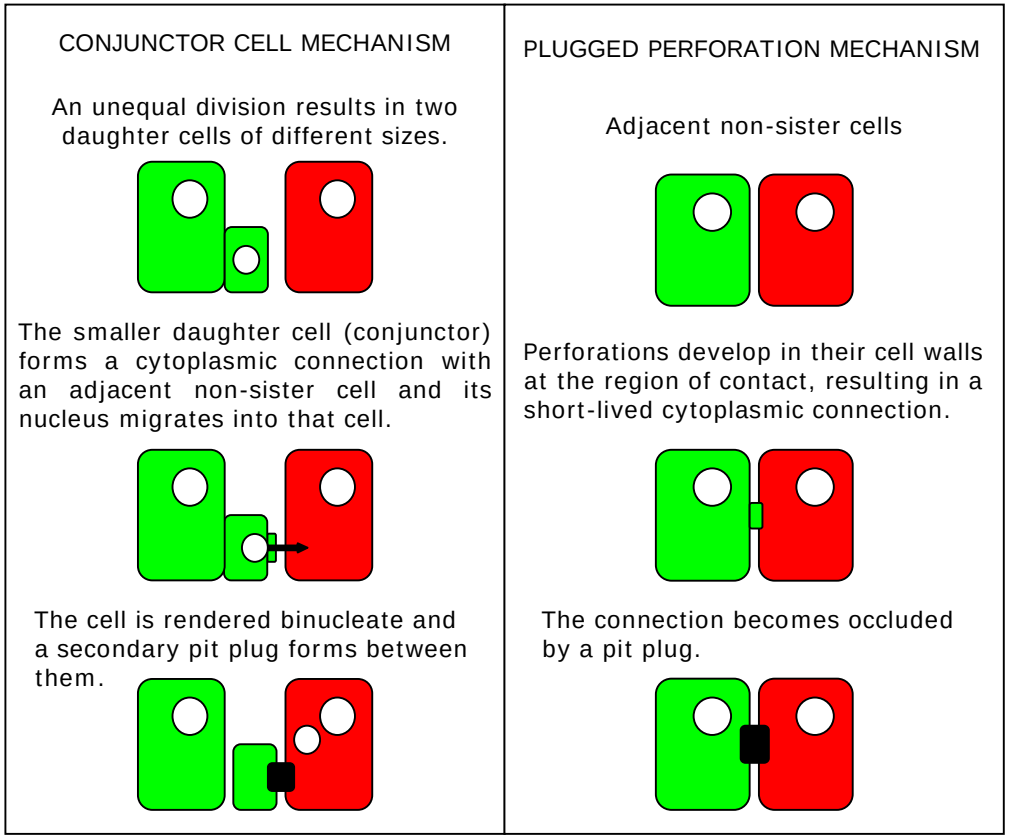


Fig. 1a. This process involves a conjunctor cell, cytoplasmic continuity between connected cells, nuclear transfer and multinuclearity.

Fig. 1b. This process involves cytoplasmic continuity between connected cells but no conjunctor cell or nuclear transfer.

Transmission electron microscopy have revealed secondary pit plugs in their various developmental stages. Medullary cells start off by producing cytoplasmic projections that grow and push their way through the cell wall towards an adjacent cell (Fig. 2). As the projection grows, the cellulose fibrils of the cell wall become distorted. Striated vesicles, contained within the cytoplasm, then start depositing granular material for the formation of the plug core. Thereafter, the plug core acquires a cap layer and a cap membrane (Fig. 3). Plug cores from adjacent filaments then make contact (Fig. 4) and fuse to form a complete pit plug.

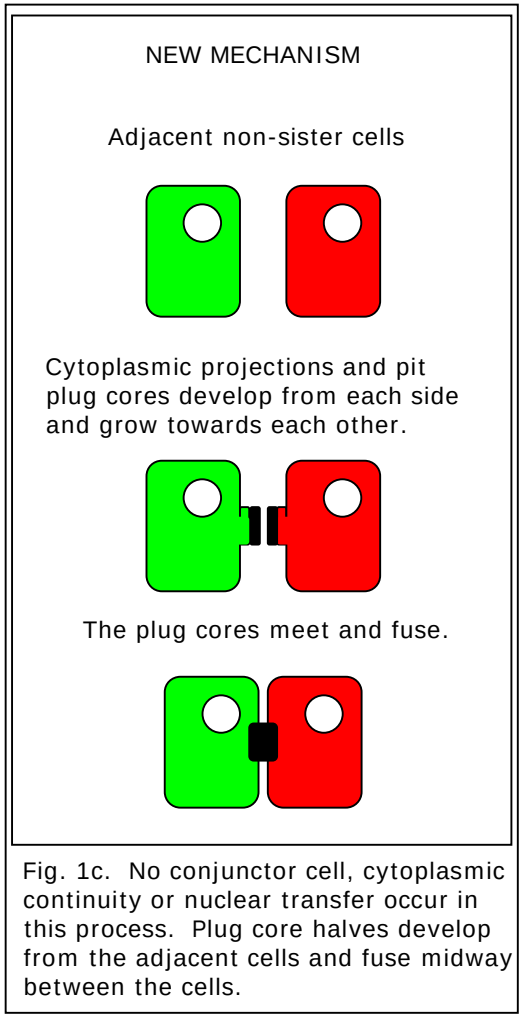


Fig. 1c. No conjunctor cell, cytoplasmic continuity or nuclear transfer occur in this process. Plug core halves develop from the adjacent cells and fuse midway between the cells.

This manner of plug formation does not allow for cytoplasmic continuity or nuclear transfer between the cells. According to Pueschel & Cole (1982), striations, cap layers and cap membranes only form once the pit plug is completely formed. We have shown that striations in the plug core, as well as cap layers and membranes are present at the plug core ends before the pit plug is completely formed. This is further evidence that it is a new mechanism of secondary pit plug formation. This mechanism of secondary pit plug formation occurring in *Gelidium pristoides* is thus far undocumented and the reason for the plug core being deposited without initial cytoplasmic continuity is unknown and requires further investigation.

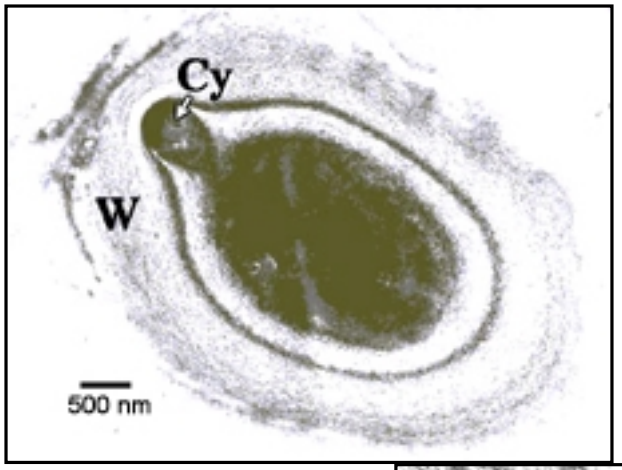
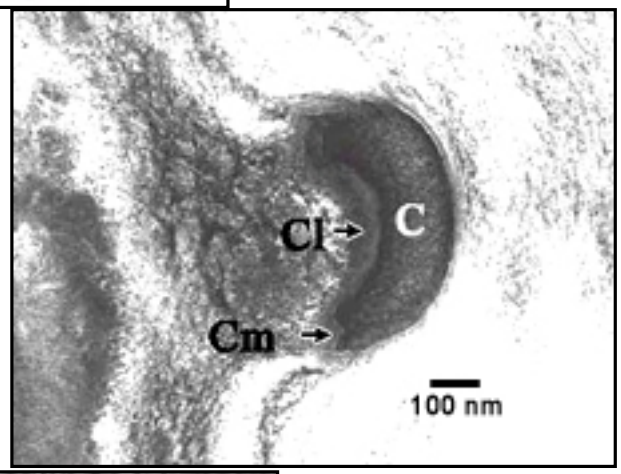


Figure 2. A cytoplasmic projection (Cy) pushing through the cell wall (W).

Figure 3. One side of a forming pit plug. The plug core (C) is bordered by a cap layer (Cl) and a cap membrane (Cm).



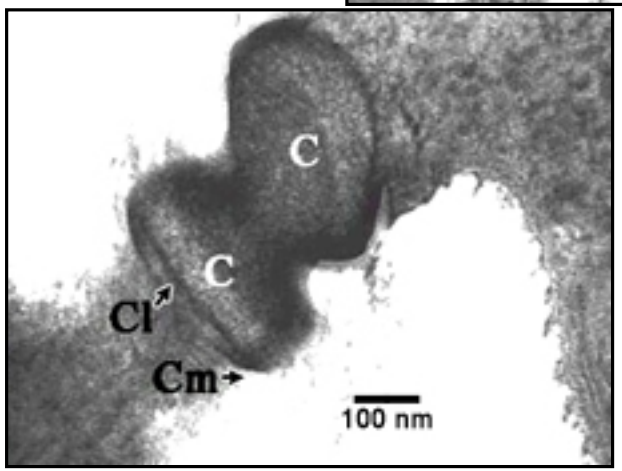


Figure 4. Two plug cores (C) fusing. The cap layer (Cl) and cap membrane (Cm) are visible on the one end of the core.

Pseudo-nitzschia australis along the west coast of South Africa

Claudio Marangoni
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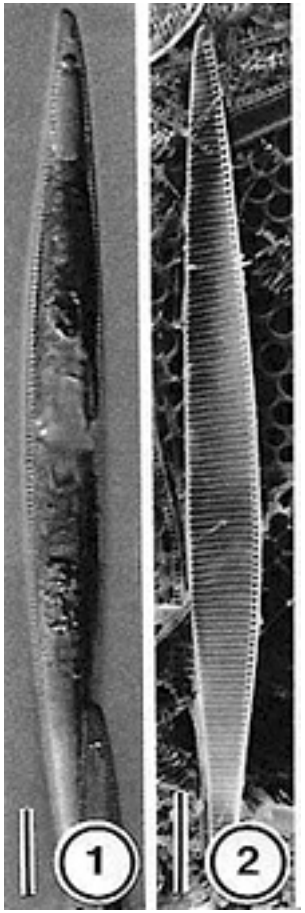
The diatom genus *Pseudo-nitzschia* was initially placed within the larger genus *Nitzschia*, but is now recognised as a separate genus. It includes some 20 marine planktonic species that have pointed valves that unite into step-like colonies of overlapping cells. In previous surveys of South African waters, *Pseudo-nitzschia* species were more than likely recorded as *Nitzschia* species with some of these having been dominant in the late summer blooms along the west coast of South Africa.

Pseudo-nitzschia has been in the spotlight over the last 15 years because of its role in the human syndrome, Amnesic Shellfish Poisoning (ASP). Mild symptoms of ASP involve gastrointestinal disorders with amnesia, seizures and death occurring in extreme cases. The responsible toxin is an excitatory amino acid, domoic acid, which is produced by 9 species of *Pseudo-nitzschia*. The toxin is transferred and enhanced via the food chain from various shellfish and fish (e.g. anchovies, pilchards and sardines) to humans, sea birds and marine mammals (mass mortalities of seals, dolphins and whales have been reported along the Californian coast).

There have been no recordings of ASP in South Africa, even in the last couple of years, where *Pseudo-nitzschia* concentrations have exceeded 2 million cells.L^{-1}. At Lambert's Bay, on the west coast of South Africa, it was a dominant component of a persistent inshore phytoplankton bloom in cold waters of about 13 ^{0}C from the 18th to the 25th of February 2000. A *Pseudo-nitzschia* species was isolated from Lambert's Bay at the end of March 2001, when it was once again a major component of a bloom in the area.

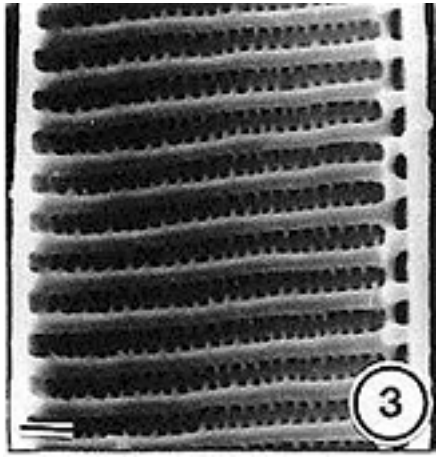
The taxonomy of *Pseudo-nitzschia* is expanding rapidly (7 new species having been described in 2002), so the isolate needed to be

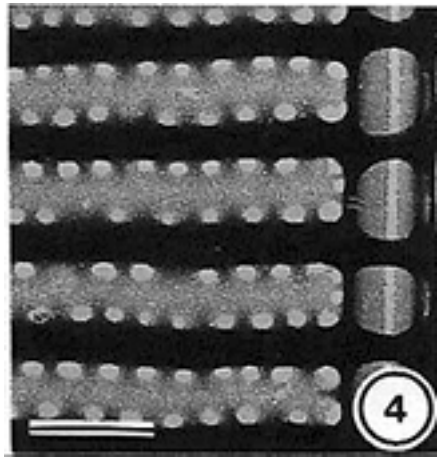
carefully characterised and identified. The isolated cells are lanceolate in valve and girdle view and contain 2 chloroplasts, one at each end of the cell, and a central nuclear area (Fig. 1). Cell dimensions are 79-90µm in length and 6.7-7.7µm in width. The cells overlap by 0.3 to 0.2 of the total cell length when forming colonies. The details of acid cleaned frustules were observed with SEM and TEM. The valves lack a large central nodule (Fig. 2). There are 14-17 striae in 10µm, 12-15 fibulae in 10µm and 20-21 band striae in 10µm. The poroids are reasonably large and simple and are arranged in 2 rows, one row along each side of the interstriae (Figs. 3 & 4). There are 4-5 poroids in 1µm. From the observed features and measurements, the Lambert's Bay isolate was identified as *Pseudo-nitzschia australis*.



Pseudo-nitzschia australis is one of the *Pseudo-nitzschia* species that is capable of producing domoic acid and has been linked to the disastrous incidents involving this species along the Californian coast. Preliminary tests for domoic acid production by the South African isolate of *P. australis* have been negative. This is surprising, as it represents the first record of a *P. australis* culture that does not produce domoic acid. However, considering the large concentrations of *Pseudo-nitzschia* that have occurred along the west coast, there is still great concern about the possible threat of ASP occurring in our waters.

Figs. 1 & 2. *Pseudo-nitzschia australis* viewed with LM (1) and SEM (2) (scale bar = 10µm).





Figs. 3 & 4. Detail of frustule viewed with SEM (3) and TEM (4) (scale bar = 1µm).

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PUESCHEL, C.M. & COLE, K.M. 1982. Rhodophycean pit plugs: An ultrastructural survey with taxonomic implications. *American Journal of Botany*, **69:** 703 – 720.

Conference Countdown

The School of Animal, Plant & Environmental Sciences at the University of the Witwatersrand, is hosting PSSA 2004. The conference will be at the Magaliesburg Conference Centre (www.magalies.co.za) from 28 - 30 January. The cost of the conference will be in the region of R1150 for students and R1250 for ordinary members. This price is inclusive of all meals, accommodation and conference registration). At this stage we envisage the deadline for registration to be 1 November 2003, payment due by 15 December and abstracts due 5 January.

Claudio Marangoni (claudio@biology.biol.wits.ac.za) is the conference administrator. The organizing committee have, however, reserved a website for the conference - http://www.pssa2004.wits.ac.za. Please keep an eye on the website for conference updates.

Please also note that the Society is hosting two international conferences namely the HAB (2004) and the IPC8 (2005) conferences (see the website for particulars).

Calendar of Events for 2003/2004

A. Upcoming Conferences

1. Wet 'n Wildlife! Joint meeting of the South African Society of Aquatic Sciences (SASAQS) and the Zoological Society of Southern Africa (ZSSA), 30 June - 4 July 2003. Website: http://www.wetandwildlife.uct.ac.za

2. The 3rd European Phycological Congress, 21-26 July 2003. Website: http://www.epc3.org/

3. Botany 2003, 26-31 July 2003. Website: http://www.2003.botanyconference.org/

4. Aquaculture Europe 2003 Conference, 8-12 August 2003. Website: http://www.easonline.org/agenda/en/AquaEuro2003/

5. The Fourth International Symbiosis Society Congress, 17-23 August 2003. Website: http://people.bu.edu/dzook/

6. The 6th International Marine Biotechnology Conference, 21-27 September 2003. Website: http://www.tuat.ac.jp/~marine/

7. **POSTPONED** The 5th Asia-pacific Conference on Algal Biotechnology, 18-21 October 2003. Website: http://www.qdio.ac.cn/english/meeting/index.htm

8. Global Change and Regional Sustainability in South Africa, 27-29 October 2003. Website: http://www.nrf.ac.za/saeon/globalchange/saglobal.htm

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

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

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

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

13. HAB 2004, 15-19 November 2004. Website: No website yet.

B. Upcoming Workshops

1. Aquaculture Europe 2003 - "Mussel Farming Technologies and Development " - 12 August 2003. Website:

http://www.easonline.org/agenda/en/AquaEuro2003/AE2003_workshop.asp

2. GEOHAB - Global Ecology and Oceanography of Harmful Algal Blooms, 17-20 November 2003. Website: http://www.jhu.edu/scor