Forum Phycologicum

Newsletter of the

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Office-bearers of the Phycological Society of Southern Africa

CONTENTS

A typical shore at De Hoop Nature Reserve, venue for the 30th PSSA Congress. The many wave-cut platforms of aeolianite/beach rock are full of pools and damp ledges that are a superb habitat for seaweeds and marine invertebrates. There are also many small sandy beaches, and if the sea is calm (as it was in the photo), the snorkelling can be excellent.

From the Editor

Greetings and welcome to Volume 80 in the PSSA newsletter series.

Eight months have passed since the last newsletter. This is longer than I had intended, but every year seems shorter than the preceding one. Google tells me that it was Chaucer who wrote "time and tide wait for no man", but as marine phycologists we tend to become preoccupied with tide and to lose track of time. So – my apologies!

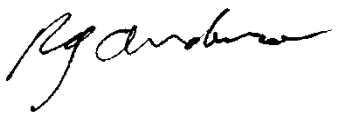
Thanks very much to the contributors to this edition, especially the students who took the trouble to put finger to keyboard. At the end of this newsletter I have also included the first notice about the forthcoming PSSA Congress (our 30th!), which will be at De Hoop Nature Reserve in the Western Cape.

PSSA congresses fall into the "small, friendly" category of conferences, with some 40-50 delegates. I believe that the atmosphere at our congresses is perfect both for the established researcher and for post-grad students making one of their first conference presentations. We usually pick a fairly remote location so that people get to spend some free time together, and get know each other and what is going on in their field.

De Hoop is a pretty place with lots of natural features, simple but comfortable accommodation, and good facilities. We intend to leave enough time each day for delegates to enjoy De Hoop, so have a look at their website for more details on the reserve (www.capenature.co.za/reseerves/de-hoop-nature-reserve/). We hope to see you at the 30th PSSA Congress!

I intend to put out another newsletter later in the year, and to include a list of members' publications that appeared since the last congress, so please bear this in mind. As usual, please use the newsletter to let us all know what you and your research groups are up to.

Yours in Phycological Endeavour,



Rob Anderson

My Belgian experience: beyond the beer, fries and chocolates.

Maggie M. Reddy

A little while back I took a leap of faith and was fortunate enough to spend 9 months in Ghent, Belgium on a fully funded EU scholarship–Erasmus-Mundus. The Erasmus exchange programme, prestigious and well-known in Europe, aims to promote training and skills transfer abroad. European Union (EU) students generally spend a semester abroad and are able to enrol for courses that may not be offered in their home institute or just enjoy a change in learning environment with the benefit of also experiencing life in another country. The Erasmus programme saw great success in the EU, prompting the extension of these opportunities to developing countries in 2009-2014.

Although the Erasmus programme is popular in Europe, I must admit that before reading the funding call I hadn't a clue it existed. However, a quick glance through the list of host Universities caught my interest. Ghent University was one of them, ranked in the top 100 Universities in the world and steadily climbing. More importantly, Ghent University is home to a leading expert in the field of algal taxonomy and systematics: Prof. Olivier De Clerck, who incidentally completed a post-doc at the University of Cape Town in 1999-2000, in John Bolton's lab.

After climbing a mountain of paperwork and finally slaying the "Visa Trolls" at the summit, I arrived in Ghent on a cold morning in September 2015. I was completely overwhelmed by my first trip to Europe and having to figure out how to get from the Airport in Brussels to Ghent, after 18 hours in transit. My first-ever train ride got me to where I wanted to be, despite everything being in a language I wasn't familiar with. I quickly realized that learning the local language would help and enrolled for a Dutch course. The first couple of weeks after my arrival were both exciting and daunting. Although I ran into countless challenges I could always rely on the comfort of a Belgian beer once I got home.

The exciting part came after settling into my new home and finally meeting and working with a scientist I held in high regard, who turned out to be down-to-earth and extremely funny at times. I gained access to a fully equipped and functional molecular laboratory and even got an office space. The lab was well run, organised and fully equipped with all the consumables and machines that are required for molecular analyses. This made working a pleasure and without the stress of administration to deal with, I was able to condense at least a year's lab work into a period of 6 months. Of course, Lady Luck was not always on my side and I ran into my fair share of lab hitches, one of the most notable being the discovery of introns in a subset of my samples. While this may not sound terrifying to non-geneticists, introns can be a big problem to molecular studies. However, this hurdle turned into an exciting opportunity and gave me the chance to design and optimise new

primers, with Oli's help of course. While at UGhent I also attended Masters-level Courses on Phylogeny and Systematics. Being the only English speaker in the class was sometimes funny, but disconcerting when discussions were in Flemish!

My initial Erasmus scholarship was for 6 months and I was lucky enough to be offered an extension for a further 3 months, which I gladly accepted. In my additional time, I had a crack at my data analyses and was exposed to cutting-edge methods, new to the field of taxonomy and systematics. The outcome was the discovery of new *Porphyra* and *Pyropia* species, which I will tell you more about in an upcoming publication. My enthusiasm for the otherwise bland and shapeless *Porphyra* also got me two morphologically unique specimens from Italy, which I am looking at.

My academic year (2 semesters in Belgium) was an extremely fruitful academic experience and also gave me a chance to immerse myself in Flemish culture, art and history. Being a part of the Erasmus Society Network in Ghent gave me the opportunity to meet many different people from all over the world, learn about cultures I didn't know existed and re-evaluate misconceptions about better-known societies. Stepping out of my comfort zone saw me grow academically and personally. I would highly recommend the Erasmus programme, as pipeline funding opportunities are still running for similar exchange programmes. Naturally, it goes without saying some of the most enjoyable times in Belgium involved beer, fries and chocolates!

The molecular group, UGhent.

Biographical note: Maggie M. Reddy completed her undergraduate degree in Life Sciences at the University of KwaZulu-Natal (UKZN) in 2009, majoring in Marine Biology and Microbiology. She then did an honours degree in Marine Biology in 2010. She followed this with an MSc at UKZN (2012) on the molecular phylogeny and population genetic structure of *Panulirus homarus* in the South-West Indian Ocean. During this work she was affiliated to the Oceanographic Research Institute (ORI) in Durban, where she then worked in 2013 under the supervision of Johan C. Groeneveld. She is currently completing her PhD at the University of Cape Town on the molecular systematics and taxonomy of the Bangiales in Southern Africa.

Wits group on the (algal DNA) map!

Jonathan Featherston and his colleagues are to be congratulated on their very recent paper in the European Journal of Phycology in which they demonstrate an early relationship between organelle genomic complexity and the complexity of organisation in volvocine algae.

Jonathan Featherston reports…

The Wits Evolutionary Medicine Institute showed that *Tetrabaeana socialis* (a four-celled chlorophyte that is amongst the simplest of all multicellular organisms) developed complex organelle genomes at the cusp of multicellularity in this lineage. The chloroplast genome of this species is particularly remarkable; at over 405kb in length it is amongst the largest chloroplast genomes ever sequenced. The study also suggests that circular mitochondrial genomes were present at or near the origin of multicellularity in the volvocine lineage.

The published work is included in my PhD, which forms part of the larger Volvocales Genome Sequencing Consortium project based in the USA and Japan. The overall aim of the Volvocales project is to explore the molecular mechanisms associated with the evolution of simple colonial multicellularity in the volvocine algae. For my PhD this is being accomplished by assembling and annotating the nuclear genome of *T. socialis* and then comparing it with the genome of the related uncellular alga *Chlamydomonas reinhardtii* as well as with the genomes of the more morphologically complex *Gonium pectorale* and *Volvox carteri*. This work on the *Tetrabaena* organelle genomes hints at the important role of non-adaptive processes in the evolution of genome complexity, which we are now exploring in the nuclear genomes. Using a number of comparative genomics and bioinformatics techniques, we show that very little by way of molecular innovation was required for the evolution of multicellularity in the volvocines. In addition, and together with collaborators at Carlton University in Canada and my PhD supervisor at Wits (Pierre Durand) I am exploring the relationship between the complexity of interactomes (protein-protein interactions) in the lineage and multicellularity evolution.

Last year, I was fortunate to receive a travel grant worth 1000 pounds to present some of my PhD results of the nuclear genome assembly of *T. socialis* at Cambridge, UK, at the Third International Volvox Conference. I was also awarded a University of Witwatersrand Faculty of Health Science research grant for the organelle genome work that was just published.

Jonathan Featherston and his daughter, Emily

Reference and abstract:

Jonathan Featherston, Yoko Arakaki, Hisayoshi Nozaki, Pierre M. Durand & David R. Smith (2016): Inflated organelle genomes and a circular-mapping mtDNA probably existed at the origin of coloniality in volvocine green algae, *European Journal of Phycology*, DOI:10.1080/09670262.2016.1198830

JONATHAN FEATHERSTON[1,2], YOKO ARAKAKI[3], HISAYOSHI NOZAKI[3], PIERRE M. DURAND[1,4,5] AND DAVID R. SMITH[6]

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The volvocine lineage is a monophyletic grouping of unicellular, colonial and multicellular algae, and a model for studying the evolution of multicellularity. In addition to being morphologically diverse, volvocine algae boast a surprising amount of organelle genomic variation. Moreover, volvocine organelle genome complexity appears to scale positively with organismal complexity. However, the organelle DNA architecture at the origin of colonial living is not known. To examine this issue, we sequenced the plastid and mitochondrial DNAs (ptDNA and mtDNA) of the 4-celled alga *Tetrabaena socialis*, which is basal to the colonial and multicellular volvocines.

Tetrabaena socialis has a circular-mapping mitochondrial genome, contrasting with the linear mtDNA architecture of its relative *Chlamydomonas reinhardtii*. This suggests that a circular-mapping mtDNA conformation emerged at or near the transition to group living in the volvocines, or represents the ancestral state of the lineage as a whole. The *T. socialis* ptDNA is very large (>405 kb) and dense with repeats, supporting the idea that a shift from a unicellular to a colonial existence coincided with organelle genomic expansion, potentially as a result of increased random genetic drift. These data reinforce the idea that volvocine algae harbour some of the most expanded plastid chromosomes from the eukaryotic tree of life. Circular-mapping mtDNAs are turning out to be more common within volvocines than originally thought, particularly for colonial and multicellular species. Altogether, volvocine organelle genomes became markedly more inflated during the evolution of multicellularity, but complex organelle genomes appear to have existed at the very beginning of colonial living.

Seaweeds and echinoderms in Maputaland

Robert Anderson

Maputaland, between St Lucia estuary in the south, the Mozambique border in the north, and the Lebombo mountains in the west, is a small part of the sandy plain that stretches up the east coast of Africa to Somalia. This part is named after the 19th Century Thonga king, Mabudu, who ruled the area up to the present-day capital of Mozambique, which is also named after him. History has judged him kindly, because he avoided bloodshed and conquest by paying tributes to the Zulu king, Shaka. However, his kingdom was to some extent also protected by tsetse fly, which made these sandy lowlands unsuitable for cattle.

Outcrops of beach-rock interrupt the straight, sandy coastline of Maputaland and create small points and bays that make for very pleasant snorkelling and collecting.

The coast of Maputaland is biologically interesting because it is our only bit of tropical seashore, falling within the Indo-West Pacific Biogeographic Realm (*sensu* Spalding et al. 2007). The seaweed flora of Maputaland is overwhelmingly tropical in affinity, but also contains warm-temperate elements from the central and southern KZN coast to the south (Bolton et al. 2004). Like the seaweeds, the echinoderms of Maputaland have tropical and warm temperate affinities. Maputaland therefore makes a disproportionate contribution to South Africa's overall marine biodiversity. It also contains the southernmost coral reefs in the western Indian Ocean, with their attendant flora and fauna, and is mostly renowned for the well-known diving destination of Sodwana Bay.

I first visited Sodwana in 1968, when as a schoolboy in Johannesburg, I hitch-hiked there with a friend during the July holidays. At Sodwana we slept under the Casuarina trees behind the foredune, and lived mainly on fish that we caught and peanuts and bananas bought from the local Thonga women. We snorkelled in the warm, clear water over swaying beds of sea-grass and seaweeds, and stared at fish that were coloured in patterns we had never imagined. It all said "become a marine biologist".

Colleagues and I returned there during 1990-2003 seaweed/echinoderm project, when we sampled most of the KwaZulu-Natal coast and increased the known biodiversity of seaweeds and echinoderms of KZN by 30% (Bolton et al. 2003). This led to the 293-page "Guide to the Seaweeds of KwaZulu-Natal" (De Clerck et al. 2005) and many other publications on these two groups of organisms. However, since then molecular methods have become essential to systematic studies, and most of the material that was collected back then is unsuitable for

DNA sequencing. The need for better samples for molecular systematics, as well as concern about climate change, prompted our Belgian colleagues to plan another project, this time focussed on Maputaland. Participants came from several Belgian institutions, UCT, DAFF, DEA and Ezemvelo KwaZulu-Natal Wildlife.

The new seaweed/echinoderm project took place in January 2016 and had three main aims. The first was to collect voucher specimens and DNA samples of as many species as possible, the second to see if there had been any change in the composition of these organisms in the decade and a half since the first trip, and the third was to run a short workshop on seaweed and echinoderm systematics, at UKZN.

We worked from two bases. The first was Triton Diving in Sodwana Bay, from which we covered the southern Maputaland area (Leadsman Shoal in the south to north of Nine-Mile Reef). The second base was Manzengwenya (about 30 km north of Sodwana), where EKZN Wildlife has a research house, and from there we covered reefs up to Kosi Bay. Throughout, we enjoyed the excellent diving facilities and support of the Triton team, led by Eve Marshall.

Mark Rothman and Olivier De Clerck processing samples in the Triton lab at Sodwana

Collecting (from shore or by diving) was done during morning low tides, and afternoons spent sorting and processing specimens. For the phycologists (led by Olivier De Clerck and dubbed “flower pickers” since our first expedition), the afternoon processing was fairly straightforward, although the numbers of specimens often prolonged things into the evening. Once specimens were sorted, DNA clips were removed and placed in silica gel, while voucher specimens were pressed. For our “echinoworm” colleagues, processing was trickier, because the animals usually have to be relaxed in magnesium chloride or freshwater (sometimes for hours) to prevent them expelling their viscera (sea cucumbers) or contracting into useless bundles (feather stars and brittle stars).

Although diving was very productive, shore collections and shore-based snorkelling also yielded many unusual and interesting seaweed finds. In fact my impression was that even without boat-based diving, one could probably collect about 80% of the seaweeds that can be found, because the biomass and diversity of seaweeds is definitely highest between the lower eulittoral and shallow sublittoral zones, where wave action gives some protection from fish grazing. Fish-grazing is a powerful structuring force on most tropical reefs, and on many of the coral-dominated Maputaland reefs this is visible by its effect on the seaweeds, which fall into two groups. The first comprises small, turfy, often cryptic communities growing on dead coral and biogenic reef material, on small spaces between the more elaborate corals and on sand-influenced edges of reefs. These turfs contain an amazing diversity of small seaweeds: we have previously recorded 104 species in a series of quadrats with a total area of 1.56 m^2 – an area about the size of a door (Anderson et al. 2005). The second comprises occasional,

large, conspicuous species that we assume are protected by anti-grazer compounds – for example the striking thalli of *Halymenia durvillei*. Nevertheless, some reefs do have relatively little coral and extensive areas that are dominated by brown seaweeds such as *Dictyopteris serrata*, *Lobophora variegata*, and *Zonaria subarticulata.* Again, these browns are very likely unpalatable to fish.

Halymenia durvillei, one of the few large fleshy seaweeds on the reefs

We returned to the Triton Lodge at Sodwana to do some final sorting and packing of samples, then travelled back to Durban to collect some fresh material and plan and run the workshop. Our host at UKZN was Prof. Ahmed Thandar, who, although retired, is still very active in sea-cucumber research. Some 20 professionals and students attended, and morning sessions covered a range of topics relevant to both seaweeds and echinoderms, such as nomenclature, species-concepts, and biogeography. In the afternoons the participants identified a selection of organisms. There was plenty of discussion and we left feeling that it had been very worthwhile.

Voucher specimens of the taxa are to remain in South Africa: seaweeds in the Bolus Herbarium at UCT, and most of the echinoderms at Iziko SA Museum. Of course some work remains to be done. DNA samples must be analysed, some taxa still have to be identified by experts, and overall results remain to be analysed. The project has provided a good set of "baseline" specimens for many species, with DNA samples that will improve taxonomic identifications and our understanding of higher-level systematic relationships with other taxa and areas.

Have there been any changes in the seaweeds or echinoderms in the last 16 years? First impressions were that the seaweed species that are present look much the same. Yves Samyn, leader of the echinoderm team, noted that 11 echinoderm species were recorded that are new to South Africa, and yet he felt that overall abundances had decreased. Such impressions need to be confirmed once more work has been done on the samples.

A reef covered by *Dictyopteris serrata,* lying at about 10 m depth, near Kosi Bay

Finally, detailed records from various sites along the Maputaland coast bring us closer to having the "canary in the coalmine" that might detect any climate changes as they begin to happen.

Acknowledgments

The expedition was funded by the King Leopold III Fund for Nature Conservation, the Royal Belgian Institute of Natural Sciences, the National Research Foundation (NRF), UCT, DEA and DAFF.

For superb diving support we thank the staff of Triton Dive Charters, especially Eve Marshall, Grant Brockbank, Zakhele Zikhali, Ine Smith and Janco Fourie. We thank Rocktail

Bay dive camp for assisting with launching from Manzengwenya. Special thanks to Eve Marshall and Triton for their new lab that makes work there a pleasure!

Thanks to Jennifer Olbers and Ezemvelo KZN Wildlife for providing accommodation at Manzengwenya and the University of KwaZulu-Natal (Westville) for hosting the workshop. Research permits were granted by iSimangaliso Wetland Park Authority, Department of Environmental Affairs and the Department of Agriculture, Forestry and Fisheries.

Launching near Manzengwenya - waiting for a lull in the swell (photo John Bolton).

Divers scanning the reef for echinoderms – or was it seaweeds?

The Manzengwenya team. Top row L to R: Janko Fourie (Triton), Zoleka Filander (DEA), John Bolton (UCT), Erich Koch (UCT), Neville Ayliffe (Triton), Olivier De Clerck (Belgium),Grant Brockbank (Triton), Chris Boothroyd (DAFF), Jennifer Olbers (EKZN Wildlife); Bottom row L to R: Didier vandenSpiegel (Belgium), Rob Anderson (DAFF/UCT), Brigitte Segers (Belgium), Yves Samyn (Belgium), Mark Rothman (DAFF), Zakhele Zakhile (Triton). Absent: Eve Marshall (Triton).

Lobophora dichotoma, the cause of some excitement. This species, known only from Maputaland (type locality) and southern Madagascar, has strap-like fronds that are completely atypical of *Lobophora*, and was recently shown to be part of the most basal lineage in the genus.

References

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Only its mother could love it. This evil-looking specimen was very well camouflaged, a few inches away from some very collectable seaweeds. It was probably a stonefish, which can deliver an agonising and sometimes lethal sting via poisonous spines.The seaweeds were left where they were.

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30th Congress of the Phycological Society of Southern Africa (PSSA2017)

Call for "expression of interest"

You are cordially invited to the 30th Congress of the Phycological Society of Southern Africa. The Congress is held every 1-2 years and is attended by industry, researchers and students involved in the study and use of algae. The programme usually includes a wide range of phycological topics such as applied research, taxonomy, freshwater algae, biofuels, climate change, harmful algal blooms, estuaries, sandy beaches, etc.

Venue

De Hoop Nature Reserve (http://www.capenature.co.za/reserves/de-hoop-nature-reserve/) is a 34 000 hectare natural area lying only three hours (by road) from Cape Town. It is one of the largest marine protected areas on our coast, conserving a variety of sea-life. In addition, the reserve covers a number of vegetation types including some rare limestone plant communities, and is home to a variety of wildlife and a rich bird-life.

Dates 12 – 16 January 2017.

Arrive Thurs 12, in the afternoon.

Fri 13 –Sunday 15 – conference, including field trip.

Monday 16, leave after breakfast.

Estimated Costs

Room choices	**Complete conference package**
Single room	R 6 000.00
Shared room (non-student)*	R 4 800.00
Shared room (student reduction)	R 3 800.00
Accompanying person**	R 4 800.00
Daily fee (including lunch and teas)	R 750.00

* The shared rooms are in the cottages at De Hoop Village which has three rooms per cottage and one bath room.

** It is assumed that an accompanying person is sharing a room with a delegate.

Conference packages include registration fee, welcome pack, accommodation and all meals (excluding drinks).

Day visitors who want to attend any of the special dinner events (ice-breaker and banquet) can do so at an added fee.

Ice breaker: R250.00

Banquet: R300.00

Accommodation

Delegates will be housed in the "De Hoop Village"" or the "Equipped Cottages". These all comprise self-contained cottages, each with one bathroom and a kitchen, but the "Village"" cottages have three bedrooms and the "Equipped" have two. Both are a short walk to the conference venue. Further details of the cottages are on the attached pdf file called "Accommodation Details". Please note that registrants paying the "Student" fee will be required to share bedrooms.

Transport

We regret that no transport will be provided.

Expression of Interest deadline: 31 August 2016

Registration: 1 September – 31 October 2016

What to do now?

- ✓ Complete the "Expression of Interest" form on the next page.
- ✓ Keep the conference dates free in your diary.
- ✓ Make sure you have funding for your group to attend.

Organising committee chair: Mark Rothman

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30th Congress of the Phycological Society of Southern Africa (PSSA2017)

Expression of Interest

Name and Surname	
Institution	
E-mail address	
Phone and cell number	
No. of non-students delegates	
No. of students in your group	
Total no. oral presentations	
Total no. poster presentations	
Suggestions – special workshops/sessions?	
General comments/suggestions	

Please email your “Expression of Interest” form by 30 August 2016

to Mark Rothman (mark.rothman@uct.ac.za).