



SANCOR'S CURRENCY AND STRENGTH IS INFORMATION

# SANCOR Newsletter

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## *ABALOBI: Communication for development in small-scale fisheries in South Africa*

By

**Serge Raemaekers**

*Environmental and Geographical Sciences, UCT*

With the increasing affordability of mobile devices and rapid development of internet systems and mobile apps, more and more organisations are making use of this ubiquitous form of communication to develop sophisticated monitoring systems to address some of

the world's more pressing social and ecological challenges. Examples abound of development projects around the world that are making use of cellphones to empower local communities to monitor issues as diverse as natural resource use, community health and water quality, as well as to empower these same communities with marketing and management tools. The pending implementation of the recently gazetted small-scale fisheries policy has provided an impetus for similarly novel



[www.abalobi.info](http://www.abalobi.info)  
SSF INTEGRATED CATCH MANAGEMENT SYSTEM  
Pilot: Lambert's Bay, South Africa



approaches to small-scale fisheries governance in South Africa, and an opportunity exists to leapfrog the traditionally marginalised small-scale fisheries sector into the forefront of fisheries management through the use of modern, mobile and cloud-based information technology.

The new small-scale fisheries policy is seen as a bold step towards recognising small-scale fishers' traditional rights and seeks to implement novel co-management approaches, decentralise resource allocation, and involve fishers in resource monitoring and compliance. At the same time, the policy aims to enable fishers to play a more empowered role throughout the value chain. This new policy environment, which will impact the more than 100 000 households involved in the small-scale fisheries sector along the South African coast, provides an exciting opportunity to develop innovative information and communication systems. With the help of an integrated small-scale fisheries information-management system (IMS),

a new project aims to enable these communities to be integrated into information and resource networks, from fishery monitoring and maritime safety to local development and market opportunities.

### **Partnerships, a proof of concept and on-going pilots**

Abongile Ngqongwa from Department of Agriculture, Forestry and Fisheries (DAFF), several fisher communities, Nico Waldeck and Stuart Du Plessis, both community workers, have partnered with Dr Serge Raemaekers at the University of Cape Town in the development and operationalization of the IMS system which fishers have labelled 'Abalobi'. A phased approach has been employed. In phase 1, the IMS was designed and developed using commonly available database software. Data gathering protocols were put in place, and community-catch monitoring data is currently being gathered at a local level and subsequently fed into the IMS. DAFF extension officers working on the ground already use the IMS for their monthly reporting and decision-making. In Phase 2, with funding from the Vodacom Foundation and help from WWF-SA, a mobile and cloud-based solution was designed with involvement from several fisher communities along the coast. This Proof of Concept was presented to senior



managers in the DAFF Fisheries Branch, who expect that this system could become the official catch management system under the new small-scale fisheries policy. Phase 3, which is currently underway, entirely funded by the National Research Foundation, comprises of rigorous pilot site testing with fishers and monitors using the app, and the co-production of knowledge and social learning in several coastal communities. Several other partners

'Abalobi' is isiXhosa for small-scale fishers and is the name given to the app by several fishers involved in the project.

have also come on board (see [www.abalobi.info](http://www.abalobi.info)). Phase 4, which still requires funding, will consist of the full scale development of the mobile platform with all its modules, linking catch management with market (restaurant), safety-at-sea (weather and SOS) and communication functionalities. The ultimate aim is to provide a free platform that will stimulate sound monitoring, transparency and traceability of the data and small-scale fishers who are empowered to partake in the governance (incl. post-harvest) of the sector. The app will be open source and work-in-progress has already received much attention by the UN-FAO through their newly formulated Guidelines on Securing Sustainable Small-scale Fisheries. Lastly, phase 5 will see the implementation of the tool across all identified small-scale fisheries communities in South Africa, the establishment of a long-term maintenance and sustainability plan as well as the evaluation of how small-scale policy objectives are being met. The platform has the possibility to be used in other small-scale fisheries worldwide, but with a proudly South African stamp. The mobile and web applications further present an opportunity to introduce these communities to a range of communication technologies that can empower them to participate actively in development opportunities along our coast.



### Co-production of knowledge

The current app version allows data recording and imminent reporting on the fishers' phone while ensuring their local knowledge is protected. With this knowledge they engage with the fisheries authority at the co-management table. Fishers own their data and through a process of relationship building, they engage with other fishers, monitors, researchers and DAFF around the data. At the same time, fishers and monitors record a range of atmospheric (wind direction, strength, cloud cover, etc.) and oceanic (surface temperature, current strength and direction, water colour and clarity, etc.) variables. Complemented with other climate data and scientific knowledge this data enables fishers and managers to track

environmental changes, and plan for adaptation and mitigation measures in a participatory and highly contextualised manner. Fishers, community workers and community-catch monitors employed by Jaymat, from places such as Struisbaai, Kleinmond, Lambertsbaai, Hondeklipbaai and Port Nolloth are helping us test and fine-tune the application.

### An opportunity for transdisciplinarity and social transformation in the small-scale fishing sector

It is envisaged that the development of the full-scale app and the participatory process in fisher communities as well as with associated stakeholders (DAFF, NGOs, retailers, etc.) can become 1) a transdisciplinary research endeavour linking expertise from the social, natural as well as information technology sciences and 2) a possible model for partnership-driven community empowerment.

Our website [www.abalobi.info](http://www.abalobi.info) and facebook page provide more detail and insights from the pilot sites as well as fishers' impressions thus far. Please do not hesitate to contact Dr Serge Raemaekers

([serge.raemaekers@uct.ac.za](mailto:serge.raemaekers@uct.ac.za)) and Abongile Ngqongwa ([abongilen@daff.gov.za](mailto:abongilen@daff.gov.za)) for further questions, a demo and if you are interested to get involved. ✉



## Understanding the ocean carbon cycle through ocean acidification research

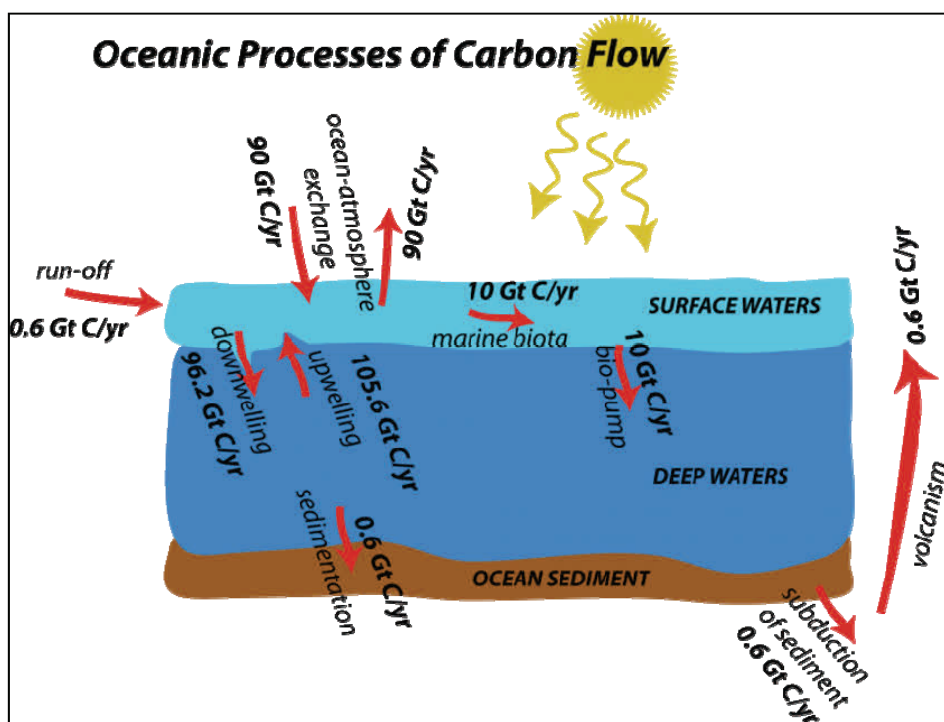
By

**Marcello Vichi**

Department of  
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Cape Town

- ◆ *Why do we need to quantify the components of the Earth carbon cycle?*
- ◆ *Why does the carbon in the ocean play such a determinant role in the cycle?*
- ◆ *What will happen to the ocean in a high CO<sub>2</sub> world?*

These are just a few of the fundamental questions that people approaching the study of the Earth carbon cycle usually pose themselves or seek for answers from experts and the scientific literature. They are not “just” academic questions because of the environmental and societal implications and the fact that our own everyday lifestyle has a small but not negligible contribution. In Africa, these questions take a further interesting perspective: quantification implies the need to measure in the appropriate way the amount of carbon in the ocean and the characterization of the ocean’s role requires to consider a variety of marine environments. Africa is bordered by two major oceans, the Atlantic and the Indian Oceans and two semi-enclosed basins,



**Figure 1:** Scheme of the natural carbon flows in the ocean (units of Gt C/yr = Pg C/yr = 1015 g C/yr). The numbers are reference estimates of the mean global exchanges assuming steady state equilibrium and in the absence of anthropogenic emissions. Image taken from [this link](#) (accessed on 2015-11-6).

the Mediterranean Sea and the Red Sea. The southernmost coasts of Africa are in particular the sites where two of the major boundary currents interact, known as the Agulhas and Benguela current systems, with relevant implications on food resources as well as maritime and recreational activities.

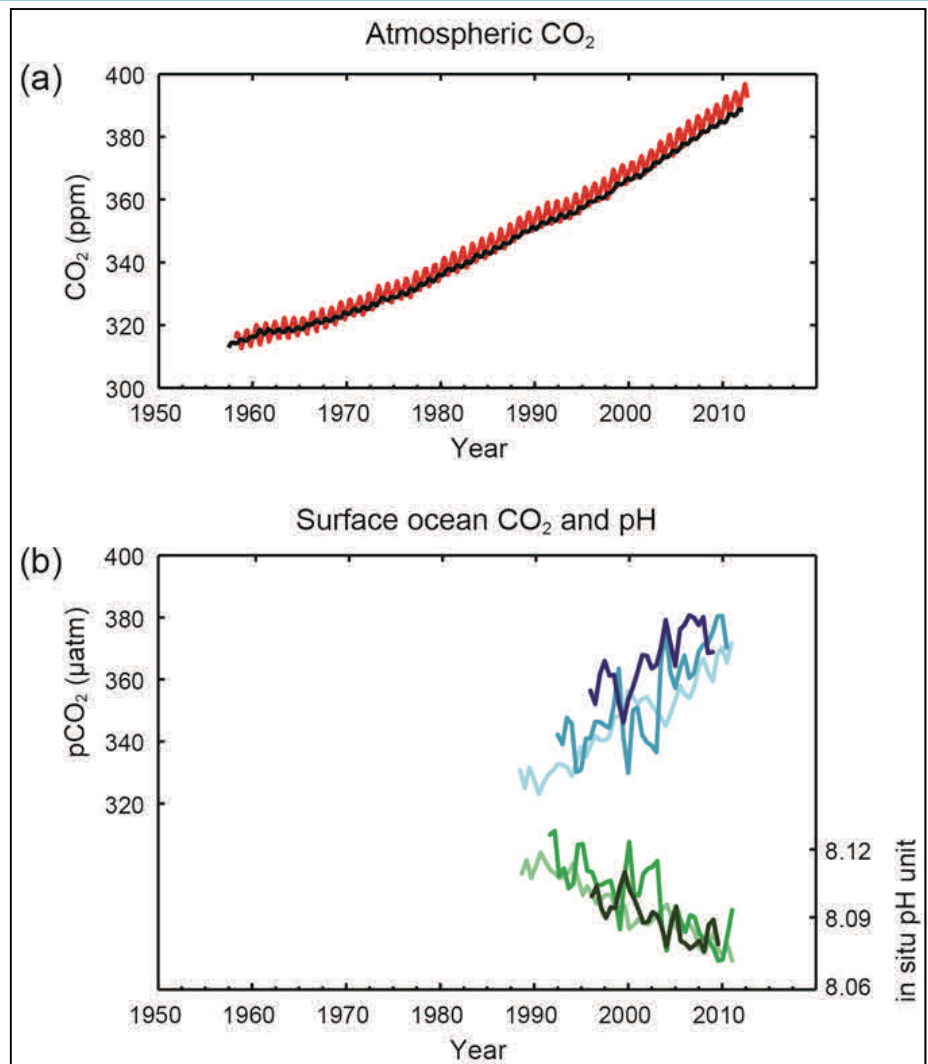
The study of the ocean carbon cycle in Africa is yet to become a science priority; a recent Training Course on Ocean Acidification held in Cape Town, South Africa, and organized by the International Atomic Energy Agency (IAEA) Ocean Acidification -

International Coordination Centre (OA-ICC) in Monaco, has given a considerable impulse to its diffusion. The course was co-hosted by the Department of Oceanography of the University of Cape Town and by the Oceans and Climate Research Unit of CSIR on 2-6 November 2015. 26 participants from 17 African countries met with world experts on ocean acidification to learn about best practices on measuring ocean carbon variables and the impacts on marine organisms. During the course and the many discussions, however, it became clear that there is a need to foster the knowledge of the ocean carbon cycle all

along the African coasts and that ocean acidification can be seen as a vehicle to promote the interest of research organizations and governing bodies.

Ocean acidification is a simple concept that nevertheless is very much linked to the understanding of the carbon cycle and to the overarching questions introduced above. Carbon is a ubiquitous element; it is found in the atmosphere in the form of carbon dioxide (CO<sub>2</sub>), it is the basic structural component of life forms and in the marine environment it is exchanged at various time scales between the atmosphere, seawater and the organisms. Yet, quantifying its cycle entails understanding the exchange of carbon into living cells - for instance the carbon taken up by phytoplankton during photosynthesis - as well as the transfer of CO<sub>2</sub> between ocean and atmosphere or between different basins in the ocean.

The concepts of carbon cycle quantification started to come together in a bunch of years around the 50's, when a circle of scientists realized that humans had been altering the composition of the atmosphere and that this perturbation was likely to have implications on the climate. Modern human activities entered as new components of the carbon cycle, accelerating mechanisms occurring at geological scales, that is, millions of years. The natural cycle of oceanic



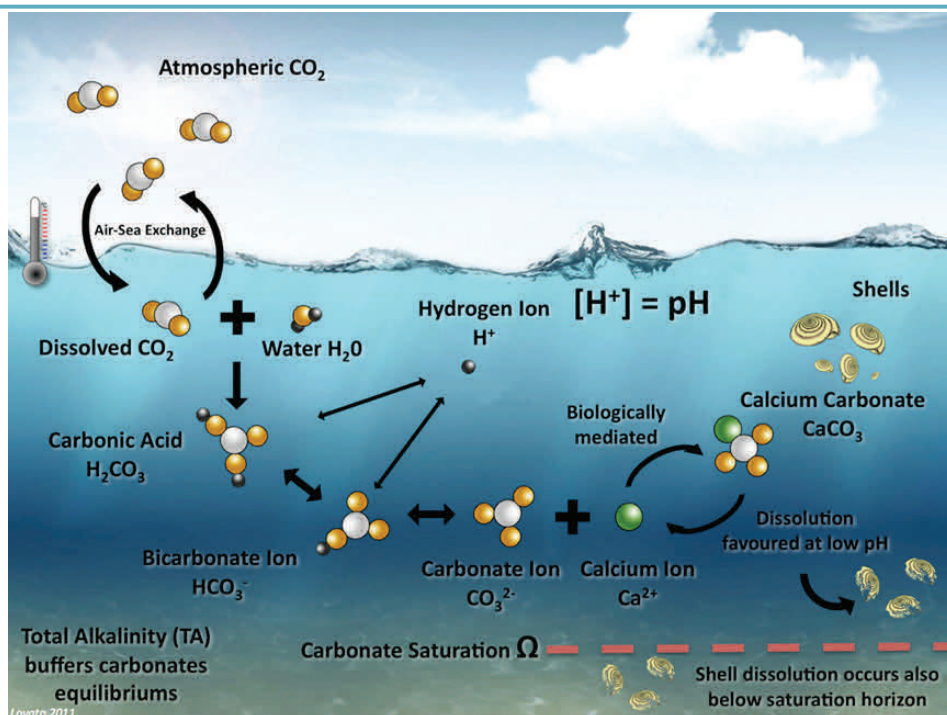
**Figure 2:** Multiple observed indicators of a changing global carbon cycle:

- (a) atmospheric concentrations of carbon dioxide (CO<sub>2</sub>) from Mauna Loa (19° 32'N, 155°34'W – red) and South Pole (89°59'S, 24°48'W – black) since 1958;
- (b) partial pressure of dissolved CO<sub>2</sub> at the ocean surface (blue curves) and *in situ* pH (green curves), a measure of the acidity of ocean water. Measurements are from three stations from the Atlantic (29°10'N, 15°30'W – dark blue/dark green; 31°40'N, 64°10'W – blue/green) and the Pacific Oceans (22°45'N, 158° 00'W – light blue/light green). Fig. SPM<sub>4</sub> from IPCC, 2013, Summary for Policymakers.

carbon consists of processes occurring simultaneously but at very different paces (Fig. 1); starting with the transformation of inorganic atmospheric CO<sub>2</sub> to organic material in the illuminated upper ocean and proceeding with the death of the

organisms, the deposition and burial in the ocean floor sediments and the formation of fossil carbon that eventually – very slowly but steadily – is released back into the atmosphere through tectonic plate movements and volcanic activity.

Palaeo-climatology, the science that uses geochemical methods to reconstruct past climate conditions of the Earth has provided robust evidences of the various phases of the cycle, as well as indications of perturbing conditions that lead to atmospheric carbon concentrations that far exceeded the current values. The palaeo-climatic records indicate that before the Carboniferous (about 350 million of years ago) atmospheric  $\text{CO}_2$  was close to 20 times the concentration that was measured in the late 50's (Fig. 2a). The Earth's carbon cycle is thus capable to mobilize large quantities of inorganic carbon between the various reservoirs on geological time scales. These natural mechanisms were part of the Earth functioning in the past and are continuously at play nowadays, almost unperceived by humans. However, this cycle has been accelerated by the mobilization of fossil organic carbon that humans have been burning since the industrial revolution to produce energy and achieve the current technological, economical and societal conditions. In 2014, human activities have released about 10 Gt C/yr from fossil fuel burning (<http://globalcarbonproject.org>); this ever increasing number is more than 15 times larger than the estimated release of carbon from natural volcanic activity and led to the steady growth of atmospheric  $\text{CO}_2$  (Fig. 2a).



**Figure 3:** A scheme of the chemical reactions underlying the process of ocean acidification (courtesy of T. Lovato, CMCC).

Technological advances in the measurement of carbon content in the air made scientists realize already since the 50's that not all the emitted carbon remained in the atmosphere, but it was actively taken up by land and ocean. Particularly, the chemistry of the ocean helps to absorb the excess of  $\text{CO}_2$  released into the atmosphere (Bolin and Eriksson, 1958). The ocean is capable to absorb a percentage of the anthropogenic carbon emissions that varies between 20 and 30%. This natural service is becoming more evident now that the atmospheric carbon is increasing at such a rapid pace.

However, the ocean service comes at a

cost. The ocean is capable to absorb large amounts of carbon. When atmospheric  $\text{CO}_2$  increases, it dissolves in the water and undergoes a series of chemical reactions that lead to a progressive increase in the acidity of the ocean (Fig. 3). This process, when occurring over an extended period, is called ocean acidification and the acidity of the ocean is measured as the hydrogen ion concentration ( $\text{H}^+$ ), expressed in a logarithmic scale known as pH. It is important to note that acidity increases as the pH decreases. We know that ocean acidification is occurring in the ocean thanks to three long-term monitoring stations that have been established more than 20 years ago (Fig. 2b). They are all in the northern

hemisphere and through the monitoring of ocean carbon (measured as the partial pressure of CO<sub>2</sub> in the surface ocean) and pH demonstrate that as the atmospheric CO<sub>2</sub> increases, this carbon is absorbed and the pH decreases indicating ocean acidification.

It is indeed fairly simple chemistry: the excess carbon from the atmosphere gets dissolved in seawater and the concentration of hydrogen ions increases. The overall process is however more complicated (Fig. 3). The presence of carbonate ion in the ocean buffers this increase and despite the large continuous exchange, ocean pH is very much constrained between 8-8.2 units. The carbonate ion is abundant in the ocean but the vertical movement of oceanic waters limits the rate of supply. The abyssal circulation has a scale of 1000 years and human activities have increased their emissions from 0 to 10 Gt C/y over a period of less than 200 years. It is too quick for the ocean to keep up with this pace.

There is also a biological aspect of this process. The organisms known as

calcifiers (like shellfish and corals) use carbonate ion for their shells and structures that are made of calcium carbonate. It is well known that the increase in ocean acidity causes problems in the formation of shells and it can lead to species extinction. The geological history of the Earth reconstructed through the palaeoclimatic records report a massive event of species extinction related to ocean acidification occurred 250 millions of years ago in the transition between the Permian and the Triassic. The Earth went through something similar to what is happening now, but the time scales and the environmental conditions were completely different.

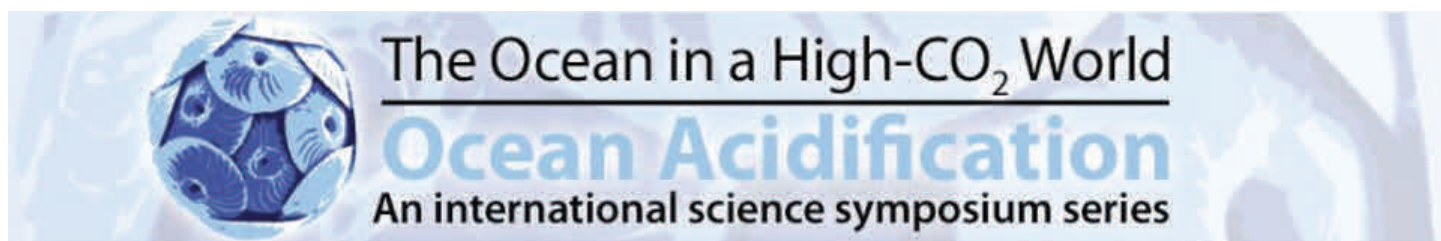
Ocean acidification is not a future threat; it is a real fact that is occurring now and it is directly related to the emissions of CO<sub>2</sub> from fossil fuel combustion. This is a human-driven large perturbation of the natural carbon cycle and the consequences are likely to persist for many years to come, in the order of thousands of years. The understanding of the ocean carbon cycle as a whole is daunting but the

monitoring of ocean acidification is a viable indicator of this perturbation in the ocean system. The direct consequences of ocean acidification in Africa are yet to be investigated; a few numbers of scientists are already studying the impacts on some major economical sectors such as aquaculture and recreational activities. A coordinated effort of the African countries in fostering carbon cycle studies and the monitoring of ocean acidification in coastal systems is therefore seen as a first important starting point to tackle this global problem.

#### Further reading

- IAEA OA-ICC [website](#).
- [20 facts about ocean acidification](#)
- Bolin, B. and E. Eriksson, 1958. [Changes in the Carbon Dioxide Content of the Atmosphere and Sea due to Fossil Fuel Combustion](#). In *The Atmosphere and the Sea in Motion: Scientific Contributions to the Rossby Memorial Volume*, Bert Bolin, ed. New York, Rockefeller Institute Press, 130–142.

✂



[3 – 6 May 2016, Hobart, Tasmania, Australia](#)



# Ocean acidification and consequences for abalone aquaculture

By  
**Mike Lucas and  
 Nina Lester**  
*Department of Biological  
 Sciences, University of Cape  
 Town*

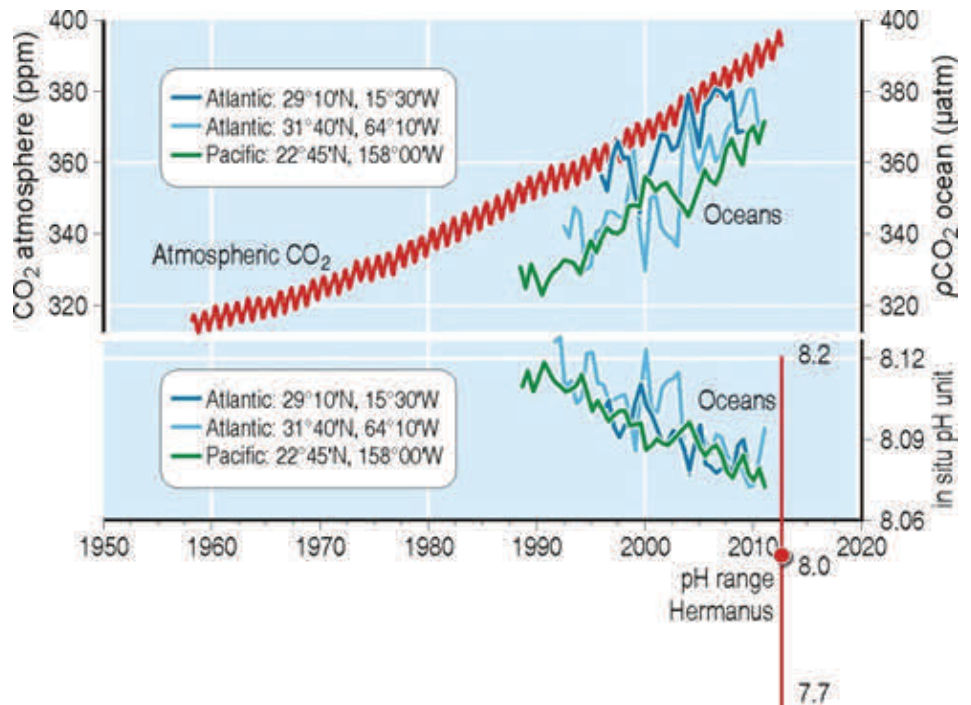
An unavoidable consequence of rising CO<sub>2</sub> concentrations in the atmosphere due to fossil fuel combustion is that atmospheric CO<sub>2</sub> concentrations are rising faster and higher than they have done over the last 800 000 years or more. The CO<sub>2</sub> concentration is now about 400ppm relative to the pre-industrial value of about 250ppm in the 1750's, resulting in more of this CO<sub>2</sub> dissolving in the oceans. When CO<sub>2</sub> combines with seawater, it forms a weak solution of carbonic acid, which lowers the ocean's pH, but only slowly, because of the buffering capacity of carbonate and bicarbonate ions in the ocean. This process is called ocean acidification, and has proceeded in exact parallel with the better-publicized rise of CO<sub>2</sub> in the atmosphere. The scale that measures pH ranges from 1 (most acid e.g. battery acid), upwards through 7 (neutral e.g. pure water), to 14 (most alkaline e.g. caustic soda). Seawater is in fact mildly alkaline, with a natural pH of between 8.2 and 8.3. Ocean pH has fallen over the past two centuries by about 0.1 pH units.

This does not sound like much, but since pH is a logarithmic scale this translates to an approximately 30% increase in acidity.

The process of ocean acidification is accelerating and will be felt strongly here on the west coast of South Africa – more so than in the Atlantic and Pacific Oceans – see graph. Note that the average pH range at Hermanus on the south coast is approximately 8.0, substantially lower than the average for the Atlantic and Pacific Oceans. Note too the substantial range in pH. What could be the causes of these low values.



Abalone growing in tanks on a farm in Hermanus (Photo: Nina Lester).



As the atmospheric CO<sub>2</sub> rises, the dissolved CO<sub>2</sub> in the ocean (pCO<sub>2</sub>) rises in exact parallel, but delayed by a few decades. This causes the ocean pH to fall. The multiple coloured lines represent various datasets. (After IPCC WG1, AR5, 2013.)



The answer is uncertain, but probably lies with the origin of the coastal water adjacent to Hermanus. The water here is partly of water that originates from the Benguela upwelling system, which itself comes originally from the South Atlantic and Southern Ocean waters at about 1000m to 400m depth. This cold water was in contact with the atmosphere at about 50-55°S, and being cold, absorbed large amounts of atmospheric CO<sub>2</sub> that resulted in these waters having a pH of about 7.87.

Transport of this low pH water into the Benguela region means that this region experiences some of the lowest pH values anywhere in the global oceans. While this explains the average, how can we explain the large range?

Coastal waters here are strongly influenced by the recent proliferation of kelp beds here. Like all plants, they

photosynthesise during the day, thus removing CO<sub>2</sub> from the water and converting this into plant tissue. Removal of CO<sub>2</sub> from the water in this way raises the pH. But at night, the converse is true. At night, the plants are respiring (as all organisms do, all of the time), and this releases CO<sub>2</sub> into the water, which lowers the pH to the very low values we see (approx. 7.7). For the Benguela region, future pH for the year 2100 is expected to fall to about 7.6, relative to a global average of about 7.7 to 7.8.

#### Consequences for abalone aquaculture

Aquaculture of the South African abalone (*Haliotis midae*) is a major and growing industry in South Africa, based largely on the west coast and around Hermanus in particular. Several farms here are growing and exporting several hundred tonnes of abalone each year (of about 100 to 180 grams each

depending on demand) to the Far East, mostly China. However, like all organisms with shells made of calcium carbonate, they are vulnerable to low pH, which causes the shells to begin to dissolve. Low pH also makes the process of growing their shells (called calcification) difficult. This affects both the formation of the shell and the physiology of the abalone, resulting in lower growth rates and perhaps a less appealing taste, which in turn impacts on the economics of abalone aquaculture.

This is a problem the Abalone Farmers Association of South Africa (AFASA) are aware of and they are investing significant amounts money into research by a UCT student, Ms Nina Lester, to assess the impacts of ocean acidification on abalone growth rates due to lower pH and to seek ways to minimise these impacts. This could potentially make use of the green seaweed *Ulva*, to remove CO<sub>2</sub> (by photosynthesis) from the flow-through seawater. So far, her research efforts are proving to be very rewarding and have been internationally recognised as being at the cutting edge of research by an International Ocean Acidification Workshop hosted here in Cape Town just last week. Funding by AFASA is supported also by the NRF as a joint Industry-NRF initiative (THRIP) and although her work is still at an early stage, the results look very promising from both an academic and industry perspective. ✂



'Grow out' tanks containing abalone on a farm in Hermanus. Water from the sea is pumped through the tanks, hence the concern about low and variable pH on the growth rates of these abalone (Photo by Nina Lester).

## Sevengill shark rescue in the Strand

By

Ingrid Sinclair

*Two Oceans Aquarium*

On 10 September 2015 the Two Oceans Aquarium collections team was called out to Strand by the City of Cape Town to help free a shark that had been stuck in one of the tidal pools at Harmony Park Resort for almost a week. No one knew what kind of shark it was and guesses around the office included spotted gully shark or pyjama shark. Turns out our guesses were wrong ... it was in fact a male broadnose sevengill shark (*Notorynchus cepedianus*), aka cow shark.

City of Cape Town Coastal Management Officer Sarah Chippendale met us on the scene on what was a rainy, windy and frankly cold (and early) Thursday morning on the beach. A fair-sized crowd also gathered as Operations Manager Tinus Beukes and his team members Simon Brill and Deen Hill walked down to the tidal pools, clad in wetsuits and carrying nets, fins, stretchers, goggles and snorkels.

The first step was to read the shark's mind. What would his movements be



Simon and Tinus wait on one end while Deen gently coaxes the shark (still not correctly identified at this point) towards the net. *Photo by Ingrid Sinclair.*

and how would the team be able to get close enough to him to get him into a stretcher while making sure the animal experienced minimal stress?

Tinus reckoned the shark was doing laps around the pool and based on that he and Simon moved to the north of the pools while Deen jogged to the south end and jumped into the water, swimming towards the shark.

Since wild animals should always be handled with care and caution, and since safety always comes first (for the people and the animals), Deen decided not to force the shark into the net, but instead followed it closely and gently

coaxed it towards Tinus and Simon. This went on for some time and the team was close to the northern edge of the pools when we heard Deen's incredulous shout: "I think it's a cowshark?!"

Simon and Tinus then ran over to where Deen and the shark were and a light scuffle broke out as the men tried to restrain the shark and get it into a stretcher. By the time they did this it was a fact – a male sevengill shark had been trapped in the tidal pool.

This was a particularly special moment as the Two Oceans Aquarium together with Woolworths is supporting Dr Alison Kock's [five-year study](#) on these

mysterious sharks. The thing is, so far Dr Kock has only found and tagged female sevengills (around the Miller's Point area), so finding and possibly being able to tag a mature male was a massive coup for her research project.

Simon and Deen were ready to release the shark but Tinus asked them to hold on and to move him into a transport tank conveniently attached to the Aquarium's bakkie (you never know when this may come in handy). Tinus knew that Alison would be thrilled to be able to tag this male sevengill, so he telephoned her as well as our resident vet Dr Georgina Cole (who is actually on study leave) and told them to hurry to the scene.

Together the doctors would insert an acoustic telemetry tag as well as a microchip, and would take blood and fin samples, muscle biopsies and various measurements.

"Going out expecting to find a gully shark and coming across a male cowshark was fantastic," says Simon. "The first challenge was removing him from a fairly large pool, which we managed to achieve without too many hassles. Then, keeping the animal happy and healthy till the vet arrived posed the second challenge."

Alison and Georgina arrived, as did Alison's research assistants Dave van Beuningen (Shark Spotter research assistant), Leigh de Necker (MSc student at UCT doing her thesis on sevengill feeding ecology) and Tamlyn Engelbrecht (MSc student at UCT doing her thesis on sevengill spatial ecology). Pippa Elrich of the Save Our Seas Foundation (which supports Dr Kock's project as well as a number of other shark research programmes) was also there to document the impromptu but important tagging process.

Tagging and performing biopsies on a wild animal, especially a wet one, is tricky business. Utmost care is given to the handling of the shark, and Dr Cole monitored our sevengill's health closely before deciding to go ahead with the minor procedures.

It takes practise, preparation, cleanliness, care and speed, gentleness and above all focus to perform these tasks without stressing the shark too much. Communication between team members is vital too – everyone was certain of their role and followed Dr Cole's instructions closely.

Teamwork was everything on the day and the visceral excitement (and a fair number of onlookers and cameras) did not get in the way of the highly professional and fast operation.

The number-one priority was to get the



Onlookers were thrilled to be able to come this close to the sevengill. Look at the beautiful white spots - male sevengills are considerably smaller than females and have thinner skin too, according to the experts. Photo by Ingrid Sinclair.



Dr Cole makes her first incision as the team supports her - ensuring her instruments are nearby and that the shark does not suddenly move. The rain makes things slightly more urgent. Photo by Ingrid Sinclair.



shark back in the water as quickly as possible.

Tinus decided that it would not be wise to release the shark back into the rocky shore of Harmony Park, as Deen and Simon would be unable to swim with the animal for a while to make sure that it was in good nick. So, extremely slowly, they drove up the road to the Gordon's Bay harbour where they could release the shark by swimming out and along with it.

"I am thrilled we have tagged this large male, hopefully he is the first of many more and I look forward to tracking his progress over the next few years," said Dr Kock. "I am very thankful to everyone involved for contributing to this successful story."

"Once the tag was inserted we woke him up and released him back into his natural environment," says Simon. "All in all it was a fantastic and rewarding day for all involved." ✂



The end of a long week for the sevengill and a long day for the team. Photo by Ingrid Sinclair.

**ClimEco5**  
Praia Mar Hotel, Natal, Brazil 10-17 August 2016



**Towards more resilient oceans:  
Predicting and projecting future changes in the ocean and their impacts on human societies**

We are pleased to announce that applications are now open for the IMBER ClimEco5 summer school – Towards more resilient oceans: Predicting and projecting future changes in the ocean and their impacts on human societies – that will be held in Natal, Brazil from 10–17 August 2016.

ClimEco5 will focus on anthropogenic and natural changes effecting the ocean, and will emphasize linkages between these and social, economic and policy issues associated with maintaining sustainable and productive oceans.

Participants will be guided through integrated modelling and monitoring approaches, as well as the use of indicators to evaluate these complex systems and to make the information relevant to managers and decision makers. Lectures will include information about modelling approaches, indicators, data analysis, management perspectives, and communicating research and information that is practically useful for management. Each afternoon there will be practical sessions where participants will work with concepts discussed during the lectures, using a range of models, indicators and analytical methods.

We invite students and early career researchers (<10 years post PhD) working on global change issues, and interested in working at the interface of human and natural systems to apply to attend. Numbers are limited to about 60 participants to ensure optimal student-lecturer interactions, interactive practical sessions and group projects.

For more information [visit the summer school website](#) or contact us at [imber@imr.no](mailto:imber@imr.no)

Application closing date: 31 March 2016

## When do coastal inlets become estuaries?

By

**Alan Whitfield**

*South African Institute for  
Aquatic Biodiversity (SAIAB)*

South Africa has more than 100 coastal inlets, most of which arise from streams flowing from small catchments in the immediate surrounding hills. The vast majority of these inlets do not even have names, and the structure and functioning of these systems has never been investigated on either a national or international basis.

In July 2015 a team of scientists from SAIAB, SAEON, NMMU and RU began a comprehensive study of 10 of these systems in the central part of the Eastern Cape Province. Based primarily on size, five of these systems have been

provisionally classified as micro-inlets and five as micro-estuaries. Seasonal sampling in each system covers all the major biotic categories, from birds, fish, zoobenthos and zooplankton to aquatic macrophytes, epipsammic microalgae (diatoms) and phytoplankton. Apart from detailed physico-chemical measurements in each system on each sampling occasion, the scientists will also be able to draw on hourly recordings of salinity and temperature data using submerged automatic loggers installed by Dr Shaun Deyzel (SAEON Elwandle Node) that are uploaded every three months.

The collecting of bird information is being led by Prof Tris Wooldridge (NMMU), the fish data by Prof Alan Whitfield (SAIAB), the invertebrate sampling by Prof Renzo Perissinotto

(NMMU), with the botanical components being co-ordinated by Prof Janine Adams (NMMU), Dr Lucienne Human (NMMU) and Dr Tatenda Dalu (RU). In addition, Ms Lyndle Naidoo and Mr Mandla Magoro are conducting their MSc and PhD studies on the macrophytes and overall ecosystem functioning respectively.

Some of the key questions to be addressed by this project include;

- What are the distinctive features of micro-inlets and micro-estuaries from a physico-chemical and biological perspective that can be used to distinguish them from other estuary types?
- How do spatial and temporal variations in physico-chemical properties influence the abundance



A tentatively identified Eastern Cape micro-inlet (left) and micro-estuary (right) respectively.





Some of the 'micro-team' discussing sampling strategies at one of the Eastern Cape coastal inlets.

and distribution of the biotic components in the two coastal inlet types.

- What is the current ecological status and likely susceptibility of these small systems to anthropogenic influences such as farm dams, weirs and localised pollution events.

At the conclusion of this collaborative project in 2018 we should also be able to define the position of both micro-inlets and micro-estuaries in the range of aquatic ecosystems on the South African coast. We should also be able to answer the fundamental question – when and under what conditions does a micro-inlet become a micro-estuary? ☞

### Marine Stewardship Council 2016 Science Scholarship Program

Undergraduate and postgraduate students from around the globe are invited to apply before 1 February 2016 to be in with a chance of securing up to £4000 scholarship grant to assist with fisheries science or supply chain management research. To qualify for the program, a project will have the objective of studying an aspect of environmental improvement, performance, impact or best practice in fisheries or seafood product integrity and management. In 2016, the MSC also welcomes applications researching in sustainable seaweed harvesting and management. Click [here](#) for the full details.

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## The extent and impact of a macroalgal bloom in the Knysna Estuary

By

**Lucienne Human**

*SANCOR Postdoctoral Fellow  
at Nelson Mandela  
Metropolitan University*

The Knysna River Estuary, apart from being one of the most popular holiday destinations in South Africa, has been recognised as one of the country's most important estuaries for biodiversity. Knysna is a unique system as it is classified as an estuarine bay and remains permanently open to the sea.

This of course indicates that there is good tidal exchange with water coming in from the sea through its rocky head lands famously known as the Heads. Tidal exchange has been important in maintaining good water quality. In the summer of 2014/2015 the estuary experienced its first macroalgal bloom composed of an opportunistic species from the Genera *Ulva*. Opportunistic, meaning that the macroalgae in question is a type of invader; it grows fast and outcompetes neighbouring algae and other macrophytes and is adapted to a wide range of salinity, temperature and light conditions. But the most important characteristic honed over many centuries is that opportunists are able to take up and store significant quantities of



Rows of decaying and dead macroalgal mix, principally *Ulva lactuca* deposited along the upper shore of Lands End, Leisure Isle, February 2015 (photo by Brian Allanson).

nutrients (nitrogen and phosphorus) very quickly and make them unavailable to other vegetation.

Globally when an opportunist colonizes an estuary it is considered as a sign that the estuary is in a degraded state due to deterioration in the estuary's water quality. This is the case for the Knysna Estuary; the macroalgal bloom can be found occupying the niche around the Ashmead channel and in the vicinity of Lands End and Leisure Isle. The Nelson Mandela Metropolitan University represented by Prof Janine Adams and myself in collaboration with the Knysna Basin project represented by Prof Brian Allanson and Ms Louw Claassens have started to investigate the causes and

consequences of the bloom. Thus far it has become apparent that the shallow nature of the Ashmead channel is one of the primary reasons for the bloom settling here. Moreover, the sediments in the Ashmead have become anaerobic, meaning that over the years there has been considerable degradation in the quality of the sediment. This degradation has been brought about by a lack of adequate flushing with the incoming tide and sedimentation occurring within this channel. Another contributing factor to the persistence of the algal bloom arises from the waste water that flows into the Ashmead channel from the adjacent wastewater treatment works. While the wastewater treatment works functions and treats waste, there are occasions

that it fails and raw sludge gets deposited into the Ashmead channel. When sediments become anaerobic they store significant amounts of nitrogen and phosphorus and become biologically active for many years. These sediments release nutrients into the water column and are subsequently taken up by the opportunistic macroalgae which then proliferate through the entire water column. A survey of the water column indeed showed higher NH<sub>4</sub> (30 - 140 μM) concentrations within the water column which is the major form of nitrogen released during re-mineralization of organic matter. The dissolved oxygen concentrations were hypoxic (3mg/l) which is at the critical level considered to be uninhabitable for marine fauna. Harvested samples of macroalgae were collected at six sites along the length of the Ashmead channel. Preliminary results indicate that the nitrogen concentration within the tissue of *Ulva* ranged from

1000—300mg/kg. A similar concentration was found for the phosphorus within the alga, ranging from 800—1200mg/kg. The highest macroalgal wet weight was 2040g/m<sup>2</sup> indicative of its success as an opportunist.

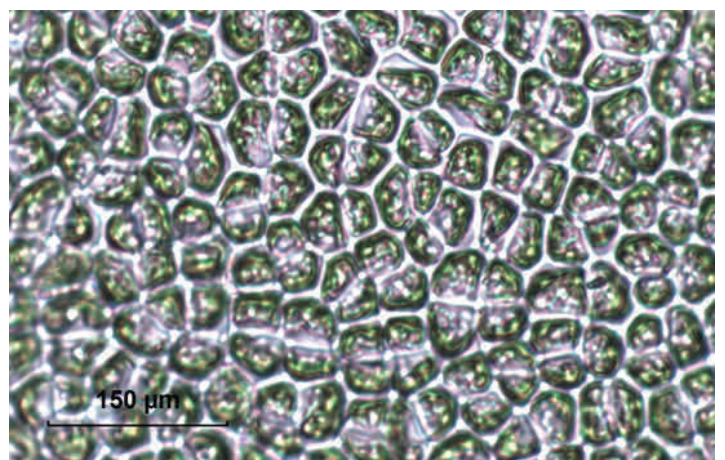
Macroalgal blooms can have devastating secondary effects on the flora and fauna in the vicinity of the bloom. Blooms take up oxygen present in the water column making it unavailable to other primary producers and consumers. Seagrass beds dieback under the thick blankets of macroalgae due to smothering and insufficient light for photosynthesis. With the incoming tide the algal masses are lifted onto the salt marsh also causing smothering. The collapse of these intertidal habitats then affects the secondary consumers that depend on these habitats for their survival resulting in a loss of food

source to many consumers and loss of nursery areas for juvenile fishes. In this way food web structure may be affected and cascading effects higher up in the food web may ensue sooner rather than later. But the buck does not stop there, when the algal bloom does eventually collapse, decomposition commences and a high organic load associated with nitrogen and phosphorus is then recycled back into the sediment and the process starts all over again. These "boom" and "bust" cycles alter the functioning of the estuary and every effort must be made to control these nuisance algae. This can only be achieved with informed scientific research, that is ongoing, and the buy-in from different government departments once a management strategy has been developed.

*Implementation Implementation Implementation* a difficulty that has consumed our country much like the bloom in the Knysna Estuary. ☞



*U. lactuca* on the intertidal mudflats of the Ashmead channel (photo Zandri Bekker).



Micrograph of *U. lactuca* at 100x magnification (photo Zandri Bekker).



## Why sustainability makes good business sense: the case of the RFA

By

**Junaid Francis**

*Responsible Fisheries  
Alliance*

Contrary to what many may think, corporate fishing companies are far more concerned about sustainability than is often perceived. The reality is that these companies are wholly reliant on healthy marine ecosystems to provide them with more long-term ecological, social and economic benefits. There is therefore a strong business case to be made for the safekeeping of marine resources. Businesses with the foresight to recognise that the longevity of their businesses is underpinned by a sustainable supply of fish should be actively engaged in the protection of these resources. It is with this rationale that the Responsible Fisheries Alliance (RFA) was established in 2009.

The RFA is a partnership between major fishing corporates, I&J, Oceana, Pioneer Fishing, Sea Harvest and Viking Fishing, and environmental NGOs, WWF-SA and BirdLife South Africa. The partnership is premised on the need to inform and promote responsible fishing practices within the South African fisheries sector. In lieu of the impacts of overfishing and



other unsustainable marine uses, the RFA seeks to harness the influence of these leading brands to galvanise the fishing sector and drive positive change. Whilst a NGO-corporate partnership of this nature is not unique to South Africa, using this model to address environmental concerns in the fishing sector is a novel approach.

In order to achieve this vision of a responsible fishing industry, since its initiation, the RFA members have invested over R 3 million in support of several projects informing ecosystems-based management to better understand and mitigate the impacts of harmful fishing practices. Some of the most notable projects include

supporting the work championed by BirdLife South Africa and the deep sea trawl industry on a series of projects resulting in a 90% reduction in seabird mortalities, including a remarkable 99% reduction in the deaths of the many majestic albatross species. This success story is the key focus of the WWF-SASSI #SASSIstories campaign in October. The campaign enables consumers to share this success story whilst providing them with the opportunity to share their own sustainable seafood stories.

The RFA has also supported research on another iconic species, the African penguin. This research is focused on populations on the south and west coasts to better understand the impact



of fishing activities on these endangered species. Furthermore, the RFA has helped to initiate an important collaboration between the University of Cape Town (UCT) and the South East Coast Inshore Fishing Association (SECIFA) to develop and trial an improved bycatch management plan which considers a broader range of bycatch species landed in the fishery. Perhaps one of the most important RFA contributions has been the training of more than 1100 skippers, crew, observers, compliance officers and law enforcement officials with the skills to better comprehend and contribute toward ecosystems-based management. The training course has catalysed a greater appreciation for marine life among those that operate at the 'coal face' of the ocean. Coupled with these conservation gains, the Alliance has also played a critical role in fostering the co-management of fisheries through collaborative efforts between government and the fishing industry.

Despite these successes, like any start-up, the RFA still faces a number of challenges. There is clearly significant potential for an organisation such as the

RFA to effect large scale change but there are limitations both in terms of funding available and the extent to which the Alliance is willing and able to use its voice to lobby for change within government or the fishing industry. Going forward, it will be important for the Alliance to develop a more prominent public presence on topical issues that undermine responsible fisheries. The Alliance's ability to better address competitive barriers will also be key to its future success. It is now well understood that environmental sustainability is one of the areas that businesses are willing to collaborate around, however, with so many different companies and interests involved, setting up effective pre-competitive collaborations such as the RFA remains a challenging task.

Looking ahead, the RFA now seeks to focus on interventions that will benefit the broader fishing sector to address the challenges identified. Lobbying for evidence-based decision making, ensuring a robust marine legislative framework, promoting the application of ecosystems-based management and safeguarding sustainable marine uses

from unfavourable practices have been identified as the key focus areas. Projects will be elected which contribute towards these areas of work.

Whether it is to leverage off of the demand for sustainable seafood from increasingly aware consumers or for the protection of marine resources, it is clear that sustainability is central to the success of corporate fishing companies. By forming collaborative partnerships such as that of the RFA, the fishing sector will continue to build resilient ecosystems and reliable fish stocks and, in doing so, secure business success in years to come.

The RFA members are in the process of agreeing to a further two year term until 2017. For more information visit the RFA website at <http://www.rfalliance.org.za/> and visit [www.sassistories.co.za](http://www.sassistories.co.za) for information about the #SASSIstories campaign. ✂



## Management and governance of the coastal and marine environment in the spotlight

By  
**Reyhana Mahomed**  
CSIR

Over 500 local and international marine scientists and biologists gathered at the Wild Coast Sun Resort in Port Edward between 25 – 31 October for the biennial Western Indian Ocean Marine Science Association (WIOMSA) 9th Scientific Symposium.

“Our ocean space is a resource rich and relatively pristine environment. The ocean represents a significant asset for current and future generations of South Africans. The use of various marine resources in our ocean space has increased over time and there remains significant potential for the unlocking of further economic development opportunities,” said the Chairperson of the KwaZulu-Natal Sharks Board, Mr Siphso Mkhize, who officially opened the WIOMSA 9th Scientific Symposium on 26 October 2015.

Operation Phakisa addresses development constraints in a fast and efficient manner. The approach has been adopted from the Malaysian government and tailored to suit South Africa’s development needs.

According to CSIR coastal systems research group leader and scientist, Dr Louis Celliers, the aim of the symposium is to showcase the growing scientific capacity of countries in the Western Indian Ocean region, and to devise ways and means to use this capacity to better



Participants at the WIOMSA 9th Scientific Symposium.

manage our coastal and marine resources to the benefit of communities". The CSIR is proud hosts of the conference, along with the University of KwaZulu-Natal and the KwaZulu-Natal Sharks Board.

"Coastal and marine science is strong and healthy in countries bordering the Western Indian Ocean. The question is how we put this wealth of capacity and knowledge to good use. How can the products of science make us better custodians of the incredible diversity and abundance of ecosystem services of the WIO?"

"The CSIR is dedicated to contributing to an understanding of the ocean environment through its many related research groups that include Coastal Systems, Ocean and Climate Systems, Ecosystem Services and Coastal and Marine Remote Sensing," said CSIR Group Executive: Operations, Mr Laurens Cloete.

The Symposium was convened under the theme; "Knowledge – improving lives in ocean and coastal systems". In line with its reputation as the major hub for exchange and dissemination of information, the 9th Symposium comprised a range of presentations and sessions from keynote presentations to oral and poster presentations. Six

keynote presentations, 215 oral presentations, and over 250 poster presentations were delivered during the week. A total of 12 special sessions on different topics were held on 30 October. Two new books were also launched at the Symposium.

"The WIOMSA Symposium is one of the most exciting and unique fora where coastal and marine science meets management and policy," said Dr Celliers.

"South Africa is committed to the protection of our oceans. Monitoring the ocean and coastal environment over the last 20 years has grown to be a significantly greater practice than ever before. This is due to the ever increasing understanding of the importance of the oceanic environment to South Africa. A network of Marine Protected Areas is extremely important to increase ecosystem resilience, maintain genetic biodiversity and our ability to cope with and adapt to the greatest threat facing human kind: climate change," said Mr Mkhize.

The Western Indian Ocean is incredibly important to countless coastal communities and populations. From small subsistence fishermen, to large ocean going ships, this part of the world's oceans sustains millions.

Fourteen African countries have coastlines in this ocean, stretching out from Madagascar to Egypt, and down to Cape Agulhas in South Africa. Coral reefs along the coastline of Kenya, Tanzania, and northern Mozambique form a large fringing reef complex that is amongst the largest in the world.

#### About WIOMSA

The vision and mission of WIOMSA is to study and care for the Western Indian Ocean, combining science and local indigenous knowledge to promote healthy, functioning ecosystems, and protect ocean resources for all users and stakeholders. WIOMSA aims to further community involvement and conservation, connecting people and the environment as together we face the oncoming threat of climate change in a warming ocean. ☞





## Deep dive into the 2015 Deep-Sea Biology Symposium

By

**Kerry Sink<sup>1</sup>, Ryan Palmer<sup>2</sup>, Zoleka Filander<sup>3</sup>, Robyn Payne<sup>3</sup>, Seshnee Maduray<sup>3</sup> and Jock Currie<sup>1, 4, 5</sup>**

*<sup>1</sup>South African National Biodiversity Institute, <sup>2</sup>African Coelacanth Ecosystem Programme, <sup>3</sup>University of the Western Cape, <sup>4</sup>South African Environmental Observation Network, <sup>5</sup>University of Cape Town*

Six South Africans attended the 14<sup>th</sup> DSBS in Aveiro, Portugal, in September 2015. Key focus areas included the impacts of sea bed mining and petroleum, deep-sea

connectivity and genetic resources, the ecology of sensitive and chemosynthetic ecosystems and technological innovations advancing

deep-sea research. The conference included 360 delegates from 35 countries, with 200 oral presentations and 240 posters that shared insights into deep-sea taxonomy, research methods, ecology, environmental impacts, policy and management.

Presentations from South Africa included ten years of experience on offshore biodiversity planning, work to improve mapping and protection of sensitive ecosystems, the development and

*Group photo of the 14<sup>th</sup> DSBS participants in Aveiro, Portugal. Photo by Isa Cunha.*



change in our hake trawl fishery, and progress with the trawl closure experiment on our West Coast. South African research on sponges included regional diversity patterns and work on the deep-water sponge fauna from ACEP's Walters Shoal Seamount project. The ACEP team soaked up ideas on novel technologies for deep-sea science and developed collaborations that will deepen South Africa's research capacity.

### Stewardship and policy highlights

Scientists' concern for the future of deep-sea ecosystems was reflected by increased attention to stewardship, conservation and policy. Kristine Gjerde, high seas policy advisor for the IUCN, delivered a keynote address on environmental management of the deep sea, while multiple presentations spoke about policy development in Areas Beyond National Jurisdiction (ABNJ). Bronwen Currie shared Namibia's precautionary approach in developing phosphate mining and Ashley Rowden presented some scientific considerations behind New Zealand's recent decision to disallow phosphate mining on the Chatham Rise. One of the key elements in the latter decision was the existence of a fisheries exclusion area that had been developed for the protection of corals.

The conference was preceded by a one-day meeting of the Deep Ocean Stewardship Initiative (DOSI). DOSI seeks

to integrate science, technology, policy, law and economics to advise on ecosystem-based management of resource use in the deep ocean. Progress and outputs presented demonstrate DOSI's development in terms of raising awareness, identifying management needs, developing best practices and fostering centralized science to support decision making in the deep sea.

### Corals and canyons

The importance of the ecology and conservation value of deep-sea corals was reflected by the number and diversity of projects displayed at the symposium. Amongst the highlights was a talk by Buhl-Mortensen, who reported on a 20 000-year-old cold-water coral reef situated at 400 m depth on Ghana's continental shelf. This 70-m-high and 400-m-long reef is dominated by corals *Lophelia pertusa* and *Madrepora oculata*, both of which potentially occur in South Africa. Seafans were found to be useful indicator species in tracking the impact and recovery of oil spills such as that of Deep Water Horizon. Interestingly, studies showed that benthic sites below areas treated with oil dispersant were more damaged than sites exposed to oil pollution without the use of dispersant.

Ocean acidification was a prominent theme at the symposium. Fascinating



*Zoleka Filander's poster on work to identify and map sensitive marine ecosystems helped foster new international collaborations in taxonomy, deep-sea sampling and predictive habitat mapping.*

insights were presented on the physiological effects of decreasing pH on deep-sea corals. By way of lab experiments, Georgian and co-workers demonstrated a highly variable response to decreasing pH among different populations of coral. These results highlight the importance of considering natural variability in climate change studies.

A special session was held on submarine canyons and their sensitive communities. Sandra Brooke presented on a 2013 cruise that reported a fifty-fold increase in the known number of cold-water corals in the US mid-Atlantic canyons. This and other studies revealed high spatial heterogeneity among canyons.

Further oceanographic and molecular studies revealed how connectivity shapes communities and informs conservation strategies across canyons. Multiple presentations underlined the value of fine scale predictive models to support observational data and identify further areas of likely occurrence. Such findings can guide projects currently under development in South Africa and inform future coral and canyon research.

### Seamounts and sponges

A session on seamounts included a review of global seamount ecosystem knowledge and introduction of an open-access database that seeks to collate seamount knowledge and standardise research frameworks ([www.seamounteef.org](http://www.seamounteef.org)). Currently containing records from 597 seamounts, the dataset reveals that only 0.4 to 4% of the global seamount population has been sampled for scientific purposes. Schlacher presented the implications and ethics to be considered when deciding on sampling tools (especially destructive vs non-destructive methods), while multiple studies characterised benthic assemblages in relation to environmental characteristics, with implications for mapping and management planning.

Work on the phylum Porifera included new research on carnivorous sponges.

For example the first lab-based observations of larval dispersal, behavior and settlement were presented, as well as a revised classification of the group. A pertinent study by Zeng and co-authors detected genetic differentiation among populations of two species of demosponges off New Zealand, which should inform the placement of Marine Protected Areas. Two studies modelled habitat suitability for aggregations of the birds' nest sponge *Pheronema carpenleri*, and found that the predicted distribution matches that of other vulnerable marine ecosystem indicators (e.g. corals). Finally, NOAA's (National Oceanic and Atmospheric Administration) comprehensive Deep-Sea Coral and Sponge Database and Map Portal (<https://deepseacoraldata.noaa.gov>) was launched. It currently contains over 250 000 deep-sea coral and 70 000 sponge records respectively, providing an important resource for both scientists and resource managers.

### Technological innovation and data management

The conference showcased many advances in equipment and methods for conducting research in deeper waters. South Africa's deep-sea research capability is constrained by access to a variety of technologies that

can study and sample the ecosystems beyond 200 m depth. This is of particular concern since the majority of our marine territory is deeper than this and there are multiple expanding industrial pressures on the continental margin and shelf break.

South Africa needs to develop and strengthen expertise in technologies such as benthic landers, cabled seafloor instrumentation, deep-water remotely operated vehicle (ROV) and baited remote underwater video (BRUV) rigs, autonomous vehicles and deep-sea geological sampling apparatus. A benthic lander is a sophisticated self-powered mooring that can be deployed for extended periods to conduct in situ monitoring or discrete experimental research. Landers range in size up to large platforms accommodating entire research stations such as the DELOS fixed point open ocean observatory at 1400 m depth in Angolan waters. A wide array of instruments can be attached to landers, including oceanographic sensors, sediment traps and advanced acoustic and camera modules. Deep-water BRUVs can be fixed to landers, the development of which is a short-term goal for ACEP. ACEP is also working to extend the depth capability of its ROV and in the longer term, is considering a 1000 m ROV to advance South African deep-sea research.



The plenary talk by Jamieson “Beyond the abyss: progress in hadal exploration” showcased exciting video footage from ocean trenches. An engineer by training, Dr Jamieson has developed cutting edge technology to study habitats and life at depths of 5000 to 12 000 m. One of the take-home messages from his talk was that the technology exists to work at any depth in the ocean and opportunities exist to customize components to specific research needs. The exposure to, and learning from, international successes and failures is critical in planning deep-sea capacity development in South Africa and beyond.

Another theme of presentations and discussions was the importance of effective data management and some of the innovations in this field. Standardisation of fields and provision of effective metadata were emphasized, as these allow compatibility among datasets and increase the use of data (and return on funding for fieldwork). The accessibility of datasets, data sharing and open data were a common theme, especially among researchers involved in efforts to collate regional or global databases.

### Collaborations and Networking

Multiple contributions at the symposium demonstrated the value in opportunities provided by partnerships between researchers and industry. Such

collaborations can promote access to platforms and specialised deep-water equipment not normally available to the constrained budgets of researchers. An example of this is the global SERPENT (Scientific and Environmental ROV Partnership using Existing iNdustry Technology) project. This is of particular relevance to the South African Marine Research and Exploration Forum, a Phakisa initiative to develop such co-operative research opportunities locally.

The networking opportunities at the conference were extremely valuable and new collaborations were developed to advance studies on sensitive ecosystems, cold seeps and to draw from global work on climate change, fisheries impacts and predictive habitat modelling. Links with taxonomists were made to strengthen local work on black corals, deep water scleractinia, crinoids, microbes and xenophyophores. Exciting news is that collaborations with Plymouth University are being explored to trial an ROV capable of diving to 1000 m, as well as a deeper tow camera in South Africa. Colleagues from Florida State University have expressed interest in mentoring young scientists in the ACEP Deep Secrets project and provide ROV training opportunities with their pilots. The University of Hawaii is providing technical information to help with the development of ACEPs deep-

water BRUV system.

South African scientists attended several of the DOSI working groups (including those on mining, petroleum, climate change, genetic resources and capacity building). This allows us to remain abreast of relevant developments in these fields and participate in work to support global good practice and stewardship in the deep ocean. The conference was an inspiration and an education that will help shape the future of South African deep-sea research.

### Acknowledgements

The authors would like to acknowledge funders for sponsorship and contributions that enabled our participation at this stimulating conference including the INDEEP and International Seabed Authority Endowment Fund Travel Bursary, SANBI, ACEP, SAEON, and the Department of Environmental Affairs, Branch Oceans and Coasts. We are deeply grateful! ✂



## The wanderings of a PhD student

By

Taryn Murray

Rhodes University

In July 2015, through the financial support of the SANCOR International Travel Student Award, I had the wonderful opportunity to attend the 3rd International Conference on Fish Telemetry (ICFT) held in Halifax, Canada. Almost 24 hours after leaving cold wintery East London, I found myself in sunny summery Halifax for the next two weeks. The next five days saw 250 students and researchers from 25 countries gather in Halifax, Nova Scotia (headquarters of the Ocean Tracking Network) to present the latest in aquatic animal telemetry research from around the world. Conference themes ranged from *behavioural ecology* and *large-scale movements to new frontiers* and *conservation physiology*. Concurrently, several workshops focusing on topics ranging from modelling and data analysis to science communication were run. Four plenary speakers – Rory McAuley from Australia, Chris Holbrook from USA, Sara Iverson from Canada, and Francisco Chavez from USA – opened each day of the conference focussing on different research themes. Overall, a total of 92



Taryn Murray, winner of the 2015 SANCOR International Travel Student Award, presented at the 3<sup>rd</sup> International Conference on Fish Telemetry in Halifax, Canada.

oral presentations were given. I presented under the *behavioural ecology* theme, being one of only three South Africans to give an oral presentation at the 3rd ICFT. My presentation entitled “Wanderings of leervis *Lichia amia* (*Carangidae*), an estuarine-dependent piscivore” focussed on the area use, movement patterns, residency and multiple habitat connectivity of juvenile leervis *Lichia amia* tagged in two estuaries spaced approximately 620 km apart – the Kowie and Goukou estuaries. It was extremely well-received but the overwhelming response was “I’d love to catch that fish”.

Conferences on acoustic telemetry have been held biennially for the last 20 years, with the first conference taking place in Belgium in 1995. Dr Eva Thorstad, a researcher employed by the Norwegian Institute for Nature Research (NINA) and the chair of the ICFT International Steering Committee, closes every conference with a summary presentation. The 3<sup>rd</sup> ICFT was attended by 253 participants with a total of 142 oral and poster presentations. Approximately 56% of all presentations focused on marine species, 36% on freshwater species and 7% on other species. A strong focus of the conference was on applied research questions (54%),

with 27% of presentations focusing on basic fish physiology and 19% on methodology. The hosts for the next conference were also announced. In 2017, telemetry researchers from around the world will be jet-setting to the other side of the world, where Michelle Heupel, Colin Simpfendorfer and Jayson Semmens will be welcoming us all to Cairns, Australia for the 4<sup>th</sup> ICFT. Considering the current exchange rate but the two-year warning, I should have saved enough money by then to join them all for some good Australian humour and the breath-taking beauty of the Great Barrier Reef!

As with all conferences, it's not all work, but some play is involved too. Monday evening saw the conference delegates making their way down to the Halifax waterfront where we all attempted to eat an entire lobster each! For a first-time lobster-eater and an ichthyologist, I must admit that I first scanned the crustacean for interesting features, like their musselcracker-type "teeth" on their claws or their very strange furry legs. On completing the assessment, it was time to get "stuck in". Luckily the claws were cracked and the tail was already split. On discovering an uncracked claw, I very unsuccessfully tried to crack it myself and had to ask for assistance from Carl Meyer – a fish biologist based in Hawaii. Overall, it was quite an experience but it was a great night celebrating local flavour in

both food and fun. The majority of delegates took full advantage of the mid-week conference break, boarding buses and driving to the picturesque, historical colonial village and UNESCO Cultural World Heritage Site of Lunenburg, where we were given the opportunity to go on a whale-watching cruise. Unfortunately a thick fog had rolled in, the whales were being more than shy and the only thing of interest seen was a sunfish *Mola mola*. The World Wildlife Fund hosted "Shark Night" on Wednesday evening, where Dr Nigel Hussey gave an informative talk on Greenland sharks followed by a 'shark cage trivia match' where teams of shark researchers battled it out, answering shark trivia questions. The conference gala dinner was held at the Citadel Hill Fortress, a hill first fortified in 1749, on Thursday evening amidst ceremonial bagpipers and highland dancers. I must admit that, considering the large amount of tartan worn and the sounds of bagpipes making their way around the venue, there was much confusion, but on consulting a Canadian (and using common sense), I embarrassingly realised that Nova Scotia means New Scotland. The evening ended at the *Alehouse* where a live band was performing. The conference drew to a close on Friday morning, ending with afternoon workshops.

While all other delegates made the long trips back home, I stayed in Halifax to attend a three-day workshop with OTN's data management team. South Africa's Acoustic Tracking Array Platform (ATAP), a network of acoustic receivers deployed from False Bay to Ponto do Ouro in Mozambique, uses a number of OTN-loaned receivers. As such, ATAP conforms to OTN's data spreadsheet templates. As the team member managing ATAP, I was taught how to process data, making it ready for uploading onto a greater database. These three days were an "information overload" but I learnt a great deal and moving forward, this will only benefit South Africa's greater network of fish movement biologists. Many thanks go to Lenore Bejona, Marta Mihoff, Jon Pye and Brian Jones for preparing and presenting the workshop. It was another wonderful learning experience.

On concluding the workshop, I packed my bags, ready to return to South Africa the following day. However, Dr Aaron Spares, working with Acadia University and whom I met last year at the OTN Symposium held in Ottawa, Canada, told me that he was going on a fieldtrip to tag Atlantic sturgeon for the next two days and that he needed an extra pair of hands. Of course I jumped at the opportunity. We headed out at 22h00 to the "weir" – essentially a giant fish trap in an even bigger estuary. As a South



African having seen a number of our country's estuaries, they pale in comparison to the huge estuaries of the Bay of Fundy. With a tidal range of 15 m, we had to wait until the tide was low enough that we could access the fishing weir. Using headlamps to light our way, catching my first glimpse of a sturgeon swimming in the shallow water at night is something I will not soon forget. Seeing these prehistoric fish swim around was an incredible experience. What was even more of an experience was literally wrestling and bear-hugging a sturgeon as I carried it out the weir into a slightly deeper pool, the tail thrashing against my legs. I even got a complimentary cut on my thumb where a sturgeon thrashed its head unexpectedly, managing to pierce my thumb with a scute (hard bony structure on their body). In total, I helped tag over 20 sturgeon with conventional dart tags and PIT tags. We also managed

to tag three fish greater than 1.5 m in length with acoustic transmitters. Seeing, let alone tagging, a fish that does not occur in South Africa was truly an amazing opportunity. Thank you to Drs Aaron Spares and Lara Atkinson for allowing me to tag along.

One of the conference plenary speakers, Dr Chris Holbrook, said "there have not been more exciting times working with fish telemetry". After attending this conference, listening to almost all 92 presentations, reading almost all poster presentations, attending a three-day data management workshop and tagging Atlantic sturgeon, I realise that this could not be truer. Without SANCOR's financial support, I would never have been able to attend such a wonderful conference. Thank you. ✂



Tagging an Atlantic sturgeon. Photo by Tracy Rounds.

## Microbial and Geochemical Oceanography in Upwelling Ecosystems

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# SANCOR Steering Committee Appointments

The SANCOR Steering Committee is pleased to announce the following recent appointments:

Dr Louis Celliers was appointed as the new SANCOR Steering Committee Chairperson. Louis is currently employed



Dr Louis Celliers

by the CSIR in a dual role as a Principal Researcher in, and Research Group Leader of the Coastal Systems group of the Natural Resources and the Environment business unit. His field of study includes Integrated Coastal Management, Coastal Governance, Institutional Assessment, and other coastal and marine science-to-policy processes. Louis enjoys debating the power play of science and its usefulness to society. Louis also serves as the SANCOR Forum National Representative.

Dr Serge Raemakers was appointed as Steering Committee Vice-Chairperson.



Dr Serge Raemakers

Serge is a Researcher/ Senior Lecturer at the Environmental and Geographical Sciences at UCT. His has

expertise in inter-disciplinary research on understanding and assessing livelihoods and fishing practices, while undertaking participatory ecological and socio-economic research with local rural communities. His work engages with systems thinking and fisheries governance theory with the aim to recommend governance models and management approaches that are more applicable to small-scale fishers' realities. Serge is the SANCOR Forum National Representative for Social Sciences.

Dr Ursula Scharler was re-appointed as the KwaZulu-Natal Regional Representative



Dr Ursula Scharler and will be serving a second consecutive term. Ursula is an ecologist working in both the applied and theoretical field. Her research is focused mainly on subtropical and warm temperate estuarine and nearshore marine ecosystems, which she characterises in terms of their ecosystem function and connectivity using network analysis tools. She also engages in theoretical work on network analysis indices,

regarding their applicability to empirical systems with colleagues from Europe and the USA. She is currently Subject Editor of the journal Ecological Modelling, and a founding member of the ISEM-Africa, the Africa branch of the International Society for Ecological Modelling (ISEM).

Dr Nikki James, is the newly appointed Eastern Cape Representative.



Dr Nikki James

Nikki is an Aquatic Biologist at the South African Institute for Aquatic Biodiversity (SAIAB) focusing on global change research for the past 6 years. Prior to this she was based at SAEON/SAIAB and was involved in long-term ecological surveys of Algoa Bay and the ports of Richards Bay, Durban, East London, Port Elizabeth, Mossel Bay, Cape Town and Coega. Her involvement in the Phuhlisa Programme shows dedication to building human capacity in marine sciences. Nikki is an effective and dedicated communicator of her science in both popular print and lectures.

In January 2016, Dr Sophie von der Heyden will start her term as the SANCOR Forum Chair. She is the principal

investigator for marine research in the Evolutionary Genomics Group at the University of Stellenbosch.



Dr Sophie von der Heyden

She has received several awards for excellence in science: The World Academy of Sciences, which selected Sophie as a Young Affiliate (only 25 affiliates are chosen annually worldwide); a Senior CV Raman fellowship to carry out research collaborations in India; at Stellenbosch University she has been recognised twice

in four years for excellent performance as a researcher, as well as teaching by receiving the Rector’s award. Raising awareness and providing education to the public is another facet, which Sophie is also actively engaged with and passionate about, specifically furthering marine conservation and research awareness.

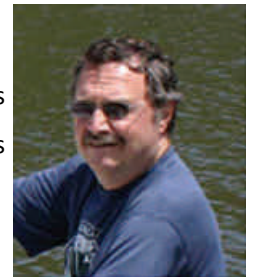
The SANCOR Steering Committee bids a fond farewell to:

- Dr Anusha Rajkaran as the outgoing chair and Eastern Cape Representative. We thank Anusha for her excellent dedication and leadership and wish her well in her future endeavours.



Dr Anusha Rajkaran

- Prof Ticky Forbes as the outgoing SANCOR Forum Chair. We are grateful for his contribution of time, effort, commitment and resources to SANCOR’s activities. ✍



Prof Ticky Forbes

## Out & About



## SANCOR at the WIOMSA Symposium

The ninth Scientific Symposium of the Western Indian Ocean Marine Science Association (WIOMSA), was held on the 26-31 October 2015 at the Wild Coast Sun Hotel in South Africa. This biennial forum is the largest open scientific conference in the region on marine and coastal issues and gathered approximately 500 delegates from across the globe. A morning plenary

session was sponsored by SANCOR. Dr Mike Watkeys and Dr Hugh Govan were the keynote speakers. SANCOR Steering Committee Chairperson, Dr Anusha Rajkaran gave the introductory talk to the SANCOR session. SANCOR Steering Committee Member, Rita Steyn served as the social media representative for the conference.



## Out & About



Rita hands over a memorial plate to Captain Bob Perkins on behalf of SANCOR.

## *SANCOR at the 2nd World Seabird Conference*

SANCOR hosted an exhibition stand and sponsored a student prize at the 2nd World Seabird Conference which was held in Cape Town, October 26 – 30, 2015 at the Cape Town International Convention Centre. Just under 600 delegates from 52 countries attended

this superbly organised conference to participate in discussions, collaborations and networking over the general sessions, symposia sessions, workshops and poster presentations. The SANCOR exhibition stand was sponsored by the WWF-Responsible Fisheries Alliance.

## *Handover of the Climate Declaration*

SANCOR Steering Committee Member, Ms Rita Steyn hosted the handover of the Western Indian Ocean (WIO) Region Climate Declaration on behalf of SANCOR, WIOMSA and SAEON. The document will also be taken to Paris and COP21 by a delegation of leading French scientists from the *Institut de recherche pour le développement (IRD)*, as well as representatives of the French government. This event was held at the Two Oceans Aquarium in Cape Town on 26 November 2015. French representatives at this handover meeting in Cape Town included, amongst others: IRD President Dr Jean-Paul Moatti, Director of CNRS French National Center for Scientific Research - National Institute for Earth Sciences and Astronomy, Dr Pascale Delecluse and French Ambassador to South Africa, Ambassador Elisabeth Barbier. This document was prepared by the leaders and scientists of WIOMSA and has been signed by over 400 delegates and supporters of the WIO region.

presented to crew members of the *Hokule'a* wa'a canoe, traveling around the world on their *Malama Honua* voyage, and will then go on the deck of the canoe for the remainder of their worldwide transit.

*"Mālama Honua*, the mission of the voyage, in Hawaiian means "caring for our Island Earth" has a very similar message to our local South African ubuntu philosophy of community and caring. This is voyaging in the ancient way, as their Polynesian ancestors once did when they first came to the islands of Hawai'i. On board, there is no compass, sextant, or cell phone, watch, or GPS for direction. The navigator and crew find their way by the stars, the sun, and the moon. The Polynesian Voyaging Society and the *Hōkūle'a* are almost exactly halfway around the world from their home port, and have embarked on this worldwide voyage to further the message of global connectedness, sustainability, and creating a future that includes healthy oceans." - read the full article by Rita Steyn in the [WIOMSA Newsletter](#), Issue 1, Page 6.

This historic document as well as a memorial plate from SANCOR was

## ***SAMREF Research Sector Workshop— identifying collaborative opportunities for offshore marine research***



Offshore oil and gas exploration has the potential to provide a unique opportunity to gather important research information that would normally be difficult to obtain due to the expense of dedicated research voyages. Industry vessels and fixed platforms frequently put to sea and hence have the capacity to obtain and share such data. In turn, the marine research community has the knowledge and willingness to work with industry in order to get maximum potential from the data they are collecting. The Offshore Oil and Gas Environmental Research Collaboration Project is a project to implement Operation Phakisa's Offshore Oil and Gas Exploration Initiative B3: Exploiting the broader research opportunities presented by offshore oil and gas exploration. The overall objective of the project is to support the inclusive process of development of the South African Marine Research and Exploration Forum (SAMREF).

A Research Sector Workshop was held in Kirstenbosch during 17-18 September 2015 to identify and investigate opportunities for cooperation in more detail. In particular, the workshop aimed

to:

1. Understand and capture the interests of the research community
2. Investigate the additional opportunities provided by the private sector, and understand the requirements in order for these opportunities to be taken up
3. Collect information to refine the design of SAMREF as a forum that can broker agreements between the private and public sectors.

Participation in the workshop was open to all parties (private, public and academic sectors) who have an interest in offshore marine research and industry in South Africa, including those currently involved in offshore oil and gas exploration and ocean-related climate change, biodiversity, natural resource management, renewable energy or related activities. The meeting was attended by 60 participants.

Case studies were presented on local research that had already been successfully undertaken with industry partners (how co-operations were taking place, recommendations made and lessons learned). The focus was on group work to allow for discussions around research opportunities and requests, and several were successfully identified.

The results from the Research Sector meeting has been used in the development of the Research Catalogue and Gap Analysis Report and the Research Opportunity Exploitation Report. All these reports are available on the [SAMREF website](#). The workshop was facilitated by the National Research Foundation on behalf of the Department of Science and Technology. ✂



Dr Findlay reports on marine mammal observation data received from the PASA (Petroleum Agency of South Africa) seismic survey.

## CSIR contributes to the first *Regional State of the Coast Report for the Western Indian Ocean*

By

**Jayson Ledwaba**

*CSIR Natural Resources and Environment*

Experts from a wide range of disciplines worldwide, including CSIR researchers, contributed to the development of the first Regional State of the Coast Report (RSCOR) for the Western Indian Ocean (WIO) region as authors and lead authors.

CSIR researchers provided insight on the work done by the CSIR in the coastal and marine environment. The RSCOR contributes to the United Nations Regular Process in preparation for the first integrated World Oceans Assessment report.

"The WIO is a region that is world-renowned for the vast array of habitat with remarkable natural beauty, spectacular biodiversity and rich natural resources," said Didier Dogley, Minister of Environment, Energy and Climate Changes in the Seychelles in the foreword to the report.

The report launched earlier this year aims to integrate the socio-economic and ecological systems of the WIO region by using a uniform methodology and

approach. The report describes the status of coastal and marine resources of the WIO. The aim of the report is to establish a common understanding of the environmental baseline of the region, and will be used for scenario building and forecasting.

### **Assessment of human activities and marine environment**

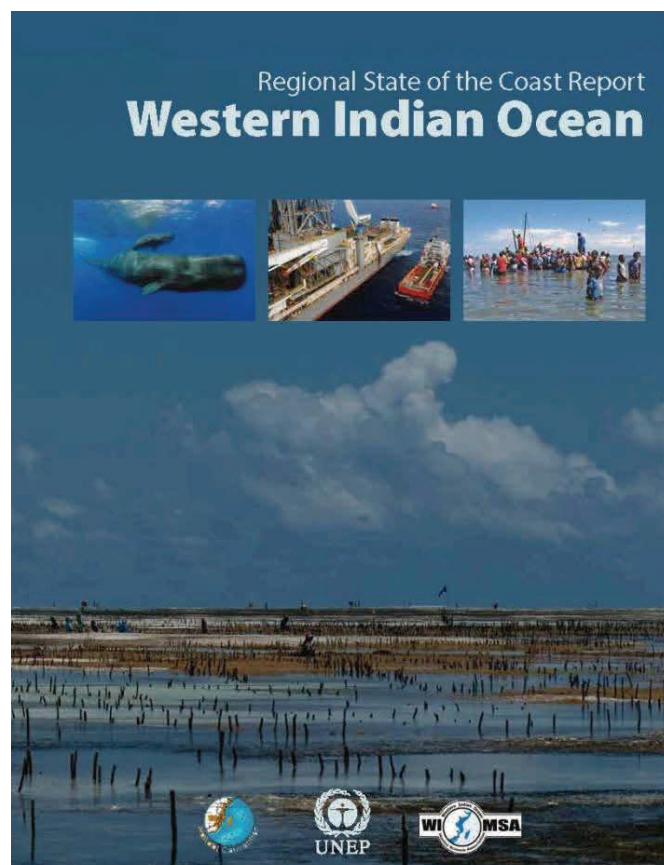
"The WIO offers a wealth of opportunities for the profitable and beneficial use of coastal and marine resources - a prospect for a true ocean economy," said Dr Louis Celliers, CSIR coastal systems research group leader.

Louis was the lead author of part VI of the report which consists of six chapters and includes a number of sectorial issues such as maritime activities, oil, gas and renewable energy. Part VI of the report presented an assessment of human activities on the coastal and marine environment that affect the

sustainability of natural resources.

"The pressures and opportunities created by emergent human activities mean that efforts should be invested in increasing our knowledge about resources, their environment and the social aspect of their exploitation," said Louis.

Louis and Cebile Ntombela, a CSIR specialist in water governance, also co-authored a chapter that focused on urbanisation, development, vulnerability and catchments. The chapter explores the growth of urban areas and large coastal cities. The aggregation of human





communities in urban areas places an increasing demand on natural coastal extractive and non-extractive resources. The use and conversion of coastal land and catchments is considered a permanent effect of growth and development.

Cebile explains, "Coastal cities in the WIO region are desirable places to live in and work at which will result in ongoing and increasing urbanisation. She says "Urbanisation will have a direct effect on biodiversity and the state of the coastal environment."

The coastal area in the WIO is home to over 60 million people with long and rich cultural traditions on the management of the coastal and marine resources. The WIO is faced with strong challenges regarding the sustainability of its marine and coastal environment, both in terms of global trends that require wider international integration, as well as regional and local sources of disturbance that governance mechanisms need to address.

The RSCOR of WIO was published in 2015 by the United Nations Environment Programme (UNEP) and the Nairobi Convention Secretariat.

[Click here to download the report.](#) 

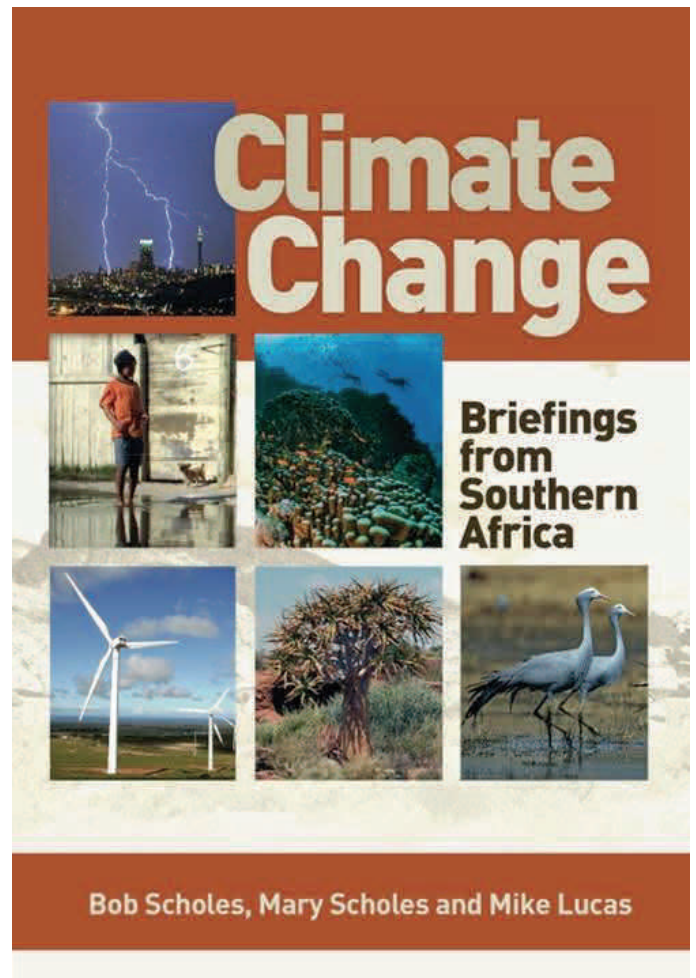
### NEW BOOK: *Climate Change Briefings from Southern Africa*

- How do greenhouse gases regulate the Earth’s temperature?
- How hot will it get?
- Will South Africa run out of water?
- Is sea-level rise something to worry about?
- Do cow-farts really cause global warming?
- Will marine fisheries collapse?
- Isn’t climate change just part of a long-term natural cycle?
- Can solar and wind power meet our energy needs?
- How can I reduce my carbon footprint?
- Is there any chance of runaway global warming?

These and many other questions are answered in this full-colour illustrated book.

Climate change

affects us all, but it can be a confusing business. Three leading South African scientists who have worked on the issue for over two decades help you to make sense of this topic. *Climate Change: Briefings from Southern Africa* takes the form of 55 ‘frequently asked questions’, each with a brief, clear scientifically up-to-date reply. The authors’ introduction provides an overview of current national and international policies aimed at regulating climate change. The four main sections take you through the science of



Bob Scholes, Mary Scholes and Mike Lucas

how the climate system works, the projected impacts in Southern Africa during the 21<sup>st</sup> century, what this means for South African society, and what can be done to avoid harm.

The profuse illustrations and local examples help to explain complex issues in simple terms. The book is aimed at interested but non-scientist readers, including business people, decision-makers and students, and is very timely in relating to impending international treaties and national efforts to avoid the worst consequences of a changing climate.

The year 2015 is regarded as a watershed for global climate change action if a global average temperature rise of more than two degrees above the pre-Industrial level is to be avoided. This book provides compelling evidence that the impact on agriculture, fisheries, water resources, human health, plants and animals as well as sea levels will be dangerous. However, the book ends on a positive note by offering advice on how the world can avoid such bleak outcomes, while allowing a good life for all. ∞

**For more information visit**

[Wits University Press.](#)

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