

SANCOR NEWSLETTER

South African Network for Coastal and Oceanic Research

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Accelerated eddies moving around Africa's southern tip

By Bjorn Backeberg^{1,2}, Pierrick Penven^{2,3}, & Mathieu Rouault^{1,2}

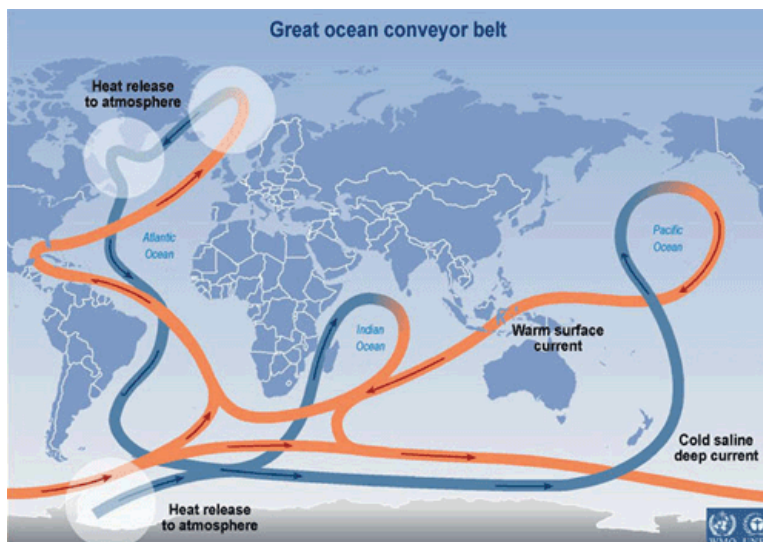
¹Nansen-Tutu Centre for Marine Environmental Research; ²Oceanography Department, University of Cape Town; ³Institut de Recherche pour le Développement, France

Over the past 10 years, research of the Agulhas Current has received increasing attention from the global scientific community. And recently, the Agulhas has become recognised as a key element in the global climate system. A SCOR working group investigating the climatic importance of the greater Agulhas system was formed and a review paper was published in *Nature* in 2011.

In the Department of Oceanography at the University of Cape Town, researchers from

the Nansen-Tutu Centre for Marine Environmental Research, the *Institut de Recherche pour le Développement* under the International Centre for Education, Marine and Atmospheric Sciences over Africa and the Marine Research Institute have been working together to advance our understanding of the Agulhas system.

The Agulhas Current is a western boundary current located at the western edge of the Indian Ocean basin. It flows southward along the East Coast of South Africa, and is counted among the fastest currents in world's ocean.



In the North Atlantic, heat from the ocean causes it to become denser and sink, driving the great ocean conveyor belt that transports heat from the equator to the poles. Freshwater input from the melting glaciers on Greenland may cause the conveyor belt to shut-down.



Surface velocities up to 2 m/s (~7 km/h) have been measured in the Agulhas, and at the 30° latitude, “our” current is significantly stronger when compared to its Northern Hemisphere counterparts: the Gulf Stream and the Kuroshio Current.

The main function of western boundary currents are to transport warm tropical waters from the equator toward the poles, redistributing ocean heat and making the higher latitudes warmer. They form a vital component of the global oceanic conveyor belt, whose role is to distribute heat ocean heat across the world’s ocean, thereby affecting global climate and change.

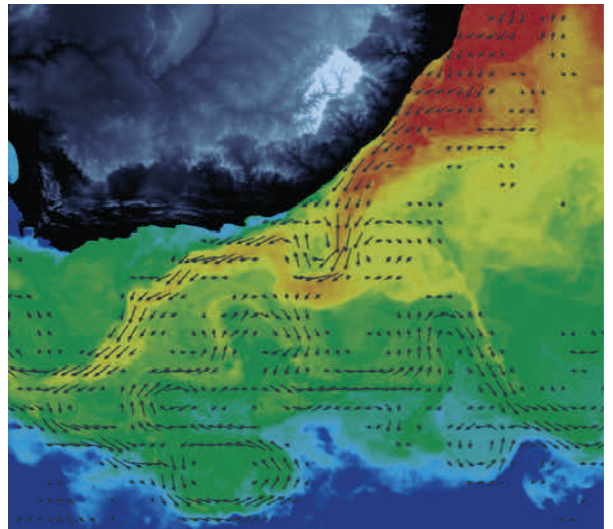
The conveyor belt system begins near Greenland and Iceland in the North Atlantic. As the warmth of the Gulf Stream is lost to the cold winds from Canada, the waters become denser and sink, forming a deep ocean water mass known as North Atlantic Deep Water. The newly formed water mass then flows southward along the sea floor to

the Antarctic Continent where it continues eastwards, warming and mixing as it goes and ultimately resurfaces in the Pacific. Thereafter, it flows back to the North Atlantic along the surface, completing the global conveyor and distributing ocean heat across the globe. In a warming climate, melting of the ice-sheets from Greenland and the Arctic might slow down or even stop the global oceanic conveyor belt. The Agulhas Current is an integral link in the global oceanic conveyor belt, transporting warm and salty waters from the Indian to the

Atlantic Ocean. This occurs directly south of Africa, where large Agulhas Rings (eddies containing warm and salty, tropical waters) are shed into the Atlantic Ocean. This “ring shedding” process is known as the Agulhas leakage, and is considered to be the main mechanism through which warm and salty waters are transported into the Atlantic Ocean.

Paleoclimatic studies, combined with simulations from numerical models have suggested that an Agulhas leakage shutdown is associated with extreme glacial periods, whereas a vigorous increase has preceded shifts towards interglacials. These changes are largely associated with the thermohaline circulation driving the ocean conveyor belt, otherwise termed the Meridional Overturning Circulation. It now appears that the input of warm, salty waters from the Agulhas into the Atlantic Ocean is vital in terms of counter-acting the recent freshening in the North Atlantic due to ice melt.

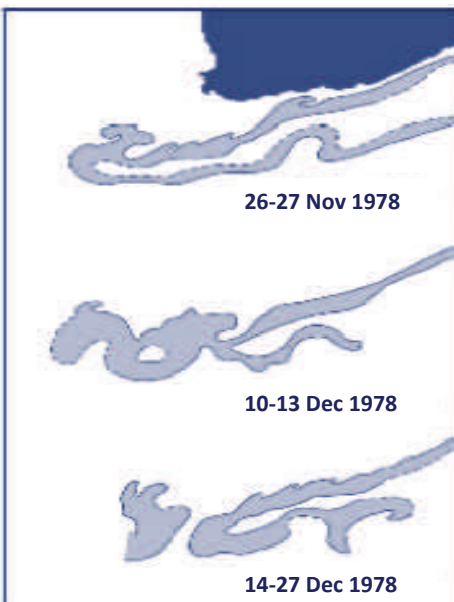
Despite the monumental advancements in technology, sampling the ocean remains a costly task. Observations of the ocean are



Sea surface temperatures measurements of the Agulhas Current from SEVIRI overlaid with geostrophic currents derived from altimetry measurements of the sea level. Courtesy: Marjolaine Krug (CSIR - Earth Observation).

limited to its surface from satellites, or point measurements by ship-borne or autonomous instruments. Numerical ocean models that represent ocean circulation mathematically allow us to gain deeper understanding of processes occurring in the ocean. Because of the paucity of ocean observations, in particular for the Agulhas Current and Southern Ocean, studies of these regions have relied heavily on numerical models. These models have revealed a possible increase in Agulhas leakage and have implied climate related changes on a global scale.

However, the Agulhas Current is one of the most difficult regions in the world to model accurately. This is because of its extremely turbulent nature and our limited understanding of the processes that drive the system. The ocean dynamics in the Agulhas are largely dominated by eddies and meanders of the order of 100’s of kilometers. Model simulations of these features vary significantly as these are dependent on the resolution of the model, and the parameters used to specify processes that we cannot resolve explicitly such as mixing, viscosity and diffusion. In



The shedding of an Agulhas Ring observed from satellite infrared imagery. Agulhas Rings transport heat and salt into the Atlantic Ocean vital for maintaining our present day climate. Courtesy Lutjeharms and van Ballegooyen, 1988.

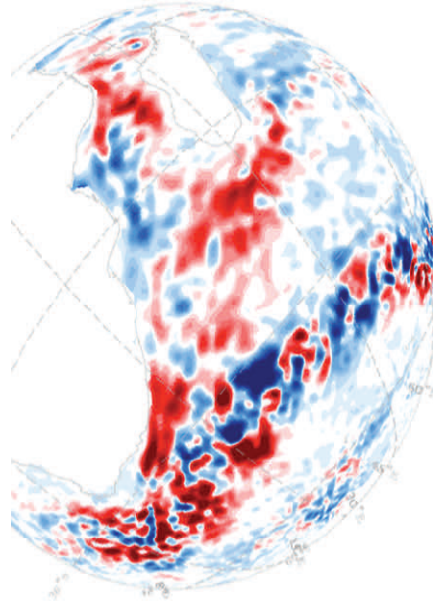


some cases simply changing the equation used to calculate the velocities, or the detail of the ocean bottom topography completely changes the result obtained from the simulation. Such discrepancies stem from our limited understanding of the processes that drive the dynamics, and hence our inability to describe it in mathematical terms. Indeed there is a need for observations that confirm these important model results.

Altimetry is a technique for measuring height. A pulse of radiation is sent from a satellite toward the Earth's surface, and the return time to the antennae is measured. Combined with precise information about the height of the satellite above the Earth, the ocean's sea surface height can be determined. This information in turn can be used to derive ocean currents, and in their kinetic energy. Eddy kinetic energy is the energy contained within the varying component of an ocean current. For example, regions of high eddy kinetic energy are said to contain a lot of eddies and meanders, that cause the current to shift significantly, and often, from its mean path. Satellite altimeters have been measuring the ocean height since 1993, these data are now the longest, most accurate data series of global ocean currents.

Recently, scientists at the University of Cape Town showed, using satellite altimetry measurements, that the eddy kinetic energy in the Agulhas system has intensified over the past two decades.

By tracking eddies in the Agulhas system from the satellite measurements it is apparent that the intensified eddy kinetic energy is related to accelerated eddies moving through the system. In particular south of Africa, eddies propagate into the South Atlantic Ocean at a much faster rate, which suggests that the Agulhas leakage has



The decadal trend of eddy kinetic energy calculated from geostrophic currents derived from sea surface height measurements from satellite altimeters. Warm colours indicate regions of increased variability of eddies and meanders.

increased since 1993. This confirms previous modeling studies, and for the first time an increased Agulhas leakage has been inferred from observations.

The overall intensification and acceleration of mesoscale features in the Agulhas can be attributed to enhanced Indian Ocean trade winds that result in a faster flowing South Equatorial Current feeding into the Agulhas Current system. The results, recently published in *Nature Climate Change* (available [here](#)), present a new aspect of how changes in the gyre-wide circulation of the Indian Ocean impact the Agulhas system, and ultimately may effect our present day climate.

For more information, please see the paper entitled "Impact of intensified Indian Ocean winds on mesoscale variability in the Agulhas system" published in *Nature Climate Change* (2012) doi:10.1038/nclimate1587.

PHD OPPORTUNITIES IN GERMANY

We are looking for PhD students interested in studying in Kiel, Germany as part of a bilateral, multi-institutional German/South African program. There is a full bursary, inclusive of a 3 month intensive language course. The research would involve global ocean models with regional focus in the Agulhas. There will be an opportunity to set up and run the model, validate the output and look at various scientific questions, both regional, such as the interplay between Agulhas rings and Benguela Upwelling, but also global, mainly the embedding of Agulhas leakage in the thermohaline circulation.

You would be based in Germany working with Arne Biastoch, the South African collaborators are Prof Chris Reason and Drs Juliet Hermes and Bjorn Backeberg.

Contact Juliet Hermes Juliet@saeon.ac.za and/or Arne Biastoch abiastoch@ifm-geomar.de if you are interested. Click [here](#) for more information.

Application closing date

30 SEPTEMBER 2012



GEF-UNDP publications feature Large Marine Ecosystems

The United Nations Development Programme (UNDP) and the Global Environment Facility (GEF) have recently produced two publications which includes results on the Benguela Current Large Marine Ecosystem (BCLME) and the Agulhas and Somali Current Large Marine Ecosystems (ASCLME) projects.

International Waters – Delivering Results

The earth's water and ocean ecosystems provide mankind with a wide range of both market and non-market ecosystem services, including food, drinking water, recreation, transport, energy resources, minerals, climate regulation, etc. Billions of people depend on healthy marine and freshwater systems for their livelihoods and security. These vital ecosystems face a range of threats to their integrity, including pollution, overfishing, unsustainable water use, invasive species, habitat loss, and impacts from climate change such as ocean acidification. Despite numerous international commitments, the majority of these threats continue to increase at a geometric rate, underscoring the urgency for taking immediate action to reduce stress on these ecosystems and permit their recovery.

The majority of the earth's major freshwater and ocean ecosystems straddle the boundaries of two or more nations, underscoring the need for cooperative approaches among the countries sharing such resources. For over twenty years, UNDP-GEF's International Waters programme has been supporting groups of countries in their joint efforts to sustain the critical market and non-market ecosystem services provided by many of the world's most significant transboundary lakes, rivers, aquifers and Large Marine Ecosystems (LME). To date, UNDP-GEF has supported over 100 countries in efforts to sustainably manage 13 LMEs, 10 river basins, 6 lakes and 2 aquifers.

UNDP-GEF has developed and applied a series of strategic planning methodologies that have proven highly effective not only at facilitating regional and national governance reform to improve management of these transboundary systems, but, in many cases,

at catalysing sizeable quantities of public and private finance to address priority transboundary issues. These instruments include the GEF's Transboundary Diagnostic Analysis/Strategic Action Programme process, Integrated Coastal and Water Resources Management, and building on regional and global legal frameworks. Each approach follows a similar overall process of prioritising water or ocean issues, identifying barriers to sustainable use, determining appropriate mixes of policy instruments to remove barriers, and implementing agreed reforms and investments.

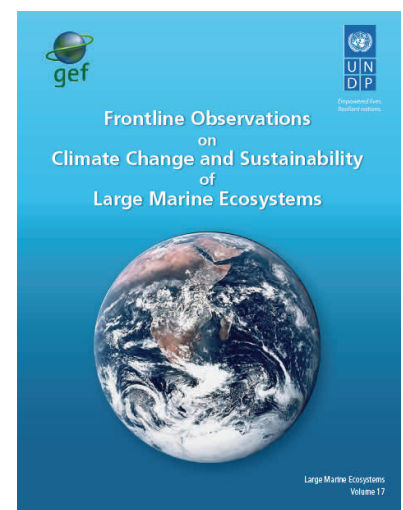
This publication highlights UNDP-GEF International Waters portfolio results achieved across four UNDP-GEF 'signature' programmes: Large Marine Ecosystems; Transboundary Lakes, Rivers and Aquifers; Integrated Water Resources and Coastal Area Management; and Global Programmes. A series of project case studies review delivery of results in the context of the GEF International Waters focal area's Results Indicators framework – Process, Stress Reduction and Environmental and Socioeconomic Status Results. The publication also includes an overview of cumulative results delivery across the entire UNDP-GEF International Waters portfolio since 1991.

[International Waters – Delivering Results](#) 2012 clearly demonstrates how a series of proven strategic planning instruments can be used to deliver both the governance reforms and investments needed to reverse the degradation of the world's principal transboundary water systems. These methodologies are not only effective but are highly replicable and scalable, underscoring the importance of continued GEF and partner investment in sustaining the world's critical water and ocean systems if we are to move towards a truly sustainable pathway.



Frontline Observations on Climate Change and Sustainability of Large Marine Ecosystems

The growing risks and impacts of climate change and the accompanying loss of ecosystem services require the world to urgently invest in a new development paradigm. As the UN's global development network, UNDP recognizes the increasing urgency of mainstreaming climate change into sustainable development planning at all levels, linking development policies with the financing of solutions and helping countries move towards less carbon intensive economies. The Large Marine Ecosystem (LME) approach recommends a baseline of information at the LME management scale on changing states of productivity, fish and fisheries, pollution and ecosystem health, and socioeconomic and governance conditions. This information provides data to assess the extent of overfishing, nutrient over-enrichment, habitat loss, and warming in LMEs around the globe. Through the GEF's Transboundary Diagnostic Analysis/Strategic Action Programme (TDA/SAP) approach, this LME data set can inform issue prioritization, strategic planning and adaptive management of LMEs towards sustainability. This volume is a key contribution to advancing LME management in a changing climate. The authors describe the impacts of climate change on LME sustainability in Africa, Asia, and Latin America and the key role the GEF has played in mobilizing financial support crucial to developing countries committed to carrying forward an ecosystem based approach to sustain LME goods and services. The publication can be downloaded [here](#).





The negotiation of knowledge for coastal governance

By Louis Celliers¹, Dianne Scott²,
Susan Taljaard¹, Mvu Ngcoya²
& Michelle Audouin¹

¹CSIR-Natural Resources and the Environment

²School of Built Environment and Development Studies, University of KwaZulu-Natal

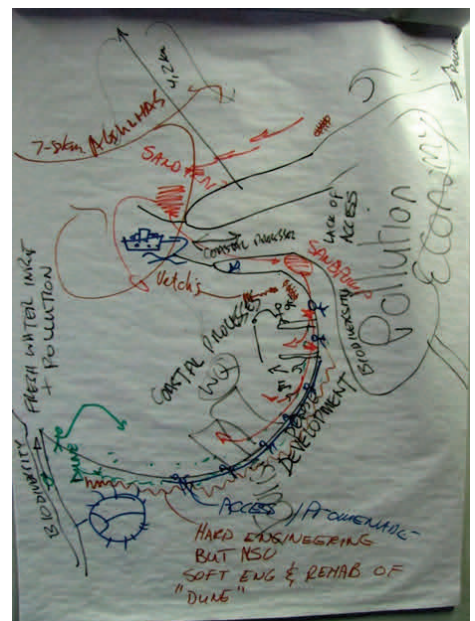
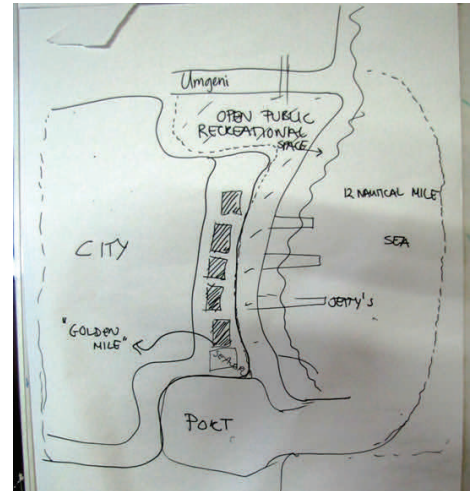
In May 2011, the CSIR (Natural Resources and the Environment), in partnership with University of KwaZulu-Natal's (UKZN) School of Development Studies (SDS, now School of Built Environment and Development Studies – SBEDS) - submitted a proposal to the Department of Science and Technology (DST) within the context of the Global Change Grand Challenge and the Global Change (GCGC), Society and Sustainability Research Programme (SSRP) Knowledge Challenge D: Innovation for sustainability posing the main research question: *How applicable is the 'knowledge negotiation' model for producing appropriate knowledge for coastal governance in the context of a neo-liberal, developing society in the process of transformation?*

The main objective of the research is the development and testing of an innovative and radical model for (scientific) knowledge production at local (or municipal) levels. The theoretical problem posed in this project, is that in order to create a 'democratic knowledge-society' an alternative model of knowledge production needs to be developed that is appropriate for coastal zone governance in a developing society. The purpose of this model is to inform evidence-based decision-making and management of South Africa's coastal resources, to build competence and to contribute to the theoretical debate around the development of a democratic knowledge-society. The main research question is the following: *How applicable is the 'knowledge negotiation' model for producing appropriate knowledge for coastal governance in the context of a neo-liberal, developing society in the process of transformation?*

The project team is using the Durban Golden Mile as a case study since this area represents a typical relationship at the city-port-environment interface. In Durban, climate change challenges have received much attention and are being actively addressed by the local municipality.

At the core of the project is the convention of a competency group of relevant "knowledge holders" e.g. scientist, managers, beach users and residents that will produce a new type of knowledge for coastal management. During a series of workshops over a period of a year, the competency group will debate the range of conflicts occurring in the study area and combine their knowledge to produce a more comprehensive and richer basis for decision-making. Traditionally, such information is generated by an appointed consultant, focusing on biophysical and management aspects but to date have neglected the inclusion local knowledge, e.g. the underpinning value systems of various actors competing within a specific coastal space. Such information (typically referred to as situation assessment reports or background information documents) is a critical starting point in the development of integrated coastal management programmes.

One of initial research activities of this project was an inception meeting of the research team that was held over two days, directly followed by a key stakeholder meeting. One of the first and obvious observations made during these meetings were the framing of the coastal issues that is at the heart of the project. The manner in which these two groups, i.e. the project team (scientists) and key stakeholders (government official/managers) observed their world and represented their perspective on a two dimensional surface (the Golden Mile of Durban), was conspicuously different. This provides an inkling of the diversity of the expression of knowledge,



and the need to explore ways in which to learn from each other in order to understand the problem and find mutually agreeable solutions for coastal issues.

The project will run over three years and will form the basis for active collaboration between the project team and eThekweni Municipality, the Provincial and National Government.

For more information contact Louis Celliers (lcelliers@csir.co.za), Dianne Scott (scottd@ukzn.ac.za) or Mvu Ngcoya (mvu.ngcoya@ukzn.ac.za)



The African Marine Atlas of ODINAFRICA

By Anja Kreiner

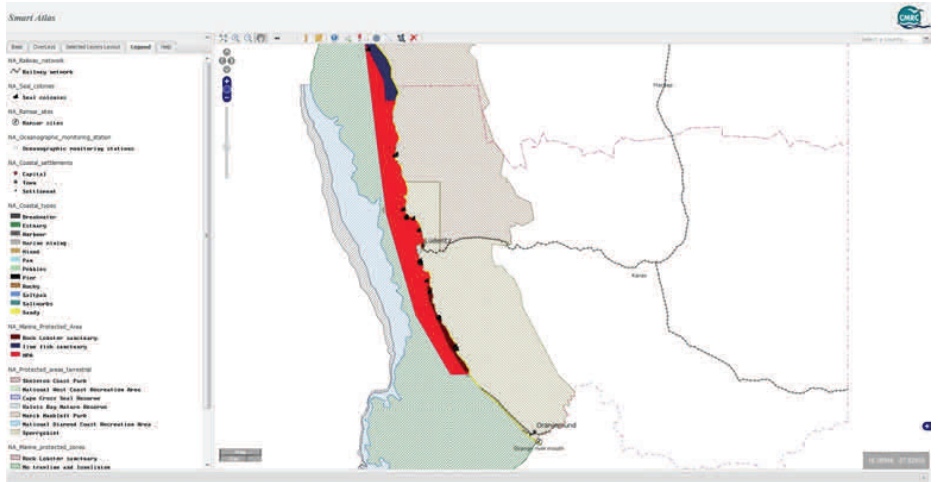


National Information and Research Centre, Namibia

The Ocean Data and Information Network for Africa (ODINAFRICA) brings together marine related institutions from twenty seven (27) Member States of the Intergovernmental Oceanographic Commission (IOC) of UNESCO from Africa.

With the support of the IOC of UNESCO and the Government of Flanders (Kingdom of Belgium) the network strives to address the challenges faced in ensuring that ocean and coastal data and information generated in national, regional and global programmes are readily available to a wide range of users in an easily understandable format. The participating institutions constitute a network of ODINAFRICA NODCs (National Oceanographic Data Centers) which are part of the IODE network of NODCs.

The African Marine Atlas (AMA) (www.africanmarineatlas.org) is being developed under the current phase of the ODINAFRICA project. AMA will eventually



An example of layers included in the Namibian National Atlas

form part of the International Coastal Atlas Network (ICAN).

AMA provides a comprehensive resource for coastal and marine information at regional and national scale for decision makers and marine scientists. Target products and services will be developed for national and regional users about the African coasts and oceans. AMA further provides an opportunity to build capacity for marine data management.

The African Marine Atlas allows the user to search for available layers and view metadata. The five themes displayed in the atlas are: Atmosphere, Basemaps, Biosphere, Geosphere, Human and Hydrosphere. Open

source data (e.g. from World Ocean Atlas) as well as national datasets are displayed in the atlas. Layers, which address priority issues at local, national and regional level, have been developed. Several workshops were held during which atlas team members were equipped with skills to develop the atlas on a national basis.

Initially the MIDA software was used for the atlas. In 2012 the new software (Smart Atlas) was developed. Smart Atlas is more user-friendly and has additional features which were not available under MIDA.

In July 2012 the atlas editorial team met in Nairobi to test the new software (Smart Atlas), to define the base layers to be included in all national and regional atlases and to standardize symbols and legends. In September 2012 all national atlas team leaders will meet in Nairobi to receive training on the new software and transfer the national layers to Smart Atlas.

The final online atlas will consist of continental, regional (LME) and national components, each aiming to present data at the appropriate scale. We are aiming to have the first version of the atlas online by the end of October 2012 and the final version in March 2013.

To read more about the ODINAFRICA project, please visit the website www.odinafrica.net



Members of the African Marine Atlas Editorial team: (from left to right) Anja Kreiner (Namibia), Angora Aman (Ivory Coast), Anis Diallo (Senegal), Yassine Lassoued (Ireland), John Bemiasa (Madagascar), Ednah Onduso (Kenya) and Zacharie Sohoun (Benin)



A global network for monitoring ocean acidification

By *Louis Celliers & Pedro Monteiro*

CSIR - Natural Resources and the Environment

In the wake of a national workshop on Ocean Acidification (OA) that was convened in Cape Town in November 2012, Drs Louis Celliers & Pedro Monteiro were invited to attend an International Workshop to Develop an Ocean Acidification Observing Network of Ship Surveys, Moorings, Floats and Gliders. This event was held at the University of Washington, Seattle June 26 - June 28, 2012. This workshop was supported by the NOAA Ocean Acidification Program, the International Ocean Carbon Coordination Project, the Global Ocean Observing System, the Integrated Ocean Observing System, and the University of Washington. The details of the workshop, list of participants, agenda and the eventual outcomes will be available on the workshop [website](#).

This international workshop was convened in order to develop a proposal for an integrated global observing network for both carbon and ocean acidification that addresses the requirements of nations affected by this emerging environmental problem in response to societal needs.

The international workshop had five principal goals. Firstly it were to provide the rationale and design of the components and locations of an international carbon ocean acidification observing network that includes repeat hydrographic surveys, underway measurements on volunteer observing ships, moorings, floats and gliders, taking into account existing networks and programs wherever possible;. Furthermore the workshop aimed to identify a minimum suite of measurement parameters and performance metrics for each major component of the observing system; develop a strategy for data quality assurance and data distribution; and discuss requirements for program integration at the international level.

The 3-day workshop was held at the University of Washington on June 26-28, 2012 for a group of 50-60 international scientists and program managers.

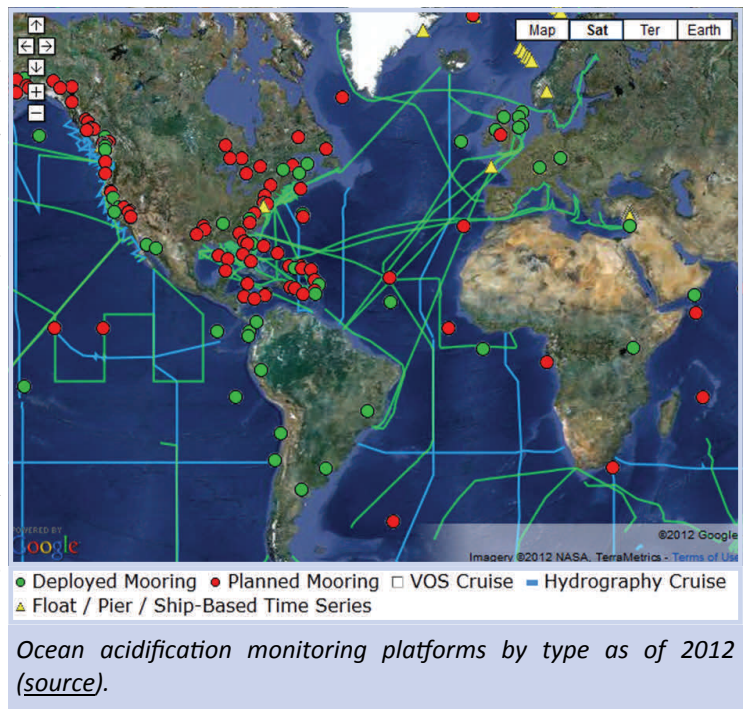
It was clear from the level of ongoing and existing monitoring that there is a mismatch between the infrastructure and capabilities of developing nations and developed nations (as seen in the figure below).

The cost of providing platforms for any ocean monitoring remains high. This is no different for the deployment, operation and servicing of sensors for the measurement of OA parameters. These costs are a barrier for the use of platform such as ships, gliders and moorings. The resultant limited skills and capacity available in developing nations is the cause of large geographical gaps in the existing global monitoring coverage. The Seattle workshop participants, primarily from the northern hemisphere, acknowledged these gaps and expressed their interest and commitment to contribute to the development of a truly global OA network. (For science media coverage of the workshop visit [here](#)).

South Africa, through the work of the CSIR Southern Oceans Carbon-Climate Observatory (SOCCO), is an exception to the general lack of skills and infrastructure on the continent, and represents a collection of world-class assets for OA monitoring. The success of SOCCO has resulted in the devel-

opment of a CSIR funded project entitled The Sensitivities and Vulnerabilities of Southern African Regional Seas and their Ecosystem Services to Ocean Acidification (SAVES-OA). This four year project, in collaboration with other partners such as ACCESS, SAEON and DEA, will create the basis for the inception of coastal OA monitoring in South Africa, and provide a platform for discussions on regional OA monitoring. The Western Indian Ocean region, through the work of CSIR, WIOMSA, ASCLME and other institutions, is ready to grow the capacity and skill to take part in this global monitoring and science programme.

South Africa is developing infrastructure, skills and capacity to play an active role in the fledgling global OA community. The potential impact of OA on coastal communities of Southern and Eastern Africa is truly frightening and the ability to measure and predict these impacts is no longer a luxury.



For more information on coastal and ocean acidification contact Louis Celliers (lcelliers@csir.co.za) or Pedro Monteiro (pmonteir@csir.co.za) of the CSIR.



Monitoring coastal dynamics from space

By *Melanie Lück-Vogel & Louis Celliers*

CSIR - Natural Resources & the Environment

The coast of South Africa is a highly dynamic environment. Tidal influences, seasonal variations and the effects of storm events can rapidly and dramatically change the face of the shoreline. This is particularly true for sandy beaches. Besides the natural forces, humans and their activities shape the coast through the transformation of the natural environment to the sealed surfaces common of urban settlements, crop agriculture or more subtle changes through the gradual degradation of dune vegetation.

As a coastal manager, some of the coastal processes have to be monitored over time to decide if, for instance, the retreat of a beach is just a seasonal and natural phenomenon or whether it is an anthropogenically-driven process which requires a management intervention. However, the scale of monitoring is a challenge given the considerable length of the national coastline of more than 3,500km.

As a result, the assessment of coastal processes and dynamics usually focuses on "hot spots" of high economic value, such as urban areas and ports. The assessment of rural and undeveloped coastal areas remains largely unmonitored.

However, these coasts which are considered to make a limited economic contribution are becoming increasingly important since they provide natural goods and services the rural coastal communities depend on.

Based on a growing understanding of such ecosystems goods and services, governments are starting to respond by promoting management interventions that will restore and maintain these services. This is particularly important for the growing need to increase the resilience of communities to the projected impacts of global environmental change, particularly for the tropical African shores. As many of the continental shores are predominately sandy, these coastal communities often live in low-lying areas exposed to natural hazards such as storm surges and hurricanes. The force and the frequency of such extreme events are expected to increase in the predicted future climate. The expectations are that the natural coastal environment will be changing faster than we can monitor using traditional methods.

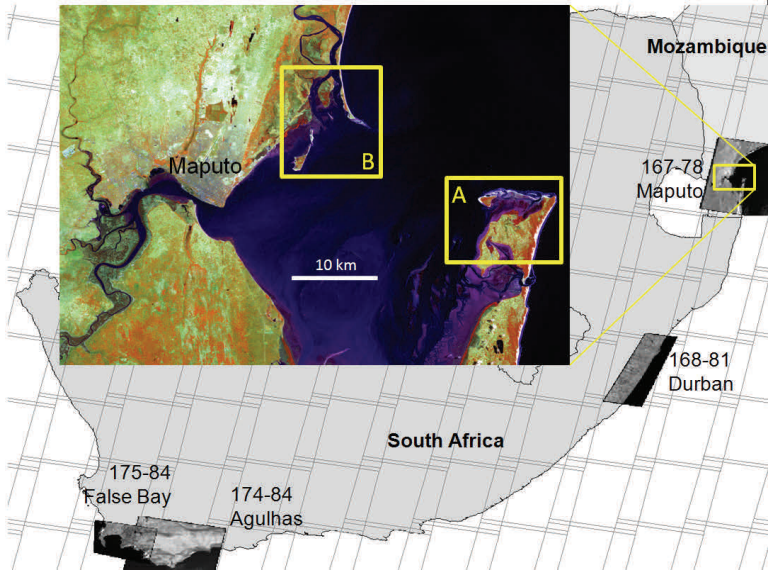


Figure 1: Location of the test sites in South Africa and Mozambique. Colour image inlaid: details of Maputo image; A and B: areas displayed in figures 2 and 3.

Remote sensing technology can be employed to identify areas at risk from coastal and marine hazards by assisting with the collection and interpretation of data over large areas, over time, while being fast, cost-effective and consistent in delivering information and data with high-levels of accuracy. Some of the environmental earth observation satellites, such as the satellites of the Landsat family, have been in space since the 1980s and can therefore provide information on the Earth dating back more than 25 years. The value of remote sensing for coastal management purposes has been recognised for many years, yet its full application and benefit is still to be realised in Africa.

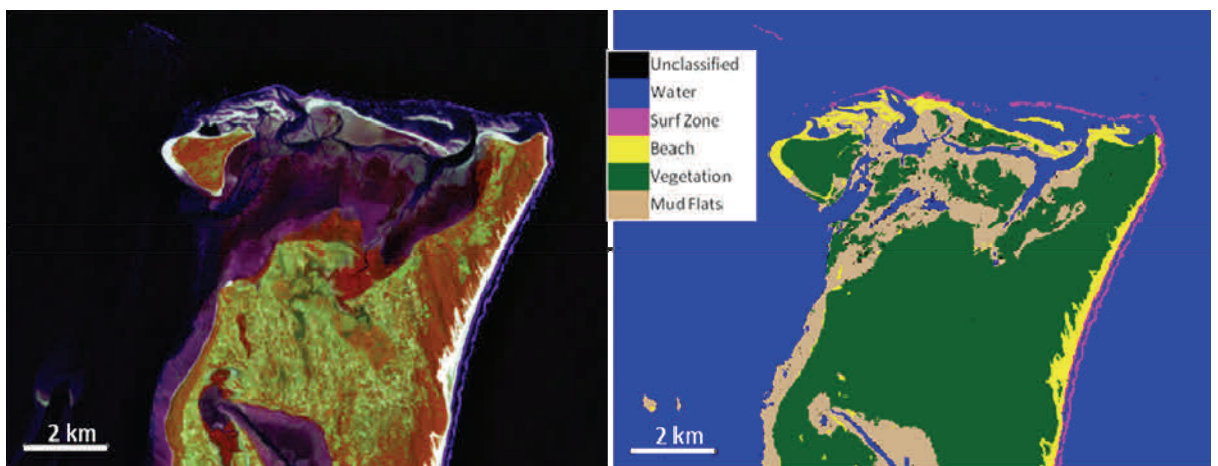


Figure 2: Subset of the Maputo image from 30 Oct 2001. Left: In this band combination of the Landsat image, dense and woody vegetation shows in red, open non-woody vegetation in green tones. Right: classification result.



The remote sensing unit of the CSIR Coastal Systems Research Group in Stellenbosch explored the use of space-borne imagery for the detection and monitoring of coastal dynamics. The aim of the project was to prove that relevant land cover types and the position of their respective borders can be extracted from satellite imagery in a push-button approach. The push-button approach was a requirement to ensure fast and efficient extraction of result for use in an operational coastal management environment. Such a system allows for the rapid, reliable and repeatable extraction of standardised information from a series of images over space and time.

Therefore it was decided to focus on the automatic detection of beaches, coastal vegetation, water (the ocean) and the surf zone. The position of the waterline (as indicator for the shoreline) can then be extracted as the border between beach (or vegetation) and ocean. When comparing images over time and taking into account tidal variation, changes in the position of the water line will reveal potential erosion or accretion of the shore. The tidal effect is of particular importance for shallow areas with great intertidal ranges such as you would find in Mozambique.

We also extracted the surf zone, which is the near-shore area where the waves break. For the waves to break, the water needs a certain shallowness. Therefore, changes in the surf zone can be taken as an indicator for changes in the bathymetry which is the underwater shore topography. For example, a decreasing width of the surf zone might alert the coastal manager of potential erosion processes. Coastal stabilisation measures can then take place.

We tested our approach on four coastal locations which were Maputo Bay, Durban, Cape Agulhas and False Bay (Figure 1).

Maputo Bay is characterised by a shallow sandy shore line which exposes large tidal mudflats during low tides. Using a Landsat image which was taken at low tide, the extensive mudflats could be detected (Figure

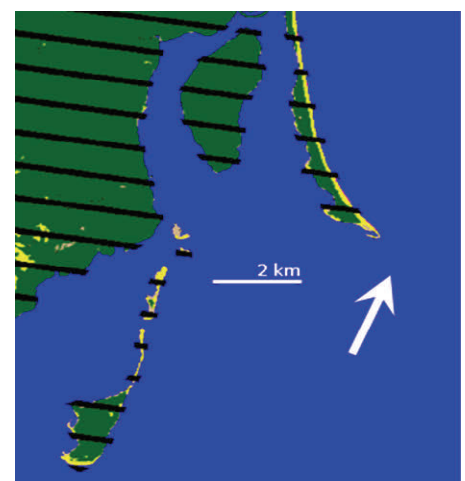
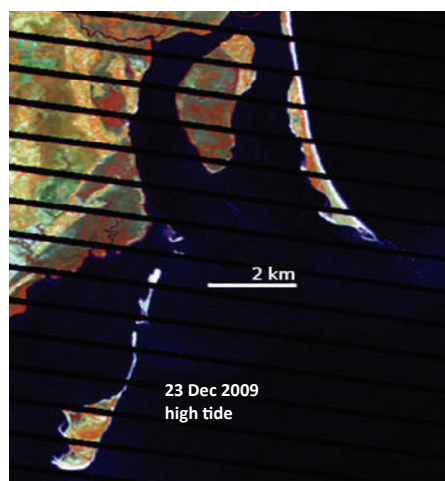
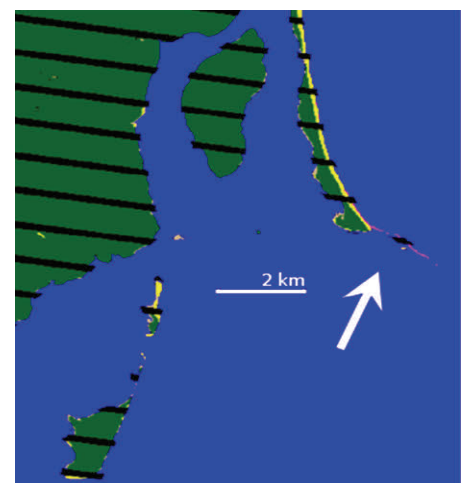
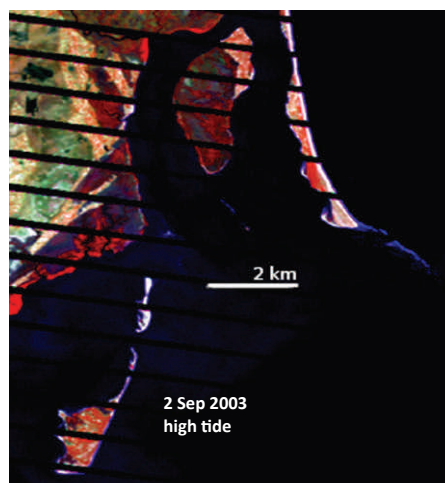
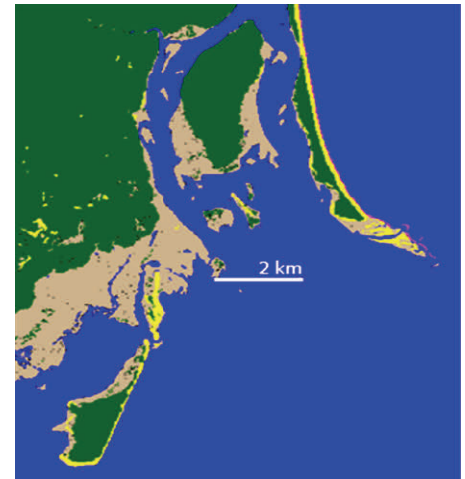
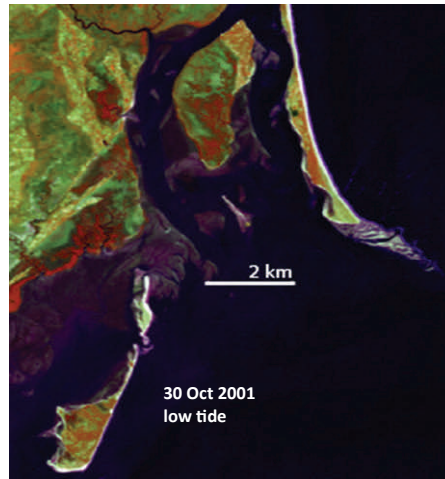


Figure 3: Another subset of the Landsat image for Maputo. Left: False colour image, same as in Figure 2. Right: the respective classification results. The same colour code as in Figure 2 is used. White arrow indicates changes in submerged sandbank. The black stripes in the 2003 and 2009 images originate from an error in the original Landsat images.

2). Comparing the tidal states of a series of images helps to interpret the classification results. For instance, we know that the Maputo image from 30 Oct 2001 (Figure 2 and Figure 3, top) was taken at low tide. Extensive intertidal mudflats are visible. In con-

trast, the images from 2 Sept 2003 and 23 Dec 2009 (Figure 3, centre and bottom) were taken at high-tide. So their tidal state is comparable and the images should look identical. However, at the headland in the right image part (white arrow) there are differ-



ences visible. In the earlier years there was an intertidal sediment bank prelocated to the tip of the headland. In the 2001 low tide image, the sediment bank is exposed and detected as mud flat in the classification. In the 2003 high-tide image the bank is inundated, but its presence still indicated by the pink fringe of breaking waves at its eastern extension. However, in the 2009 high-tide image, this fringe is no longer visible, indicating that the sand bank has eroded. According to local experts this erosion took place during a storm-event in the period between the acquisitions of the images.

Cape Agulhas is South Africa's southernmost and sparsely populated land tip. The shore is relatively low, with a mixture of rocks and sandy beaches. The classification of the Landsat image from 14 May 2003 shows large mobile dune fields in the Cape Agulhas/Struisbay region (Figure 4). Also, as a surprise, the classification detected submerged vegetation, probably kelp beds, close to the coast (red arrow in Figure 4).

For this project, images of the Landsat 5 and Landsat 7 satellites with a pixel size of 30m have been used. Their multispectral sensors Thematic Mapper (TM) and Enhanced Thematic Mapper plus (ETM+) onboard Landsat 5 and 7 respectively have been delivering comparable images since about 1984. This makes Landsat the best available satellite for long term monitoring of environmental processes at a regional scale. A further advantage is that now the images can be

downloaded from the internet free of charge (for instance <http://glovis.usgs.gov/>). This makes the assessment of coastlines even on a national scale affordable taking into consideration that e.g. South Africa's coastline is covered by about 20 Landsat images (compare Figure 1). However, for steep coasts with narrow beaches spatially limited but relevant changes of the coast are likely not to be detectable with Landsat. A retreat of the shoreline for 30 meters or more to be detectable on a Landsat image might already be a disastrous event for such areas. For those cases we will have to come up with solutions using other satellites with a better spatial resolution. Potential options are using [SPOT 5 imagery](#) (2.5-20 m pixel size,) or [RapidEye](#) (6.5 m pixel size,), just to name a few.

The results of the presented CSIR project demonstrate a solution to assess the major coastal land cover types in a fast and efficient way and to monitor changes over time. It is in a ready-to-use state for environments where the level of spatial detail provided by Landsat is sufficient, such as the shallow sandy coasts of the Western Indian Ocean. This approach can also easily be advanced to allow for the detection of other relevant land cover types, such as mangroves, sedges and settlements for a more comprehensive picture of dynamics of the coast as a baseline for integrated coastal management solutions.

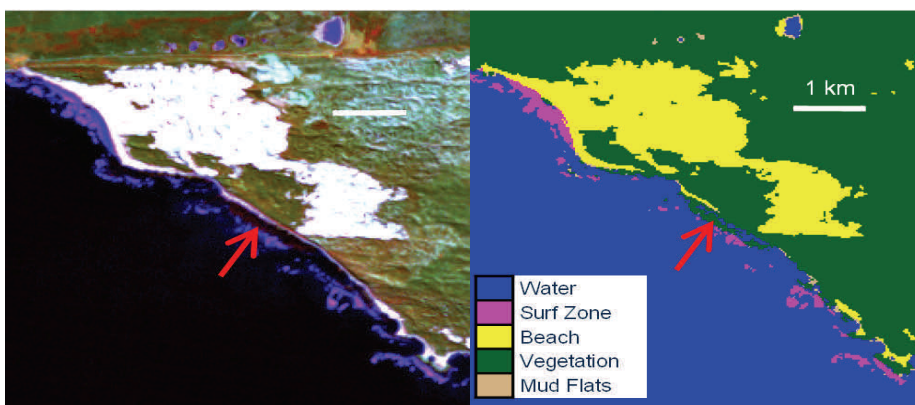


Figure 4: Subset of the Cape Agulhas Landsat image from 14 May 2003 and the classification derived thereof. The red arrow indicates an area where vegetation has been detected in the water, probably kelp beds?

Vacancy for Professor/Associate Professor in Oceanography



The University of Cape Town has a strong international reputation in ocean and climate research and teaching. Within the Department of Oceanography, particular areas of interest include the Agulhas and Benguela Current systems, the Southern Ocean, climate change and variability, marine biogeochemistry and mesoscale meteorology. The department seeks to appoint a senior academic with research expertise in ocean, atmospheric, or climate modelling to complement and extend existing departmental strengths. The department has well developed computing facilities (including access to the Centre for High Performance Computing), a marine biogeochemistry laboratory, and access to ship time for research cruises in the South Atlantic, South Indian and Southern Oceans.

A PhD in Oceanography, Atmospheric Science, or related field is required. The incumbent will be expected to contribute strongly to teaching at both undergraduate and postgraduate levels, develop his/her own research programme and raise associated research funding, and provide academic leadership in the department and more generally within the Faculty of Science.

Closing date for applications:

1 October 2012

Further details are available [here](#).



The inaugural winter cruise of the SA Agulhas II

By Mthuthuzeli Gulekana

Department of Environmental Affairs

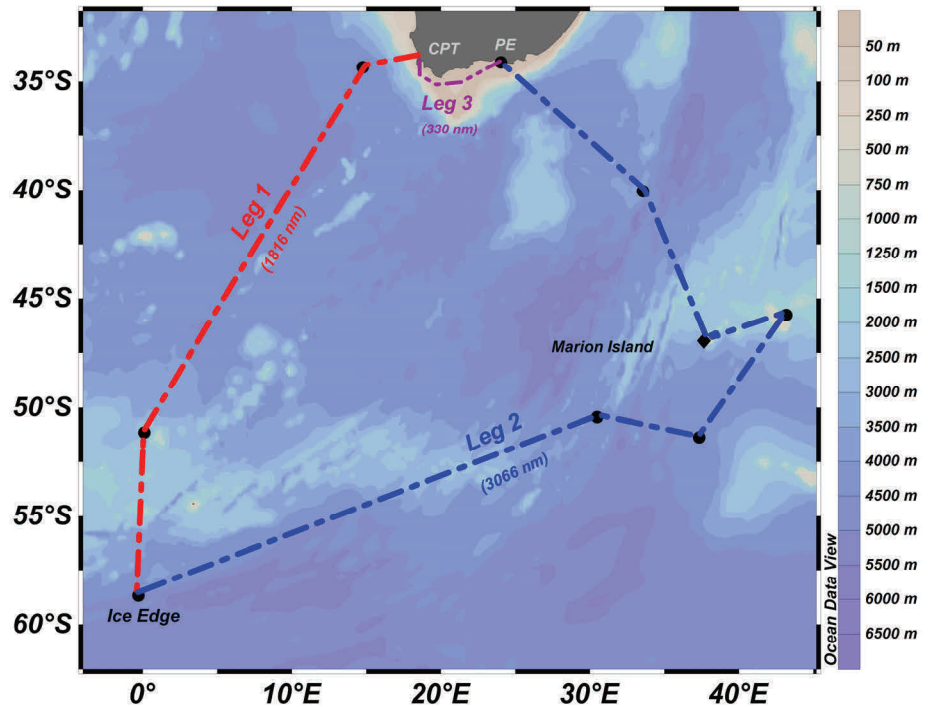
South Africa's new polar ship, the SA Agulhas II, embarked on its inaugural cruise to the Southern Ocean in July this year. Built in Rauma, Finland, it was acquired for scientific research and supply (logistics) purposes in the South African research bases situated in the Antarctica (SANAE IV) and the sub-Antarctic islands of Prince Edward and Marion (hereafter referred to as "Marion Islands").

In early April 2012, the ownership of the R1.3 billion vessel was officially transferred to South Africa, under the custodianship of the Department of Environmental Affairs (DEA). At this handover function in Finland, the ship was dedicated to the memory of Miriam Makeba, international jazz artist and civil rights activist.

On its arrival in South Africa in May, the ship was christened by a *sangoma* (African spiritual healer/doctor) who broke a calabash of *umqombhothi* (African traditional beer) on the ship's hull to welcome it to South Africa. The arrival received extensive media coverage and attracted huge public interest. The event (coordinated by DEA) was attended by dignitaries including Minister of Environment and Water Affairs, Ms Edna Molewa and Deputy Minister of Science and Technology, Mr Derek Hanekom.



Welcome and christening of the SA Agulhas II



Inaugural cruise track of the SA Agulhas II
Winter Shakedown Cruise

As the ship arrived, plans were already completed for the mandatory inaugural or 'shakedown' cruise to the Southern Ocean, to test the ship's scientific equipment and mechanical capabilities to withstand the harsh and extreme conditions that it would need to endure for the next 30 years. Shakedown cruises also provide an opportunity to familiarise the operators with the vessel. Collaborations were formed with scientists, engineers and technicians from various institutions and organisations in South Africa to advise DEA management on the assessment of the ship's capabilities.

The major objective was to sail the ship to the Antarctic ice edge, in the Southern Ocean, where the ice is thick enough to test the ship's ice-breaking capabilities (there was insufficient sea ice in the Baltic Sea). The cruise track consisted of three legs:

- Leg 1: From Cape Town, towards the east, southwest into the Greenwich Meridian Line and proceed to the ice edge
- Leg 2: From Ice-edge northeastward towards Marion Island and finally
- Leg 3: from Marion Island northward to Port Elizabeth and finally to Cape Town (the cruise track is shown alongside).

Each leg comprised of several stations where the Conductivity-Temperature-Depth (CTD) and eXpendable BathyThermograph (XBT) and Underway-CTD's (UCTD) were to be deployed at predetermined locations and times. The Chief Scientist on this voyage, Mr Ashley Johnson (DEA), liaised with the ship officers regarding crucial decisions about stations. The Chief Scientist was assisted by two co-principal investigators (PIs), UCT's Dr



Isabelle Ansoorge (Leg 1) and Dr Azwianewi Makhado of DEA (Legs 2 and 3) who reported directly to the Chief Scientist. The Pls had, in turn, group leaders in their team to ensure that the cruise was as successful as possible and to ensure that all systems were tested fully. A multidisciplinary research team of 49 members in total were deployed. These members included physical, chemical and biological oceanographers, zoologists, meteorologists, engineers, electronic technicians, ornithologists, marine ecologists and ship-builders amongst others.

The 28-day voyage was undertaken from 9 July 2012 until 6 August 2012. Researchers and students worked around the clock collecting a wide range of scientific data throughout the voyage. The last oceanographic samples were collected during an underway station at midday on 1 August 2012 after which, as mandatory to all cruises, the scientific equipment was switched off and/or packed away. Full analysis of the collected data was to be processed in the few coming weeks, with possible scientific and technical publications.

SA Agulhas II docks in Eastern Cape

After sailing its maiden voyage to the Southern Ocean, the SA Agulhas II docked in Port Elizabeth on 2 August 2012, to give members of the public in that region an opportunity to learn more about the vessel and its operations.

The SA Agulhas II could not have arrived in



the mainland at a better time, than to arrive at the start of August - Women's Month. To mark this special month, an all-women crew - from the pilot who guided the ship into port to the quayside crew who safely strapped the ship's rope to the quay poles - ensured that the ship was secured in its reserved berth. It was clear: women were on duty.

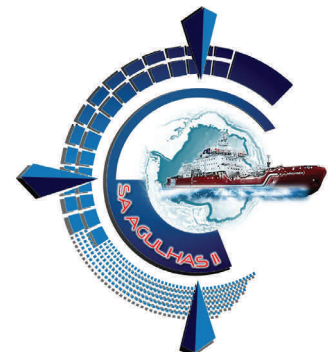
Once again, welcomed by dignitaries soon after docking, the SA Agulhas II drew wide interest from the media and the community. Eager to explore the vessel, 500 learners from surrounding areas boarded the ship on Friday, 3 August. They clearly enjoyed the demonstrations given by scientific personnel in the laboratories. No doubt, the scholars had set the tone for the open day on Saturday, 4 August. Later termed the "PE Anacon-

da", the queue of eager public came from as far afield as Uitenhage, Grahamstown, East London and Port Elizabeth. At least 3000 people attended the open day. The exhibitors and demonstrators inside the ship were given no chance to relax as groups of 15-20 people were ushered in at a time, with the ship's crew playing a major role in controlling the "traffic onboard" by directing the groups to the various designated stops and areas.

The last group went down the gangplank at 16h00 on Saturday. More than 3500 people had seen the ship in two days. As a result of this overwhelming success, the SA Agulhas II was meant to sail from Port Elizabeth at 17h00, the ETD (expected time of departure) was eventually moved to 21h00. Returning to Cape Town, this concluded a successful winter inaugural cruise.



Spiraling queues of interested people came to view the vessel





Dolphin pathology project—how healthy are our dolphins really?

By Stephanie Plön^{1,2} and Emily Lane³

¹South African Institute for Aquatic Biodiversity (SAIAB); ²Bayworld; ³National Zoological Gardens of South Africa

It reads like a scene from a science fiction thriller: first about 900 dolphins and porpoises washed up dead on the beach, then almost as many pelicans. The scientists were puzzled—no-one really knew what was causing the mass die-off - and speculations about the possible reasons ranged from acoustic trauma caused by seismic exploration to a virus affecting both birds and mammals alike.

Unfortunately it is not a science fiction novel, but a harsh reality that recently played out along Peru's North Pacific coastline. Such incidences have to date only been known from the Northern Hemisphere, such as the seal and dolphin die-offs from the North Sea and Mediterranean in the 1980's and early 2000's, which were caused by Phocine distemper virus and a previously unknown morbillivirus (the morbilliviruses are a group of viruses including the human measles and canine distemper viruses).

To date we have been lucky here in South Africa as we have not seen any such major die-offs involving marine mammals off our coastline. Although we record and expect low levels of disease in wild populations as a natural occurrence, it was surprising then that the same pathological changes visible with the naked eye were evident in almost all dolphins dissected during routine necropsies at the KwaZulu-Natal Sharks board in 2009. Between 20 and 25 dolphins drown in the shark nets off KwaZulu-Natal every year and since the early 1980's scientists from the Port Elizabeth Museum have made use of the opportunity to dissect these unfortunate animals and to accession data and samples from them to the Graham Ross Marine Mammal collection at the museum for them to be available for research purposes. Past and present studies on these samples include research on the morphometrics, genetics, life history parameters, and diet of

these animals.

But 2009 proved to be an unusual year as almost all animals showed signs of some abnormalities on major organs, such as numerous blisters on the lining of the organs and in the abdominal cavity. What was going on?

Us traditionally trained marine biologists unfortunately learn very little about diseases in the marine environment, so I knew I had to seek expert input. Luckily someone suggested that I enlist the assistance of the pathologist at the National Zoological Gardens of South Africa in Pretoria, Dr. Emily Lane. And fortunately Emily did not shy away from such an exciting new challenge either, since she knew all about land critters of all sorts, but had until then had very little exposure to marine animals. Jointly we set out to try and elucidate what was going on and, together with German colleagues trained in the very specialized field of marine mammal pathology (Drs. Peter Wohlsein and Ursula Siebert, both from the Veterinary University, Hannover, Germany), a collaborative research project supported by the NRF and the DFG (its German equivalent) was initiated in 2010 to investigate the general health, including the pathological changes we had observed, of the dolphins incidentally caught in the shark nets off KwaZulu-Natal.

Marine mammals in general and particularly coastal species are increasingly used as indicator species of marine environmental health as they can be sentinels for human health where humans are using the same coastal environment. Most of the dolphins caught in the shark nets are either Indian Ocean bottlenose dolphins (*Tursiops aduncus*) or Indo-Pacific humpback dolphins

(*Sousa chinensis*), both coastal species, and thus potentially prone to a number of anthropogenic impacts on their health, ranging from disturbance due to coastal developments to pollution from agricultural run-off and sewage outlets. However, we know very little about the general health status of these animals—some baseline studies on the general biology of these two species from KwaZulu-Natal exist due to previous studies on specimens from the shark nets, but little is currently known on how the changing marine environment affects the lifestyle, population dynamics, and health of these species.

However, increasing evidence emerges elsewhere in the world that supports a link between human environmental disturbance and emerging infectious diseases of wildlife populations. It is becoming clear that anthropogenic environmental changes may promote the emergence of pathogens through transportation and introduction of infectious agents or hosts to new environments, through the manipulation of local ecosys-



Morne de Wet (University of Pretoria, Onderstepoort), Ursula Siebert (Veterinary University of Hannover, Germany) and Stephanie Plön (SAIAB/Bayworld) during necropsies at the KwaZulu-Natal Sharks Board.



tems to favour proliferation or prolonged survival of infectious agents, or by facilitating new host-pathogen interactions. These emerging infectious diseases in turn pose threats to ecosystem biodiversity and human health. Thus the interdisciplinary field of conservation medicine, the interface between human, wildlife and ecosystem health, is emerging as an ever more important field of research.

The preliminary results from the health assessment obtained by the MSc student on the project, Dr. Morne de Wet (a qualified veterinarian), under the guidance of Dr. Peter Thompson from Onderstepoort, indicate that the changes in the animals first seen in 2009 were caused by a parasite, which appears to have been sweeping through the populations at that time. Nowadays we rarely see animals with similar signs any more. Exactly what caused this “outbreak” of the parasites and why they were seen in so many animals from both species remains unclear- possibilities range from an altered immunity of the dolphins due to environmental pollutants, over climatically driven changes in the food of the dolphins causing

changes in the lifecycle of parasites, to the introduction of a new parasite due to altered rates of contact between different species.

The results from the investigation of the Peruvian pelicans indicated that the animals died from a combination of malnutrition and parasitosis. A lack of Peruvian anchoveta (*Engraulis ringens*) (whether due to climatic conditions or overfishing is unclear) had led to the pelicans not finding sufficient food, thus taking fish they usually do not eat and which may therefore not provide the required nutrition. As a result the animals may have been in bad condition, enabling the parasites, which are commonly present in wild Pelican populations, to thrive and thus cause the demise of the birds. However, the results on the dolphins and porpoises affected by the die-off remain contentious, some scientists being convinced that acoustic trauma was the cause.

Certainly the case of the Peruvian pelicans illustrates how changes in climate and related environmental changes go hand in hand with animal and human health as their habitats overlap or come into increasing contact. Peruvian authorities have warned people not

to eat the pelican meat or to get into contact with the dead birds due to the possibility of contracting the parasite.

But the story does not end here. Recent findings by Ian Lipkin and colleagues in the United States are alarming: their research results recently published by the *American Society for Microbiology* indicate that the cause of death of 162 harbour seals in New England, USA, last year may have been from a type of the H3N8 influenza A virus, which is closely related to a flu strain circulating in North American birds since 2002. Since seals have receptors for both the bird and mammalian flu virus the virus could potentially mutate into a variety more capable of causing disease in humans.

What we do know is that the South African coastal dolphins currently show very few signs of disease and appear to be generally in good health within the realm of what is expected for wild mammal populations. However, exactly what caused this “outbreak” of the parasites and why they were seen in so many animals from both species remains unclear. Multidisciplinary teams are needed to piece together the full puzzle: biologists, parasitologists, pathologists, toxicologist etc. As we continue collaborating with colleagues in Germany it becomes more evident how much capacity building still is required in South Africa in the field of marine diseases and, more specifically, marine conservation medicine.

Further reading:

T. B. Waltzek, G. Cortés-Hinojosa, J. F. X. Wellehan Jr. and G. C. Gray (2012) Marine Mammal Zoonoses: A Review of Disease Manifestations *Zoonoses and Public Health*: 1-15. published online 14 June 2012 (DOI: 10.1111/j.1863-2378.2012.01492.x)

[Lipkin and Moscona](#)

M.A. Miller, I.A. Gardner, C. Kreuder, D.M. Paradies, K.R. Worcester, D.A. Jessup, E. Dodd, M.D. Harris, J.A. Ames, A.E. Packham, P.A. Conrad (2002) Coastal freshwater runoff is a risk factor for *Toxoplasma gondii* infection of southern sea otters (*Enhydra lutris nereis*) *International Journal for Parasitology* 32: 997–1006



Team members from the Port Elizabeth Museum/Bayworld, National Zoological Gardens (Pretoria), Rhodes University and the Veterinary University of Hannover, Germany, during dolphin necropsies at the KwaZulu-Natal Sharks Board.



BASICally – It works!

By Paws Pillay

Marine Research Institute – UCT

In 2010 Ma-Re affiliated researchers gathered at the Kirstenbosch Botanical Gardens and took on the challenge of addressing aspects of climate change research in an interdisciplinary manner. After much discussion, debate and further deliberation the BASICS project - **B**enguela and **A**gulhas **S**ystems for supporting **I**nterdisciplinary **C**limate-change **S**cience — was conceptualised and developed. The project was designed to focus on the development of a system of 'marine data collection and integration into models' that aim to project ocean conditions (both physical and biological) at the seasonal time scale.

The overarching aim of Ma-Re BASICS is to provide an umbrella framework that incorporates diverse projects on marine social

and ecological systems, spanning multiple disciplines and extending across different departments and faculties. From this a system of physical and biological indicators are being developed, that will be of practical use in ocean forecasting and fisheries management, with the prospect of better social and economic planning for coastal communities. Hence the BASICS programme is at the nexus of interdisciplinary research, rapid coastal development and planning and the increase in demand for resources from the ocean.

Two years down the road and the BASICS project has set the landscape for interdisciplinary marine research at UCT and involves not only departments within the natural sciences but a number of departments within the social sciences (Dept. of Social Anthropology, Dept. of Sociology and the Dept. of Historical Studies). The core funding for the BASICS programme has been sourced through the University of Cape Town Vice Chancellor's Initiative to the value of R1.8

million p.a. for 2 years and then a further R1.6 million p.a. for another 2 years, drawing to an end in December 2013.

The programme to date (2010 – mid 2012) has funded 46 students (10 postdoctoral students, 16 PhD's and 20 MSc's). By the end of 2011, six masters dissertations had been submitted and the students have graduated. Several publications are in the pipeline with a host of PhD graduates coming up to completion of their degrees in 2012/2013. The programme has proven that interdisciplinary research is indeed possible and workable in a structured university set-up. New avenues are being explored to fund and stimulate this ongoing interdisciplinary research post-2013. It is imperative that UCT continues to provide the active, exciting, collaborative research framework needed to support marine scientists working in the Benguela and Agulhas ecosystems with a rich and vibrant work environment aligned with global programmes and initiatives.

Ma-Re Students Network – It's all about getting involved!

*By Hayley Evers-King, Morgan Brand
and Emily McGregor*

Marine Research Institute – UCT

The Marine Research (MA-RE) institute involves a large number of postgraduate students conducting interdisciplinary marine research across departments. The MA-RE students committee & network has been formed to help make the most of this diverse group by fostering collaboration, creating a more unified student body and raising the profile of our students on the international stage.

The committee has set up a Facebook group ("MA-RE UCT Students") and a twitter feed ("@MARE_UCT") and will be hosting a

launch in mid-September. Later in the year we have plans to organize thematic workshops and other activities dependent on student requests. Students and academics involved in marine science across disciplines are encouraged to find us on Facebook and follow us on Twitter to keep up to date with the latest student news and take part in lively discussions.

Please contact us through facebook/twitter or via ma-re@uct.ac.za if you would like to join our student network – you do not need to be a UCT student/academic to join, share and contribute to the network!



Applications now open!

This Masters degree is offered by the Marine Research Institute at the University of Cape Town. The programme, consisting of coursework and dissertation, provides students and professional researchers with a multi-disciplinary and integrated overview of marine science in Africa.

Closing dates for
South African applicants:

30 September 2012

More information available [here](#)



A different kind of Carnival - Rio +20 dialogues: Ocean theme

By John Field

Invited to represent
Marine Research Institute – UCT

The 3rd World Summit on Sustainable development was held in Rio de Janeiro, Brazil in June 2012 and named “Rio +20”, coming 20 years from the first summit and ten years after the Johannesburg summit in 2002. A new feature of Rio +20 was the “Rio +20 dialogues” arranged jointly by the Brazilian government and the UN Development Programme (UNDP) to publicise the event. The dialogues were arranged in 10 themes, one of which was Oceans; others including water, poverty, forestry, agriculture, ...etc. Academic facilitators (1 Brazilian, 1 from the North and 1 from the South) were appointed for each theme, our job being to invite interested colleagues to contribute ideas, suggestions and eventually, recommendations for sustainable development in relation to our theme.

The Oceans facilitators came up with 10 recommendations, which were advertised on the web along with those of the other 9 themes and the public was invited to vote on them over a two-week period. The Oceans recommendations were, (in order of popularity of the invited group):

1. Launch a global agreement to save high seas marine biodiversity
2. Develop a global network of international marine protected areas.
3. Expand and implement international institutional arrangements to protect the marine environment from land-based activities.
4. Promote the creation of Marine Protected Areas designed and co-managed by artisanal fishers as a suitable tool to ensure marine governance and the sustainability of fisheries resources worldwide
5. Fishery management should be ecosystem-based, making allowance for the needs of all components of the ecosystem, including predators.

6. Fishery management procedures should be agreed among stakeholders whenever possible, with management measures agreed in advance under realistic scenarios of future ecological and fishery conditions for several years.
7. Create global ocean governance mechanisms to preserve biodiversity and genetic resources in a scenario of growing nationalization of the marine environment.
8. Avoid ocean pollution by plastics through education and community collaboration.
9. Monitor and promote international coordinated research on ocean acidification and its effects on marine life and ecosystems.
10. As far as possible, fish captured in the wild should be used for human consumption, with unmarketable by-catch used for fishmeal.

The first round of voting by the public chose No. 8 as the most popular recommendation so it automatically went forward to the summit meeting of the heads of state. Next, in a one-hour session, the facilitators explained the remaining recommendations to the theme panel, chosen by the Brazilian government in consultation with UNDP. This panel of ten (very much a decimal system!) put their individual views to an audience of some 2,000 people at the 3-day dialogues meeting at the new RioCentro convention centre on the outskirts of Rio de Janeiro. The panel included a son and grandson of Jacques Cousteau, and Sylvia Earle, and also other well-known public figures. After ten “short” presentations each urging the assembled crowd to vote for their favourite recommendation, the assembly voted electronically for the next recommendation to go forward: Recommendation 1 in the list above. Finally the panel had the liberty of formulating their own recommendation as the third to go forward, so the three recommendations that Sylvia Earle presented to the Heads of State were:



1. Avoid ocean pollution by plastics through education and community collaboration.
2. Launch a global agreement to save high seas marine biodiversity.
3. Take immediate action to develop a global network of international marine protected areas, while fostering ecosystem based fisheries management, with special consideration for small-scale fishing interests.

However, in parallel to the Dialogues meetings described above, the governmental ministries were negotiating the text of the document to be signed by the Heads of State, a process we that we heard was fraught with often acrimonious argument as the original drafts were watered down in attempts to reach consensus. Thus by the time the Heads of State assembled in the days following the dialogues, the text had already been negotiated and there was little prospect of the three minutes allocated for presentation by each theme rapporteur making any difference to the outcome.

In summary, the Rio Dialogues were an interesting experiment that succeeded in involving many more people than would otherwise have been there, and publicised the event and issues, but made no difference to a disappointing outcome for the summit. This was to be expected, given the serious economic and political issues being confronted, and symbolised by the absence of the Heads of State of the USA, UK and Germany. As usually happens in politics, short term issues (such as re-election) take precedence over the serious long term issues facing our planet.



When talking science alone does not get the message across!

By Paws Pillay

Marine Research Institute – UCT

“Knowledge alone does not yield appropriate action.” – Naomi Oreskes (2010)

In June 2005 Steve Jobs, Apple Macintosh founder, encouraged Stanford graduates to “Stay Hungry. Stay Foolish” – nowhere can the hunger for knowledge be more clearly seen than in a young learners eyes when they gaze upon a marine touch tank or shudder in anticipation and excitement when asked to touch a starfish or squeak with disbelief when you show them a picture of a Spanish dancer nudibranch or an animation of an ocean glider! Initially young learners have an innate respect for the planet and its resources but then they grow up!

By the time learners get to high school, many have lost the thirst for knowledge along with a decline in the understanding of science. Even more startling there seems to be a loss of concern in the environments health and a dislocation from being part of the earth’s ecosystem. Along with this disassociation from and disinterest in the natural environment, many live in a world of instant messaging, Facebook, Twitter, bbming and reality television, a combination of instant satisfaction and short-term success. So how do we keep learners hungry for science and based on the current environmental crises we are facing, how do we get them to think and act responsibly?

One way through which Ma-Re is trying to get learners submerged into marine science and related environmental aspects is through learner participation in the teaching process and in integrating current social media networks (Facebook, Twitter etc.) into fun and engaging activities. Most effective undertakings have involved getting learners

completely immersed in the task. One activity that has particularly worked well has been the

development of a murder mystery game around a marine theme.

Picture this – a fishing vessel that is notoriously known for illegal fishing comes into port with a dead observer on board. Analyses of the evidence and the blood found at the crime scene reveals that the blood was not only the victim’s blood but also the blood of another person (possible the killer). The game comprises of developing character sketches of the observer, the fishing crew, the fishing company, and various other nefarious characters. The more creative you are the better the game! Get a cast of post-graduate students together to act out the characters. Then set the scene for the learners and get them to solve the murder through interviews and observation of a staged crime scene. Go even as far as setting up a fake Facebook page or Twitter account with news of the death, the illegal fishing and using your mobile phone send updates, giving clues and misinformation during the game. Give the learners access the site by projecting the Facebook page via a data projector on a wall in the room. CSI – Marine Science Style!

The game is highly interactive with the learn-



ers conducting interviews with characters and false pieces of information and evidence being fed to them. All the while learners listen and learn, by mere conversation, reading the Facebook page, interaction and sometimes interrogation, about DNA, DNA profiling, the DNA database, marine observers, sustainable marine resource, SASSI, the fishing industry etc. After two, sometimes three fun-filled hours, learners using just observational and circumstantial evidence predict who the killer(s) are. You then reveal the killer(s) using DNA sequencing along with other more conclusive observational evidence – something that you would have setup at when developing the game. When leaving the classroom, amidst much chatter and excitement, learners say that the session has made them eager to learn more about solving a murder using DNA, illegal fishing, the power of observation and wanting to be forensic scientists, marine biologists and some such things, all the while sharing tales and anecdotes of their interviews with the characters in the most animated ways.

Clearly then using such methods and mechanisms of outreach Ma-Re hopes to keep young learners staying “hungry” for knowledge and a little less “foolish”.



Sustainable Oceans & Coasts – let's do it together

The Marine and Coastal Educators Network (MCEN) hosted its 12th annual national conference in Durban during 24-27 June 2012. MCEN is a SANCOR co-ordinating group which facilitates collaboration between educators and assists marine educators in their activities. The event was successfully hosted by uShaka Marine World and efficiently co-ordinated by Heidi Kilian and Jone Porter.

The conference was themed: "Sustainable Oceans & Coasts – let's do it together" and was attended by 33 participants from Kwa-Zulu-Natal, Northern, Eastern, Southern and Western Cape, as well as Gauteng. Organisations represented were Two Oceans Aquarium, Sea World, SAMREC, WESSA, SANParks, SANCCOB, NZG, Namakwa District Municipality, Ndlambe Municipality and other conservation authorities. The conference attracted both new and regular members - a positive indication of its vital role to supporting educators.

Presentations were given by researchers and educators along the daily themes: i) Sustainability & Characteristics of a Coast, ii) Coasts and Ecosystems; iii) Oceans; iv) Exploration and v) Into the future.



Arno Munro (DAFF) presented on SA's fishing sector and the sustainable use of marine resources. The audience was divided into groups to demonstrate lesson activities relevant to the curriculum for learners at different grade levels.

These are just a few highlights from the comprehensive programme: Sean Fenessy presented on prawn bycatch reduction and Bruce Mann explained the methods used by fisheries scientists to monitor fish populations. This was followed by a hands-on exercise to highlight the choices available to seafood consumers using the

SASSI guidelines. With intense animation and skill, Mpho Lephaila used storytelling to convey the unique physiology of various marine organisms. Arno Munro's presentations and activities illustrated the various fishing methods and the sustainability of each method. Camilla Floros, Phanor Montoya-Maya and Justin Hart provided insight into coral reef studies. Judy Mann shared results on studies which investigated the impact of environmental awareness campaigns on changing individual behaviour.



Khonzani Lembeni's (Two Oceans Aquarium) Fish-Mathematics Lesson and activities on sustainable fishing were designed to develop literacy and numeracy skills. Khonzani received the Best Presenter Award for 2012.

Field trips included a guided excursion by Jone Porter to the mangroves in the Bay Head Natural Heritage site, a shark dissection at Kwa-Zulu-Natal Sharks Board and a tour of the port of Durban which is Africa's busiest general cargo port and container terminal.

Lessons and activities were demonstrated that were aimed at the various grades, with an

aim to complement the syllabus content and to cover the practical aspects of the theory taught in the classroom. The informative and engaging activities were designed with the dual purpose of educating learners on the marine and coastal environment while at the same time building numeracy and literacy skills. The regions shared presentations on their lessons, activities and outreach programmes, allowing educators to exchange ideas, materials and resources.

As Judy Mann concluded in the final talk of the conference— it is MCEN's vibrant and infectious passion for the coast and their dedication to environmental education that will make a positive impact on the learners as well as the public in general.

ACRONYMS

DAFF	Department of Agriculture, Forestry and Fisheries
NZG	National Zoological Gardens
SAAMBR	South African Association for Marine Biological Research
SAMREC	South African Marine Rehabilitation and Education Centre
SANCCOB	Southern African Foundation for the Conservation of Coastal Birds
SANParks	South African National Parks Board
SASSI	Southern African Sustainable Seafood Initiative
WESSA	Wildlife and Environment Society of South Africa



SANCCOB and friends celebrate Mandela Day with a beach clean-up

By Francois Louw

Southern African Foundation for the Conservation of Coastal Birds (SANCCOB)

Mandela Day is celebrated every year on Nelson Mandela’s birthday – 18 July - to honour his legacy and his values, through volunteering and community service. With the onus on caring for our seabirds and marine environment, SANCCOB hosted a beach clean-up at Lagoon Beach to clean the seaside area by collecting litter and rubble for 67 minutes.

The event was opened by Margaret Roestorf (SANCCOB’s Acting CEO) and Nicky Stander (SANCCOB’s Rehabilitation Manager) who emphasised to the 100+ crowd why it is so important to keep our seaside areas clean for the sake of preserving our marine life for future generations. Bottle-caps, fishing lines, rope and plastic bags found on beaches are some of the many potentially fatal items to seabirds. As a working seabird hospital, SANCCOB regularly sees the harm that such seemingly insignificant everyday items can cause to African penguins, gulls, cormorants and many of the other seabirds that we admit 365 days a year.

The enthusiastic crowd included members from the Blouberg Beach Cleanup team, National finalists from Miss Earth South Africa in association with Console, Cape Town Surfers Webazine, Junior Junction pre-school and the ER24 Milnerton Crew. Milnerton Municipality was kind to assist with providing litter bags for the day and was very helpful with the collection of the countless bags with the conclusion of the event.

SANCCOB is a leading marine-orientated non-profit organization which has treated more than 90 000 oiled, ill, injured or abandoned African penguins and other threatened seabirds since being established in 1968. Independent research confirms that the wild African population is 19% higher directly due to SANCCOB’s efforts.



Those attending the event were treated to a meet-and-greet with SANCCOB’s very own Rockhopper penguin, Rocky, who was there to thank everyone for giving their 67-minutes with SANCCOB on the special day.



Birthday greetings from the South

By Leonora Finca, Samantha Ockhuis, Sandra Setati and Dayne Williams

Interns from the Department of Environmental Affairs It was on the 18th July 2012, onboard the SA *Agulhas II* on its maiden cruise to the Southern Ocean, that the ship had sailed through the “Roaring Forties” and traversing the “Furious Fifties”, the latitude was 57°South along the Greenwich Meridian longitudinal line that an idea was born.

What seemed like an innocent suggestion was transformed to serious action. Armed with spades, hands, buckets and anything that could scoop, a few people began digging into the thick snow that accumulated over two days on the “aft” deck. Working with energy and synchronization, crew members turned the potential slip hazard into a meaningful pile with a special message.

The message was directed to former SA president, Nobel-Laureate and global legend in our life time, Dr Nelson Rolihlala Mandela.



Above: All hands on deck as crew members arrange a birthday tribute for Madiba from the Southern Oceans on Mandela Day. Photos by Darrel Anders and Mutshutshu Tsanwani.



A fond farewell to Larry Hutchings, recently retired from DEA

Compiled by Jenny Huggett¹, with contributions from Hans Verhey¹, Rob Crawford¹, Lieze Swart¹, Carl van der Lingen², John Field², Coleen Moloney³, Astrid Jarre³, Colin Attwood³, Anthony Richardson⁴, Eva Plaganyi⁴, Su Painting⁵ and Vere Shannon.

¹Department of Environmental Affairs; ²Department of Agriculture Forestry and Fisheries; ³Ma-Re and Zoology Department, University of Cape Town; ⁴Commonwealth Scientific and Industrial Research Organisation, Australia; ⁵Centre for Environment, Fisheries and Aquaculture Science, UK

Larry Hutchings retired from Oceans and Coasts, Department of Environmental Affairs, at the end of June 2012, following a 45-year career in biological oceanography. Larry has spent most of his career unraveling the dynamics and functioning of the Benguela upwelling ecosystem. He specialises in zooplankton, but has a broad knowledge of all components of the Benguela as well as other eastern boundary upwelling ecosystems, including the basic physical mechanisms that control plankton, key species such as small pelagic fish, and top predators. While many of his colleagues are mired in discipline-specific views, Larry's deep understanding of the physics and biology of all ecosystem components make his insights unique. His ability to think "out of the box" and his distrust of conventionally-accepted explanations helped us to challenge paradigms on how things work and also how things should be done.

Larry studied at the University of Cape Town, achieving his BSc in 1967 with majors in both Zoology and Chemistry. Soon after joining the Department, he applied to study Honours at UCT, but without asking permission from the Director, who curtly told him "we don't want your sort here" and thereafter pointedly ignored him in the corridors (Larry says he has had pretty much the same relationship with many of his bosses since!). Larry persevered, however, and gained his PhD in 1979 for his thesis entitled: "Zooplankton of the Cape Peninsula upwelling region", supervised by Prof John Field at UCT. His PhD occupied an entire volume of the Sea Fisheries Investigational Report series.

Larry headed the Plankton Group at the old Aquarium in Sea Point from 1976 to 1992, where he was the "Oceanographer with a view of the ocean", and tolerated the transformation of the "Sea Point School of Apathy – Why bother?" into the "Sea Point School of

Enthusiasm – We bother!" He fondly remembers these years as a golden era within his career. Vere Shannon, ex-Director of the Sea Fisheries Research Institute (SFRI), as it was called then, recalls: "In the report of an extensive official work study of Sea Fisheries in the 1970s the inspector from Pretoria reported about the Plankton Section that '... a carnival attitude prevails there'. He was referring to *laissez-faire* way in which Larry and the "plankton bums" functioned. So now you know what the essential ingredient is for stimulating innovative research! That is why it was successful and what is more, they had fun at the carnival." Further insights from the "good old days" are provided in a separate article by Peter Shelton. In 1992, Larry moved reluctantly to the Foreshore headquarters of the SFRI, later to become Marine and Coastal Management, to co-lead the "Whole Systems" group with Rob Crawford, which later evolved into the Ecosystem Utilisation and Conservation group.

Larry lost his lower right leg in a motorcycle accident in 1983, but this never stopped him from pursuing his favourite activities – "armed" with a series of prosthetics, including a flipper foot, Larry has still managed to bodysurf, snorkel, participate in annual "Beach Olympics" between SFRI and UCT, climb the steep Cape Point mountainside to and from his favourite fishing spot, and navigate the decks and stairwells of various research vessels. Naturally his artificial leg became a useful tool for entertaining colleagues and terrorizing hapless waitrons, as ripping it off and waving it in the air he



Larry takes charge during a drogue study cruise in 1995



Larry sampling "adult ichthyoplankton" on the FRS Africana

would shout "this meal cost an arm and a leg!"

Larry played a pivotal role in the development of the initial Benguela Ecology Programme (BEP) in the 1980s, which fostered cooperation between UCT, CSIR and SFRI. This was a pivotal moment in helping South Africa move forward in interdisciplinary and inter-institutional marine research, was important in raising Sea Fisheries' scientific profile, and was seminal in the development of a generation of young research scientists who will continue to contribute to marine research in South Africa and beyond. Larry later played key roles in BENEFIT, the research component of the Benguela Current Large Marine Ecosystem Programme (BCLME) and the Benguela Current Commis-



sion (BCC), which broadened regional scientific cooperation between South Africa, Namibia and Angola. He attained the highest scientific level within DEA, as Chief Specialist Scientist, and served on many scientific advisory panels and working groups within SFRI/MCM/DEA, as well as regionally and internationally (e.g. the startup of GLOBEC, and GOOS).

Larry often has great foresight, and his championing of environmental monitoring time-series is typical. As time-series around the world were being shut down in the 1980s, South Africa was increasing theirs, partially in response to his often-articulated belief that the environment controlled fisheries. Besides initiating routine environmental and plankton monitoring on the bi-annual pelagic fish stock assessment cruises, he was instrumental in initiating regular monitoring of fish eggs and larvae in the Benguela jet current off the Cape Peninsula, and he established the monthly St Helena Bay monitoring line in 2000. Larry loves going to sea and participated in all but one of the November pelagic spawner biomass surveys between 1988 and 2011, collecting zooplankton and conducting copepod production experiments to assess the feeding conditions for pelagic fish, as well as assessing stomach contents of pelagic fish to analyse their diet (besides packing many for bait!). He also spearheaded long-term line-fish monitoring off De Hoop, and argued strongly for the incorporation of environmental knowledge in fish stock-management procedures.

With more than 80 scientific publications to his credit (and still counting!), Larry has a high profile internationally, and has given several keynote addresses. Larry is one of South Africa's most well known and respected marine scientists, and was awarded the prestigious Gilchrist Medal in 1993 for his contribution to marine science. He was made an Honorary Professor at UCT in 2009. Larry has enthused and inspired many others over the years with his passion for plankton and his "bottom-up" perspective of the ecosystem, from lecturing undergraduates at UCT and Cape Peninsula University of Technology (CPUT), training students at sea, to officially mentoring 10 MSc and 11 PhD students, with one ongoing. Out at sea, it is impossible not to convert to a plankton fa-

natic as Larry reveals the fascinating diversity to be seen under the microscope, and there are many past students that remain grateful for the colourful and thorough grounding that Larry provided as a teacher. He has an ability to generate and passionately deliver a plethora of hypotheses about what was happening in a system and why, often without taking a breath. This left some of his collaborators bewildered and bemused by the volume and scope of alternative ideas – and indeed, many wishing they had brought along a tape recorder! For those collaborators who would winnow this surfeit of ideas into those most relevant and testable, there were – and are - rich rewards. Often one's best insights and subsequent science come from listening to Larry and carefully dissecting his ideas afterwards.

In a time when focus, specialisation and domain-specific knowledge was the norm, his broad knowledge continued to urge students and colleagues to see the bigger picture. Larry has always highlighted the importance of field work, for anyone involved with the ocean to "see what's really out there". His never-ending curiosity to understand "what makes the oceans tick", and his exceptional talent as a builder of intellectual bridges is held in high esteem in current-day interdisciplinary research. Larry's ever-youthful enthusiasm and willingness to share ideas is an excellent model for young researchers wanting to make a substantial contribution to the sciences.

Larry will mainly be remembered for his passion for fishing, his deep love and understanding of the ocean and all its components, his warm and infectious enthusiasm, and the great wisdom that "poured forth from his thumbs". Whilst his retirement is well-earned and richly deserved, it will leave a huge hole at DEA, and his insight, lively mind and irreverent no-nonsense comments will be sorely missed by the marine scientific community. He has been invited to stay on as an Honorary Professor in the Marine Research (Ma-Re) Institute at UCT where his intuitive 3-dimensional understanding of the physics, chemistry and ecology of the ocean can be put to good use challenging the modellers and theoreticians. We hope to see you around, Larry!

A Tribute to Larry

by Peter Shelton

Department of Fisheries and Oceans, Canada

Larry's passion for science is infectious. In the 1970s and early 1980s the Plankton Section in Sea Point was at the cutting edge world-wide in the study of plankton dynamics - the study of plankton blooms and succession along upwelling plumes. The SCUM and SCREW programs were legendary, as were the strategic fishing stations on top of the more productive reefs to carry out Larry's favorite research program – monitoring of handline CPUE! When I joined the Pelagic Section stationed in the Sea Point building next to Larry's lab to work with Garth Newman, Rob Crawford and Oliver Centurier-Harris on stock assessment in 1976, Larry soon sought me out and made sure I didn't end up being solely a desk scientist studying paper fish. My first sea trip was on a hake survey sharing the hospital with Larry on the top deck of the old *Africana* with Andy Payne as scientist-in-charge. It was Larry who suggested the topic for my MSc - to track a patch of newly spawned anchovy eggs using a drogue, sampling repeatedly for 4 days with a flight of 8 Miller nets, over which time we slept for a total of less than 6 hrs. At the end of it I had all the data needed to substantiate the role of the Nils Bang jet current in transporting anchovy eggs and early stage larvae from the spawning ground to the nursery ground. Larry's intuition regarding the functioning of the Benguela ecosystem is astounding and many of us have benefited from his generosity in sharing his ideas and encouraging collaborative research to explore the hypotheses he generated. Together with John Field and Vere Shannon, he was instrumental in breaking down the age-old divide between Sea Fisheries and UCT by initiating the Benguela Ecology Program and the weekly on-campus science seminars. I still remember the regular face-offs between The Devil's Advocate who claimed that all we needed were three parameters to explain the world, and Larry who claimed we needed to actually understand how the ecosystem functions! With the demise of SFRI and the morphing into a succession of bureaucracies, there are probably few of Larry's bosses who have any idea who he is and with what high esteem he is held in the international scientific community.



Prof Rudy van der Elst retires

By Larry Oellermann

Director of Oceanographic Research Institute

As a student of ichthyology & fisheries science in the 1980's, I had the privilege to meet, be terrified by (anyone remember honours seminars?) and mentored by some of the great characters of marine science in South Africa. One of the characters I never got to meet as a student, but whom I have been privileged to work with in his last year before retirement, is Prof Rudy van der Elst, maverick marine scientist from KwaZulu-Natal. I first came across Rudy's name when I was given two of his newly minted "A Guide to the Common Sea Fishes of Southern Africa" books for my 21st birthday. The book was an instant hit with us fish students; less technical and much easier to carry around than "Smith's Sea Fishes"!

Rudy was born in the Netherlands, but became a South African citizen in 1959. A product of King Edwards School and Wits University in Johannesburg, Rudy moved down to Durban in 1969 to join the Oceanographic Research Institute (ORI) as a scientist. His early research focussed on KZN marine conservation, including artisanal and recreational linefish, and the estuarine fishes of St Lucia. He also worked part time on his MSc thesis, and graduated from the University of Natal in 1975. In his thesis, Rudy investigated the declining catches of the shad (aka elf, *Pomatomus saltatrix*), a popular linefish in KZN. His subsequent recommendation to the authorities to introduce strict fishing controls for the species resulted in widespread dissent amongst fishermen. A national, week-long commission of inquiry resulted in a 450-page document, in which

the panel of experts vindicated Rudy's research. The management plan was enforced and in time the fishery recovered, providing the impetus need-

ed for more widespread fisheries management actions in South Africa. Never afraid to stand up for his science, Rudy courted controversy again a short time later, when the results of his study on the ecosystem effects of the KZN shark net programme on large predatory sharks was made public. Nevertheless, the research ultimately contributed to reductions in netting and lower mortality.

In 1985 Rudy was promoted to senior scientist, responsible for ORI's fisheries research. During this stage of his career he developed large information gathering programmes, still on-going today, which represent some of the longest continuous marine data sets in KZN. For example, the National Marine Linefish System (NMLS), developed in collaboration with Ezemvelo KZN Wildlife and the then Department of Environmental Affairs & Tourism's Marine and Coastal Management Directorate (MCM), documents the activities and catch details of up to 1 million fishermen outings in KZN annually, providing a long-term comprehensive database on line fishing trends in the province. Another example is the nationwide linefish tagging project, which was initiated with private donor support. The project involves voluntary tagging and release of angled fish by fishermen and



is one of the largest such programmes anywhere. More than 4 800 fishermen are involved, having tagged more than 250 000 fish from at least 120 species. Now, nearly 30 years later, the project is still vibrant and the data generated have been widely used in research and fisheries management.

Rudy became the head of ORI in 1990. Besides leading the ORI research team whilst continuing with his various research interests, he also began to play a growing advisory role in marine and coastal resource management in South Africa. He was an active participant and contributor to the development of South Africa's national fisheries policy (subsequently promulgated as the Marine Living Resources Act). He was also appointed to the national Coastal Zone Policy Committee, which was charged with developing a national coastal zone policy (White Paper) for South Africa, recently promulgated as the Integrated Coastal Zone Management Act (ICZMA).

During the last decade, Rudy's contributions have not just been limited to KZN and South Africa. He has spearheaded ORI's growing involvement in the marine and coastal resources affairs of the Western Indian Ocean



(WIO) nations. The institute has carried out research, consultancies or training programmes in all of the east coast states of Africa, from Mozambique to Eritrea, as well as the WIO islands. WIOFISH, a database championed by Rudy and managed by ORI, is one of the most comprehensive artisanal and small scale fisheries information systems available in the region. Rudy also played a key role in the development of the GEF and World Bank's South West Indian Ocean Fisheries Project (SWIOFP), a WIO regional fisheries development and conservation initiative involving nine countries of the East African region.

Along with his other activities, Rudy has found the time to produce a respectable body of academic work, consisting of more than 950 publications, including books, scientific publications & reports, popular articles as well as conference proceedings. He has taught and mentored a number of post graduate students as an associate professor at the University of KwaZulu-Natal and as a guest professor at the University of Brussels. A past Chair of the SANCOR Forum, Rudy has dedicated time to a number of other important bodies, such as the Forum of Academic & Research Institutes in the Western Indian Ocean Region (FARI; current Chair),

West Indian Marine Science Association (WIOMSA; Trustee board member); KZN Shark Board (Board member) and the *African Journal of Marine Science* (Editorial panel member) to name the most recent of a long list.

After more than 42 years of dedicated service to ORI and marine science both locally and regionally, retirement finally caught up with Rudy in 2012. During his farewell party held in SAAMBR's Sea World Aquarium and celebrated with a collection of his peers, friends and colleagues from across the years, Rudy was presented with the Megladon Award by the Chairman of SAAMBR, Mr Chris Rudham, and Mr Barry Rebeck, the Association's President. The Megladon Award consists of a framed cast of a fossilized tooth from a Megladon shark, possibly the largest fish ever to exist, which swam the oceans some 28 – 1.5 million years ago. The award is the Association's highest accolade, and has only been bestowed on three other recipients in SAAMBR's 60 year history; Prof Desmond Clarence, Principal and Vice-Chancellor of the University of Natal and past head of SAAMBR's Scientific Assessment Committee; Mr Roy Phillips, past President of the Association; and Prof Tony de Freitas, past CEO of SAAMBR.

Although Rudy plans to retire to Mossel Bay by the end of 2012, he shall continue to play an active role at ORI as a research associate. In fact, now that he no longer has the administrative duties of ORI to tie him down, Rudy seems to be more involved in research work and consultancies than ever, with requests for assistance with projects in the WIO region constantly flooding in, from national governments, regional associations and international bodies such as the Food & Agricultural Administration (FAO) and the World Bank.

The passion that Rudy has brought to marine science is surpassed only by his passion for ORI, the organisation he has worked tirelessly for and helped shape over the last 42 years. The path for a not-for-profit, non-governmental organisation bent on carrying out relevant, high quality research is not an easy one. The remarkably rude health of the institute that Rudy recently handed over to me is a testament to his vision, entrepreneurship, dedication and drive. On behalf of those of us left behind to carry on ORI's good work, Thank You Rudy!



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