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South African Network for Coastal and Oceanic Research

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Jellyfish in the Benguela Ecosystem

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Jellyfish or medusae are frequently found in samples of marine plankton from coastal and oceanic waters. They are pelagic cnidarians and belong to three classes of Medusozoa: Hydrozoa, Scyphozoa and Cubozoa (see Box). While most medusae are small and inconspicuous (hydrozoans), some scyphozoans can attain a large, indeed massive, size: up to ~2.5 m in diameter, trailing tentacles up to ~30 m. It is these large scyphozoans that most people are familiar with because whilst a lot of jellyfish get washed ashore, it is only the large ones that we tend to see: it is the large ones too that get the bad press because of all the problems they cause at high abundance.

Medusae, for the most part, represent the pelagic, dispersive and sexually reproducing phase in the life cycle of the organism. This alternates with a more inconspicuous benthic, or bottom-living, polyp stage that buds off medusae asexually. As with all cnidarians, medusae are equipped with cnidoblasts or stinging cells that they use to poison and trap prey: different orders of medusae have different types of cnidoblasts, which mean they are able to "specialise" in different prey types. All medusae are carnivorous, to varying degrees, and their planktivorous diets include items as small as diatoms and dinoflagellates and as large as other medusae and fish: they will essentially catch and eat anything that triggers their cnidoblasts and that cannot subsequently escape. As a rule of thumb, only cubozoans are fatal to humans though all should be treated with caution.

In a healthy ecosystem with large numbers of pelagic fish, the densities of jellyfish (especially big ones) are usually fairly low. This is probably because huge numbers of fish consume vast quantities of zooplankton (including, in all probability, small medusae), which makes it difficult for large populations of jellyfish to develop. High density patches of jellyfish can still be encountered, especially at fronts or in enclosed and semi-enclosed bays, but these generally reflect physical processes of aggregation or concentration: they do not necessarily reflect fundamental changes in population size. Blooms may also occur naturally, in response to climatic forcing and there is evidence linking inter-annual changes in population size of several jellyfish species in the Mediterranean and North seas to natural fluctuations in atmospheric pressure, which has multiple knock-on effects in the marine environment. Although jellyfish blooms are a natural feature of healthy marine ecosystems, there is increasing evidence to suggest that they are not only becoming more frequent but that they are persisting for longer periods of time, especially in coastal waters.

The jury is out on exactly why jellyfish are now more common than they used to be, as different explanations (over-fishing, climate change and eutrophication) have been variously invoked by different authors to explain their "local" observations. Regardless, all reflect some disturbance of the natural ecosystem that now favours the survival and persistence of medusae and (importantly) their polyps.

The implications of jellyfish blooms and aggregations are considerable. There are short term, direct impacts on man's use of the marine environment and its resources. For example, they can block the intake and cooling systems associated with power-plants, which impacts on electricity supply (remember the closure of Eskom's Koeberg nuclear power station in May 2005); they can cause the local closure of beaches and have an impact on tourism and recreation, as has happened in parts of Hawaii, the Mediterranean Sea and along the NE coast of Queensland.

They obviously interfere with fishing operations at sea by spoiling fish catches and bursting seine and trawl nets and they interfere with the hydro-acoustic assessment of pelagic finfish resources by fisheries management authorities. In the medium term (i.e. if the outbreaks are relatively short-lived), jellyfish blooms and aggregations may have a negative impact on local fish recruitment, and there is evidence from the N Atlantic to suggest that year-class failures of some commercially valuable finfish species have been linked to jellyfish aggregations around the time of spawning. The longer-term economic and ecosystem implications of jellyfish blooms are more worrying. Because jellyfish are "voracious" predators of finfish eggs and larvae, it is likely that resident fish populations would have a hard time becoming re-established once their densities have become depressed by something like over-fishing (the "predator-pit" hypothesis). This of course has numerous implications for all those other organisms within the ecosystem that otherwise prey on fish, such as seals and seabirds. Jellyfish not only have an impact on the survival of fish eggs and larvae, but because they consume many of the same prey items as adult fish, they have the potential to compete with them and so reduce their condition - which will have a variety of direct and indirect knock-on effects. Jellyfish are eaten in a big way by very few predators except sunfish and some turtles (none of which are common): jellyfish are often the biggest predators of other jellyfish! This means that they are essentially trophic dead-ends, and when they die and sink they rapidly transport energy and nutrients out of the water column, which impacts on water column processes - in an unknown way.

There has been quite a bit of press recently about the lack of pilchard off Namibia and the effect this is having on seals and seabirds as well as the pelagic fishing industry there. In 2005, the SA government went so far as to allow the Namibian fleet access to the resource in its own territorial waters, whilst in 2006 some Namibian fishing companies effectively shut-up shop half way through the fishing season. The lack of pilchard and anchovy off Namibia is being blamed on the very high abundance of jellyfish and there can be no doubt that there are a lot of jellyfish off Namibia. It has recently been estimated that there were 12.2 million tonnes of jellyfish off Namibia in 2003 and only 0.8 million tonnes of clupeids. But is there a link between the two?

A net full of jellyfish caught off Namibia in September 2001

Namibia, like South Africa, is bathed by the cold, productive Benguela Current. The process of wind-driven upwelling results in the introduction of nutrient-rich water to the surface, close to shore. These nutrients, in the presence of sunlight, allow the massive proliferation of microscopic phytoplankton that in turn fuel a short food-chain and lead to industrial-scale fisheries. The Namibian Benguela is one of the most productive marine ecosystems on earth, and catches of pelagic fishes were routinely high during the early decades of the last century and peaked at over one million tonnes in the late 1960s: only to decline and dwindle by the early years of this century. So much for the fish - but what do we know about the large jellyfish during the same time period? Unfortunately there is no such neat time-series for jellyfish and we are left to interpret anecdotal evidence (or a lack thereof).

The problem jellyfish off Namibia include a species of *Aequorea* (*A. aequorea*, now considered to be *A. forskalea*) and a couple of species of *Chrysaora* (*C. hysoscella* and C. (*Dactylometra*) *africana* - see Box). Of the three, only one (*D. Africana*) was collected and described (for the first

time) during the Great Expeditions at the end of the 19th century (the Deutsch Tiefsee Expeditions on the *Valdivia*): *A. aequorea* was first officially recorded from the region during the Discovery Expeditions in the 1950s and *C. hysoscella* was first formally recorded and described from the region during the 1980s! Of the three, *Aequorea* is currently the most abundant and *D. Africana* is the least common. Given that the visiting scientists in those early years collected, described and commented on numerous very small medusae it is surprising that they did not make reference to large numbers of the larger, more conspicuous species, though they did note that *D. Africana* was common (only) in the vicinity of Great Fish Bay (Walvis Bay).

The relative scarcity of large jellyfish prior to the late 20th century might be further presumed from the absence of records to the contrary in the reports of the various whaling companies operating in the area (Dr Peter Best, University of Pretoria, personal communication). Locals will tell you that there have always been jellyfish off Namibia, and so there have, but if they were a "problem" (i.e. occurring at such abundances to have a noticeable impact on activities associated with either fishing or recreation) then such would inevitably have been reported. That it was not (to our knowledge) further indicates that large jellyfish were relatively uncommon prior to the mid 1970s[1] , when high concentrations of large jellyfish became routinely apparent off Namibia. This date is a little too close to the time of the collapse of the pelagic fishery for comfort, and in the absence of any coincident climatic event/s it implies a link between the two populations.

It has been suggested then that the increase in abundance of jellyfish off Namibia is due to their filling of the vacant space created by the demise of the once-abundant pelagic fishes. However, further research is needed to settle the debate: studies on the biology and ecology of the benthic polyp need to be initiated as well as others on the growth characteristics and behaviour of the newly released medusae (do pelagic fish eat them for a start!).

Fig 1: A swarm of box jellies (Order Cubozoa) off the Cape Peninsula. Photograph by Cleve Robertson

Such work can only be conducted in the laboratory once a culture of the organism has been established and maintained. This is risky work, in the sense that it involves much trial and error but jellyfish are cultivable: some species are farmed for human consumption in the East whilst others are star attractions at commercial marine aquaria. The potential rewards from such studies are likely to be high: not only may the results provide us with some insight into the likely persistence of the "problem" (with all of its long-term economic, social and biological implications), but hard data can then also be used in computer simulations to predict where and when possible outbreaks of jellyfish may occur. Given the risk factors associated with jellyfish culture in the laboratory, such work is unsuitable for postgraduate student projects (in the first instance). As a consequence it does not lend itself to funding by the regional research councils which steer away from funding salaries and an appeal is therefore made to those with a long-term interest and investment in the marine environment to step forward and assist in this regard. As the jellyfish species in question are also found off our own west coast, where they have already had an impact on regional electricity supply by blocking the cooling water intake pipes at Eskom's Koeberg nuclear power station, the appeal includes those with a vested interest in the marine environment south of the Orange River.

A programme of research into smaller Hydromedusae around South Africa was initiated by the author at the very end of the 1990s, which was supported by a grant from De Beers Marine (Pty) Ltd and the Franco-South Africa Scientific and Technical Cooperation Research Programme. This work was expanded to include the larger jellyfish off Namibia following a series of successful applications for ship's time to the Nansen Programme and BENEFIT (http://www.benefit.org.na). Collaboration was deliberately sought with experts at the University of St Andrews (UK) and the Institute of Marine Research (Bergen, Norway), and this has allowed the successful development of hydro-acoustic tools that can be used to discriminate large jellyfish from commercially valuable pelagic fin-fishes during routine fishery surveys: these tools led to the first ever hydro-acoustic survey of jellyfish biomass anywhere in the world during 2003. Support for the collaboration was largely obtained through the NRF-Royal Society (London) SET Development Programme grant awarded to the (then) Zoology department at UWC. This funding came to an end in 2005 and a recent

application to further research into jellyfish around South and southern Africa was made to the NRF in 2006. This application was successful and, until a sponsor for the aquarist post can be secured, research will initially focus on looking at genetic links between populations of jellyfish, as well as identifying jellyfish indicators of climate change: interested students (at the MSc, Phd and postdoctoral level) are urged to contact the author for more details.

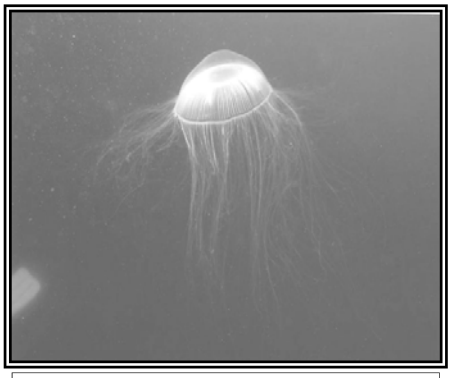


Fig 2: A specimen of *Aequorea* (Order Hydrozoa) off the southern Cape. Photograph by Kerry Sink

BOX

The Medusozoa contains three important Classes of jellyfish. Cubozoans are always box-like and have tentacle/s at each corner: they have a fairly rigid structure and should always be treated with extreme caution as some species can be fatal to humans. They are found primarily in the coastal environment, where they are generally uncommon (but not around Cape Town). Most are about the size of large fist. Most marine jellyfish belong to the Class Hydrozoa, where they can be found in both coastal and oceanic waters. Hydromedusea are mostly smaller than your thumbnail, though one (Aequorea forskalea) may be large and is abundant off Namibia: they are of variable shape and are characterised by a narrow, inwardly projecting shelf of tissue at the edge of the umbrella. The other species of jellyfish belong to the Class Scyphozoa, and are generally of medium to large size. Most have a shape that is based on some sort of disc or saucer. Scyphozoa can be further classified by whether they have tentacles at the margin of the umbrella and/or a set of oral arms that hang down from the centre of the animal. Individuals without marginal tentacles but with oral arms belong to the Order Rhizostomae; those with both oral arms and marginal tentacles belong to the Order Saematosomae , whilst those with marginal tentacles but without oral arms are members of the Order Coronatae. The former two orders are predominantly found in the coastal environment, whilst the latter are deep-water forms of the open ocean and fjord. The large translucent blue/white jellyfish that commonly get washed are rhozostomes, and the red/purple jellyfish found on beaches along the west coast are saematosomes.

Footnotes:

1. At the time of the South West Africa Pelagic egg and larval (SWAPEL) surveys, initiated by the then Division of Sea Fisheries of the South African Government.

AfrOBIS offers free access to local and international marine bio-geographic data

By Marten Grundlingh

mgrundli@csir.co.za

Summary

AfrOBIS, the sub-Saharan Node of OBIS (Ocean Biogeographic Information System) has been successfully established and commissioned. After setting up the portal and software for data handling and communication, more than 3 million records of 17 500 species have been loaded, forming a significant contributed to the 13 million international records presently in OBIS. AfrOBIS/OBIS allows ***free, open access to all data****, to support investigations into species distributions. The integration of AfrOBIS data into the global pool of data held at the Rutgers University enables a variety of useful reports and graphs to be generated online. Readers are encouraged to submit their data to further strengthen this facility.*

Introduction

SADCO was requested to establish AfrOBIS as one of seven regional nodes of OBIS (Ocean Biogeographic Information System, part of the Census of Marine Life), and to populate the node with as much data from Sub-Saharan Africa as possible. Work started in July 2005, with the focus on system development and intense scouting for data and has now entered a stage of more routine data handling.

Data handling

The development of the system (portal, data structure, load/extraction routines, communication software) was the first activity to be tackled, since this formed the foundation upon which all other processes followed. Data loaded into AfrOBIS is uploaded ("crawled") to the global data base at the Rutgers University, USA and integrated into the global data set (to enable universal searches on taxonomy, distributions, etc).

The focus during data scouting was to locate and load data where the original

The overall amount of data collated by AfrOBIS (3 193 343 records of 17 527 species) outstripped initial expectations by an order of magnitude. Approximately 40 000 fully digitised records still await loading before March 2007.

specimens are held by the data provider (so-called "vouchered data").

It should be noted that, although the data providers are considered sufficiently diligent in terms of quality control, and other quality control procedures have been built into the system, some of the data has not been peer reviewed in the true sense. Data scouting was very successful in **South Africa**, with a total number of 3 344 359 records scouted, or 99.6% of the overall total (see example in Fig. 1). The reason for the success could be ascribed to, firstly, the ability of data base staff to visit data providers personally and engage with the management structures at a suitable level; and secondly the large amount of data located at Marine and Coastal Management and willingness of that organization to share their data.

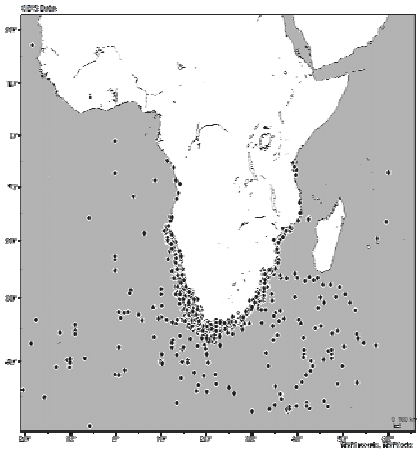


Fig. 1 Plot of 14 315 of the locations of the fish data supplied by Iziko Museum, Cape Town

On the other hand, scouting of data from countries outside South Africa was less successful. Scouting was extended from Namibia and Mozambique northwards into central and North Africa and a number of scientists in 20 countries (excluding South Africa) were contacted (Fig. 2 shows an example of a data submission).

The amount of data that has resulted from direct support by OBIS for digitising of historic data constituted only 2.6% of the total data published, the remainder being submitted already in digitised form. This was because the digitisation process proved surprisingly time consuming, largely because of the comparatively large effort required to convert descriptive localities (e.g. "20 km south-east of Durban") to latitudes and longitudes.

Use of AfrOBIS

The primary function of AfrOBIS is to map the distribution patterns of marine species. The AfrOBIS portal can be accessed at

afrobis.csir.co.za:8000

Whenever a request for data extraction is submitted via the AfrOBIS portal, the request is uploaded to OBIS (Rutgers) and the extraction is done directly from the global database. This ensures immediate access to the global, integrated data set, as well as to the plotting facilities.

There are just too many options to extract and plot data to be listed here. A number of global plots of taxonomic distributions have been pre-prepared (click on "Browse by taxonomic groups" in the AfrOBIS portal), but manifold other extraction options are available. A few examples are provided in the SADCO Newsletter of December 2006 (sadco.csir.co.za). Most selections are intuitive, but if you are interested in other options, or need more guidance, please drop an e-mail to:- **mgrundli@csir.co.za .**

Conclusion

The project to establish AfrOBIS as the Sub-Saharan Node of OBIS has been very successful, and achieved more than the quantifiable goals. Marine scientists now have access to a free, versatile and powerful global data base with which to study species locations and distributions. Researchers who are in possession of distributional data for any marine species from Sub-Saharan Africa and that are not already loaded onto the AfrOBIS data base are strongly encouraged to submit these to the author, so that the data base can continue to be strengthened and expanded.

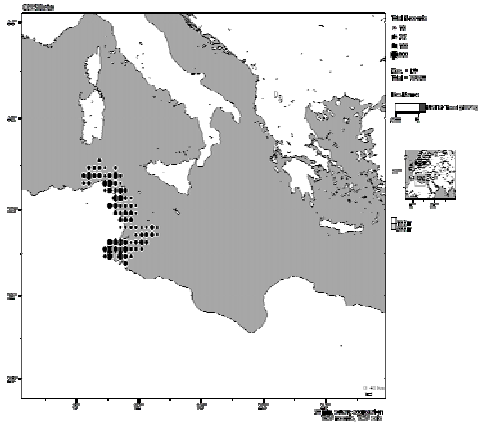


Fig. 2 Density plot of 7 664 observations of trawl data supplied by the National Institute of Marine Sciences and Technologies, Tunisia

The Benguela Plankton Portal – a valuable resource for scientists and managers

By Kim Prochazka

During 2006, IOI-SA developed the Benguela Plankton Portal, an online resource which facilitates the exchange and sharing of plankton data across the Benguela region.

The portal was developed by IOI-SA as part of the Benguela Current Large Ma-

rine Ecosystem (BCLME) project "Retrospective analysis of plankton community structure in the BCLME to provide an index of long-term changes in the ecosystem" (EV/ PROVARE/02/05). The overall objective of this project was to document and quantify changes in plankton communities of the Benguela region over the past 50 years, providing a basis for the assessment of natural and human-induced changes across the system, a prerequisite for sustainable ecosystem management.

One of the specific objectives of the project was to establish a regional inventory of plankton data archives from the Benguela region. The Benguela Plankton Portal was thus developed co-operatively by BCLME, BENEFIT and IOI-SA to provide a centralized and accessible facility for capturing and storing the regional inventory of plankton data.

The major component of the Benguela Plankton Portal is a metadata directory which contains metadata from a number of data holders, and which is growing as new records are added. Datasets currently included in the portal cover the entire Benguela and into the Agulhas Current, and go back in time as far as the 1950s. During the project, several older datasets which existed previously only in hard copy were entered electronically. In cases where the data were available, these have been made directly accessible online through the portal.

The Benguela Plankton Portal also includes a searchable bibliography of scientific publications on plankton in the region. These publications are the products of over 100 years of scientific enquiry in the region. The bibliography, which can be searched using over 250 keywords, provides scientists and managers with a quick and easy means of finding high-quality scientific information which is directly relevant to their research and/or management interests.

A resource such as the Benguela Plankton Portal is never really completed as new data are collected, new scientific studies are published, and 'lost', forgotten or overlooked data and publications come to light. Thus, if you are aware of appropriate datasets or publications which should be added to the Benguela Plankton Portal, we request that you please contact the Portal Administrator so that these can be added.

The Benguela Plankton Portal may be accessed by clicking on 'Plankton' on the BENEFIT homepage **www.benefit.org.na**

An Eye for the Gulls

By Phil Whittington

The Kelp Gull Larus dominicanus is widely distributed in the Southern Hemisphere. The southern African form, L. d. vetula, is considered a separate subspecies and is essentially endemic to the region, although a few pairs have bred in Senegal. It is the familiar large, black and white gull of the coastline, often seen gliding effortlessly behind boats or across the sand, dropping mussels onto rocks to break the shells and obtain the flesh inside, or simply helping itself to bait when the fisherman's back is turned!

Unlike many seabird species in South Africa that have suffered as a result of man's activities, the Kelp Gull has prospered. Once persecuted because of its liking for the eggs and young of guano-producing seabirds, its numbers have doubled over the past 25 years. This is largely due to its ability to utilise human-derived food sources, such as fisheries by-catch, discarded offal and urban refuse that is available in open waste treatment and landfill sites.

The Kelp Gull's breeding range extends from southern Angola in the west to Algoa Bay, in the Eastern Cape of South Africa, to the east, although odd breeding attempts have been recorded as far east as Hamburg in the Eastern Cape. Outside of the breeding season, birds have wandered as far as Luanda, Angola and into Mozambique, and there are even records of vagrants occurring in Mauritania, France and Barbados!

The birds normally nest in colonies, although odd single nests have been recorded, and these may be situated on offshore islands, in saltworks, on islands in lakes and rivers, on sandy beaches or among dunefields - often adjacent to a river mouth, on coastal cliffs and stacks and very occasionally on the roofs of buildings. Intruders in a Kelp Gull colony are not generally made welcome! Expect a torrent of verbal abuse, a salvo of gull effluent delivered with the accuracy of a heat-seeking missile and, if you are unlucky, a hefty whack on the head from the feet or bill of a dive-bombing adult.

Yes, the life of a gull researcher is not all milk and honey, and one has to brave these perilous conditions in order to achieve one's goals! Going into the field armed with a trusty stick to ward off aerial attack and a hard-hat for cranial protection may seem more like a military exercise than working for the cause of science.

Counts of gulls in the vicinity of Port Elizabeth during 2003 and 2004 revealed an autumnal peak in numbers of adult birds and a winter peak of juvenile

birds in the area. Ringing of chicks at the nest showed that many of the young birds wintering around the Friendly City had actually come from the west and in particular the large colony on the Keurbooms River, at Plettenberg Bay. Some of these young birds continued to disperse eastwards and at least five were known to have reached KwaZulu-Natal.

Ringing returns suggest that most movements of adult birds are within 30 km of the site of ringing but this may in part be a consequence of the comparatively low numbers of adult birds ringed. So, where do the adults that spend the autumn in Port Elizabeth come from? It seemed a fair bet that the colonies to the west of PE, such as the Keurbooms colony, would also be the most likely source of this annual avian invasion. In order to put this to the test, a number of adult Kelp Gulls were ringed at the Keurbooms colony during the spring of 2006.

Catching adult gulls is not an easy matter. Opportunistic they may be but they are certainly not stupid and however tempting a morsel you may provide, enticing one into a trap is like trying to extract blood from a stone! The best time to catch adult gulls is when they are nesting and this is done by placing a trap over a nest with eggs. The birds can enter the trap through a gull-sized gap in the frame. It is important that this gap is facing the observer, who secrets themselves at a suitable distance to await the return of the sitting bird. When the observer approaches the nest, the bird's instinct tells it to move away rather than walking back out towards the source of danger, and it then gets caught in the back of the trap. The bird can then be caught by hand and released by carefully lifting up the trap, ensuring that the eggs are not damaged.

Using this method, 143 adult gulls were caught and ringed at the Keurbooms colony in 2006. Some had already been ringed as chicks in 2002 and 2003 and thus provided further information on the age at which Kelp Gulls begin to breed. All 143 were fitted with a white plastic ring bearing a two letter code in black on the left leg and a standard metal SAFRING ring on the right leg. The letters on the plastic ring should be legible in the field with the aid of binoculars or a telescope. In addition, five adults were trapped at the Gamtoos River colony and these were given a plain orange leg flag on the left leg, instead of a white, alphanumeric ring. And to further investigate the dispersal of young birds, 30 chicks at the Swartkops Estuary, Port Elizabeth, were fitted with a green plastic flag on the left leg.

And this is where you come in! If anyone out there in the SANCOR community should see a Kelp Gull sporting a plastic ring on either leg, please report your sighting to:

SAFRING, Department of Statistical Sciences, University of Cape Town, Rondebosch, 7701, South Africa.

Tel:-021 650 2421/2

Email: safring@adu.uct.ac.za

The information required is the colour and position of the ring or flag (e.g. orange flag, left leg), the two letter code if it can be read (e.g. white ring, black letters "BC"), the approximate age of the bird (juvenile, immature or adult) and the location and date of the sighting (e.g. main beach, Timbuktoo, 3 January 2007). Sightings can also be sent to and further information obtained from:

Dr P.A. Whittington, Department of Zoology, PO Box 77000, Nelson Mandela Metropolitan University, Port Elizabeth, 6031, South Africa.

Tel:- 041 504 4281

Email: Philip.Whittington@nmmu.ac.za

In the meantime, I shall look forward to some glorious days at the harbour, sewage works, waste treatment site and other tourist attractions that Port Elizabeth has to offer this coming autumn, eyeing up the gulls – for rings of course!

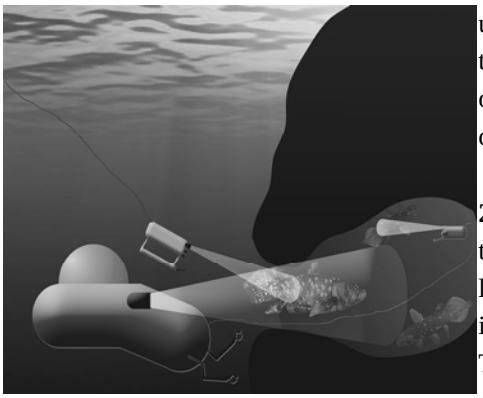
Moulding the South African Manned Submersible

By Tony Ribbink

South Africa is about to acquire its own manned research submersible. The initial impetus for the submersible arose from the African Coelacanth Ecosystem Programme (ACEP), and clearly the submersible should be designed to support coelacanth research. To be a truly worthwhile asset for South Africa, however, the submersible should be able to serve the entire marine fraternity, extending the research capabilities of its scientists into deeper water. A small team at Marine and Coastal Management and the South African Institute for Aquatic Biodiversity is drawing ideas together. We need to ensure that 21st century technology and capabilities are incorporated into the design of the submersible so that it will be able to achieve a broad variety of research goals. While ACEP personnel are able to call for designs that enable us to study coelacanths, we would like the SANCOR community to help us ensure that the submersible is able to perform the tasks that are necessary to achieve the SEAChange and other goals. We

invite your participation prior to finalising the specifications. For those interested in specifications and who believe that they might make direct technical contributions please see the evolving, specifications http://146.231.180.28/SANCOR/subspecs.doc

Current ideas



Current Ideas: Manned submersible supporting fly-away ROV. Further plans include additional stand alone ROV and potentially robotic observation platforms such as the coelacanth robot depicted in the cave entrance.

In essence the manned submersible should also carry a flyaway ROV, manipulators, slurp guns and other collection devices so that whole specimens of biota might be collected. It should also be able to implant acoustic tags or physiological probes into coelacanths and other organisms.

A considerable amount can be achieved through still and video photography to record geological formations, habitats, biodiversity and oceanographic features as individual shots or as full transects. Indeed, a 2007 submersible should have 21st century technology to be cutting edge and effective. Many of the ideas are captured already in the proposed specifications, but we do need your ideas too.

Your contributions

Your contributions can take either of two forms:-

1. Deep research needs. We would like to know how your research might benefit from the use of a manned submersible. A sentence or two would do, simply describe the nature of your work and how it might be enhanced by using a submersible. Our team would then determine what technical developments are required to achieve your objectives.

2. Technical specifications. Describe the technical capabilities that you believe the submersible should have if it is to meet your research objectives. This is a more technically specific and can be passed on to engineers to determine how your specifications might be met.

Constraints

Costs soar as we make the submersible bigger to accommodate more people, especially if increasing the size requires that substantial changes are made to the mothership. Similarly, the deeper the submersible has to penetrate, the greater the weight and cost, affecting once again both the submersible design and the mothership requirements. So we are almost certainly restricted to a maximum of a three person (but probably two person) submersible, capable of two knots underwater and able to penetrate a maximum of 500m depth (but perhaps only 400m depth).

Decision to build a manned submersible

The decision to have a submersible built was taken jointly by the Department of Science and Technology (DST) and the Department of Environmental Affairs and Tourism (DEAT). Collectively they have agreed to make R11 million available and DEAT will meet running costs (R1 million per annum). It was recognized from the outset that this amount would provide only the basic funding, so it is the intention to find further sponsorship. However, the basic submersible will be built in a manner that will enable additions to be made to it as sponsorship is found for specialist equipment. Clearly, the sooner further sponsorship is found, the better. With respect to building the submersible, expressions of interest have been received from a number of overseas manufacturers. I have had the opportunity to visit several of these engineering concerns and examine their submersibles and discuss various aspects.

There does not seem to be an existing submersible that will meet our requirements for a cutting edge submersible and also fit into the space available on the after deck of the FRS Algoa, the designated mothership. The fact that we wish to incorporate modern computerization, excellent technology and a broad range of research capabilities into our submersible also precludes most of the "off the shelf" special offers. Defining what will go into the submersible to meet South Africa's needs is our collective responsibility. You have an opportunity to help develop the submersible, please seize the opportunity.

Timing

We would like to finalize the specifications soon , so we would really appreciate your comments. Please send email messages to me at: A.Ribbink@ru.ac.za and to James Stapley at J.Stapley@ru.ac.za

Many thanks,

Tony Ribbink

Capacity Building in Marine Science: Recommendations from Three Studies

By Sheldon Dudley and Judy Mann

In line with national government strategies, and as a result of concerns expressed by scientists working in the marine environment, three SANCOR- or NRF-initiated studies on capacity building were conducted between 1998 and 2006. Although the findings of these studies have been reported individually, this article aims to communicate to the marine science community the collective recommendations regarded by the SANCOR Steering Committee (SSC) as important.

- The first initiative was the establishment of a Corrective Action Task Team (CATT) that reported on the progress of corrective action in marine science from 1994 to 1998 (Akkers et al. 1999).
- A labour market analysis of marine scientists in South Africa was completed in 2004 by Mr Pieter Grootes for a Masters degree in Economics at Rhodes University.
- A second CATT addressed the period 1999-2003 and presented a preliminary report in March 2004. Subsequently a synopsis based on further analysis of the data was published by Prochaska and Miller (2006).

Recommendations, with supplementary comment by the SSC

1. Neither Akkers et al. (1999) nor Prochazka and Miller (2006) found a decrease in the number of marine science students. Also, both reported an increase in numbers of black students, although numbers remained very low at PhD level. Although the most recent year for which data were available was 2003, it does not appear that additional measures are necessary to increase total student numbers nor numbers from previously disadvantaged backgrounds. What is necessary, however, is to increase the number of previously disadvantaged individuals at PhD level, perhaps through staff development programmes.

2. Grootes (2004) estimated the returns to government investment in higher education using an approach called the "labour market drop-out rate". The essential argument is that there is no social return (return to society) on an individual obtaining an education if the acquired knowledge base is not used by the individual in the labour market. The approach takes into account the demand for and supply of expertise to the labour market, and emphasizes the importance of the determinants of supply (i.e. the factors that give rise to the supply of newly qualified marine scientists). Based on the approach developed by Grootes (2004) it is suggested that consideration be given to developing and applying the labour market drop-out rate approach in order to obtain a measure of the return to society of investing in the training of marine scientists. The NRF is urged to monitor whether students funded through bursaries actually graduate. Although this may be difficult, innovative measures to track students through to graduation should be developed. An opportunity exists to require grant-holders in the new SEAChange programme to report whether funded students graduate. Where possible, grant-holders should also be encouraged to monitor how many of their MSc and PhD graduates become employed in marine science and to feed this information through to the NRF. Without this information there is no measure of the return on investment in education. It is noted, however, that some return on investment is realized even in those cases where marine science graduates move to sectors of the economy other than marine science if the newly trained scientists first publish their graduate research.

3. It appears that the drop-out rate of marine scientists from the labour market may be very high, representing a low return on government investment in marine science. In a 2003 survey of 31 recent marine science graduates from a particular university, Grootes (2004) found that as many as 75% had either left the country or found employment in other fields. To address this, consideration should be given to a reduction in emphasis by the NRF on numbers of students and an increase in emphasis on research quality and on investment in capital equipment. This should not be viewed as conflicting with the NRF's aim of capacity building. Instead, the intention would be to increase the real return on investment. The SSC suggests, however, that the investment in students who are trained in marine science but then find employment in other sectors of the economy in South Africa should not be considered to be completely lost. The education received by those students does benefit the national

economy.

4. Grootes (2004) found that most students enrol for a higher degree in marine science primarily because funding is available. Consideration should be given, therefore, to ensuring that students register for MSc and PhD degrees because of a genuine desire to be employed in marine science. Two mechanisms for achieving this have been suggested and should be evaluated: (i) A graduate contribution scheme whereby students are expected to repay their tuition fees over an extended period. (ii) Greater competition for bursaries, with fewer bursaries but of higher value being awarded. The SSC notes that the anonymous author of an article in SANCOR Newsletter 183 (November 2006) argues that the first option is a non-starter because the necessary employment opportunities do not exist.

5. Universities should consider whether marine science curricula are appropriate for market requirements. Grootes (2004) found that the market for academic scientists is very limited and the skills of graduates are too narrowly focused for the requirements of two major employment sectors, the government (i.e. MCM) and consultancies. This suggests that two streams of training may be needed; a focused academic training for those planning a career in research, and a broader training for those planning a career in which natural science is combined with social, economic and legal skills. The SSC notes that some universities have introduced coursework Masters programmes that address this recommendation. An additional skill requirement that has been noted in many forums is that of being able to communicate research findings to managers and consultants.

6. Women are under-represented amongst those actively employed in marine science. It is anticipated that this will be addressed in time through continued efforts by employers to achieve equity targets.

7. Capacity at MCM, however, has been adversely affected by rigid adherence to achieving equity targets. Grootes (2004) reports that there have been occasions when posts have remained vacant despite the existence of qualified applicants who did not match equity requirements. MCM/ DEAT are urged to adopt a more flexible approach to staff recruitment, in the interests both of the management of South Africa's renewable marine resources and of the social return to investment in the education of marine scientists. The SSC acknowledges, however, that this problem arises from government employment policy and is not restricted to marine science.

8. Akkers et al. (1999) called for mentoring to be an integral part of a scientist's responsibilities. Given the departure of many qualified scientists from MCM, for example, resulting in part from a change in mandate and to greatly increased responsibilities, care should be taken to ensure that expectations in terms of mentoring are reasonable. The need for mentorship programmes within institutions is acknowledged by the SSC but it is noted that such programmes require clear objectives and definitions and that mentorship cannot be made obligatory.

9. Grootes (2004) found that SANCOR's membership records, particularly with regard to private members, were incomplete and contained errors. This is acknowledged by the SSC and attention will be given to updating and verifying those records.

10. Akkers et al. (1999) called for universities and other marine science institutions to increase their marine awareness campaigns, or outreach. This recommendation is endorsed by the SSC.

Based on the results of the three studies, it does not appear that further research into capacity building is called for immediately. The SSC suggests that, instead, the recommendations should be considered, as applicable, by the NRF and DEAT and by those universities engaged in training marine scientists. It has been noted, however, that a broader study into the state of marine science in South Africa may provide valuable insight into areas that require attention. A study of this nature is currently being considered by the SSC.

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SAEON ELWANDLE NODE APPOINTS FIRST DOCTORAL CANDIDATE

By Mitzi Du Plessis

It was with great pleasure that Dr Angus Paterson, Manager of the SAEON Elwandle Coastal Node for Coastal and Inshore Ecosystems, welcomed the Node's first doctoral student, Lukhanyiso Vumazonke. The reason for this is that Angus and Lukhanyiso's paths have crossed before in an interesting way.

In 2000, as a young researcher at the South African Institute for Aquatic Biodiversity (SAIAB) in Grahamstown, Angus initiated an estuarine ecology field camp with Honours students from Fort Hare. On this field trip one student (Lukhanyiso) stood out clearly from the rest and Angus urged the young man to carry on with his research.

From 2000 to 2006 the two had little to no contact as Angus went into consulting and Lukhanyiso went on to complete his MSc. It thus bodes well that when Angus was appointed Node Manager of Elwandle in June, he again ran into his former protege at SAIAB. Lukhanyiso, currently a Marine Biologist at SAIAB, indicated that he was looking to undertake a PhD under Professor William Froneman at Rhodes University, and enquired about the possibility of linking up with SAEON.

Oddly enough, Lukhanyiso never considered Marine Biology as a possible career option. He wanted to study medicine. After matriculating from Nonceba Senior Secondary School in King William's Town, he enrolled for a BSc at the University of Fort Hare, with the aim of doing one year and then going on to medical school.

But the science bug bit hard and he was soon doing an Honours in Zoology. He was selected to join a group of scientists from Rhodes University on a research trip to the sub-Antarctic Prince Edward Islands on board the research vessel *mv SA Agulhas.*

Lukhanyiso soon found himself drawn to the ocean, completing an MSc through Rhodes University on the biology of the shrimp found around the Southern Ocean Islands. He has since participated in several sub-Antarctic cruises and has published several academic papers and popular articles on Antarctic research.

Due to his involvement with the South African National Antarctic Programme (SANAP), he was invited to participate on the first-ever international, multi-disciplinary expedition dubbed ICEFISH. The ICEFISH 2004 cruise started in Punta Arenas, Chile, and sailed for the Falklands, South Georgia, the South Sandwich and Bouvet Islands, Tristan da Cunha and finally to Cape Town.

Being the only black person on the cruise and also one of the first two black people to join SAIAB's Research Division, has enabled Lukhanyiso to inspire other black students into joining the field of aquatic science. He has delivered popular talks during National Marine Week, National Science Week, Sasol SciFest and Antarctic Month celebrations. He has also been involved with SAIAB's Communications Division in communicating aquatic sciences to the pupils of the rural Eastern Cape.

Although still a SAIAB staff member, Lukhanyiso is based at the SAEON Elwandle Node and is preparing for his PhD studies, for which he will register in 2007. The focus of his studies will be on the understanding of spatial and temporal trends in coastal zooplankton in Algoa Bay.

Lukhanyiso will be supervised by Prof William Froneman of Rhodes University, a recipient of the University's distinguished young researchers medal as well as a Gold medal from the Royal Society. The study will be aimed at contributing to the broader research on long-term ecological monitoring around Algoa Bay conducted at the SAEON Elwandle Node.

Above:

Lukhanyiso Vumazonke, Elwandle's first doctoral candidate. As a young Honours student in Zoology, Lukhanyiso found himself drawn to the ocean and Marine Biology. (Picture © Dr Angus Paterson)

NAMIBIANS JOIN SOUTH AFRICAN STUDENTS FOR A DISTANCE LEARNING COURSE ON DLIST-BENGUELA

By Raquel Garcia

This year, the course on *Environmental Engineering—Sustainable Development in Coastal Areas* welcomes sixteen distance learners, fifteen of which hail from Namibia. Through the DLIST-Benguela portal, they join the students at Cape Peninsula University of Technology (CPUT) on this semester course that covers core environmental concepts with a focus on the coastal areas of South Africa and Namibia.

The course material, a dynamic pool of information and a forum for discussion are accessible on the DLIST portal to all students—as well as to anyone interested to learn and exchange views about coastal development. This year CPUT's Environmental Resource Centre (ERC) will provide additional support to contact students through the Library and distance learners through the online portal.

A warm welcome to the Namibian students!

Once again, the course on Environmental Engineering—Sustainable Development in Coastal Areas, offered by the CPUT, has started. Once again, CPUT students are joined by distance learners who enrol through DLIST. This year, most of the distance learners come from Namibia, mainly from the Ministry of Fisheries and Marine Resources but also from the private sector and research institutions. Ten out of the sixteen distance learners were sponsored by the Benguela Current Large Marine Ecosystem (BCLME) Programme, which shares the same target area as DLIST-Benguela—the coastal areas of Angola, Namibia and South Africa.

The course in a nutshell

Students are introduced to core environmental concepts, with a focus on the coastal areas of South Africa and Namibia. The course starts with an introduction to the socio-economic and environmental coastal areas of South Africa and Namibia, followed by a discussion of governance rules and management tools required for their sustainable development. The remaining modules are dedicated to resources such as water, energy, air and natural living resources, covering aspects relating to their use, depletion or degradation, and protection.

Case studies from the coastal regions of South Africa and Namibia are used, and the exchange of experiences and views between students and environmental/development practitioners is encouraged. During one semester, the students follow the course material (and, in the case of contact students, attend lectures) and complete assignments at the end of each module, as well as a final project at the end of the course.

A revised version of the course was piloted in 2006 and will be offered this year with some further improvements. One such improvement is the addition of an introductory module on information literacy to equip the students with better information search, technical writing and referencing skills that they will need throughout the course.

Wider online support for students

Both contact and distance students have access to a dynamic pool of information and a network of experts at DLIST at www.dlist-benguela.org to complement their studies. Not only is the course material available on the DLIST portal in the Online Courses section, but they can also search for additional documents or photos in the Information Hub. In the Student Discussions, contact students, distance learners and the course coordinator can interact on course related matters, while in the General Discussions they can engage in debates with other interested people on the coast and experts.

Another source of information and support for both contact students and distance learners this year is the ERC at CPUT. Contact students will be able to access environmental journals, reports and DVDs at the ERC Library, as well as to use dedicated computer workstations. Distance learners as well as contact students can access the online Environmental Resource Portal through the CPUT website at http://erc.cput.ac.za, where they will find a video library and the Student Wiki, providing a great starting point for research on a diverse range of environmental topics.

What else is coming up?

The DLIST Team, together with partner universities in Namibia and Angola, is working to make more courses available to distance learners on DLIST. If you have any suggestions and ideas to use the DLIST portal to further environmental training in Angola, Namibia and South Africa, write to us at courses@dlist-benguela.org.

In the meantime, you can find more information about the CPUT course on www.dlist-benguela.org/About Online Courses, where you can also download the course material to learn more about environmental issues. The DLIST portal also has a wealth of knowledge gathered from conventional and indigenous sources in the Information Hub and Online Discussions that are well worth a visit.

DLIST-Benguela

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The 2005 group of students at the Rhodes Memorial in Cape Town for an introductory lecture.

MONITORING MARINE PROTECTED AREAS - ELWANDLE NODE STARTS INTERACTING WITH SAIAB, SANPARKS AND RHODES

By Dr Angus Paterson

With Dr Albrecht Götz joining the SAEON team as post-doctoral fellow, SAEON has become involved in two ongoing monitoring projects in collaboration with the South African Institute for Aquatic Biodiversity (SAIAB) and South African National Parks (SANParks). These are on the inshore marine resources at Woody Cape Nature Reserve and Tsitsikamma National Park. Data sets spanning more than 15 years are actively being built on, and valuable insights into the temporal variability of marine resources have been gained.

In the offshore environment the node is also involved in two projects - one in Algoa Bay, Port Elizabeth and the other in the offshore environment at Tsitsikamma. In Algoa Bay, information has been collected around the Bird Island and St Croix Island group since the beginning of 2006 as part of establishing a baseline and long-term monitoring plan for the Greater Addo Marine Park. The programme, which was commissioned by SANParks and is funded primarily by the World Bank, is led by the Department of Ichthyology and Fisheries Science and EnviroFish Africa and should run for four years.

Through Dr Götz, the SAEON Elwandle Node has played a strong role in the scientific design and actual data collection within the programme. Greater collaboration by SAEON in the programme is expected in 2007, with SAEON undertaking some comparative work on areas outside of the park boundaries and also by providing some additional infrastructure and resources to the programme.

The Tsitsikamma National Marine Park has a long history of marine research activities and SAEON aims to add a number of different components to this research. An array of permanent automated systems, monitoring climate and oceanographic conditions, is already in place and maintained by Marine and Coastal Management. Through monitoring additional biotic and abiotic parameters within the Park, SAEON will be able to examine long-term trends without anthropogenic impacts complicating causal relationships.

Equipment purchase and sharing

Due to the high costs involved in the purchase and maintenance of marine equipment, inter-institutional collaboration is the approach of choice and SAEON is in the process of reaching an agreement with the Department of Ichthyology and Fisheries Science (DIFS) of Rhodes University to share management and usage of their research vessels.

These are "Banga", a 5.5-metre Gemini semi-rigid rubber duck and "Calmar", a 7-metre Butt-Cat ski-boat. Whereas Banga is suitable to launch in most surf conditions along the South African coast, Calmar provides greater comfort, working and loading space. The present fleet is an ideal combination of boats and will allow for all planned marine field operations to be conducted by the Elwandle Node.

Above:- "Banga", a 5.5-metre Gemini semi-rigid rubber duck, is suitable to launch in most surf conditions along the South African coast. (Picture © Dr Angus Paterson)

To increase the efficiency and safety of marine operations, the Elwandle Node is investing in new marine electronics for these boats. Both vessels will be fitted with a set of state-of-the-art echo-sounder transducers that are connected to a combined sonar-GPS unit (Lowrance LCX-111C HD). This unit can store up to 17 hours of topographic mapping data on its 20GB internal hard drive. GIS/ArcView can interpolate these data into continuous seafloor maps which will be used to assess the suitability of inshore marine environments for long-term monitoring.

The Node has also purchased a new 4x4 vehicle that will enable SAEON staff to tow and launch the vessels. After on-road comparisons of the towing capacity of a variety of vehicles, the choice fell on the Mitsubishi Colt Rodeo 4x4 2.8 litre Turbo-Diesel which had the best combination of engine torque and fuel economy for the required operations.

SAEON staffing

SAEON is very happy to have secured the services of Dr Albrecht Götz as a post- doctoral fellow to lead the Node's marine park monitoring.

Dr Götz gained extensive experience in North Sea ecology during his time studying at a German University, in the Caribbean (one year marine field research in Trinidad for his MSc), and

Above:- Dr Albrecht Götz's qualification as a scientific diver and his vast experience in marine ecology in South Africa, in combination with his extraordinary mathematical and analytical skills, make him the ideal candidate for a post-doctoral fellow at SAEON.

locally, where he has spent four years studying the marine ecosystem in the Goukamma Marine Protected Area.

He has published scientific papers and presented at local and international Marine Science Symposia. With completion of his PhD in South Africa, he has produced ground-breaking research in that he was the first to unequivocally demonstrate the broad ecological impacts of linefishing on the marine offshore environment.

Since completion of his PhD he has being involved in a number of long-term monitoring programmes at Woody Cape, Tsitsikamma and Algoa Bay in collaboration with the Department of Ichthyology and Fisheries Science, EnviroFish Africa, SANParks and SAIAB.

Amphids, Notopodia and Exopods – A workshop on Invertebrate Taxonomy at UWC

By Mark Gibbons

The Royal Society (London) - NRF SET Development Programme in Zoology at the University of the Western Cape went out with a "bang" during the week of the 22-26 January 2007, when the Department hosted an international workshop on marine invertebrate taxonomy. The Development Programme in Zoology has been operating since 1996, with the overall aim of uplifting research at UWC through collaboration with partners in the UK: over the period of the grant, the four local staff members have graduated more than 50 MSc and PhD students and have published in excess of 150 peer-reviewed publications. Importantly, the staff have developed their own research projects, often involving international collaborators, and are now attracting their own independent research grants. The project been variously led through its two phases by Prof Walter Veith and Mark J Gibbons on the SA side, and by Drs Michelle Kelly and John Lambshead on the UK side, both the latter from the Natural History Museum (NHM), London.

It was decided at the outset of Phase II of the programme that the Department would share some of the fruits of its UK collaboration with the wider scientific community in the region when it came to an end. One of the key areas of collaboration has been in the field of marine invertebrate taxonomy, and to date the Department has managed to train and graduate both a sponge and a bryozoan taxonomist, and has established expertise in the taxonomy of nematodes, polychaetes and foraminifera. Given that there are (at the time of writing), no full-time marine invertebrate taxonomists at any institution in the region and that SA no longer has the human capacity to train its own biodiversity assessors, the Department felt that it should share its expertise and contacts in this area with colleagues and students from the region by way of a closing gesture. The workshop was conducted at UWC, drawing in eight experts from the UK and two from UWC, and focused on three of the taxa that are most frequently used in the assessment of marine invertebrate biodiversity: free-living nematodes, polychaetes and crustaceans.

There were twenty one "student" participants at the workshop: two from Angola, two from Namibia, one each from Kenya and the UK, and the rest from SA. The SA learners were mostly from the east coast (KZN and the E Cape), with only one from the Western Cape. There was a satisfying balance between learners from universities, the private sector (including CSIR) and government departments (all the foreign participants). Exactly half the learners were female, 60% already had a higher degree of one form or other and just under half were registered for higher degrees. Whilst the oldest learner was in his late 50s, most were in the early stages of their careers: only four were not working explicitly in the field of marine biodiversity assessment!

In order to make the workshop a meaningful experience for the learners, they attended one of three parallel workshops set up around the different taxa for the duration of the entire week. Although most of them brought along their own material, standardized specimen sets were also available for training in the first instance. Personal copies of some of the key literature were made available to the learners during the workshop, although they were also encouraged to bring their own more specialized literature.

Of the three workshops, that on nematodes was the smallest. It was run by Drs Tim Ferrero and Natalie Barnes from the NHM and Mr. Martin Hendricks from UWC. Both Tim and Natalie are research taxonomists, whilst Martin is a chief scientific officer. As

microscopes are obviously a very important tool to aid in the identification of these microscopic organisms, learners first got the opportunity to refresh their knowledge in the use of compound microscopes. They were subsequently introduced to the use of the camera lucida and to drawing pictograms of specimens. The accurate identification and recording of anatomical reference points and their associated morphometrics are critical skills that learners built on over the course of the workshop, which enabled them to successfully identify material through families to genus level: species-level identifications were often not possible to achieve because the Department did not have the very high-power microscopes required for this type of work.

The workshop on polychaetes was the largest, attracting ten learners. It was run by Drs Adrian Glover (NHM) and Christopher Barrio Froján (CEFAS), and was assisted by Mr Dylan Clarke (UWC) and Ms Margaret Packer (NHM). Adrian is a researcher in polychaete systematics, whilst Chris is a benthic ecologist. The range of taxonomic expertise within the group of learners varied considerably, from absolute beginners to competent polychaete taxonomists. Taught components of the course, therefore, included everything from the very basics of how to use a microscope and camera lucida, polychaete anatomy, dissection and slide preparation, to the more advanced skills of taxonomic key construction, digital photography, record keeping, and the use of web-based resources and information sharing networks. Learners were also given the chance to work on a personal project of their choice; each then presenting his/her results to the group at the end of the workshop. By the end of the course all learners were capable of identifying polychaetes to family level and had the skills necessary to develop and communicate their own standardised species-level taxonomy with others – an essential requirement when working with the notoriously poorly described fauna of southern Africa.

The workshop on Crustacea was run by Mr Paul Clark and Dr Roger Bamber, both of the NHM: the former being the collections manager for higher invertebrates, whilst the latter is a consultant marine biologist in charge of external contracts for the Zoology Department. The seven learners all had experience of trying to identify marine crustaceans but were finding difficulty in understanding what available literature there was, and had insufficient experience of the variation within and the 'jargon' pertaining to malacostracan crustaceans.

The course began with a general introduction to the aims and format of the crustacean workshop. This was followed by an extensive session on the anatomy of a generalized malacostracan, whereby the terminology was explained and illustrated, and the point was made that the anatomy is fundamentally the same across all groups. The learners were then lead through the dissection of a decapod, to understand this fundamental anatomy using a large crustacean. Subsequent overall presentations included explaining the fundamentals of taxonomy and nomenclature (what and why is a Latin name), and explaining how experienced taxonomists actually identify animals (i.e. not just from keys, what is wrong with keys, using knowledge of ecology and reproduction, sexual dimorphism, tube-structures, species restricted to certain habitats, etc.). Seven orders of the malacostracan crustaceans, viz. Isopoda, Tanaidacea, Leptostraca, Cumacea, Mysidacea, Amphipoda and Decapoda, were then explained in more detail, with relevant literature supplied and representative material available for examination, dissection and identification. Finally, the learners were able to work on their own material which they had brought, in the light of what they had learned over the first three days, with the teachers readily available to assist and to answer any questions as they arose, and with encouraging and positive interaction between all the learners and the teachers.

A series of more general talks on the three groups studied during the workshop provided a means to close each

Group Photo (from **L** to **R**): Roger Bamber, Paul Clark, Adrian Glover, Leia Seto Sousa, Holly Bik, Toufiek Samaai, Christopher Barrio Froján, Zigi Schlebusch, Mathys Vosloo, Manuel Pinto, Cloverley Lawrence, Dylan Clarke, Ferdinand Hamukwaya, Fiona Mackay, Tim Ferrero, S Arabi, Erika Steyn, Alan Blair, Martin Hendricks, Janine Basson, Tim McClurg, Ryan Peter, Nompumelelo Thwala, Lukhanyiso Vumazonke, Margaret Packer, Esther Fondo, Natalie Barnes.

day. These included subjects as varied as the ecology and systematics of deep-sea and whale carcass-inhabiting polychaetes, the global threat of the invasive Chinese mitten crab and the challenges of cataloguing the vast diversity of free-living marine nematodes. Although these presentations were thrown open to the wider community in the region, few others attended. This is a pity because it is not often in SA that we get exposed to experts working on coastal and deep-sea biodiversity, and I cannot ever recall having heard a talk on the biology of whale falls in the open ocean!

A short qualitative evaluation of the workshop was conducted by means of a questionnaire at the end of the week's activities. This revealed that all the learners had thoroughly enjoyed the workshop and that their knowledge of taxonomy had improved as a result of attending. Given the often vastly different levels of proficiency amongst the learners in any one workshop, this is a testament to the effort, knowledge and flexibility of the experts involved. All learners felt that their time had been well spent and some now feel confident enough to share their new-found knowledge with colleagues in their host institutions. The teachers themselves enjoyed participating in the workshop and viewed it as a valuable experience for all: they also indicated a willingness to assist the learners with any subsequent enquiries they might have with regards to taxonomy, which provides a very useful network for their careers. As some of the learners did not know each other before the workshop, there is now another network in place that can be built on with time.

From the perspective of the Royal Society – NRF SET Development Programme in Zoology at UWC, the workshop can be viewed as a success. The Department has show-cased and shared its collaboration with the region, it has assisted in the training of marine invertebrate taxonomists elsewhere and it has stamped its mark on the field.

Participation in the workshop was provided free of charge to all learners, regardless of their home institution. The workshop was supported primarily through the Royal Society (London) – NRF SET Development Grant in Zoology at UWC, which funded the participation of the UK experts as well as the transport costs of some of the learners. An additional grant was provided by the NRF through the Knowledge Fields Development Programme, which supported accommodation and other local costs incurred by some of the delegates. BENEFIT provided some funds to cover the cost of material preparation, and MCM and IZIKO Museums (Cape Town) variously provided unaccessioned material and equipment for student use. The CSIR picked up the transport and accommodation costs for most of its learners, whilst BENEFIT provided similar support for those learners from Namibia and Angola.

As with any such project there are a number of people that need to be thanked for the role they played in mak-

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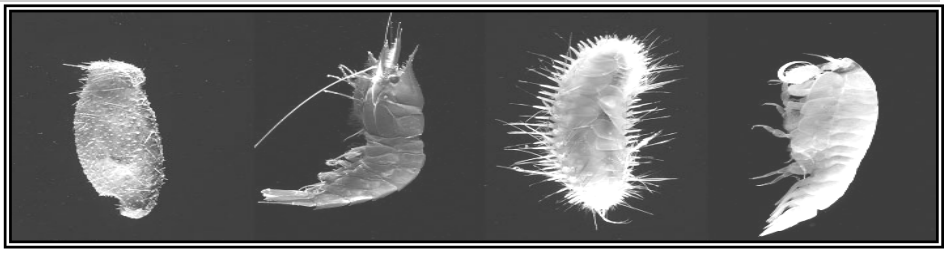
Just so that you know who the various learners were, a full list is provided in the table above. This in itself provides a useful tool for the community, in the sense that it knows where the local "expert" can be found!

ing it the success it clearly was. These include Christopher Barrio Froján (CEFAS, UK) and Mr Dylan Clarke, Mrs Audrey King, Mr Verno Gordon, Ms Linda van Heerden and Ms Lorne Gelderbloem: the latter four support staff members in the BCB Department at UWC went way beyond the call of their job descriptions to ensure that the logistics were in place and the Programme leaders are very grateful to them.

Mid Atlantic Ridge workshop report

By Tony Ribbink



Exploration of unknown habitats in the depths of the ocean and the role that these have on global processes are intriguing. I admit to my bias, but to me it is amazing that so many countries invest more heavily in "outer space" and astronomy than they do on "inner space" (submarine) and curiosity-driven marine studies. I believe that it is the great mysteries that lie practically on our doorsteps and which directly affect our daily lives in tangible - but often poorly understood - ways that should get the attention and support of big spenders. My philosophical disposition, which favours deep sea exploration, meant that I was truly delighted to be invited to attend a meeting on the Mid-Atlantic Ridge Ecosystem (MAR-ECO). I imagined projects in the future during which I could unravel fascinating mysteries of inner space during the day, while in the evenings I could lie on deck and contemplate outer space.

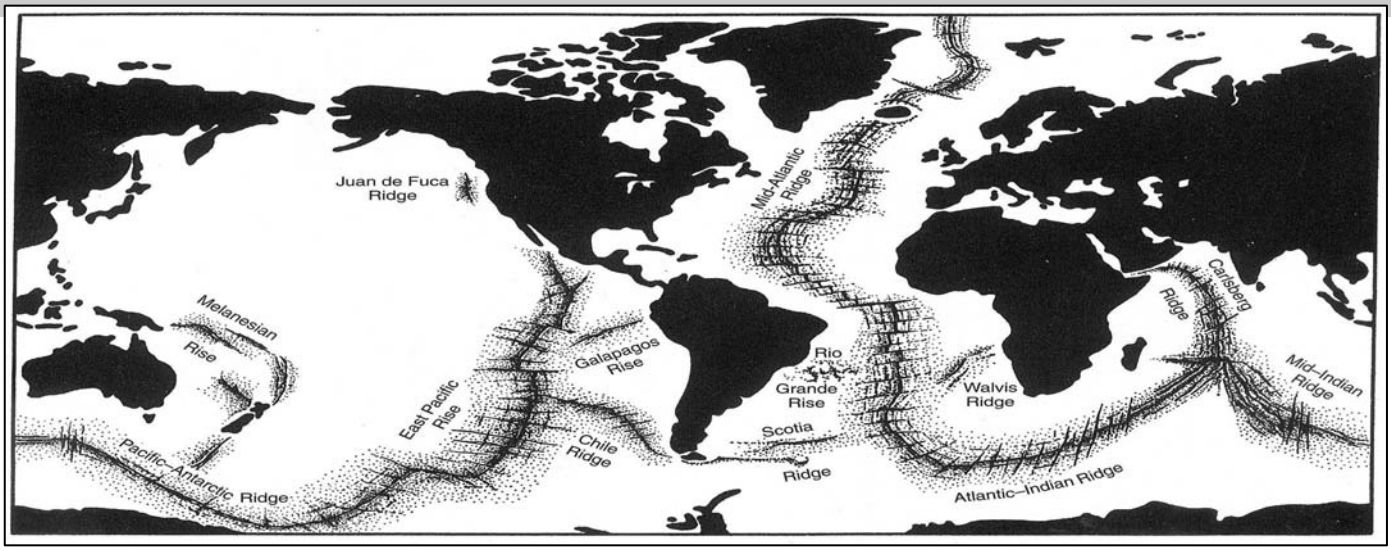
Before going to the meeting I had to brush up on my very limited knowledge of the MAR, especially as I was expected to give a presentation on South Africa's capabilities with respect to contributing to further studies. I learned that the ridge is much bigger than I imagined. It is essentially an underwater mountain range running 16,000 km from a starting point 87°N, a mere 330 km south of the North Pole, all the way down the Atlantic, roughly mid-way between the continents as the name implies. It runs into the southern Ocean, ultimately to the subantarctic Bouvey Island at 54°S. It links up with other ridges in the subantarctic, as part of the global mid-oceanic ridge system: eastwards as the Atlantic Indian Ridge (which is also staggeringly large) and westwards as the Scotia Ridge. There are no mountain ranges or mountain chains on land that even remotely approach the scale of these immense underwater ridges. But do those who know about the mountain ranges of the moon, Mars and Venus also know about the phenomenal spectacles in our seas?

Much of the MAR is in very deep water, but every now and again some high, substantial mountains of the ridge pop their heads above water to form islands or groups of islands, of which Ascension, Saint Helena, Gough, the Azores and Tristan da Cunha are familiar. Iceland is the biggest of the mountains to break surface.

Like all mid-oceanic ridges, the MAR is considered by geologists to result from the separation of tectonic plates - a continuing legacy of the driving force behind continental drift. These plates are still moving apart at a rate of about 7cm per year in an East-West direction. This means that the Atlantic Ocean is broadening annually. Those who made the crossing under sail hundreds of years ago did not have quite as far to travel as those of us who depend upon fossil fuels to cross the Atlantic these days. In our part of the world, it is the African Plate that is moving away from the South American Plate. In the northern Hemisphere, the North American Plate is moving away from the Eurasian Plate, the division running through Iceland too. Not surprisingly, there is a break between the North Atlantic and South Atlantic plates fairly near to the equator. The Romanche Trench, a narrow submarine deep sided valley, with a maximum depth of 7,758m, divides north from south. It is one of the deepest locations of the Atlantic Ocean, dividing the Mid-Atlantic Ridge into the North Atlantic Ridge and the South Atlantic Ridge.

Amazingly, this huge mountain range, one of the most prominent features of the globe, was only discovered in the 1950s. Man walked on the moon in the 1960s.

In effect, the mid-oceanic ridge systems are a prolific series of mountain ranges with numerous seamounts, all of which have volcanic origins. The seamounts have been classified according to their shapes and given descriptive names such as hummocky seamounts, large and small flat topped seamounts, hat seamounts, and ridge seamounts (Deborah K. Smith Woods Hole Oceanographic Institution: http://



humm.whoi.edu/Volcano.html). Seamounts around the world are of special interest because they host aggregations of species and, often by virtue of their isolation from other similar habitats, have levels of endemicity that are unusually high.

Oceanic ridges excite scientists from several disciplines. Marine geologists probe plate tectonics and the manner in which the plates are moving apart. They analyse the past and infer what they might regarding continental drift. They investigate volcanism, and they determine the structure and composition of different parts of each ridge. Multibeam bathymetry maps the topography so that scientists might guess more accurately at the nature of really deep habitats and the organisms that they might find there. Oceanographers are intrigued by the manner in which the ridges affect current flow, cause upwellings and temperature fluctuations which might impact on productivity. Oceanographers and biologists endeavor to predict dispersal patterns of larvae and nekton. Exploring new seamounts along a ridge holds the expectation that at every seamount, new endemic organisms might be found, that hydrothermal vents could be discovered and that the overall intriguing distribution patterns of the diversity, richness, species composition in communities, trophic webs, ecosystem functioning and evolution might merge to explain mysterious processes. The MAR is indeed a challenging, fascinating unknown world worthy of study. It has already attracted some major explorers using the deep diving manned submersibles "*Alvin*", which explored the huge mountains of the Atlantis Massif and "*Mir*" which seems to have had a more biological objective.

The Workshop

Northern Hemisphere countries have been studying the North Atlantic Ridge for some time and have had spectacular results from thoroughly professional projects under the banner of MAR-ECO. The South Atlantic Ridge has been virtually overlooked. A major objective of the workshop was to find ways to enable the southern Hemisphere countries to undertake this venture. Accordingly, Argentina, Brazil and Uruguay were well represented from South America, but South Africa, Namibia, Angola and the Democratic Republic of Congo were poorly represented, but we were energetic.

Achievements along the North Atlantic Ridge

Much of the first day of the meeting was learning what had been accomplished by MAR-ECO working along the North Atlantic Ridge. It was indeed impressive. MAR-ECO is an international research project in which scientists from 16 nations take part. Norway, has taken the lead, with project coordination by the Institute of Marine Research and the University of Bergen. The Norwegian research ship *R V G. O. SARS* is a spectacular, superbly equipped platform for marine research. http://www.mar-eco.no/Shiptoshore/g._o._sars

The project was exceptionally well organized and managed with an emphasis on meticulous handling of data and images. The purpose of their research was to enhance understanding of occurrence, distribution and ecology of animals and animal communities along the Mid-Atlantic Ridge between Iceland and the Azores. The biological focus of the workshop reflected the role of the Census of Marine Life (CoML) in supporting the work. MAR-ECO is a project affiliated with CoML.

They adopted an exploratory, process-oriented, ecosystem approach to determining how a major geologic feature – the northern Mid-Atlantic Ridge and associated circulation boundaries – affects distribution and productivity of organisms.

They saw their three main tasks as:

• Mapping of species composition and distribution patterns,

• Identification of trophic interrelationships and modelling of food-web patterns,

• Analyses of life history strategies.

Their key questions were:

• Are the MAR communities extensions of the communities inhabiting the North Atlantic continental slope regions?

• Is there a difference in species occurrence either side of the MAR?

• Do circulation features, such as the North Atlantic Drift (extension of the Gulf Stream), act as barriers between the northern and southern fauna?

• In the region of the North Atlantic Drift, what is the effect of eastward drift and import of material from the west?

• What is the significance of individual seamounts within the ridge system?

• Is the trophic structure of the northern mid-Atlantic ecosystem similar to that on the slope regions of the eastern and western sides of the Atlantic?

• What is the life history strategy of key species, and how vulnerable are they to habitat disturbance and exploitation?

I was impressed by the considerable emphasis that MAR-ECO placed on quality and excellence in science. Their underlying philosophy seemed to be that if policies are going to be influenced and if decisions regarding sustainability and conservation are going to be made, then the most powerful leverage would stem for superb science in which all can have confidence. They planned very carefully and meticulously, they laid great value in using the best, most reliable and most appropriate equipment for investigation. They correctly argued that using custom-built research ships and the finest modern technology is the only cost-effective manner to learn how ecosystems in the oceans are structured and function. This is especially true of deep waters such as those over most of the MAR. Setting and achieving excellence encourages participation of others who also have ambitious aspirations. Accordingly, the cruises enabled Iceland, Russia, Norway, United Kingdom, Germany, Portugal, USA (CoML) and others to pool resources on various expeditions to sample animals, film and observe over protracted periods (using landers) in rugged terrain to considerable depth. The use of the two Russian manned submersibles, MIR-1, and MIR-2 took scientists to areas never visited by humans before to depths of 4,500m.

Their results were outstanding and the organisms that they discovered were spectacular. Readers are encouraged to visit the websites to read about the discoveries and see the amazing images. http://www.mar-eco.no/;

http://www.coreocean.org/Dev2Go.web?id=247404

Servicing stakeholders

From the outset MAR-ECO recognized the need to give a return to those who sponsored them and to involve the public and particularly children in all that they did. They arranged special report back sessions and then ensured that the media were kept abreast of all that they did. Additionally, they organised education and fun events for children to fuel their interest and inspire an insatiable quest for more knowledge.

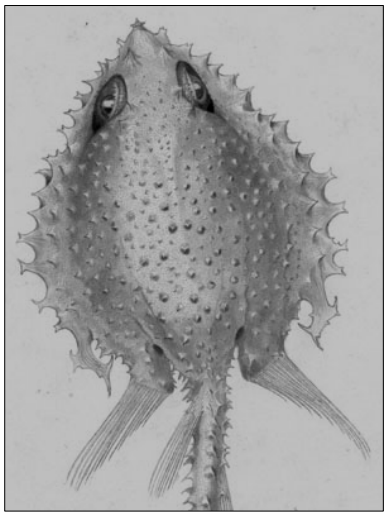
The South Atlantic Ridge

The real issue of the workshop was how could the southern Hemisphere countries begin to emulate that which had been accomplished along the North Atlantic Ridge? All were very excited about the prospects and indicated what their capabilities were in terms of being able to participate. It was most impressive to learn of the excellence in science and depth of practicing marine taxonomists in South America, particularly Brazil. Perhaps even more encouraging than the obviously outstanding quality of many of the scientists, was their enthusiasm coupled with practical good sense and an ability to plan well.

Differences in approach between the northern Hemisphere and southern Hemisphere countries emerged. The affluent countries of the northern Hemisphere enjoy the luxury of a purely curiosity driven approach which might incidentally produce practical economic benefits. Southern Hemisphere countries focus immediately on benefits that might accrue to the fisheries and the people of our countries, hoping that in the course of such studies new insights into evolutionary and ecological processes might emerge.

The future riding on enthusiasm

There are very compelling reasons to undertake substantive studies of the MAR and determine the manner in which it impacts on the south Atlantic Gyre, nutrient cycling and larval dispersion. There are equally compelling curi-



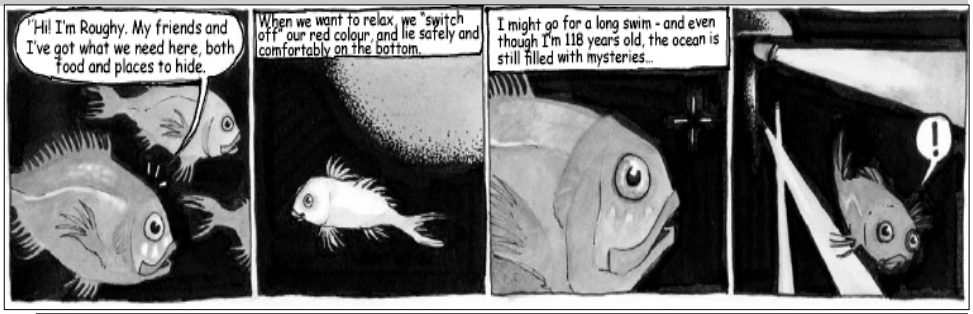
osity driven questions to be answered, and it would be great fun. It would also be very, very costly. No money to support the southern Hemisphere initiative was placed on the table and no philanthropic institution was to make the appropriate ships and their expensive geological, oceanographic and biological equipment available. Positive, overt enthusiasm carried the day. A committee was formed which would look into ways to make it possible for the southern Hemisphere to explore the south Atlantic Ridge. The committee is dominated by very energetic capable scientists from South America and we have the wisdom and reliability of Dr Johann Augustyn, Marine and Coastal Management, to represent South African interests on the committee.

Conclusion

The Mid-Atlantic Ridge is one of the most spectacular features of this globe. It is close to our doorstep waiting for us to explore it and unravel mysteries and ancient secrets. It would be truly wonderful for the southern Hemisphere countries to form the partnerships that allow this to happen. We in the southern hemisphere have the enthusiasm and capabilities. If the committee can raise the funds, the exploration will take place. In the meantime, you and I can dream about exploring this deep unknown wonder while we focus on the pressing problems that demand our attention along our immediate coastline.

Acknowledgements

I take great pleasure in thanking MAR-ECO and Census of Marine Life for sponsoring my attendance at the most interesting meeting. A warm thank you is extended to the various hosts in Brazil who organised the meeting so professionally and made our visit so enjoyable.



Report back on 28th General Meeting of the Scientific Committee on Oceanic Research (SCOR) in Concepción, Chile (23 – 26 October 2006)

By John Compton

I attended the General Meeting of the Scientific Committee on Oceanic Research (SCOR) in Concepción Chile (23-26 October 2006) as a national member of South Africa's Scientific Committee on Oceanic Research. Also at the meeting from South Africa was Sakhile Tsotsobe, a member of the South Africa National SCOR Committee. Overlapping with the SCOR meeting at the same hotel venue was the workshop: "Oxygen minimum systems in the ocean: distribution, diversity and dynamics" and South Africa was well represented by Sakhile Tsotsobe and Warren Joubert (CSIR, Stellenbosch) who both presented posters on their respective research work in low oxygen systems at the meeting.

The SCOR General Meeting was broadly composed of two parts: a review of current and proposed SCOR Working Groups and an update on international research organizations associated with SCOR. SCOR Working Groups are geared toward addressing key, timely issues at the cutting edge of ocean research. Working Groups consist of approximately 10 scientists who convene once a year to achieve a set of specific objectives. SCOR provides funds (typically $15,000/year for three years) to allow these scientists to meet. The final product of working groups is typically a book or a special issue journal volume. The concept is that these working groups help to drive and direct large-scale ocean research initiatives. The modest seed money of SCOR is intended to promote internationally-funded research projects of principal scientists. The graphic representation is an inverted triangle with funding increasing upward through the application of individual scientists for funds from their national funding agencies. The endorsement of SCOR helps to underscore the priority of the research and aids in the collaboration of scientists internationally.

After much lively discussion, two new Working Group proposals were recommended for funding in 2007. "Deep Ocean Exchange with the Shelf" proposes to look into the complex physical oceanography at the shelf/slope break and should have important applications to understanding the biology, chemistry and geology of continental margins. The South African SCOR committee ranked this proposal as one of its top choices and Pedro Monteiro (CSIR, Stellenbosch) is a proposed associate member. The other recommended new working group for 2007 was "Automatic Plankton Visual Identification" to accelerate and standardize the development of image analysis hardware and software for zooplankton. This proposal had moderate support

from the South Africa SCOR committee and has Hans Verheye (MCM) proposed as a full member. South Africa is well represented in currently active SCOR working groups. Lynne Shannon (MCM) is a full member to the working group "Quantitative Indicators of Marine Ecosystem Change Induced by Fisheries." Pedro Monteiro is a full member to the working group "Natural and Human-Induced Hypoxia and Consequences for Coastal Areas." Hans Verheye is co-chair and Chris Reason (UCT) a full member of the working group "Global Comparisons of Zooplankton Time Series." Hans Verheye is also a full member to the working group "Standards for the Survey and Analysis of Plankton" which held its third meeting in 2006.

The second half of the meeting was largely centered on the relation of SCOR to other intergovernmental and nongovernmental organizations which have an overlapping interest in ocean science to see where those ties could be strengthened, particularly in areas needing scientific expertise. There are several South Africans involved in these large-scale ocean research groups. John Field (UCT) is a member of GLOBEC (Global Ocean Ecosystem Dynamics) and GOOS (Global Ocean Observing System), Coleen Maloney (UCT) is a member of IMBER (Integrated Marine Biogeochemistry and Ecosystem Research), Isabel Ansorge (UCT) is a member of SCAR (Scientific Committee on Antarctic Research and is promoting the upcoming International Polar Year), Ray Barlow (MCM) is a member of IOCCG (International Ocean-Colour Co-ordinating Group) and John Rogers and I are involved in IMAGES (International Marine Global Change Study). There are no South Africans on the GEOTRACES (Global Marine Biochemical Cycles of Trace Elements and their Isotopes), but it looks as if they will have two cruises off South Africa in the region of the Agulhas Bank and a southwest transit offshore of Cape Town. These cruises are scheduled for January 2008 and anyone interested can contact either of the two GEOTRACES co-chairs, Robert Anderson and Gideon Henderson. The results of the first symposium on 'The Oceans in a High-CO2 World' are now published in *Journal of Geophysical Research - Oceans* and the second symposium is scheduled for early 2008.

A SCOR committee on capacity building was proposed and strongly supported at the meeting. The committee on capacity building will consists of approximately 6 to 8 individuals and include a SCOR Executive Committee member. The committee would be in charge of coordinating and promoting SCOR's capacity building initiatives. There was a lot of interest and discussion during the meeting on capacity building. I reported back from my attendance at the ICSU Regional Office for Africa meeting held in Johannesburg in September 2006. It was agreed that SCOR can work best through the regional offices and frameworks set up by ICSU/IOC. Africa is the first of three regional offices planned with regional offices in Southeast Asia and Central/South America underway. It was also agreed that these developments must be bottom up and driven by the local research community with a strong emphasis on regional graduate schools. I mentioned the newly established Marine Research Institute (MA-RE) at UCT and its focus on capacity building in southern Africa. The success of the regional graduate school in oceanography established at the University of Concepción in Chile was clearly reflected in the large number of South American oceanographers at the Oxygen Minimum Zone meeting. Many of these researchers had been trained overseas but had now returned to their home countries and had research positions and funding to train the next generation of oceanographers. The situation in Chile was a very encouraging example of how to achieve sustainable capacity building.

I very much enjoyed the meeting because it provided a thorough overview and update on the activities of SCOR and other international organizations (many with links to SCOR) and how these activities are shaping and directing coordinated ocean research projects. More details on what I have reported here are available on the SCOR web site www.jhu.edu/scor.

I thank the NRF International Science Liaison Grant for travel funds and UCT for leave time to attend this important meeting.

Report back on 28th General Meeting of the Scientific Committee on Oceanic Research (SCOR) in Concepción, Chile (23 – 26 October 2006)

By Sakhile Tsotsobe

I attended the General Meeting of the Scientific Committee on Oceanic Research (SCOR), in Concepción, Chile, held on 23-26 October 2006. SCOR promotes and facilitates international cooperation in ocean science research, by providing funding for, inter alia, SCOR Working Groups and large-scale research projects. Proceeding concurrently (though only commencing on 24 October) with this meeting was a workshop titled "Oxygen minimum systems in the ocean: distribution, diversity and dynamics." Delegates attending the

general meeting were automatically accepted to participate in the workshop. I was participating in both events.

I found the SCOR General Meeting to be quite eye opening and informative. The main objectives of the general meeting were to evaluate existing SCOR activities, and to review and consider proposals for new working groups. It was impressive to see that most of the existing working group projects were close to completion, papers have been published and in some cases books were being written. Those working groups that have not been showing progress faced consequences, such as holding of funds until certain conditions had been met. Discussions on proposals for new working groups were quite stimulating. It was interesting to compare the views of the SA National Committee, to those of other National Committees. Also, it was interesting to observe how an impression about a particular proposal would evolve from, for instance, favorable, to complete rejection.

From the point of view of an early stage scientist, another discussion I found particularly relevant and pertinent was the one on capacity building. SCOR is committed to capacity building through funding: regional graduate schools of oceanography; visiting fellowships; and travel for scientists from developing countries. It was stressed at the meeting that SCOR should not dictate to developing countries on what research to undertake, but the supported countries must initiate their own programmes. Also, a suggestion was made to encourage retired scientists to be part of capacity building initiatives, such as summer schools and regional postgraduate schools.

In the Workshop a total of 73 oral and poster presentations were made, by delegates representing 22 countries. It was fitting that this Workshop was held in Concepción, as it is in the eastern Pacific that the world's largest oxygen minimum zone is found.

In the Workshop I presented a poster titled "Impact of low oxygen on the life cycles of zooplankton in the Benguela Current upwelling region." The poster highlighted the important collaborative work done by scientists from South Africa, Namibia, Angola and Germany, on the ecological impact of low oxygen waters in the Benguela Current.

The presentations were an interesting mix of chemistry, biogeochemistry, microbiology and biological oceanography. Presenters elucidated the chemistry of low oxygen waters, by analyzing different redox reactions and the actions of various trace elements, the nitrogen removal processes – most notably anammox. It is estimated that the world's three main oxygen minimum zones – namely, Eastern Tropical North and South Pacific, and the Arabian Sea – are responsible for the most intense nitrogen removal globally (about one third). Research explored varying effects of hypoxia on microbial degradation of organic matter from region to region. It was shown that low oxygen waters reached benthic communities via undercurrents, with the benthos responding to the various oxygen regimes. Some studies explored the impacts of global warming on low oxygen regions, with some fascinating results emerging.

There were interesting findings in the biological front: of relevance to me was the observed interaction of south Pacific copepod species with the oxygen minimum zone. Even though some species were inhibited by the low oxygen layer, other species temporarily or permanently inhabited the low oxygen layer.

Proceedings of the workshop were published in the volume 70 of Gayana: international journal of biodiversity, oceanology and conservation. In this issue of the journal extended abstracts of Invited Speakers, as well as of poster presentations, are included.

I would like to thank SCOR SA National Committee for nominating me to attend the meeting, as well as to the National Research Foundation and the MArine REsearch Institute, for jointly providing funding for the trip.

EDUCATION & OUTREACH

National Marine Week 2006

Nelson Mandela Metro

By Karen Binning

National Marine Week is an initiative of the Department of Environmental Affairs and Tourism (DEAT) and aims to increase the awareness of both the youth and general public to the important role that the marine environment plays in our daily lives.

A number of organizations, companies and NGO's in the Nelson Mandela Metro work together to co-ordinate

events around National Marine Week under the auspices of the Marine and Coastal Educators Network (MCEN). As part of National Marine Week this year, an Exhibition and art competition was planned.

Art Competition

The art competition was open to any schools in the Metro and surrounding areas in the following categories: Grades 0 – 3, Grades 4 – 7 and Grades 8 – 12. The Committee received 248 entries from 15 schools in the Metro, Alexandria and Grahamstown. All entries received were of a high standard, and the judging panel had a hard time deciding on the winners for each category. The winners won prizes that included a whale watching trip to St Croix island with Raggy Charters, a tour of the Cape Recife lighthouse with SAMREC, a trip on the Apple Express train, tickets to Bayworld Museum and Oceanarium Complex, books, and a host of other prizes.

Marine Week Exhibition

The National Ports Authority (NPA) was the main sponsor of the event providing a venue and funds to make the Exhibition possible. The Marine Week Exhibition took place in Shed 12, Quay 3 at the Port Elizabeth Harbour.

A total of 19 organizations / companies set up an exhibit at the venue and converted the shed into a marine environment with islands - both polluted and pristine, rock pools and our own octopus, which proved to be a highlight.

As part of Marine Week, a Workbook is produced and distributed to all booked schools before the Marine Week Exhibition to enable learners to engage with marine issues and come to the Exhibition looking for answers to their questions. We have found that by making use of the Workbook, the visit to the Exhibition becomes more of a learning experience rather than just an outing.

During the week 3445 learners and 149 educators from 54 schools visited the Exhibition and learnt more about the marine environment. Schools visiting the Exhibition were mainly from the Nelson Mandela Metro, but a few schools from the Transkei and Queenstown also visited. The National Ports Authority sponsored busses for 30 schools from previously disadvantaged areas to attend the Exhibition.

The Exhibition could not have taken place without the assistance of our volunteers who give of their time freely to assist with guiding learners through the Exhibition and also with translation into Xhosa where needed. This year the volunteers also included travel & tourism students from a High School in Port Elizabeth who put their theoretical knowledge into practice as they met the learners and organized their time in the Exhibition.

National Marine Week ended on a high note with a closing function attended by guests, media, exhibitors, volunteers and winners of the art competition. Dr Malcolm Smale, senior scientist at Bayworld shared information on the movement of sharks and fish with those who attended and this was followed by the announcement of the winners of the Art Competition and the handing over of their prizes by Miss Port Elizabeth, Chuma Myoli.

Special thanks must go to the main sponsors, the National Ports Authority, Port Elizabeth, the Department of Environmental Affairs and Tourism, the Department of Economic Affairs, Environment and Tourism, the Nelson Mandela Metropolitan Municipality and Coca Cola for their sponsorship and support of Marine Week Activities in the Nelson Mandela Metro.

Obituary: Dr Burke Hill

Some of the "older" SANCOR community will recall Dr. Burke Hill, an outstanding South African marine biologist who moved to Australia in 1978. Burke died in September 2006.

In South Africa, Burke was based at Rhodes University and part of the exciting research team led by Prof Brian Allanson. His passion for research was contagious and many innovative projects were undertaken, including studies at the old Lake Sibaya Research station and in the St Lucia estuarine system.

In Australia Burke held several senior positions, including acting chief of CSIRO division of fisheries. His research on prawn behaviour and the effects of trawling on the Great Barrier Reef are some of his many notable achievements.

By Rudy van der Elst

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