

AARDVARK

Newsletter of the Zoological Society of southern Africa
September 2013

LETTER FROM THE EDITORS

This first, rather late, issue of Aardvark for 2013 focuses on student research and articles. Thank you to those who submitted interesting articles and images. If you think your work should have been publicised here, make a note to get your submission in early next year for the 2014 issue. This issue being late, the ZSSA president's letter was able to include feedback on the success of the recent ZSSA conference. Fitting for an issue focused on student research there is also a tribute to Prof. Phil Hockey, one of South Africa's leading ornithologist, who passed away earlier this year.

Even though this issue is late we have started working on the second issue of Aardvark for 2013, which should be out before the end of the year. If you have departmental or research news you wish to share please would you submit it as soon as possible. Details for submissions to Aardvark are in the box to the left, and are also available on the ZSSA webpage (<http://www.zssa.co.za>).

Teresa, Vincent and Genevieve

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Submit articles to
Teresa.kearney@africanbats.org
mnakin@wsu.ac.za or
gend@sun.ac.za by the last week of
April for April/ May and last week of
October for October/ November



LETTER FROM THE CURRENT PRESIDENT

“Words are only painted fire; a look is the fire itself” Mark Twain

“I'm a great believer that any tool that enhances communication has profound effects in terms of how people can learn from each other, and how they can achieve the kind of freedoms that they're interested in” Bill Gates

“Communication – the human connection – is the key to personal and career success” Paul J. Meyer

In a world where techno-communication enables people from even the remotest areas on earth to connect, and information is always at our fingertips through the Internet, you may ask: “Why do I still need to belong to a zoological society?” In light of the wisdom quoted above, the reasons are obvious. No state of the art technology can ever replace the connections made and relationships forged through personal engagement and eye-to-eye communication. These are of the key benefits offered by most societies through the hosting of conferences. Many a leading zoologist in southern Africa can testify to longstanding and productive collaborations that arose from sharing ideas and building relationships at past ZSSA conferences.



ZSSA 2013 conference attendants at Thsipse.

The recent ZSSA 2013 conference at Thsipse (Limpopo Province) indeed lived up to such an event. About 153 delegates attended from universities all over South Africa, and for the first time, the majority was from HBUs within South Africa as well as from five other SADC countries (DRC, Namibia, Madagascar, Malawi and Swaziland). This testifies to success in council's endeavour to ensure that ZSSA becomes a truly “southern African” society.

Student participation was overwhelming (93 delegates) and most of them contributed posters or oral presentations of a high standard. An entertaining “narrative” poster session, which charged presenters to deliver a 3-minute *buzz* talk, sparked the invention of “most enthusiastic speakers” awards. Congratulations to Colin Fouché (PhD with Stefan Foord, UniVen), Rendani Mulaudzi (MSc with Peter Taylor, UniVen) and Govern Pahad (MSc with Bettine van Vuuren, UJ). The Best Student Oral Presentation was awarded to Lindy Thompson (MSc with Colin Schoeman, UKZN), with Shaun Welman (MSc with Kwezi Mzilikazi, NMMU) and Terry

Ramsaroop (UKZN) as runners-up. The Best Student Poster award went to Matthew Noakes (UP), with Charles Nyalangu and Tshepiso Ramalepe, both from UniLim as runners-up.



Lindy Thompson (right) with Sarita Maree.



Shaun Welman (right) with Sarita Maree.



Terry Ramsaroop (right) with Sarita Maree.



Matthew Noakes (right) with Sarita Maree.



Charles Nyalangu (right) with Sarita Maree.



Tshepiso Ramalepe (right) with Sarita Maree.

The IMC11 ZSSA Travel Award was presented to Sasha Hoffmann. Emmanuel Matamba (MSc, UniVen) was elected Student Representative for 2014-2015.



Sasha Hoffmann (centre) with Sarita Maree and Peter Taylor.

Congratulations to these students on sterling achievements. Sincere words of appreciation are due to Prof. Peter Taylor and the Local Organizing Committee of ZSSA 2013 from Univen and Unilim who organized a wonderful congress in Thshipise – it reminded all in attendance of why we became zoologists in the first place!



Sarita Maree (far left) and Peter Taylor (far right) with the international plenary speakers (from left to right), Ara Monadjem, Franz Hoelker, and Tom Gilbert.

Plenary and keynote speakers included leading international and local zoologists such as Professors Tom Gilbert (University of Copenhagen, “Degraded Samples, Simulation-Based Story-Testing And Next Generation Sequencing: Opening New Frontiers In Zoology”), Franz Hoelker (Leibniz Institute, Germany, “The Loss of The Night: Ecological Light Pollution”), Ara Monadjem (University of Swaziland, “Conservation Ecology of African Vultures”), Colleen Downs (UKZN, “Biodiversity Conservation in a Changing Climate”), Henk Bouwman (North-West University, Potchefstroom, “Overview of organic micro-pollutant issues in southern Africa”), Ian Geigher (Chair Conservation Committee Vhembe Biosphere Reserve, “Biodiversity conservation planning in the Vhembe Biosphere Reserve”), Dr. Danie Pienaar (Head of Kruger National Park, San Parks “Aliens, poaching & pollution? Dealing with increasing external threats to Kruger National Park”), and Prof. Michelle Hamer (South African National Biodiversity Initiative, “A National Strategy for Zoological Taxonomy in South Africa”).



Sarita Maree (far left) with the local plenary speakers (from left to right), Henk Bowman, Colleen Downs, Michelle Hamer and Danie Pienaar (Ian Geigher was absent).

At the gala dinner, Dr. Salomon Joubert, former Head of Kruger National Park and author of “History of the Kruger National Park”, delivered a gripping after-dinner address, and the bi-annual ZSSA Prestigious Awards were announced.



Dr. Salomon Joubert

Professor Christopher McQuaid (Rhodes University) received the Gold Medal for his monumental contribution to research on marine ecosystems and coastal ecology, with impacts ranging from the localized effects of biological invasions to large-scale issues of global climate change.



Christopher McQuaid being awarded the Gold Medal by Bettine van Vuuren (left) and Sarita Maree (right).



Karl Ammann who received the Stevenson Hamilton Award.

Karl Ammann, a world-renowned wildlife photographer, environmental journalist and conservation activist from Kenya, was the worthy recipient of the Stevenson Hamilton Silver Medal for his masterly coverage of the global illegal trade in animal products with emphasis on Africa, through journalism, photography and documentaries (<http://www.karlammann.com>). The Diamond Route (De Beers, Ernest Oppenheimer & Son) was awarded the Corporate Award for their sustained support of zoological research on three dedicated research centers at Venetia (Limpopo Valley), Tswalu (Kalahari) and Benfontein (Karoo). Research topics covered range from marine and freshwater fauna to invertebrates, reptiles, birds and mammals. The Diamond Route has also sponsored numerous student bursaries over the years (e.g. 30 student awards for attending ZSSA 2013).



The Corporate Award being presented by Bettine van Vuuren (2nd from left) and Sarita Maree (3rd from left) to representatives of The Diamond Route (De Beers, Ernest Oppenheimer & Son); Duncan MacFadyen (right).

The council is committed to facilitate learning and networking opportunities with other like-minded scientists, societies and institutions in Africa and around the globe. To this end, the society has representation on the Board of Directors of the International Mammalogical Federation (<http://mammalogyinternational.org/>) and is an institutional member of the International Society of Zoological Sciences (ISZS). I was privileged to represent and introduce the ZSSA to the Executive Council of ISZS in Beijing, and participate in a BCGC (Biological

Consequences of Global Change) Workshop at the Grassland Ecosystem Research Base of the Institute of Zoology (IOZ) of the Chinese Academy of Sciences (CAS) in Xilinhot, Inner Mongolia, China.



5th International Symposium of Integrative Zoology



Prof Zhibin Zhang at the Climate Change Research Centre in Inner Mongolia.

The future direction of ISZS is to increase membership and promote international co-ordination and collaboration between different specialized fields of zoology, involving both extant and extinct animal taxa. This is achieved through programs such as BCGC, which involves over 20 scientists worldwide researching topics such as biological invasions and endangered species conservation. This and other programmes are conducted in association with the IUBS (International Union of Biological Sciences) offer opportunities for ZSSA members to get involved. For details on ISZS membership and related programmes, as well as IUBS information, please visit the websites at <http://www.globalzoology.org/> and <http://iubs.org/>.

In 2020, the ZSSA will be hosting The International Congress of Zoology(ICZ), which will be held for the first time on African soil. This ISZS congress (held every 4 years) aims to promote zoology by improving communication between zoologists and organizations on a global scale. The current economic climate provides limited opportunities for most African scientists to visit institutions and attend conferences and workshops abroad. ICZ 2020 will thus provide unique networking and learning opportunities for zoologists and conservationists practising on the continent. Sourcing sponsorship for deserving African student attendance will be one of the main goals of the local organizing committee.

The new fully interactive ZSSA website (<http://www.zssa.co.za>) has already proved meaningful for enhancing communication between members, students and the general public in a global and African context. We

invite you to contribute to the interactive image gallery, the blog and Facebook (that now has 272 followers), as forums to be informed of current biodiversity issues, “Opportunities”, career guidance, to exchange ideas, and obtain links to national and international societies and organizations. It will only be through your support and participation in society activities that our goals for serving the ZSSA membership in a relevant and efficient way can be reached.

Finally, *The Aardvark* has been spreading “hot-off-the-press” research news from zoology departments scattered across South Africa for decades. In non-conference years, when distance and time constraints exclude face-to-face communication, it continues to be an effective channel for students and faculty members to showcase their research and share ideas. The diversity of the contributions featured herein testifies to innovative research programs at undergraduate and postgraduate levels throughout South Africa. The contribution by UNISA serves to remind us of many students who take on the challenge of completing a degree while simultaneously following a full-time career! Congratulations to Vincent Nakin (WSU), Teresa Kearney (Ditsong National Museum of Natural History) and Genevieve Hendricks (US, ZSSA student representative 2012-2013) for producing another sterling issue of our iconic newsletter.

Dr. Sarita Maree
University of Pretoria
ZSSA President (2012 – 2013)

Obituary: Professor Philip Anthony Richard Hockey

08 March 1956 – 24 January 2013



Phil Hockey Image by Samantha Hockey

On 24 January 2013 we lost a leading ornithologist, Phil Hockey, who through his passion and dedication for birds and conservation inspired and guided many colleagues, students and friends both through his writing and in the field.

Preferring the climate in South Africa to counting sea ducks from freezing Scottish shores, Phil moved to the Percy FitzPatrick Institute, University of Cape Town, in 1976 to assist with a study of White-fronted Plover (*Charadrius marginatus*) breeding biology at Langebaan Lagoon. In 1979, he directed his attention to the African Black Oystercatcher (*Haematopus mosquini*) which he studied intensely for his PhD. During the following 34 years, Phil stimulated work on rocky shore inter-tidal communities, the ecology of bird movement and migration, avian life history evolution and the ecology of rarity.

Although most of his early research focused on coastal and estuarine bird ecology, Phil was involved in setting the guidelines for the first southern African bird atlas, and was lead author on the bird atlas of the south-western Cape. Phil's focus on coastal waders and interactions with their food supplies took him to tropical Africa and islands in the Indian Ocean, South America, the Canary Islands and the Middle East. His research earned him recognition as the authority on African waders and in 1995 he published the monograph *Waders of Southern Africa*. Together with Ian Sinclair and Warwick Tarboton he also wrote the best-selling regional field guide *Sasol Birds of Southern Africa*.

By the end of the 1990s, Phil was one of the most experienced ornithologists in southern Africa, and a natural choice to lead the seventh revision of *Roberts' Birds of Southern Africa* as a fully referenced handbook. This mammoth task took more than five years, and was instrumental in bringing a wealth of scientific information to the public domain.

Phil was appointed the FitzPatrick Institute's Director in 2008 and has led the DST/NRF Centre of Excellence using 'Birds as Keys to Biodiversity Conservation' to new heights. With his love for deserts, he recently initiated a new research thrust investigating and predicting avian responses to climate change. During his career, he graduated 18 PhD and 33 MSc students, supervised eight Post-doctoral Fellows and some 30 honours projects. In addition to more than 120 scientific papers, Phil published over 150 semi-popular articles and 12 books and book chapters. He was passionate about the need to disseminate the science of birds, and their conservation, to a wide audience, and will be long remembered for his frequent public lectures, radio and television interviews. His contribution to popularizing ornithology was recognised by the South African Network for Coastal and Oceanic Research who named him 'Marine and Coastal Communicator of the Year' in 2000 and he was awarded the Stevenson-Hamilton Medal by the Zoological Society of Southern Africa in 2008 for contributions to the public awareness of science.

Phil's impact and leadership in ornithology has been exemplary and appreciated by a wide range of the ornithological sector. He will be remembered through his vast contribution to the avian literature, both scientific and popular. Phil touched the hearts and lives of many people, from deeply insightful discussions about birds to warm interactions on life itself. He was a deeply caring person with an open heart and will be sorely missed by many.

Although quiet and personal, I loved everything about how Phil influenced my birding and friendship relationship with him. From him showing me the birds of Namibia and unravelling the waders, to meaningful times having a beer together.

Dr. Rob M. Little (Manager: Percy FitzPatrick Institute DST/NRF Centre of Excellence, rob.little@uct.ac.za, www.fitzpatrick.uct.ac.za)

Fine Feathered Fauna of the Fynbos

South Africa is blessed to have an entire biome within its political boundaries – the Fynbos, with its pretty Proteas, intriguing Ericas and rustling Restios. Apart from being home to 7000 plants species found nowhere else in the world, it is also home to seven endemic species of bird. Cape Sugarbirds and Orange-breasted Sunbirds are some of the most emblematic of these.



Protea eximia flowers in the early summer in the Kougas mountains, providing a much needed source of food for nectarivores after most other Proteas have finished flowering for the winter.

Being nectarivores, from a ringing perspective it is easy to catch large numbers of these birds in areas with the right flowers at the right times. Both species rank in the top 10% of South Africa's most ringed birds – with over 6000 Cape Sugarbirds processed. Despite this, it may come as a surprise that as of yet patterns in their movements have not been identified – and understanding movements is one of the key reasons why we ring birds. It is important to know how far and when birds move, as we can then make habitat management plans in order to ensure the survival of a species – as in indeed we must as they are very much part of our South African biodiversity heritage.

What we do know is that Orange-breasted Sunbirds don't move very far if they don't have to – a fire event will of course result in forced migrations. But, Cape Sugarbirds have put in some interesting relatively long distance recoveries, and due to these there exists a paradigm that they are capable of dispersing long distances. However, is this part of their life cycle or are these handful of long distance dispersal freak events? Are these juveniles looking for new territories, or were these researchers picking up part of a more delicate migration that tracks flowering Protea species through the mountains? What are the barriers to these movements? Can they cross large areas of modified landscapes, or areas that have experienced frequent fires that may be threatening local Protea populations? What happens when it gets drier and hotter for longer periods?



Study sites in the mountains have lovely views, but have to be accessed by 4x4 or hiking.

These are some of the questions the Fynbos Endemic Bird Survey is attempting to answer. The project is supported by South Africa's leading bird conservation organisation – Birdlife South Africa, as well as the South African National Biodiversity Institute (SANBI), and the Percy FitzPatrick Institute of African Ornithology (University of Cape Town). The work is being carried out at two levels – the population level (counting the number of birds present in key sites in the Fynbos habitat mosaic of the Klein Karoo/Baviaanskloof); and at the individual level through bird ringing. Our first year's results indicate that so far none of the species is on the brink of extinction – good news indeed and kudos to CapeNature, SANParks and other organisations involved in protecting mountain Fynbos. Modelling exercises do indicate a degree of vulnerability to increasing temperatures for Cape Rockjumper, but as you so often hear.... more work is needed! To find out more, or offer some support, please log into our blog at bluehillescape.blogspot.com.

Dr. Alan Lee (Post-doc, Percy FitzPatrick Institute of African Ornithology)

Black Sparrowhawk Tyre Project (Cape Falconry Club)

The Black Sparrowhawk (*Accipiter melanoleucos*) has only been found commonly in the Western Cape for the past ten years or so, being considered a vagrant until then, it has recently become prolific across all regions in the Western Cape. It is a medium sized raptor that is adapted to living in dense woodlands, and is found to hunt in open areas often adjacent to forests, preying on large game birds such as Guinea fowl and Spur-Fowl, as well as pigeons and doves. It nests almost exclusively in thick Pine or Eucalyptus stands.

As is true for most raptor species in South Africa, there are many threats to the Black Sparrowhawk population; these include habitat loss, secondary poisoning, shooting, and most recently discovered, nest robbing by Egyptian Geese. These geese (*Alopochen aegyptiacus*) have been classified as vermin by Cape Nature Conservation, and while they are assumed by the layman to be native species they are in fact invasive. They are known to rob nests from other birds, and this behaviour is affecting Black Sparrowhawks dramatically. Twelve nest sites out of 25 that have been monitored by the Cape Falconry Club over the last 10 years were evicted and robbed over the breeding seasons of 2010, 2011 and 2012.

In an attempt to address this problem the Cape Falconry Club, with the support of Cape Nature Conservation, has been running the Tyre Project. The aim of this project is to provide adequate nesting sites for Egyptian Geese, and prevent the eviction of established Black Sparrowhawk nests. This is done by securing old tyres into suitable trees in the immediate area of the Sparrowhawk nests. These tyres are given a mesh base and are filled with nesting material so as to make them preferable.

In the early spring of last year we established three nest sites as pilot projects. These were situated in Stellenbosch, Belleville and Lynedoch respectively. The necessary tyres were bought from a scrap yard, and were adapted accordingly by Club Members at Eagle Encounters in Stellenbosch, which was used as a base for this. A cherry-picker style lift was sponsored to the club for a weekend, and we used this to reach the necessary heights, which was certainly better than climbing 15 meters up. In only two afternoons we managed to fit five tyres to each nest.

As the youngest person there I naturally did the majority of the labour. This entailed towing the lift, positioning and anchoring it, reaching the positions for the tyres, and securing them in the trees. Roughly 30 minutes was spent per tyre, and navigating the lift became fairly hair raising in the thicker stands. It came close to tipping once or twice too, where the ground was particularly

uneven. Nonetheless we finished the job in good time and good quality.

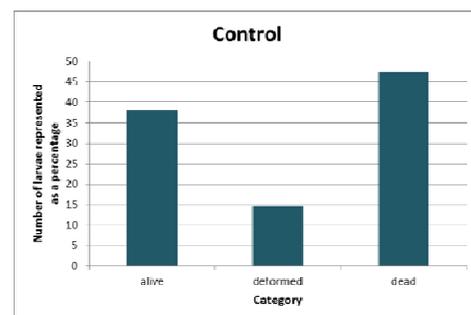
The sites were monitored through the breeding season and it was gladly noted that none of the three Black Sparrowhawk nests were evicted. Geese took stand in two tyre-nests at the Stellenbosch site, and one at each of the others. This success comes with great value, as similar solutions are now possible for many other raptor species, and the project will most certainly be expanded and improved in the coming season. I have since then taken over responsibility for the Black Sparrowhawk Tyre Project.

Marcus Carstens (Undergraduate in the Department of Botany and Zoology)

2nd year Invertebrate biology projects Determining the efficacy of water-borne secondary metabolites as a defence against potentially fouling organisms

Sponges and corals are sedentary, filter-feeding marine organisms that belong to the phylum *Porifera*. They are found in abundance in a large variety of marine environments, usually attached to rock substrates well below the water's surface. Due to their sedentary lifestyles and thus their inability to move from one place to another in response to their environment, these organisms are constantly at risk of being overgrown or fouled by other more motile marine organisms. Should these sponges and corals become fouled, they could quite possibly be unable to filter feed or enable the symbiotic algae present on their surfaces to photosynthesise, these two processes, are functions that are vital for the animal's survival.

These animals have thus had to evolve a variety of



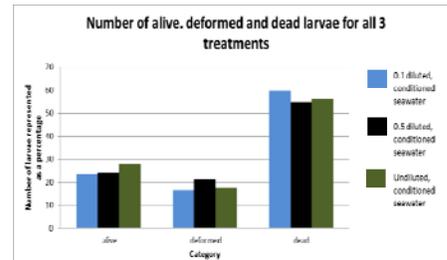
defence mechanisms to enable them to protect themselves from other organisms that could pose a potential threat, these defence mechanisms appear both in a physical/mechanical and chemical form. A common method of chemical defence used by corals and sponges is the production of secondary chemical compounds or metabolites, which are released into the water surrounding the animal. A secondary chemical compound, or secondary metabolite, is a compound that, unlike a primary chemical compound or metabolite, is not directly involved in the animal's normal growth, development and

reproduction, and thus while not critical for survival, it can help improve the animal's chance of survival in its environment. Some examples of secondary metabolites include alkaloids (a naturally occurring amine in various plant and animal species), terpenoids (a large group of lipids), and glycosides which are heavily modified sugar molecules present in a variety of organisms. These chemicals are often simply released into the water that surrounds the animal and can prevent the settlement of fouling organisms on the animal's surface, reduce competition for space with neighbouring organisms and can also inhibit or disrupt the normal growth and development of other organisms.

A group of second year Biodiversity and Ecology students at the University of Stellenbosch thus decided to conduct an experiment in which the aim was to determine the efficacy of these water-borne secondary metabolites as a defence mechanism against potentially fouling organisms. This was done by conducting an experiment that made use of two marine organisms: sedentary marine sponges and larvae belonging to *Halitios midae* or the more commonly known abalone, a group of small to large edible sea snails and marine gastropod molluscs. The first step of the experiment was to place the marine sponges in seawater and soak them for an hour to allow the metabolites or chemicals to leach into the seawater, thus creating conditioned seawater. The next step was to take abalone larvae that had been fertilised 24 hours earlier, and incubate them for a specified period of time in four different treatments: undiluted conditioned seawater (1x), diluted 0.5x conditioned seawater, diluted 0.1x conditioned seawater, and normal seawater, which served as our control for this experiment. The incubation period for the larvae was a further 48 hours after the first 24 hours of fertilisation at a temperature of 19°C. After the incubation period, samples from each of the four treatments were placed into petri dishes and examined under a microscope. For each of the four samples, the number of alive, deformed and dead larvae were counted, and then recorded as percentages. The secondary metabolites were said to be effective in cases where the larvae was recorded as either dead or deformed (showing abnormal growth patterns and development). After the incubation period, which was 72 hours after fertilisation, our control 'treatment' revealed the following results: 38% of the larvae were alive and following a normal developmental growth pattern. 14% of the larvae were alive but deformed or developing abnormally and a further 45% were dead.

This indicated to us that the percentage of dead and/or deformed larvae had to be higher in the other treatments than in the control for the water-borne metabolites to be considered effective as a defence mechanism against potentially fouling organisms. It was

further determined that all three treatments, (undiluted conditioned seawater (1x), diluted 0.5x conditioned seawater and diluted 0.1x conditioned seawater) had higher percentages of dead and deformed larvae than were recorded in the control 'treatment'.



The percentages of dead and deformed larvae for the undiluted, conditioned seawater were 55 and 17 respectively with both percentages being higher than those calculated in the control 'treatment'. In the case of the 0.1 and 0.5 diluted, conditioned seawater the percentages were: 60 and 17, and 55 and 21. Both these treatments had percentages for the dead and deformed larvae that were higher than those recorded for the control 'treatment'. For the 0.1x and 0.5x diluted, conditioned seawater, the treatments were 77% and 76% effective as a defence mechanism, and for the undiluted, conditioned seawater the treatment was determined at being 72% effective in preventing potentially fouling organisms.

It is evident, from the high percentages of dead and deformed larvae that all three of the treatments were effective in protecting the organism from other potentially fouling organisms, since secondary metabolites have the ability to disrupt development and jeopardise an organism's chances of survival. Had the sponges been allowed to soak in the seawater for a longer period of time, we might have seen a large percentage of dead and/or deformed larvae as the concentration of secondary metabolites in the conditioned seawater would probably have been higher. It also appears apparent that simply releasing these secondary metabolites into the water is an effective enough mechanism to protect these sedentary sponges, and thus a more direct or advanced mechanism is not necessarily needed to release these metabolites for them to be effective.

Caitlin Kat

Planaria regeneration: something 'spec'-tacular

Missing body parts growing back in a couple of days? Are we in some kind of mysterious future lab or so? It's a bizarre idea! Can't be real... or is it? YES! To think that organisms regenerate lost or damaged body parts or limbs... just incredible!

Some organisms have the amazing ability to regenerate a missing part of their body (sometimes over half their bodies!). A perfect example is planaria, of the phylum Platyhelminthes. This regeneration occurs if the body is damaged, but also as a method of reproduction, when it attaches itself tightly onto a substrate and then swims away until it breaks in two.

So why do this experiment? Simply put, to determine the time needed to regenerate (i.e., when the photoreceptor cells are visible). This could depend on the location as well as number of stem cells called neoblasts in the cut/damaged area.

Two planaria are placed in a petri dish in a bucket of crushed ice to stop the worms from squirming about. Worms were then cut just behind the head (cut 1), just in front of the pharynx (cut 2), or just behind the pharynx (cut 3) respectively. The two sections were placed in different dishes with bottled water, placed in a dark area, and covered by a black bag. They were checked every day for six days, and then every second day until all the tails had developed photoreceptors. Every second day the water was replaced.

A total of 26, 28, and 20 planaria were processed for each cut respectively. However, four and three died for cut 1 and cut 3, respectively. A possible reason for these deaths could be that the planaria were not looked after, in the sense that their water was not changed, hence lacked sufficient nutrients.

The rate at which fragments developed differed, although they all developed in a span between four to six days. The fastest development of photoreceptors was cut 1 which had regenerated on average five days, seven hours (median four days) later. Next was cut 3, with mean regeneration time of five days, 10 hours (median six days), followed by cut 2, which took the longest, at five days, 13 hours (median five and six days). So what can influence the regeneration rate of planaria? The different rates of regeneration suggest that there is a neoblast gradient with highest concentrations in the head and tail sections and less in the pharynx section. Additionally, environmental factors play a major role in favouring or inhibiting regeneration. These include salinity, temperature, pH levels and light exposure. For example, a solution that is too acidic will most likely end up killing the planaria as they cannot survive or adapt to such conditions. To keep some of these factors constant we used one type of bottled water.

We also made observations of the behaviour, such as movement and responses to light, of the worms. After cutting, the head fragments moved faster than the tails. This may be because it invested energy in producing the ganglion instead of movement. The head fragment moved faster as it grew because the tail offered increased movement. The sensitivity of planaria to light can be tested by covering half of the petri dish. We observed that the heads of the cut planaria moved into 'darker' areas while the tails showed no preference. We therefore concluded that the photoreceptors enabled the worm to detect and respond to light.

Wow, these observations are truly remarkable. The idea of regeneration in such a short period of time, and how quickly they respond and develop, shows the complexity in even the smallest of organisms. Humans are still in the process of researching the recreation of organ parts. It has taken humans who knows how long to attempt a similar system whereas these animals have been growing spare parts in a matter of days for a very long time.

Philip Frenzel

How will climate change and coastal nuclear power stations affect the oceans?

The rise in global temperatures is not only causing sea temperatures to rise, but the increased temperatures are causing the melting of ice caps. Ice caps are large bodies of frozen, fresh water found at both the poles. When these ice caps melt, they release large amounts of fresh water into the salty ocean. This fresh water dilutes the sea water, which usually has a salinity of about 35 ppt. So due to climate change parts of the ocean are becoming warmer and their salinity is decreasing. Similarly, nuclear power stations situated in coastal areas can affect the natural environment by pumping warm fresh water into the ecosystem. Fresh water that is used as a cooling agent in some nuclear power stations is discharged at a temperature up to 10 °C above the normal sea water temperature. For ectotherms (an animal whose body temperature varies with that of its surroundings) temperature is one of the most important abiotic factors affecting their activity and well being. Echinoderms (marine invertebrates with spiny bodies, tube feet and five-part radially symmetrical bodies) are particularly sensitive to water temperature above ambient.

The sea urchin along the South African coast is able to survive in a relatively wide temperature range (10-23°C). However, northwards along the east coast the urchin numbers decrease, probably because of an increase in water temperature. The sea urchin is largely a cold temperate species and is most abundant in the west coast where the temperatures usually varies between 10 and 15°C and seldom drops below 8°C or exceeds 18°C. This paper looks at the possible affects these changes in salinity and temperature could have on sea urchins, by testing how fertilized eggs are affected by warmer temperatures and lower salinity.

Sea urchins are a useful model system for studying early development; gametes can be obtained easily, sterility is not required, and the eggs and early embryos are beautifully transparent so cell division can be followed easily. In addition, the early development of sea urchin embryos is highly synchronous, meaning when a batch of eggs is fertilized, all of the resulting embryos typically develop on the same time course. This makes biochemical and molecular studies of early embryos possible in this system, and has led to a number of major discoveries.

A study was conducted to investigate the influence of temperature and salinity on early embryonic development of the sea urchin. Urchin males and females were induced to spawn by injecting them with a 0.5M potassium chloride solution. Fertilized eggs were put in 35 ppt sea water (normal sea water) and 25 ppt sea water (diluted seawater) at 15°C and 25° C. The control of the experiment was the 35 ppt at 15°C. Our team monitored the development for 24 hours at intervals of 2, 4 and 24

hrs. At each interval we identified the stages of development and counted them.

After 24 hours embryos in 15°C/35ppt water were mostly at the early gastrula and prism stages with few dead and abnormal. A large portion of those in the 15°C/25ppt water were dead or at the hatched blastula, early gastrula and late gastrula stages. Embryos in the 25°C/35ppt water were mostly at the hatched blastula, early pluteus and late pluteus stages. Again, most of the embryos from the 25°C/25ppt water were dead while the rest were mostly in early blastula, hatched blastula and early gastrula stages.

Changes in salinity therefore appear to have a greater detrimental effect by causing very high mortality in the sea urchin embryos. A decrease in salinity could therefore lead to sea urchin population numbers decreasing. This will also affect other animals that rely on them, i.e. they provide shelter for larval, juvenile invertebrates such as the perlemoen, to hide and grow under until they are large enough to emerge safely, and they serve as a food source. But, it might also lead to an increase in the algae on which sea urchins feed. A decrease in salinity could also cause similar effects in organisms that reproduce using similar methods to the sea urchins.

There is an expression that says that one can only preserve that which one knows and loves. We need to show people it is in their interest to preserve the sea urchin for future generations.

Danielle Sterrenberg & Michael Leach

Graduates can't get enough

For some students, graduating is as good as it gets, but others willingly choose to embark upon the exciting expedition towards post-graduate degrees in Zoology. While some Zoology students are not exactly certain which career field they want to enter, others are driven by a deep passion for animals, research, conservation and a scientific curiosity and enrol at various universities across South Africa for post-graduate studies.

Post graduate degrees usually begin with a one year full time Honours degree, which consists of various theory modules in scientific writing, research methods and other general principles of zoology, as well as a major research project. If the student utilizes every opportunity to learn during this year, his scientific training has a firm foundation for success. After this, post-graduates have a clearer view of what the scientific study of animals entails, and have free choice of committing to a two year research Masters Degree. Requiring huge amounts of dedication and self-discipline, this degree could determine the field of specialization that the post-graduate student enters when enrolling for the subsequent three year Doctorate.

Zoology is a field like no other, satisfying a wide variety of interests. Post-graduates can choose to explore the specificity of a single study species, such as those studying reproductive physiology or endocrinology, learning all there is to know about it, and making ground breaking discoveries by contributing to a large scientific knowledge base. Many post-graduate students quickly become almost experts in their study species, having read many a research paper. Others choose a more holistic approach, such as those studying ecology or conservation biology, contributing to regional and global perspectives in science. There are many areas where research is scarce, such as those of marine biology and ethology, while some students already publish research articles about improving or creating new research methodologies in scientific journals during their post-graduate studies!

Post-graduate studies in Zoology also provide very rewarding careers and working environments to a wide variety of personality types. Laboratory work, long hours of observation and desktop based studies are ideal for introverted types, and the mathematically inclined are easily engulfed in the complexities of statistical analyses. For the ones who shudder at handling living animals such as snakes, insects and rodents, many opportunities exist to do extensive research on already dead, frozen or processed samples, requiring minimal messy work, while post-graduate work provides exciting opportunities to explore many regions of the country collecting samples or

performing ecological surveying. Fieldwork is possibly one



The working environment of students in ethology (behaviour) is often just as wild as their study animal! This reed bed provided excellent cover during behavioural observations of wild wetland birds!

of the most attractive features of Zoology studies, as students visit areas often inaccessible to the general public, and getting chased by a wild animal, encountering venomous or elusive animals and experiencing breathtaking views of nature all in the name of science is very rewarding.



All the long hours of field work finally pays off when returning to base camp to care for study animals. These rodent cages provide comfortable housing during transport back to university laboratories.

Even with the long-hours and many obstacles in research projects, there is no greater feeling than that of accomplishment when a post-graduate student in Zoology receives his degree, and none like that of being congratulated as 'doctor' during a graduation ceremony! Post-graduate studies in Zoology do not merely provide an excellent scientific qualification, but seems to only further ignite the thirst for knowledge of the biological world in the student!

Gerhard Göldner (Honours student)

An alternative way to study - distance learning

Distance learning allows a student to be flexible; you're not bound by a heavy workload or classes and can study at your own pace and plan your schedule according to your needs and lifestyle. Because of this distance learning has grown increasingly popular in the last few years. UNISA is one of the largest distance learning universities in South Africa; between 2006 and 2010 the number of student enrolments increased with nearly 29,0%. Although the College of Agriculture and Environmental Sciences is the smallest in terms of student headcount enrolment, the growth was the highest showing an increase of 102,2% between 2006 and 2010.

Studying a B.Sc. through UNISA requires a lot of hard work and motivation. At the beginning of the year you receive a package: a paper student card, general information brochures, tutorial letters and the study guides of your modules. The rest is up to you. There are lecturers, as is the norm at any university; and video classes, although these are only in cities and bigger towns; and of course practical sessions, which are the highlight for most students. "Pracs" can be anywhere from 10 to 18 days. The workload is incredible and you are expected to learn and grasp a lot of new ideas, practical techniques and the application of theories. It can be challenging but at the end of the day very rewarding. An added bonus is that you get the opportunity to meet fellow students.

Two UNISA students both agree that studying through the institution was a positive experience. "I really enjoyed the practicals and meeting people who had a real passion for what they are doing. I made amazing friends and also learned how to think for myself and work independently," says Juan. Juan is currently busy with his Masters in Ecophysiology at Kopsies.

Preleen shares Juan's sentiments, "A lot of people think that studying through UNISA means less work and also tend to think it is a bit of a joke. It's actually a lot of hard work! I've had the choice of going to a normal university and I wasn't impressed, so I decided to join UNISA, and I'm more comfortable studying with them. Yes, they have their flaws, but my learning experience has become more enjoyable since switching to UNISA. Practical sessions are a bit difficult due to travel but they are quite exciting and we get to meet people from all over the country. I've made some great friends this way."



Preleen performing a titration in a practical.

As with most things in life UNISA, and all long distance institutions, aren't perfect. They work with various methods of online media which presents a problem for any student living in the rural areas of the country. Another problem, as said so well by the American Football player Vince Lombardi, is that "the difference between a successful person and others is not a lack of strength, not a lack of knowledge, but rather a lack of will." Once we are able to push ourselves in everything we do, we are guaranteed to achieve great things.

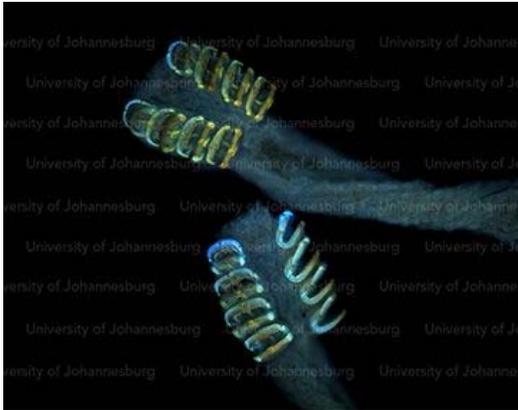
Amour McCarthy (BSc graduate of the College of Agriculture and Environmental Sciences in 2012)

Parasitology Laboratory

The UJ Parasitology Laboratory is conducting a wide variety of award winning research that focuses on a variety of parasites. Most of the research is based on parasites sampled from fishes in the Vaal River System, but some parasites are received from as far as Brazil. There are seven postgraduate students in the lab under the supervision of Prof. Annemarië Avenant-Oldewage.

Mr. Lloyd Lynch (Masters Student, first year) is investigating the metal accumulation ability of an ectoparasite, *Argulus japonicus*, in comparison with its host, *Labeo capensis*, collected from the Vaal Dam to determine the parasite's value as a sentinel organism. This follows on similar research conducted in previous years on parasites as sentinel organisms.

Mr. Quinton Dos Santos (Masters student, second year) is investigating the diplozoid parasites of fishes of the Orange-Vaal River system, and was one of the laboratory members that was awarded a prize during the 41st Annual meeting of the Parasitological Society of Southern Africa (PARSA) in Bloemfontein in 2012; the prize for best senior poster presentation was awarded for his work on the ecology of a diplozoid species from the Orange-Vaal River system. Quinton also won two of the three prizes for the best photographs in the contest for the best photograph of a parasite at the European Multicolloquium of Parasitology in Cluj-Napoca, Romania, 2012.



One of the images that won Quinton Dos Santos a prize for the best photograph in Romania. *Paradiplozoon* sp. fluorescent clamps.

Mr. Beric Gilbert (PhD Student, first year) is investigating metal accumulation in *Paradiplozoon ichthyoxanthon* from the smallmouth yellowfish, *Labeobarbus aeneus*. This follows on previous research conducted in the laboratory on other parasite species. Beric won the prize for best PhD student presenter at the Department's proposal colloquium in March 2013.



Prize winners at the 41st Annual meeting of the Parasitological Society of Southern Africa (PARSA) in Bloemfontein in 2012. From Left: Quinton Dos Santos, Lourelle Neethling and Dr Grace Moyo.

Mrs Lourelle Neethling (PhD Student, fourth year) is investigating different aspects of the biology of three branchiurian species; Lourelle was awarded the prize for the best oral presentation by a senior student at PARSA 2012 for her work on the reproductive system of *Chonopeltis australis*.

Dr Grace Moyo (Post-Doctoral Fellow) is investigating the life cycle of the copepod *Lamproglana clariae* as well as the pathology caused by intestinal cestodes of *Clarias gariepinus*. Dr Moyo graduated from the University of Limpopo, and was awarded the Willie Neitz medal for the best Dissertation in Parasitology in Southern Africa at the Annual meeting of the Parasitological Society of Southern Africa.



Members of the UJ Parasitology laboratory who attended the European Multicolloquium of Parasitology in Cluj-Napoca, Romania, 2012. From Left: Beric Gilbert, Quinton Dos Santos, Dr Moyo, Prof. Annemarie Avenant-Oldewage, and Ebrahim Hussain.

Lourelle Neethling

Molecular Ecology @ UJ

A molecular ecology lab has recently opened in the Zoology Department at UJ, headed by Bettine van Vuuren (previously of Stellenbosch University). Bettine has a keen interest in molecular ecology including phylogeography, population genetics and conservation biology. Projects that are starting up, or continuing in the new lab, include various aspects of gene flow, population health, landscape genetics, phylogeny of closely related species, as well as invasion biology. Study species include charismatic conservation cases such as wild dogs, lion and roan antelope, as well as a range of smaller mammals, plants and invertebrates.



Mark (left) and Govan (right) checking traps in the field

No one can run such a facility alone, not even a professor. The wheels of science are kept turning by Bettine's trusted lab manager, Rina Groenewald (who bravely undertook the move up north from Stellenbosch). Rina will return soon from an expedition to the southern Prince Edward Islands where much of Bettine's research takes place. The backbone of the lab is Bettine's personal assistant, Marilyn Scheepers, who navigates the mysterious world of academic bureaucracy with deft skill and grace.

There are also, unavoidably, students, and already Bettine has a small colony of postgrads nesting in the lab. We are: Govan Pahad, starting a PhD on the phylogeography of the single-striped grass mouse and its ectoparasites (with Duncan MacFadyen from E. Oppenheimer & Son, and Conrad and Sonja Matthee from Stellenbosch University); Ilana den Drijver starting a MSc on the large and small-scale genetic patterns of gerbil species (with Claudine Montgelard from France, Victor Rambau from Stellenbosch University, and Duncan MacFadyen); Mark Turnbull, starting a MSc comparing the phylogeography of invasive and indigenous rodents (with Chris Chimimba from Pretoria University, and Duncan MacFadyen). Quinton Dos Santos (supervised by Annemarië Avenant-Oldewage, see above) has added genetics to his arsenal of approaches studying *Monogea*. Philipp Wesche, who has made a valuable contribution to several projects, is completing his post doc with Bettine.

Soon to join us is Laura Tensen from The Netherlands who will work closely with Rosemary Groom, a post doc largely based in Zimbabwe, who works on various aspects of wild dog conservation. Two Honours students also frequent the lab. Joy Khuzwayo is looking at genetic health in lion populations (working closely with Rosemary and Paul Funston), and Jessica Peters who has a keen interest in bats (with Johan Watson from Free State Nature Conservation).



Ilana (left) and Mark (right) taking photos for identification

As the lab and the majority of projects are just starting up, we've spent the past month or two on project proposals, moving furniture, learning how to do genetic extractions and PCR amplifications, applying for ethics approval, putting up shelves, applying for bursaries, reading papers, cleaning out the new gel room, organising equipment, and applying to all the provinces for permission to do fieldwork (not necessary in this order). Finally, however, our brave efforts have paid off and, armed with live traps and mighty paperwork, we are now ready to head out and start our new exciting lives. Results should start flooding in soon. It is therefore, with great excitement and hope for the future that we say, 'You haven't heard the last of us!'

Govan Pahad, Ilana den Drijver & Mark Turnbull

Water quality assessment of selected dams in the O.R. Tambo District Municipality

Water quality determines the health of the community and is determined by the microbiological, biological, physical and chemical properties of water. Increasing world population increases water use for agriculture, industries, municipalities and residents. Though natural processes also add to the pollution in water bodies, they are seasonal. Anthropogenic influences are however, the main pollutants and constant, resulting in poor water quality. Dams are man-made lakes, and like many other human activities, they play an important role in the environment, acting as reservoirs for fresh water and improving socio-economic growth by attracting tourists and promoting recreation. There is a concern about the way in which dams are contaminated and consequently contributing to loss of species. According to the South African Constitution, everyone has a right to an environment that is not harmful to health, protected from pollution, and an environment where ecological degradation is prevented while promoting conservation and securing ecologically sustainable development. The aim of this study was to investigate the water quality of selected dams for potential use in aquaculture. This was achieved by examining the physio-chemical parameters (pH, temperature, salinity, electric conductivity, dissolved oxygen, and Total Dissolved Solids) in relation to anthropogenic activities using a multi-probe water quality parameter (Farrell-Poe, 2000). Six dams that form part of the Mthatha peri-urban water supply scheme were randomly selected. These included, such as Mabeleni, Mthatha, Corana, Owen, Sasol and Payne dams. Water samples were also collected from each of the dams to measure nitrates and phosphates concentrations using a nitrate and phosphate meter, respectively. In addition, species diversity and abundance of fish and frog species were estimated in each of the selected dams. A seine net was used to catch both fish and frog species from each of the dams.



Mabeleni Dam is situated in a forest where there is less human disturbance.



Car wash and solid waste as sources of pollution in Owen dam.

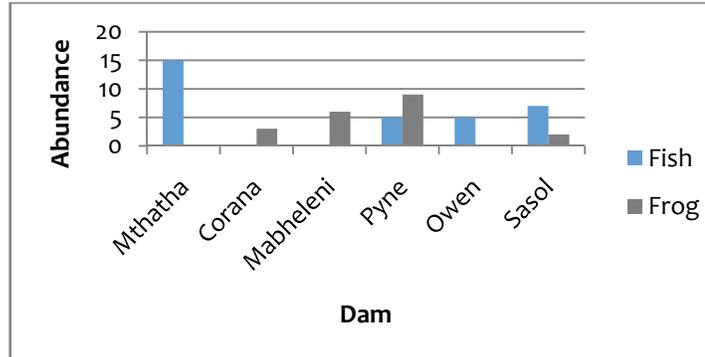


Fig. 1: Abundance of fish and frog species in the O.R. Tambo dams.

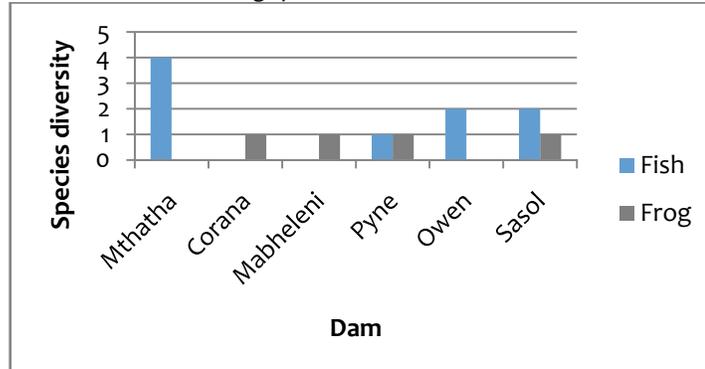


Fig. 2: Species diversity of fish and frog in the O.R. Tambo dams.

ANOVA results showed significant differences ($p < 0.05$) on temperature, salinity, electrical conductivity, dissolved oxygen, and total dissolved solids and there were no significant differences on pH and oxidation reduction potential among dams. However, dissolved oxygen, electrical conductivity, total dissolved solids, salinity, nitrates and phosphates were significantly highest but temperature lowest at Payne Dam. Total Dissolved Solids and salinity were lowest in Mabeleni Dam. Dissolved oxygen and Conductivity were lowest in Corana Dam, while temperature was highest in Sasol Dam. Mabeleni Dam had the lowest nitrate concentration, while Mthatha Dam had the lowest phosphate concentration. Payne Dam appeared to be most affected by pollution, domestic animal droppings, runoff from the roads, and dumping of waste.

To determine fish and frog species diversity among the selected dams, Simpson's and Shannon Weiner diversity indices were used. Four species of fish were found and these included, *Tilapia*, *Cyprinus*, *Micropterus* and *Oreochromus*. Mthatha Dam showed highest diversity

of fish species with *Tilapia* being the most abundant species and fish species were not found in Corana and Mabheloni dams. For frog, only two species, *Xenopus* and *Bufo* were found and recorded at Pyne Dam with *Xenopus* being the most abundant species. There were no frog species observed in Mthatha and Owen Dams (Figs. 1 & 2).

These results highlight an inverse relationship between fish and frog species among dams. A detailed and long term water quality study needs to be done before general conclusions can be made.

Tshingana Bomikazi (BSc Honours student)

Spatial distribution of hyperbenthic invertebrates in the Mngazana estuary with particular emphasis on the role of sediment characteristics

Estuaries are among the most productive systems on earth, due to the fact they support a wealth of plants and animals life, the hyperbenthos community could form the trophic base of such vulnerable life stages. It is essential to study hyperbenthic organisms as they act as a central point linking primary production and other trophic levels with marine ecosystems. The aim of this study was to provide a detailed investigation of the influence of sediment characteristics on invertebrate distribution in the Mngazana Estuary. The main objectives of the study were to determine species diversity of hyperbenthic invertebrates, estimate the abundance of hyperbenthic invertebrates, establish the distribution of the hyperbenthic invertebrates in the estuary, to compare the hyperbenthic invertebrate community among sites, and to investigate the effect of environmental variables on the distribution of the invertebrates within the estuary.

The spatial distribution of the hyperbenthos community and physio-chemical properties were investigated at Mngazana Estuary in August 2012. Six sites were sampled along the length of the estuary. Three replicate samples were collected in each site using a hyperbenthic sledge, and a Van Veen grab was used to sample the organic content. Data were analysed using PRIMER V6.o.



Yolanda holding a hyperbenthic sledge while sampling at Mngazana Estuary.

Results on physico-chemical variables showed a general decrease in salinity and dissolved oxygen values from the head to the mouth region of the estuary. Turbidity and organic content revealed highest values in the middle region of the estuary. This pattern corresponded with that of species diversity and richness. Eleven species were recorded along the length of the estuary with *Pseudodiaptomus hessei*, *Rhopalophthalmus terranatalis* and *Mesopodopsis Wooldridgei* being the most abundant species. Species density varied among sites and ranged from 1630 to 555 ind.m³. However, temperature showed the opposite trend with highest values in the head and mouth regions.

The results highlight that within the estuary the level of variation in the distribution of hyperbenthos community is strongly influenced by turbidity and organic content.

Yolanda Qhaji (BSc Honours student)

