NRF-SAIAB

Student Symposium

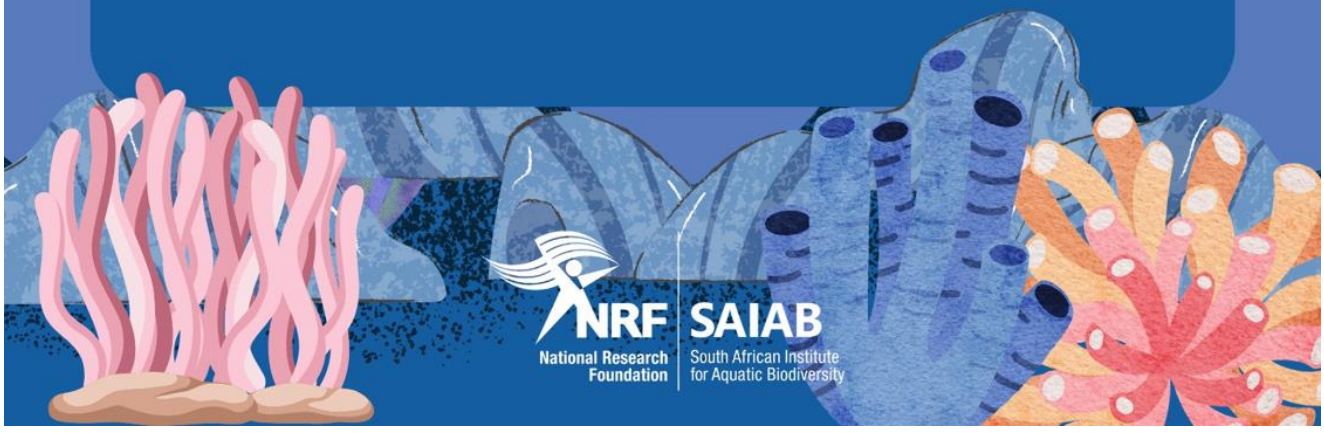
2023

"Planet Water: tides are changing"

Friday, 24 November 2023

Venue: Amazwi South African Museum of Literature, Makhanda

BOOK OF ABSTRACTS



08h40 – Guest Speaker: Professor Christopher McQuaid

Distinguished Professor at Rhodes University

Talk title: Life and Science

Prof McQuaid was born in Northern Ireland and received a PhD in Zoology at the University of Cape Town (UCT). He worked as Chief Scientific Officer aboard the expedition ship Benjamin Bowring for two years during a polar circumnavigation of the world with the Transglobe Expedition, then was a lecturer in Zoology and Entomology at Rhodes via a post-doc at UCT. He was appointed Chair of Zoology in 1991 and was the head of the Department of Zoology and Entomology for 4 years and Director of the Southern Ocean Group at Rhodes University for 20 years. He was appointed to the SARChI Chair in Marine Ecosystem Research at Rhodes in 2008 and Promoted to Distinguished Professor in 2011. He is a fellow of the Royal Society of South Africa and a member of the Zoological Society of southern Africa and of the Academy of Sciences of South Africa. He was a visiting Research Professor at the University of Hong Kong for 3 years and during two one-year sabbaticals he was a Sir Kirby Laing Fellow at the University of Wales and visiting professor at the University of St Andrews. His academic awards include the Rhodes University Junior and Senior Research awards, an NRF 'A' rating, a Harry Oppenheimer Fellowship, the Gilchrist Medal for contributions to Marine Science, the Gold Medal of the Zoological Society, and an Oppenheimer Memorial Trust Award. He is married with three children, played hockey for Ireland and holds a black belt in Aikido.

15h55 – Guest Speaker: Doctor Lyle Vorsatz

Lecturer at the University of Cape Town

Talk title: At their limits: evaluating the scale and impact of anthropogenic-induced stressors on mangroves and their macrofauna

Dr Lyle Vorsatz is currently a marine biology lecturer of the Department of Biological Sciences at the University of Cape Town. He completed his PhD at Rhodes University in conjunction with SAIAB, where he investigated the impact of mangrove microhabitats on the larval ecology of decapod crustaceans and fish, as well as explored aspects of their ecophysiology. Following this, he pursued post-doctoral studies at the University of Hong Kong, leading a project addressing macro- and microplastic pollution in critical peri-urban mangrove ecosystems. His current interdisciplinary research focuses on the ecological consequences of human-induced pollution, habitat degradation, and climate change. He explores how these factors shape the community structure and ecophysiology of both adult and larval invertebrate and fish populations, contributing to a holistic understanding of multi-scale ecosystem dynamics.

09h10 – Thembelihle Ndlovu (MSc)

Investigating the environmental influence on fish presence and abundance in the Keurbooms Estuary, South Africa

Dr C Elston (NRF-SAIAB); Dr T Murray (NRF-SAIAB)

Funded by: National Research Foundation; NRF-SAIAB

Estuaries are being altered by anthropogenic pressures such as fishing and climate change, thus it is important to understand how fish abundances and diversity are influenced by changing environmental conditions. Baited Remote Underwater Videos (BRUVs) were deployed weekly for two years (between 2021 and 2023) at three sites in the Keurbooms Estuary, Plettenberg Bay, to quantify the fish community, and various environmental parameters were recorded to determine how they influence this community. Thirty-three fish species have been identified, eight of which are dependent on estuaries as juveniles, indicating the estuary likely serves as an important nursery ground. A number of species of recreational importance (*Lichia amia* and *Seriola dumerili*) and conservation concern (*Lithognathus* and *Myoliobatis aquila)* were also recorded. The relative abundance of fish changed with distance from the estuary mouth and across seasons. Additionally, the relative abundance of the most abundant fish species *Rhabdosargus holubi* were related to the water temperature of the estuary. This study highlights the importance of ichthyofaunal and environmental surveys to ensure that estuaries and their inhabitants are sustainably managed for socio-economic benefits.

09h20 – Chandra Le Roux (MSc)

Morphological and molecular characterisation of four new species of *Trypanosoma* from fishes of the South Coast of South Africa

Prof NJ Smit (North-West University, NRF-SAIAB); Prof C Cook (North-West University); Dr M Truter (North-West University, NRF-SAIAB)

Funded by: National Research Foundation (REFRESH MSc bursary)

Members of the genus *Trypanosoma* include a diversity of flagellate and unicellular blood parasites, causing trypanosomiasis in animals and humans. Despite their global presence in vertebrates, fish trypanosomes remain understudied, with incomplete life cycles, ecological data, and uncertain phylogeny. The South African marine fish trypanosomes are particularly underexplored, with to date only two species recorded from this biodiverse region. This project aimed to improve our understanding of marine fish trypanosomes diversity along the southern African coast. It involved collecting blood samples from 379 host fishes across 31 species in various locations, including the Tsitsikamma section of the Garden Route National Park, Chintsa East (2020–2023), and Boknes in 2023. Giemsa-stained blood smears were examined for trypanosomes and when present morphologically characterised. Trypanosome DNA were extracted from whole blood and sequences were generated for the partial 18S rRNA gene. The study revealed four potentially new *Trypanosoma* species infecting the South African mullet (*Chelon richardsonii*), Barehead goby (*Caffrogobius nudiceps*), Super klipfish (*Clinus superciliosus*), and White steenbras (*Lithognathus lithognathus*). This research enhances our knowledge of marine fish trypanosome biodiversity and taxonomy, shedding light on these understudied parasites.

09h30 – Vivienne Dames (PhD)

Port of Ngqura: a clearly artificial yet totally unexpected sanctuary for fish

Prof T Booth (Rhodes University); Prof M Dicken (KZN Sharks Board)

Funded by: National Research Foundation (PMDS22061623338); Save Our Seas Foundation (Small grants 618_Dames)

The Port of Ngqura, situated 20 kilometres east of Gqeberha in South Africa, underwent a major transformation with extensive dredging of the Coegha River mouth. It was completed in April 2006 and became operational by the end of 2009. This development has created various microhabitats within the port, including dolosse, rock armour, shallow reefs, quay walls, and a small sandy beach at the Coegha River's mouth. The diversity of fish species, particularly sharks and rays. These species likely prefer the warmer, calmer, deeper waters of Port Ngqura, in contrast to the typically rough adjacent shores. This project involves a long-term dart tagging program that has generated an extensive dataset, revealing remarkable biodiversity in this man-made seascape. From 2010 to 2022, we recorded 86 species and 11,753 catches, with 6,518 tagged individuals. Sharks and rays accounted for 32.8% of all catches, spanning 27 species. Port Ngqura has become a vital habitat for these species, serving various roles, such as potential pupping grounds, nursery habitats, and refuges during unfavourable conditions in Algoa Bay. Visual observations and stereo-BRUVs continue to expand the species list and enhance our understanding of why ichthyofaunal communities recognize Port Ngqura as a critical habitat.

09h40 – Nawa Nawa (PhD)

Assessment of the multi-species Barotse floodplain fishery of the Upper Zambezi system

Prof RJ Wasserman (Rhodes University); Dr BR Ellender (NRF-SAIAB); Dr J Pegg, (NRF-SAIAB)

Funded by: DSI-NRF (Grant No. 110507); Worldwide Fund for Nature (WWF) Upper Zambezi Programme - DOB Ecology

The Barotse floodplain fishery on the upper Zambezi River system has faced increased exploitation and non-native species introductions. To assess its current status, fisheries dependant surveys were undertaken using key indicators; catch rates, species composition, size structure and gear use. Catch rates were higher in the wet season and highest in the Senanga stratum while the total annual fish yield was lower than previously estimated. Species composition was similar across seasons and strata with *Clarias* spp. being most dominant while *Oreochromis niloticus* was also harvested. Four out of five species examined were harvested below their 50% maturity length. Gear use was consistent across seasons and strata with gillnets being the most dominant. The use of illegal mesh sizes (<3 inch) was not different between seasons but was highest in Senanga while the use of monofilament gillnets was higher in the wet season and highest in Senanga. Non-native *Cherax quadricarinatus* by-catch was higher in the dry season and highest at the invasion core (Mongu stratum). All fishery indicators signal overexploitation, while non-native species *O. niloticus* and *C. quadricarinatus* pose threats. Effective management measures are required to ensure the sustainability of the fishery's resources and the conservation of biodiversity.

09h50 – Tholoana Ntokoane (PhD)

Re-assessing species limits within the lowveld largescale yellowfish, *Labeobarbus marequensis* (Smith 1841) from southern Africa

Dr A Chakona (NRF-SAIAB, Rhodes University); Dr E Vreven (NRF-SAIAB; Royal Museum for Central Africa; KU Leuven); Dr WT Kadye (Rhodes University, NRF-SAIAB)

Funded by: National Research Foundation; Mbisa Congo II (RMCA/DGD)

Forty-seven nominal species of *Labeobarbus* were previously described from southern Africa because early taxonomists recognised the important mouth morphological diversity occurring within this group. However, many of these species were subsequently put into synonymy, as the observed differences in mouth form were considered to mainly represent intraspecific variation. These synonymisations reduced the region's currently recognised species to eleven. One of these is *L. marequensis*, originally described from the Marico River in the Limpopo River system. It has the highest number of junior synonyms and, consequently, the widest distribution amongst its southern African congeners. An integrative taxonomic approach combining morphological and COI DNA barcoding data was used to test the hypothesis that *L. marequensis* could potentially harbour undocumented species diversity. The integrative taxonomic approach revealed that *L. marequensis* is endemic to the Limpopo River system, whereas the Pungwe and lower Zambezi River lineages represent distinct taxonomic entities. Yellowfishes contribute to the food security of largely poor rural human communities in this part of southern Africa. Thus, accurate delimitation of species boundaries and distribution ranges, will aid policymakers in formulating adjusted and effective conservation and management strategies.

10h00 – Nichole Donough (PhD)

Ecotoxicological responses of the African turquoise killifish *Nothobranchius furzeri* to chemical and biological stressors

Prof NJ Smit (North-West University, NRF-SAIAB); Prof V Wepener (North-West University); Prof L Brendonck (Katholieke Universiteit Leuven); Dr E Thoré (Katholieke Universiteit Leuven)

Funded by: NRF-SAIAB; VLIR-UOS

Nothobranchius furzeri killifish is a keystone species in temporary pools that exhibit characteristics that make them a suitable model for ecotoxicological studies. However, research on their natural environment in Southern Africa is scarce. To address this gap, this project aims to determine: the relationship between pond hydrology and killifish parasites; the presence of pollutants; if *N. furzeri* is a reliable bioindicator; killifish behaviour, and the effects of multiple stressors. This study will subject killifish to parasitic assessments, and water, sediment and fish samples will be analyzed. The physiological responses of the killifish at different endpoints will be compared to zebrafish and their brains will be dissected to measure size and parasite load after multiple behavioural tests. Various parameters will be altered in the mesocosm to induce a multi-stressor environment for the killifish. The knowledge gained from this project will be critical in improving our fundamental understanding of how different stressors may interact on killifish, to deepen our understanding of temporary pond ecology and parasitology, and how to effectively manage these fragile ecosystems that are increasingly polluted and threatened by the impacts of climate change.

10h10 – Jade Vermeulen (MSc)

The role of the new uThukela Banks Marine Protected Area in protecting threatened sharks and rays in KwaZulu-Natal

Prof M Lombard (Nelson Mandela University); Dr A Bernard (NRF-SAIAB); Dr L de Vos (Save Our Seas Foundation)

Funded by: National Research Foundation

At present, elasmobranchs are overfished as a result of being targeted for their body products. However, sharks and rays have low reproductive capacity, late maturity, and few offspring, which makes them highly vulnerable to overexploitation. Well-designed Marine Protected Areas (MPAs) are essential for conservation efforts as they provide suitable habitat and resources, which enables species to survive and reproduce, thereby contributing to future generations. The aim of this research is to identify critical areas and habitats for elasmobranchs within the uThukela Banks MPA and to assess its potential role in elasmobranch conservation within KwaZulu-Natal. The objectives are to: 1) describe the distribution and habitat associations of elasmobranchs by comparing areas within and adjacent to the uThukela Banks MPA and 2) determine the potential role that the uThukela Banks MPA plays in protecting threatened elasmobranchs, in relation to other KwaZulu-Natal MPAs. The study sites used were the uThukela Banks, Pondoland, Protea Banks, Aliwal Shoal and iSimangaliso MPAs. Sampling was carried out with baited remote underwater stereo-video systems (stereo-BRUVs) following national and international best-practice guidelines. The results of this research are currently underway and are therefore inconclusive. However, this research provides potential for quantifying the protection offered to elasmobranchs by MPAs.

10h20 – Vuyolwethu Mxo (PhD)

Distribution, abundance and habitat characteristics of *Cyperus textilis*

Prof J Adams (Nelson Mandela University); Prof F Porri (NRF-SAIAB, Rhodes University); Prof R Wynberg (University of Cape Town)

Funded by: National Research Foundation (Postgraduate Doctoral Scholarship); SARChI Chair Shallow Water Ecosystems; NRF-SAIAB

One of the main plants used for crafts in the Eastern Cape is *Cyperus textilis*. The usage of this sedge for craft purposes supports the livelihoods of the rural poor. The Indigenous Marine Innovations for Sustainable Environments and Economies (IMIsEE) Project intends to improve the biodiversity value of coastal urban habitats by co-creating structures for eco-engineering applications utilising *C. textilis*. Because of the potential for large-scale applications, *C. textilis* may be overexploited. One method of minimising overexploitation is to cultivate the plant, hence information on its natural habitat and distribution is firstly required. One of the project's primary goals is to assess sedge cover and conditions for growth. The distribution data from herbaria, SANBI, and iNaturalist depositories were utilised to undertake field surveys in the Eastern Cape. Culm density, plant height (cm), and percentage cover were measured, as were sediment samples collected for further analysis in the laboratory. Differences in *C. textilis* between regions within the Eastern Cape will be investigated and a distribution map will be created. The information collected from this research is not only significant for enhancing knowledge about a culturally and economically important species, but it is also important for the species' conservation.

11h00 – Dolley Thibedi (MSc)

Characterising the historical suitable habitat of *Bulinus globosus* in the Vhembe District, Limpopo Province

Ms N Ayob (North-West University); Ms N Nkosi (North-West University); Dr L de Necker (NRF-SAIAB, North-West University)

Funded by: Water Research Commission (Project No. C2019/2020-00151)

Schistosomiasis is a waterborne disease caused by infection with freshwater parasitic worms. More than 4 million people in South Africa are infected by schistosomiasis. It is a neglected tropical disease that is distributed across South Africa, including the Limpopo province. Environmental conditions such as temperature, rainfall and the presence of waterbodies can impact mortality rates and the abundance of schistosomiasis snail vectors. Changes in suitable areas potentially increase mortality rates and cause abundance in areas outside the suitable range. This study aimed to characterise the historical suitable habitat distribution of *Bulinus globosus* in the Vhembe District, Limpopo. Occurrence data for *Bul. globosus* was obtained from the National Freshwater Snail Collection (NFSC) for the years 1957 to 1963. The NFSC data contained habitat details and the number of *Bul. globosus* specimens. The results showed that the preferred habitats for *Bul. globosus* were brooks in permanent slow-running waters with a mean annual temperature range of 20-25°C and rainfall of 600-900mm. Furthermore, suitable habitats also included clear fresh water, with the presence of aquatic plants and a muddy substratum. The findings from this study are important for monitoring the potential shift in the spatial range of the intermediate host snails.

11h10 – Thamsanqa Wanda (PhD)

The geology and geomorphology of the Thukela Bank: towards ground-up marine spatial planning

Dr EA Wiles (NRF-SAIAB, Nelson Mandela University); Dr HC Cawthra (Minerals and Energy Unit-Council for Geoscience Western Cape regional office, Nelson Mandela University); Dr A de Wit (Nelson Mandela University)

Funded by: NRF-SAIAB

The seabed provides habitat for the existing ecosystems and biodiversity within the appropriate scale but only very limited portions of this have been mapped in high-resolution. The lack of hydro-acoustic data is perhaps due to a relative lack of funds, poor communication and understanding regarding multi-beam echo-sounders (MBES). The management, protection and monitoring of biodiversity that is not holistically understood poses significant challenges (e.g., lacking the contribution of abiotic factors, such as seabed geomorphology). MBES data provide an unrivalled perspective of the seabed, resolving its geomorphology in high spatial detail. Having mapped ca. 250 km^2 within and around the uThukela Marine Protected Area (MPA) with MBES, quantified spatial distribution analysis of the seabed is achieved, resolved using various derivatives MBES data (i.e., bathymetry, backscatter and slope maps along with cross-sectional profiles). These data enable the classification of the reef complexes erosional and depositional features, of various dimensions. The observed variation in paleo-coastlines preservation/expression on the continental shelf provides the sea-level record and suggests varying habitat availability. This contribution aims to discuss 1) the evolutionary advances of seabed mapping and 2) the value of MBES seabed mapping for the uThukela MPA.

11h20 – Thabani Khwela (MSc)

Mapping historic schistosomiasis risk areas in Johannesburg and Tshwane Municipalities

Miss N Ayob (North- West University); Miss NC Nkosi (North- West University); Dr L de Necker (NRF-SAIAB; North- West University)

Funded by: Water Research Commission (Project No. C2019/2020-00151)

Schistosomiasis is a neglected tropical disease reported in Sub-Saharan Africa, causing 200 000 deaths per year. Schistosomiasis is exacerbated by poor access to clean water, sanitation, hygiene practices, and various other factors including age, gender and access to potable water. Understanding these risk factors is essential for schistosomiasis control. Having information about where the hazard is occurring is paramount, to ensure services are administered to high-risk populations. This study aimed to map historic areas vulnerable to schistosomiasis in Johannesburg and Tshwane Municipalities, South Africa. The focus is on schistosomiasis risk areas coinciding with the distribution of *Biomphalaria pfeifferi* and *Bulinus africanus*. The census demographic data for 2011 was obtained from StatisticsSA and land cover from the Department of Forestry, Fisheries and Environment. The data was split into exposure and susceptibility variables and was reclassified on ArcMap and later integrated using a weighted overlay analysis. The results depicted the following areas: Bronkhorstspruit, Roodeplaat and Soshanguve to be characterized by a very high risk of schistosomiasis infections. Furthermore, Winterveldt, and the small parts of Atteridgeville had a very low risk. On the other hand, a moderate to very high vulnerability was observed in Johannesburg, Johannesburg South, and Randburg whilst Soweto remains a very high risk zone. Conversely, selected parts of Diesploot and Roodepoort were observed to have a very low vulnerability to schistosomiasis. Overall, the areas ranging from moderate to very high risk for schistosomiasis transmissions must be prioritized for action to improve schistosomiasis control and thus impede the possibility of future outbreaks of schistosomiasis in Gauteng.

11h30 – Enya Munting (MSc)

Measuring the effectiveness of Marine Protected Areas (MPAs) for the commercial line fishing sector in KwaZulu-Natal

Dr A Bernard (NRF-SAIAB); Dr J Cockburn (Rhodes University); Dr B Mann (Oceanographic Research Institute)

Funded by: National Research Foundation; WildOceans

Marine Protected Areas (MPAs) in South Africa are often gazetted with stated objectives. Of these, recovery of resources and fisheries sustainability is the third most stated socio-economic objective and is gazetted for all the MPAs in the KwaZulu-Natal (KZN) province. Another common objective among these KZN MPAs is maintaining cultural heritage. This project is measuring the impacts of the MPA network within the KZN province on the commercial line fishing sector - the oldest fishing sector countrywide and economically important. Mixed methods were used to measure relevant social and ecological impacts from a social-ecological systems perspective. For ecological impacts, baited remote underwater stereo-video systems (stereo-BRUVs) footage was used to compare fish populations inside and outside five MPAs, focusing on species on mesophotic reefs which are important to the sector. Furthermore, the perceptions of commercial line fishers regarding the ecological, social, and governance impacts of MPAs and their management were collected. Initial results indicate that although MPAs are effective, the sustainability and overall effectiveness of the network are compromised by lack of enforcement. Analyses will provide further details by the conference date.

11h40 – Nobuhle Mpanza (PhD)

Light trap efficiency validation for larval assemblages in urban coastal habitats

Prof F Porri (NRF-SAIAB, Rhodes University); Dr P Pattrick (NRF-SAEON)

Funded by: NRF-SAIAB; National Research Foundation (MCR210218586984); RC 2023

The intensified construction of seawalls has led to a global increase in artificial infrastructures in coastal environments. Such developments compromise the substrate complexity, crucial for major functional roles such as spawning and recruitment for the early stages of fish and invertebrates. Understanding how the biological communities function within such environments is imperative. This is especially true for early-life stages, which are an integral starting point to life in any ecosystem. A pilot methodology study was conducted to validate the efficiency of two light trap designs (quatrefoil and cylindrical) in assessing larval assemblages at four urban coastal sites. Results indicate no differences in species diversity between the designs nor across sites, while species richness differed significantly between sites and designs (p-values = 0.012: Port Alfred > rest; and 0.036: quatrefoil > cylindrical, respectively). These findings are crucial in choosing the correct design to sample larval diversity at urban and natural locations. This is important as the use of expensive designs, manufactured for long durability, may not be suitable for exposed sites, where the loss or damage generally poses a risk. The choice of the correct methodology has ultimate repercussions on results, interpretation of findings and recommendations to species management and drafting of policies.

11h50 – Thembani Mkhize (PhD)

A multi-method approach to assess habitat use and connectivity by juvenile coastal fishes in the St. Francis Bay seascape

Prof NC James (NRF-SAIAB); Dr G Rishworth (Nelson Mandela University); Dr A Bernard (NRF-SAIAB)

Funded by: National Research Foundation

Coastal habitats provide an important ecosystem service as nursery areas for fish and invertebrates, thereby making positive contributions to fisheries. A holistic view of the seascape nursery requires that all potential nursery habitats in a seascape and their connectivity with adult habitats be considered effectively. The success of nursery habitats is judged based on their greater contribution per unit area to adult populations of a particular species compared to other habitats. Quantitatively assessing habitat use and movement or connectivity of reef fish species in a seascape of different habitats is difficult and this leads to a lack of quantitative data on seascape connectivity. The main aim of this study is to use a seascape approach to determine nursery habitat usage by juvenile fish assemblages in an estuarine to marine seascape in St Francis Bay, Eastern Cape. This will also consider how seascape context and configuration influence the nursery role of different shallow nursery habitats within that seascape. Furthermore, connectivity among nursery habitats and export to deeper, offshore adult habitats will be explored using otolith and eye lens compound specific stable isotopes which provide an indication in adults regarding their nursery habitat occupation. This research will therefore make a novel contribution to coastal fish ecology in South Africa by characterising available nursery habitats using a multi-method approach and to determine their relative importance to adult stock populations.

12h00 – Mohammed Kajee (PhD)

Trajectories of change in South Africa's freshwater fish fauna: using historic data to support assessment and management of threatened species

Dr HF Dallas (Freshwater Research Centre, Nelson Mandela University); Dr JM Shelton (Freshwater Research Centre); Prof CL Griffiths (University of Cape Town); Dr J Pegg (NRF-SAIAB)

Funded by: JRS Biodiversity Foundation (Grants 60606 and 60919); SANBI; National Research Foundation (Grant Number: MND2000621534710–UID: 133692); NRF-SAIAB (UID 110507).

In South Africa, anthropogenic pressures such as water over-abstraction, invasive species impacts, land-use change, pollution, and climate change have caused widespread deterioration of the health of river ecosystems. Effective conservation and management of South Africa's freshwater ecosystems requires access to reliable and comprehensive biodiversity data. The Freshwater Biodiversity Information System (FBIS) was built to address this knowledge gap by developing an intuitive, accessible and reliable platform for freshwater biodiversity data in South Africa. We describe how the system is being used to provide freshwater fish data to a national conservation decision-support tool—The Department of Forestry, Fisheries, and the Environment (DFFE) National Environmental Screening Tool (NEST). The NEST uses empirical and modelled biodiversity data to guide Environmental Impact Assessment Practitioners in conducting environmental assessments of proposed developments. Occurrence records for 34 threatened freshwater fishes occurring in South Africa were extracted from the FBIS and verified by taxon specialists, resulting in 6 660 records being used to generate modelled and empirical national distribution (or sensitivity) layers. This represents the first inclusion of freshwater biodiversity data in the NEST, and future iterations of the tool will incorporate additional freshwater taxa.

12h10 – Mpilonhle Nyawo (PhD)

Assessing day-night changes in shallow and deep temperate reef fish assemblages using environmental DNA metabarcoding and stereo-BRUVs

Dr G Matcher (NRF-SAIAB); Dr A Bernard (NRF-SAIAB)

Funded by: DST-NRF Professional Development Programme

The diel cycle, which involves 24-hour periods of light and darkness, has a significant influence on the activity and behaviour of marine fish, which results in changes in the assemblage structure, composition and distribution. Studies conducted solely during daylight hours may not accurately represent the true diversity and structure of fish assemblage, therefore, it is important to include diurnal and nocturnal sampling for a holistic assessment of demersal fish communities. While this has been done globally, there has been limited research conducted in South Africa. Consequently, we have a poor understanding of how nocturnal reef fish communities are structured and also the day-night activity patterns of species inhabiting both shallow and deep reefs. As such, this study uses environmental DNA (eDNA) metabarcoding and stereo-BRUVs to investigate the day-night changes in fish assemblages on shallow (15–30 m) and deep (31–80 m) temperate reefs in South Africa. Sampling was conducted in Tsitsikamma National Park Marine Protected Area and Algoa Bay in February and March 2022. According to our knowledge, this study is the first of its kind that applies both eDNA and stereo-BRUVs to assess day-night changes in fish assemblages in South Africa. Collecting information such as diversity, abundance, and species composition over multiple diel cycles will enable us to better understand the more minor changes in fish ecology over time.

12h20 – Thembelihle Dube (MSc)

Building the foundation for efficient monitoring of mesophotic fishes to support management of the uThukela Banks Marine Protected Area

Dr A Bernard (NRF-SAIAB); Dr L De Vos (Save Our Seas Foundation)

Funded by: NRF-SAIAB; African Coelacanth Ecosystem Programme

Marine protected areas (MPAs) are spatially demarcated areas zoned to restrict, control human activity, and promote sustainable ecosystem management. They are crucial to marine conservation, however, many MPAs lack the appropriate ecological long-term monitoring (LTM) programmes required to measure their success. Effective LTM programmes must be able to detect changes in the ecosystem structure between different management zones and be cost-efficient to ensure the long-term viability of the programme. Therefore, this study aimed to build the foundation for efficient monitoring of mesophotic fishes to support the management of the newly established uThukela Banks MPA. Data on the diversity, abundance, and size structure of the mesophotic (40-100 m) demersal fish were collected from key reef sites within different management zones of the MPA using baited remote underwater stereo-video systems (stereo-BRUVs). Preliminary results showed considerable variation in habitat structure and fish assemblages among the different MPA zones. Data is utilised to determine baseline assemblage structure, perform spatial comparisons, and design an LTM programme that would enable MPA management staff to effectively report on fish status within the MPA and identify changes over time.

12h30 – Siphendulwe Zaza (MSc)

Automating anomaly detection in telemetry dataset and fish movement patterns using Long Short-Term Memory and auto-encoders: a time series analysis approach

Dr M Atemkeng (Rhodes University); Dr TS Murray (NRF-SAIAB)

Funded by: National Research Foundation

Acoustic telemetry data plays a vital role in understanding the behaviour and movement of aquatic animals. However, these datasets often contain anomalous detections that can pose challenges in data analysis and interpretation, but identifying these manually can be time-consuming and is not feasible given large datasets collected over multiple years. As such, there is considerable potential for the development of machine learning algorithms that can assist with these tasks. This study focuses on automating anomaly detection in telemetry datasets using machine learning and artificial intelligence models, using a combined approach of Long Short-Term Memory (LSTM) models and autoencoders to construct an efficient anomaly detection system. Additionally, the future positions of fish given historical trajectories will be predicted. A large multi-year dataset (>3 million detections) stemming from the long-term detection of 50 acoustically tagged dusky kob (*Argyrosomus japonicus*) in the Breede Estuary was used to develop the models. Preliminary results indicate the need to apply SMOTE to address class imbalance, utilize LSTM autoencoder, and generate detection plots to enhance the reliability of model evaluation after balancing the data. This results of this study can potentially be implemented for other large acoustic telemetry datasets, and could be extended to the marine environment.

12h40 - Sivuyisiwe Thando Cweba (MSc)

Seascape Mapping and Modelling: Shallow water habitat mapping in Cape Recife, Algoa Bay

Prof NC James (NRF-SAIAB); Dr S Parker-Nance (SAEON); Dr PP Steyn (Nelson Mandela University)

Funded by: National Research Foundation

Seascape ecology looks into the effect of seascape structure on biological assemblages using the concepts and frameworks applied in landscape ecology. Seascape structure and configuration is investigated using effective mapping methods such as satellite, acoustic and visual imagery. Maps of seascape composition are important when designing a seascape ecology research program and provide the necessary baseline spatial data to inform spatial planning, sampling, monitoring and conservation efforts. This project aims to combine and interpret multibeam data and seabed images to map and classify benthic habitat in the western corner of Algoa Bay (around Cape Recife). The overall habitat classification maps will be developed using Benthic Terrain Modeler in ArcGIS by combining the data acquired from multibeam bathymetric sampling and the underwater drop camera imagery data.

12h50 – Dinah Mukhari (PhD)

Movement behaviour and migration patterns of flathead mullet *Mugil cephalus* in the Kowie Estuary, South Africa

Dr TS Murray (NRF-SAIAB); Dr J Pegg (NRF-SAIAB); Prof A-R Childs (Rhodes University)

Funded by: National Research Foundation

Estuaries are ecologically diverse, and the fish species living in them are considered valuable natural resources. Small-bodied fish, such as mugilids, are generally abundant in estuaries, making them ecologically important. Flathead mullet, *Mugil cephalus* is a cosmopolitan, estuarine resident species making occasional longitudinal movements between the freshwater, estuarine and marine environments in different parts of the world. The information regarding the timing, frequency and extent of estuarine usage of flathead mullet is lacking in South Africa. As such, acoustic telemetry was used to study the movements of flathead mullet in the permanently open Kowie Estuary, with 21 individuals (mean ± SD: 339.4 ± 98.5 mm fork length) tagged over six months (December 2022 to June 2023). Their movements are currently being monitored by an array of 25 acoustic receivers with preliminary results showing a general downstream movement towards the lower reaches from March to June. This is not unexpected as estuaries are generally colder in winter months compared to the sea, and fish move to reduce thermoregulatory stress. Identification of seasonal movements and habitat preferences including factors influencing these is crucial for the conservation of mugilids and the development of species-specific management interventions.

14h00 – Suzanne Redelinghuys (PhD)

Ecology of *Parechinus angulosus* sea urchin: a model for fisheries and ecological resilience?

Prof F Porri (NRF-SAIAB, Rhodes University); Dr G Matcher (NRF-SAIAB)

Funded by: Rhodes University (Levenstein Bursary); DSI-NRF Post-Graduate Scholarship (Grant number: MND210602605681); NRF-SAIAB; RC grant

Sea urchins hold economic significance yet remain understudied in South Africa. Given the economic benefits echinoculture could offer in an impoverished country, understanding urchin health is vital. This study investigates whether population health indicators can be derived from genomic, gut microbial, and morphometric data in the cape sea urchin, *Parechinus angulosus*. Phylogeographic analysis of South African *P. angulosus* individuals using ezRAD-prepared genomic sequences reveals population substructuring within the Agulhas Bioregion, which may be an early indicator of speciation within the population in response to differing environmental factors. Analysis of *P. angulosus*' gut microbial communities using 16S rRNA gene sequencing identifies four dominant bacterial phyla that are consistent across all populations, suggesting that gut bacteria are highly conserved. Furthermore, significant morphometric trait variations are observed between individuals grouped into bioregions adjacent to the Agulhas and Benguela currents. Further analysis aims to investigate relationships between an individual's genotypic and phenotypic traits. This investigation sheds light on the potential of genomic, gut microbial, and morphometric data to assess sea urchins' population health, offering valuable insights into their sustainable exploitation in impoverished regions, and their ecological resiliency in anthropogenically-driven changing oceans.

14h10 – Tshenolo Masilo (MSc)

A first insight into the parasitic communities of *Labeobarbus marequensis* within the Letaba River in South Africa: a baseline to determine the historical ecology of parasitism

Prof KA Hadfield (North-West University); Prof N Smit (North-West University, NRF-SAIAB); Dr M Truter, (North-West University, NRF-SAIAB).

Funded by: National Research Foundation; SAIAB ring-fenced bursary

The historical ecology of parasitism (HEP) is a new subdiscipline focusing on extracting data from preserved specimens. The National Fish Collection (NFC) at the South African Institute of Aquatic Biodiversity has many preserved fish that could be host to parasites. A database search within the NFC unveiled a significant presence of *Labeobarbus marequensis* (Smith, 1841), spanning six decades (1960 to 2017), showing great potential for historical data mining. *Labeobarbus marequensis* is a freshwater fish species with a wide distribution range from the Zambezi River to the Phongolo River System. For a first insight into the present-day composition of the parasite community, 17 *L. marequensis* specimens were collected from the Letaba River using cast nets and electrofishing. A full parasitological screening of ectoparasites from the external surface was done, followed by an endohelminth screening of all internal organs. Overall, 65% of the collected specimens were parasitised with intensities from 1 to 27 for the parasitic taxa observed. The parasitic taxa included myxozoan plasmodia, monogeneans, bivalve larvae, copepods, digenean metacercariae and nematodes. This study provides new geographical records of these parasites in South Africa. Additionally, this represents the first record of myxozoans and larval bivalves parasitising *L. marequensis*.

14h20 - Jabulani Ndaba (PhD)

Potential use of indigenous knowledge systems for nature-based ecological engineering applications along an urban coastline: the early (biofilm) beginnings

Prof F Porri (NRF-SAIAB, Rhodes University); Dr P Pattrick (NRF-SAEON); Dr L Human (NRF-SAEON); Dr E Puccinelli (NIOZ); Dr P Cotiyane-Pondo (NRF-SAEON); Mr P Pieterse (UJ-Spectrum)

Funded by: National Research Foundation (MND210621614130; MCR210218586984)

The proliferation of artificial structures along urban coastlines is progressively altering coastal ecosystems' habitat integrity and functionality. This alteration has been shown to have a negative impact on biofilm diversity and consequentially on the recruitment and settlement of larval fish and invertebrates. To lessen these effects, combining engineering practices and ecological principles is necessary to regain habitat functionally. As a potential candidate for nature-based solutions in urbanised coastal systems, the sedge *Cyperus textilis* and its indigenous applications are currently being considered. This study assessed diatom successional changes and metal bioaccumulation at different time intervals on *C. textilis* deployed at the Port Alfred Marina. Initial colonisation of diatom species occurred within 12 hours, with representative species of *Grammatophora*, *Neofragilaria*, and *Fragilaria* observed. While after three (3) days from deployment, there was a substantial increase in diatom species diversity. In contrast, metal accumulation occurred after 1 week of deployment. These findings suggest that *C. textillis* is a suitable candidate for nature-based eco-engineered applications as it provides a functional substrate for benthic diatom succession and metal accumulation along modified coastal sites.

14h30 – Bantony Ziko (PhD)

Habitat use and movements of three sympatric mullet species revealed by acoustic telemetry

Dr TS Murray (NRF-SAIAB); Prof A-R Childs (Rhodes University)

Funded by: National Research Foundation, SANOCEAN

Mugilids are a diverse group of fishes inhabiting a wide range of habitats which are utilised for various socio-economic purposes. The majority of these species occupy transitional habitats such as estuaries and present unique life history strategies involving movements between freshwater, estuaries and marine environments. However, information on the movements of small-bodied estuarine-associated species such as mullets is largely lacking, and this project aims to address this knowledge gap. Thirteen striped mullet *Chelon tricuspidens* [234 – 330 mm fork length (FL)],12 grooved mullet *C. dumerili* (190 – 303 mm FL) and 6 southern mullet *C. richardsonnii* (223 – 303 FL) were caught and surgically equipped with small uniquely coded acoustic transmitters (V9, Innovasea). Movements were monitored by an array of 23 acoustic receivers deployed in the Kowie Estuary, South Africa. Data from a 3-month monitoring period has indicated high estuary usage by all three species. In addition, there was also evidence for interspecific habitat partitioning where the *C. tricuspidens* utilised the lower reaches of the estuary, *C. dumerili* preferred the middle reaches while the *C. richardsonnii* utilised the middle-upper reaches. Information on the movements of these species is essential in understanding their ecology, which information is crucial for their management.

14h40 – Tadiwa Mutizwa (PhD)

Review of the southern African genus *Heteromormyrus* Steindachner 1866 (Teleostei: Mormyridae) with description of six new species and updating of biogeographic patterns

Prof WT Kadye (Rhodes University, NRF-SAIAB); Dr A Chakona (NRF-SAIAB, Rhodes University)

Funded by: Rhodes University Sandisa Imbewu Scholarship; NRF-SAIAB

The existence of hidden diversity within the genus *Heteromormyrus* (Osteoglossiformes, Mormyridae) in southern Africa was first reported almost two decades ago. These fishes were recently transferred from the genus *Hippopotamyrus* to the genus *Heteromormyrus* following comparison of Cytochrome c oxidase subunit I and cytochrome *b* gene sequences extracted from the 157-year-old holotype of *H. pauciradiatus*. Recent DNA-based studies of the widely distributed *H. ansorgii*, have indicated that it is a complex of at least 10 undescribed species. The present study conducted a detailed morphological examination (both external anatomy and osteological), that delimited *H. ansorgii sensu stricto*. This resolution facilitated description of two new species in the Kwanza River system (Angola). Four new species were described from the Okavango (Angola, Namibia and Zambia), Ruo (Lower Zambezi, Malawi,), Pungwe (Zimbabwe) and Buzi River systems (Zimbabwe). Results from this study suggest that these species are endemic to the respective river systems from which they were described. Additional new species are likely to be discovered, particularly from the Kwanza and Upper Zambezi river systems, since some sections of these river systems remain poorly sampled.

14h50 – Siphelele Dyantyi (PhD)

Comparing Natural and Artificial Coastal Habitats: insights from Complexity, Soundscape and Physiology

Prof F Porri (NRF-SAIAB, Rhodes University); Dr K van der Walt (NRF-SAIAB); Dr P Pattrick (NRF-SAEON)

Funded by: National Research Foundation Post-Graduate Scholarship

Coastal environments serve as productive habitats, crucial for upholding key ecological processes that sustain marine organism populations. The expansion of coastal urban areas, however, brings detrimental consequences for the marine ecosystem, including habitat fragmentation, diminished habitat complexity, and shifts in ambient sound profiles, potentially impacting the overall integrity of the biological community. This study aims to compare natural and urban coastal systems to assess their suitability for invertebrate larval settlement. This aim will be achieved through three objectives: 1) evaluate the structural complexity of intertidal hard substrata, 2) characterise ambient thermal and soundscapes, and 3) assess temperature effects on physiological fitness of early invertebrate life stages along South Africa's southeast coast. This presentation focuses on objective 1, where structural complexity was assessed through 3D scanning at six sites (2 natural rocky shores, 2 small harbours and 2 large harbours). Various metrics (surface area, volume, curvature and texture) were used to identify structural differences among these habitats. Anticipated outcomes may reveal differences among habitats, with natural rocky shores expected to have higher complexity due to diverse microscale features, highlighting the potential impacts of urbanisation on biodiversity and ecological function.

15h00 – Jody-Carynn Oliver (PhD)

First insights into the population genomics of the Critically Endangered seventy-four seabream *Polysteganus undulosus*

Dr GF Matcher (NRF-SAIAB); Prof KJ Sink (SANBI); Prof PR Teske (University of Johannesburg); Prof S Mariani (Liverpool John Moores University)

Funded by: DSI NRF– ACEP (Grant 129216); National Research Foundation Postgraduate Scholarship (MND210406592334)

South Africa's marine ecosystems are protected by 42 marine protected areas (MPAs), representing 5.4 % of its mainland marine territory. Several MPAs were implemented to protect important fishery resources, such as seabreams (Sparidae). Even though many MPAs are in close geographic proximity to each other, this may not be sufficient to ensure optimal genetic connectivity throughout the protected species' ranges. Cutting-edge molecular methods employing massively parallel sequencing have considerable potential to provide crucial information that can improve management. Still, the inclusion of genomic data in South African marine biodiversity assessment, spatial planning and MPA design remains limited. Population genomics using single nucleotide polymorphisms (SNPs) provides a powerful approach to assessing fine-scale population connectivity. This project will use SNP data to investigate population connectivity and trends in effective population size in Critically Endangered seventy-four seabream *Polysteganus undulosus* along the south and east coasts of South Africa. It is expected to significantly improve their assessment and management and provide tangible information to inform spatial planning and the expansion of South Africa's MPA network.

15h10 – Angus van Wyk (PhD)

Understanding the interoperability and complementarity of disparate fish visual census techniques and optimising data value for stakeholders

Dr A Bernard (NRF-SAIAB); Prof AT Lombard (Nelson Mandela University)

Funded by: National Research Foundation

The assessment of fish populations is crucial for the management and conservation of marine ecosystems and fisheries. This study presents a comprehensive analysis of the nearshore fish visual census field research landscape, employing scientometric methods and the online platform, Cortext. The study utilised a dataset of 1 475 documents from 1953 to 2023. Various underwater fish visual census techniques, including Autonomous Underwater Vehicles (AUV), Baited Remote Underwater Video Systems (BRUVS), Diver-Operated Video (DOV), Remotely Operated Vehicles (ROV), Remote Underwater Video Systems (RUVS), Towed Video (TOWV), and Underwater Visual Census (UVC), were examined. Our results unveiled the evolving trends in fish visual census research, demonstrating the growth of various techniques over time. We identified 15 knowledge clusters, each representing a specific aspect of this research field. The analysis also revealed correlations between fish visual census methods and research topics, highlighting how different techniques can be combined effectively and the dynamics of the international collaborative network. This analysis enhances our understanding of the research field and can help stakeholders prioritise research areas, optimise data collection methods, and promote collaboration for improved fish monitoring and marine conservation efforts.

15h20 – Melissa Govindsamy (MSc)

The implementation of eDNA in determining species and population structure of Chondrichthyes

Prof A Engelbrecht (University of Western Cape); Dr A Bernard (NRF-SAIAB)

Funded by: National Research Foundation

With the increasing threat of human impact and destruction, less invasive scientific methodology is of paramount importance. The implementation of environmental DNA (eDNA) and stereo-baited remote underwater stereo-video systems (stereo-BRUVs) may provide such a solution. The aim of this study is to gain an understanding of the capabilities of eDNA for monitoring both demersal and pelagic elasmobranch species in Southern Africa. To achieve this, we first intend to compare eDNA and stereo-BRUVs (both day and night) data to better understand the cryptic dogfish (*Squalus*) family present on Algoa Bay's shallow and deep reefs. Secondly, we shall compare the capabilities of eDNA and pelagic stereo-BRUVs (baited and unbaited) in sampling the aggregation of scalloped hammerhead sharks (*Sphyrna lewini*) on Protea Banks. This research, through the application of non-invasive techniques such as eDNA and stereo-BRUVs, shall provide critical insights into the often indistinguishable dogfish species and the rapidly declining scalloped hammerhead shark populations. Understanding these dynamics is paramount for tailored and effective conservation efforts amid mounting human pressures on marine environments.

15h30 – Martinus Scheepers (PhD)

Revalidation of *Enteromius crocodilensis* from synonymy with *E. argenteus*, with some preliminary insights on the biogeography of southern African large sawfin barbs

Dr A Chakona (NRF-SAIAB, Rhodes University); Dr P Bragança (NRF-SAIAB)

Funded by: NRF-SAIAB; Refresh project (FBIP-211006643719); Topotypes project (IBIP-BS 13100251309)

A growing body of evidence suggests that the global diversity of freshwater fishes has been seriously underestimated. Studies of freshwater fishes that were previously thought to be morphologically variable have revealed the existence of deeply divergent lineages, with many distinct species. In southern Africa, a number of *Enteromius* species exhibit either exceedingly wide or divided distributions, patterns that should be rare for freshwater fishes with limited dispersal opportunities between river systems. One such species is the rosefin barb, *Enteromius argenteus* Günther, 1868. As it is currently defined, *E. argenteus* has a disjunct distribution that is divided between the Cuanza River system in Angola and the Incomati River system in South Africa and Swaziland, with a large geographic gap between these two populations. With the use of molecular and morphological methods, the level of divergence between the two populations was examined. The results provided clear genetic and morphological evidence for the revalidation of *Enteromius crocodilensis* Fowler, 1934 as a distinct species. The current distribution pattern of the large sawfin barbs may be linked to climate fluctuations throughout the Neogene.

15h40 - Nonhle Mlotshwa (PhD)

Developing a framework for predicting the future distributions of coastal fishery species

Prof A-R Childs (Rhodes University); Prof WM Potts (Rhodes University); Dr D Kaplan (Institut de Recherche pour le Developpement)

Funded by: Ada and Bertie Levenstein Bursary; NRF-SAIAB; Campus France; NRF MCR210429598107

South Africa's marine shore-based fisheries (MSBFs) are critical for sustaining livelihoods and generating economic activity for many. However, the coastal fish resources that they target are threatened by the combined impacts of overexploitation and climate change. While management strategies to prevent exploitation have been developed, understanding how effective these will be in a rapidly changing climate, where the distributions of fishes may shift, is essential. Two major approaches have been developed to predict climate-mediated range shifts of organisms: (1) correlative and (2) mechanistic species distribution models (SDMs) and together, they allow us to predict how the biology of species will interact with changing environmental conditions and provide essential information for conservation-decision making. The bronze bream, *Pachymetopon grande* is one of the dominant target species in the recreational and small-scale fisheries off the southern coast of South Africa. Catch rates of this species over the last 30 years have declined substantially, motivating the classification of *P. grande* as near threatened by the IUCN. This talk will describe how correlative and mechanistic SDMs will be developed for this species and how this information can be used to improve the management of the species and maintain the social and economic benefits of the fishery.

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