

NRF-SAIAB

Annual Research Report 2025



science, technology
& innovation

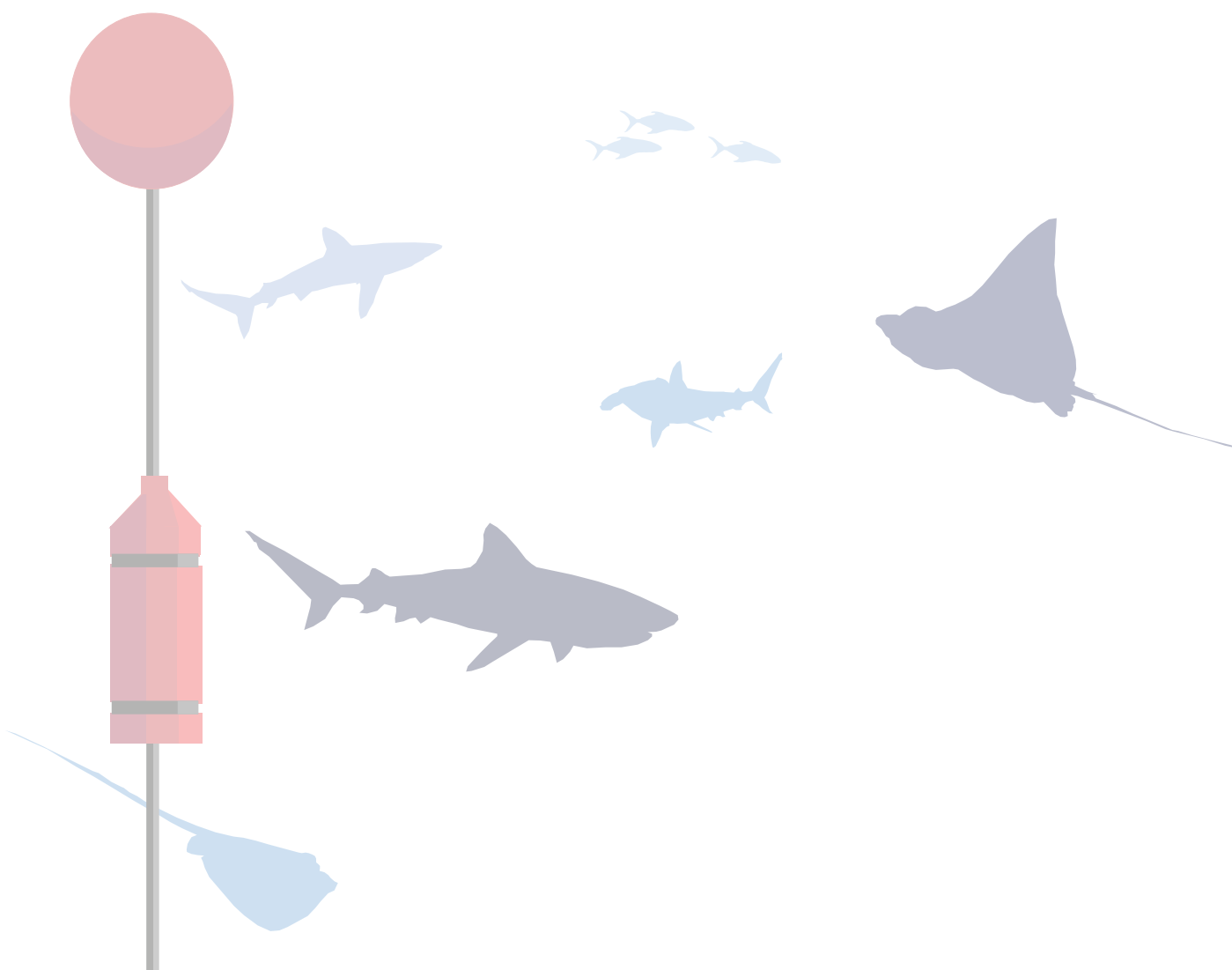
Department:
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National Research
Foundation

SAIAB

South African Institute
for Aquatic Biodiversity



Annual Research Report 2025



Department:
Science, Technology and Innovation
REPUBLIC OF SOUTH AFRICA



VISION 2030

Aquatic Biodiversity Science and Research that works for Society.

MISSION 2030

To improve the quality of life of all South Africans through advancing aquatic research, science, technology and innovation.

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This report is intended to reflect progress in the research activities of the South African Institute for Aquatic Biodiversity (NRF-SAIAB). The information contained in the individual project reports may not be quoted or cited elsewhere without the permission of the authors or the Managing Director of the Institute. Data generated by the various research projects will be published in peer-reviewed literature in due course.

The South African Institute for Aquatic Biodiversity (NRF-SAIAB) is a National Facility of the National Research Foundation, established in terms of Act 23 of 1998.

NRF-SAIAB is a Schedule 3A Public Entity of Government responsible for conducting research and promoting technological advances and innovation in both freshwater and marine environments in southern Africa.

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ARR25 COVER PHOTO COMPETITION: NRF-SAIAB staff and students were invited to submit a striking photograph and explain how this photograph captures the beauty, science or spirit of NRF-SAIAB. The winning photograph is featured on the front cover and the runner-up is featured on the back cover.

Front cover: The photograph was taken by Dr Tholoana Ntokoane (NRF-SAIAB PDP Postdoctoral Research Fellow) who explained:

'For me, this image captures the uniqueness, beauty, science, and spirit of NRF-SAIAB. It reflects the core values of the NRF being people-centred, guided by respect and integrity, and driven by a passion for excellence. It also points toward a meaningful pathway for research that creates real impact'

In the photograph Dr Vuyolwethu Mxo is interviewing knowledge holders from the Amadiba community about Indigenous methods of cultivating *Cyperus textilis*, a culturally significant plant also used in ecological engineering (see report 'From grey to green: Engineering with nature for functional urban coasts' on page 17 by Prof. Francesca Porri, with COST team). The photographer featured in the image is Siphamandla Mceleli (kneeling), who works in NRF-SAIAB Collections.

Back cover: This photo, taken by Dr Taryn Murray, shows the still waters of the Knysna Estuary which provided ideal conditions for a solid day of seine netting, sampling endemic white steenbras *Lithognathus lithognathus* as part of Jessica Seath's PhD project titled 'Past, present and future status, as well as the importance of the Endangered white steenbras *Lithognathus lithognathus* to aquatic conservation in the Knysna Estuary.'

NRF-SAIAB's small boat fleet are suitable for conducting research in freshwater and estuarine environments. *Aestuarina* (pictured here) is named after the southern African endemic estuarine round herring *Gilchristella aestuarina* which is the most abundant of any fish species in South African estuaries where they spend their entire life cycle.

This small boat is the successor to the original tri-hulled *Aestuarina* which was named by Prof. Alan Whitfield and was the reliable work boat for many NRF-SAIAB MSc/PhD degrees, including Angus Paterson, Paul Cowley, Nikki James, Nadine Strydom, Leslie Ter Morshuizen, Paul Vorwerk, Sekiwe Mbande, Naomi Richardson, Jill Sheppard, Mandla Magoro and Nokobongo Mbandzi. Its versatility and mobility allows access to estuaries, and its uses, amongst others, include setting seine nets, cast netting, deploying acoustic receivers, and fishing for study species using rod and line.

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EXECUTIVE SUMMARY

PROF. ALBERT CHAKONA

Managing Director

NRF-SAIAB's Annual Research Report for 2025 reflects a vibrant institution working within the NRF's Transformation, Innovation, Excellence and Sustainability for Impact (TIES4I) Framework through supporting and undertaking research that responds to current and future challenges linked to food and water insecurity, global environmental change, biodiversity loss and emerging threats such as antimicrobial drug resistance. The Institute's integrated research platforms play a vital role in strengthening national, regional and continental expertise in aquatic biodiversity research, monitoring and management, helping to unlock the untapped potential of the blue economy and drive socio-economic development. Applied and innovative research is gaining momentum, with huge progress made in the areas of biological control, eco-engineering solutions, intelligent applications, sea floor mapping, marine robotics, genomics and drug discovery. The Institute has also expanded its capabilities for deep sea exploration to access and collect samples from previously unreachable habitats (at depths of up to 3 500 m), bolstering NRF-SAIAB's biodiscovery initiative. A new live animal handling platform, AQUALAB, is under development to advance aquaculture, polyculture and small-scale fisheries development to address the pressing challenge of malnutrition and food insecurity in the country and the region.

Alongside these advances, human capital development (HCD) and training continue to be prioritised to build local expertise and ensure that South Africa develops a skilled pipeline of professionals capable of driving innovation in aquatic biodiversity and environmental sciences. Over 85% of the current student cohort are from designated groups, which highlights the Institute's commitment and strong drive to promote transformation. NRF-SAIAB has also continued to strengthen collaborative initiatives with Historically Disadvantaged Institutions (HDIs) to make state-of-the-art equipment accessible to previously marginalised sectors of society. Looking ahead to the new financial year, there are advanced plans to expand platform provisioning, data sharing and resource utilisation through launching Joint Freshwater Labs at inland universities in the country.

NRF-SAIAB's Research Division produced 146 peer-reviewed publications in 2025, well above the historical five-year annual average. The outputs were in critical areas that include biocontrol, climate change resilience, biodiscovery, bioaccumulation and human health risk assessments. These outputs directly inform science-driven decision making, guide aquaculture and fisheries development, guide policy formulation, and inform sustainable environmental management to safeguard essential ecosystem services for current and future generations.

A strong network of national, regional, and international collaborators affirms the Institute's standing as a hub of research excellence and provider of unique platforms that support the National System of Innovation in South Africa, while contributing to regional and continent-wide capacity. Through these strategic partnerships, there is increasing momentum towards the development of a sustainable, continent-wide network for aquatic biodiscovery and monitoring. This is particularly critical because the long-term sustainability of Africa's aquatic research and management depends on cultivating indigenous expertise. The long-term aspirations are to ensure that Africa secures its own future through harnessing the untapped potential of its rich marine and freshwater resources for socio-economic development and growth of the blue economy, while contributing meaningfully to global

knowledge and solutions.

Behind the scenes, the NRF-SAIAB's Support Division provides a pillar of support that strengthens the Institute's research endeavours through proactive outreach to build connections with stakeholders and communities, diligent oversight to ensure full compliance with national provisions and regulations on financial management and procurement, promoting employee wellness and creating a safe and conducive work environment.

As we look to the horizon, we remain steadfast in strengthening our existing capacity and embracing new technologies, so that together with our extensive network of national, regional and global partners, we continue to drive science that not only advances knowledge, but delivers meaningful impact for society.



ISISHWANKATHELO ESIFUTSHANE SENGXELO

PROF. ALBERT CHAKONA

UMphathi oLawulayo

I ngxelo yoPhando yoNyaka ye-NRF-SAIAB ka-2025 ibonisa iziko elisebenza ngempumelelo ngaphakathi kweNkqubo ye-NRF yoTshintsho, uBugcisa noPhando oluPhambili kunye neMpembelelo (*Transformation, Innovation, Excellence, and Sustainability for Impact [TIES4I]*). Iziko liyaqhubeka ngokuxhasa nokuphumeza uphando olujolise ekusombululeni imingeni yangoku neyakwixesha elizayo enxulumene nokungongophala kokutya namanzi, utshintsho lwemeko-bume, ukulahleka kweentlobo zezidalwa eziphilayo, kunye nezoyikiso ezivelayo ezifana nokunganyangeki kwamayeza okulwa neentsholongwane. Amaqonga ophando e-NRF-SAIAB edibene anegalelo elikhulu ekuqiniseni ubuchule besizwe, bommandla kunye nelizwekazi kuphando lwezinto eziphilayo zasemanzini, ukubeka esweni, kunye nolawulo lwezibonelelo zendalo. La maqonga akwanceda ukuvula amathuba oqoqosho oluluhlaza nokuxhasa uphuhliso lwentlalo noqoqosho. Uphando olusetyenziswayo nolutsha luyaqhubeka lukhula, kunye nenkqubela ebonakalayo kwiindawo ezifana nolawulo lwezinto eziphilayo, ubunjini bendalo, ubuchwepheshe obukrelekrele, imephu yomgangatho wolwandle, iirobhothi zaselwandle, i-*genomics*, kunye nokufunyanwa kwamachiza. Iziko likwandise kakhulu amandla alo okuhlola ulwandle olunzulu, nto leyo evumela ukufikelela nokuqokelelwa kweesampulu kwiindawo ebezingafikeleleki ngaphambili (ukuya kuthi ga kubunzulu obuyi-3 500 m). Oku kukuqinisa iphulo le-NRF-SAIAB lokufumanisa nokuchaza izinto eziphilayo. Ngaxeshanye, iqonga elitsha i-AQUALAB lisaphuhliswa ngenjongo yokuphucula ukhuliso lweentlanzi zasemanzini, ukwandisa ukhuliso lweentlobo ngeentlobo zeentlanzi, kunye nokuxhasa abancinane kushishino lokuloba, ngenjongo yokunciphisa ukungondleki kunye nokomeleza ukhuseleko lokutya kweli nakummandla.

Uphuhliso lwezakhono zabantu (*Human Capital Development [HCD]*) luhlala lulunyathelo oluphambili kwizicwangciso zeZiko. Oku kubalulekile ekwakheni ubuchule bendawo kunye nokuqinisekisa ukuba uMzantsi Afrika uvelisa iingcali ezinobuchule kwicandelo lezinto eziphilayo zasemanzini kunye nesayensi yokusingqongileyo. Ngaphezulu kwe-85% yabafundi abaxhaswayo ngoku bavela kumaqela achongiweyo, nto leyo ebonisa ukuzinikela okuqinileyo kweZiko ekukhuthazeni utshintsho kunye nokulingana. I-NRF-SAIAB iyaqhubeka ukwandisa intsebenziswano namaZiko aCinezekileyo ngokweMbali (Historically Disadvantaged Institutions [HDIs]), ngenjongo yokuphucula ukufikelela kwizixhobo zophando zanamhlanje kubo bonke abaphandi. Kwixesha elizayo, izicwangciso zibandakanya ukusekwa kweeJoint Freshwater Laboratories kwiyunivesithi ezingaphakathi kweli lizwe, ukuxhasa ukwabelana ngolwazi, izixhobo kunye namaqonga ophando.

Ngonyaka ka-2025, iCandelo loPhando lwe-NRF-SAIAB luvelise amanqaku ophando ali-146 aphononongwe ngontanga (*peer-reviewed publications*), ngaphezulu komndilili weminyaka emihlanu edlulileyo. Uphando lwagubungela imimandla ebalulekileyo efana nolawulo lwezidalwa eziphilayo (*biocontrol*), ukomelela kutshintsho lwemozulu, ukufunyanwa kwezindalwa ezintsha zendalo (*biodiscovery*), ukuqokelelana kwezindalwa ezinobungozi kwizinto eziphilayo (*bioaccumulation*), kunye novavanyo lomngcipheko kwimpilo yoluntu. Ezi ziphumo zixhasa ngokuthe ngqo izigqibo ezisekelwe kwinzululwazi, zikhokela uphuhliso lwezolimo zasemanzini nezokuloba, kwaye zomeleza ulawulo oluzinzileyo lokusingqongileyo.

Uthungelwano lwamaqabane asekhaya, ommandla, nawamanye amazwe luqinisa indima yeZiko njengomkhokeli kuphando kunye nomboneleli wamaqonga ngaphakathi kweNkqubo kaZwelonke yoTshintsho noPhuhliso (*National System of Innovation [NSI]*). Ezi ntsebenziswano zikwanceda ekwakheni uthungelwano oluzinzileyo kwilizwekazi liphela, ngakumbi kwicandelo lokufunyanwa kwezidalwa ezintsha zasemanzini (*aquatic biodiscovery*) kunye nokubekwa esweni kwazo. Ukugcina uzinzo lwexesha elide lophando nolawulo lwamanzi eAfrika kuxhomekeke ekukhuliseni nasekuphuhliseni ubuchule babaphandi baseAfrika. Injongo kukuba ilizwekazi likwazi ukusebenzisa ngokupheleleyo izibonelelo zalo zasemanzini naselwandle ukuphuhlisa uqoqosho nentlalo, kunye nokukhulisa uqoqosho oluhlaza okwesibhakabhaka (blue economy), ngelixa likwanegalelo kulwazi nakwizisombululo zehlabathi.

Ngasemva kwezigcawu, iCandelo leNkxaso lwe-NRF-SAIAB linika inkxaso ebalulekileyo yokusebenza kweZiko, kubandakanywa unxibelelwano nabathathi-nxaxheba, ukuthotyelwa kwemigaqo-nkqubo yezemali nolawulo, ukhuseleko nempilo yabasebenzi, kunye nokuphuhliswa kwendawo yokusebenza ekhuselekileyo nekumgangatho ophezulu.

Njengoko iZiko lijonge kwikamva, liza kuqhubeka nokuqinisa amandla alo, lamkele ubuchwepheshe obutsha, kwaye lisebenzisane namaqabane ukuze liqhubeke inzululwazi enegalelo elibonakalayo kuluntu, kuqoqosho nakusingqongileyo.

UMBIKO OFINGQIWE WABAPHATHI

PROF. ALBERT CHAKONA

UMqondisi Ophethe

Umbiko Wonyaka Wocwaningo lwe-NRF-SAIAB ka-2025 uveza isikhungo esisebenza kahle ngaphansi koHlaka lwe-*Transformation, Innovation, Excellence and Sustainability for Impact (TIES4I)* lwe-NRF. Lesi sikhungo siqhubeka nokweseka nokwenza ucwaningo olusabela ezinseleleni zamanje nezesikhathi esizayo, okuhlanganisa ukungavikeleki kokudla namanzi, ukuguquka kwesimo sezulu emhlabeni, ukulahlekelwa yizinhlobonhlobo zezinto eziphilayo, kanye nezinselelo ezivelayo ezifana nokumelana nemithi elwa namagciwane. Izinkundla ezididiyelwe zocwaningo zesikhungo zenza indima ebalulekile ekuqiniseni ubuchwepheshe bukazwelonke, besifunda kanye nobezwekazi. Lokhu kufaka phakathi ucwaningo lwezinhlobonhlobo zezilwane zasemanzini, ukuqapha nokuphathwa kwezinsiza, kanye nokuvulwa kwamandla angakasetshenziswa omnotho wezasemanzini nasogwini, okuqhubekisela phambili intuthuko yezehlalo-mnotho. Ucwaningo olusetshenziswayo nolusungulayo luyaqhubeka nokukhula, njengoba kubonakala ngenqubekelaphambili emikhakheni ehluahlukene, efaka phakathi ukulawulwa kwezinto eziphilayo, izixazululo ze-*eco-engineering*, izinhlelo zokusebenza ezinobuhlakani, ukuhlolwa okwenziwa phansi kolwandle, amarobhothi ezinto zasolwandle, i-*genomics*, kanye nokutholwa kwemithi. Lesi sikhungo siphinde sandise amakhono aso okuhlola ulwandle olujulile ukuze sifinyelele futhi siqoqe amasampula ezindaweni ebezingafinyeleleki phambilini, kufinyelele ekujuleni okungafika ku-3 500m. Lokhu kusekela umkhankaso we-NRF-SAIAB wokuthola izinhlobonhlobo zezinto eziphilayo. Inkundla entsha yokuphatha izilwane eziphilayo, i-AQUALAB, isakhiwa ngokuhloswe ngayo ukuthuthukisa i-aquaculture ne-polyculture, kanye nokweseka abadobi abaziphilisa ngokudoba. Lokhu kubhekelela inselelo eqhubekayo yokungondleki kanye nokungavikeleki kokudla ezweni nasesifundeni.

Ngokuhambisana nale ntuthuko, ukuthuthukiswa kwabasebenzi (*Human Capital Development [HCD]*) kuyaqhubeka kubekwa eqhulwini. Inhloso ukukhulisa ubuchwepheshe bakuleli kanye nokuqinisekisa ukuthi iNingizimu Afrika ikhiqiza ochwepheshe abanamakhono abakwazi ukuqhuba ukusungulwa kwezinto ezintsha emkhakheni wezinsiza zasemanzini kanye nesayensi yezemvelo. Amaphesenti angaphezu kwama-85 abafundi bakulesi sikhungo njengamanje avela emaqenjini aqoqiwe, okukhombisa ukuzibophezela ekukhuthazeni uguquko. I-NRF-SAIAB iphinde yaqina ekwakheni ubudlelwano neziKhungo Zabantu Ababencishwe Amathuba (*Historically Disadvantaged Institutions [HDIs]*) ukuze kwandiswe ukufinyelela kwemishini esezingeni eliphezulu. Uma kubhekwa phambili, kunezinhlelo zokwandisa ukuhlinzekwa kwezinkundla zocwaningo, ukwabelana ngedatha, kanye nokusetshenziswa kwezinsiza. Lokhu kuzofezwa ngokwethulwa kwama-*Joint Freshwater Labs* emanyuvesi angaphakathi nezwe.

Ngo-2025, uPhiko Lwezocwaningo lwe-NRF-SAIAB lukhiqize izincwadi ezibuyekwezwe ontanga eziyi-146, okuyinani elidlula kakhulu isilinganiso seminyaka emihlanu edlule. Imiphumela yocwaningo igxile ezindaweni ezibalulekile, ezifaka phakathi ukulwa nezinambuzane nokhula, ukumelana nokuguquka kwesimo sezulu, ukuhlolwa kwezitshalo nezilwane ukuze kuthuthukiswe amabhizinisi, ukwanda koshevu ezilwaneni, kanye nokuhlola ubungozi empilweni yabantu. Le miphumela isekela ngokuqondile ukuthatha izinqumo ezisekelwe esayensini, yathuthukisa imikhakha yezokudoba nezilwane zasemanzini, yaba yisizinda sokwakhiwa kwenqubomgomo, futhi yaqinisa ukuphathwa kwemvelo okusimeme. Lokhu kubalulekile ekuvikeleni izinsiza zemvelo lokuzilondolozela izizukulwane zamanje nezesikhathi esizayo.

Inethiwekhi eqinile yabahlanganyeli kuzwelonke, esifundeni nasemazweni omhlaba iqinisekisa ukuthi lesi sikhungo sihlala siyisizinda sokwenza kahle ocwaningweni. Ngaphezu kwalokho, sihlinzeka ngezinkundla ezeseka uHlelo Lukazwelonke Lokusungula (*National System of Innovation [NSI]*) lwaseNingizimu Afrika futhi sifaka isandla emisebenzini yesifunda neyezwekazi. Lokhu kubambisana kuyaqhubeka nokwakha inethiwekhi esimeme yokutholwa nokuqapha izinto eziphilayo zasemanzini e-Afrika. Ukusimama kwalolu cwaningo kuncike ekuthuthukisweni kobuchwepheshe bendawo. Ngokubheka esikhathini eside, inhloso ukuqinisekisa ukuthi i-Afrika isebenzisa ngokugcwele amandla emithombo yayo yasolwandle neyamanzi ahlanzekile ukuze kuthuthukiswe umnotho womphakathi kanye nokukhula komnotho wezasemanzini nasogwini, kuyilapho ifaka isandla olwazini nasezisombululweni zomhlaba wonke.

Ngasohlangothini lokusekela, uPhiko Lokusekela lwe-NRF-SAIAB luhlinzeka ngesisekelo esiqinisa ukusebenza kwesikhungo. Lokhu kuhlanganisa ukwakha ubudlelwano nababambe iqhaza nemiphakathi, ukuqinisekisa ukulandela imigomo nemithetho yokuphathwa kwezimali nokuthengwa kwempahla, kanye nokukhuthaza inhlalakahle yabasebenzi nokudala indawo yokusebenza ephophile.

Njengoba sibheke esikhathini esizayo, i-NRF-SAIAB izoqhubeka nokuqinisa abasebenzi bayo kanye nokwamukela ubuchwepheshe obusha. Ngokubambisana nozakwethu kuzwelonke, esifundeni nasemhlabeni wonke, lesi sikhungo sihllose ukuqhubeka nokukhuthaza isayensi enomthelela obonakalayo emphakathini.

KAKARETŠO YA TOKOMANE E KGOLO

MOPR. ALBERT CHAKONA

Molaodimogolo

Pego ya Ngwaga le Ngwaga ya Nyakišišo ya NRF-SAIAB ya 2025 e bontšha mokgatlo wa mafolofolo wo o šomago ka gare ga lekgotla la NRF la Diphetogo, Bohlami, Bokgoni le go Swarelela ga Tshepedišo ya Khuetsō (*Transformation, Innovation, Excellence, and Sustainability for Impact [TIES4I]*) ka go thekga le go dira nyakišišo tšeo di arabelago go ditlhotlo tša gona bjale le tša ka moso tšeo di amanago lelhlokego tšhireletšo ya dijo le meetse, go fetoga ga tikologo tšalefase, go fokotšega ga mehuthuta ya diphdi le dikotsi tše diswa tša go swana le go se sa bolawa ga ditwatši ke dihlare. Tshepedišo ya Mokgatlo wo ya go dira dinyakišišo e kgatha tema ye bohlokwa go matlafatšeng mabokgoni a bosetšhaba, a selete le a kontinente nyakišišong ya diphedi tša ka meetseng, go di bea leihlo le go di hlokomela. Gomme seo sa bula menyetla ya go ithuša ka ikonomi ya mawatleng le go thuša go hlabolla ikonomi le maphelo a badudi. Nyakišišo e tseneletšego e gare e a kgatlampana, moo go dirilwego tšwelopele e kgolo ditabeng tša taolo ya tlhago, go hlangwa ga mananeokgoparara a go se senye tikologo, diepo tše bohlokwa, go tseba sebopego sa ka tlase ga lewatle, go dirišwa ga diroboto tša ka mawatleng, go utollwa ga dikarolwana tša leabela le dihlare. Ebile, Mokgatlo wo o katološitše mabokgoni a wona a dinyakišišo tša ka mawatleng gore o fihlelele le go kgoboketša mehlala ya dilo tša go tšwa mafelong ao peleng go bego go sa kgonege go fihla go wona (a go iša fase ka dimithara tše 3 500), gomme seo sa matlafatša maiteko a NRF-SAIAB a go ithuta ka dilo tša ka mawatleng. Gabjale go hlangwa mokgwa o moswa wa go swaragana le diphedi tša ka mawatleng, AQUALAB, bakeng sa go kaonafatša tsela ya go rua diphedi tša ka meetseng, go di godišetša mafelong a go swana le go hlabolla barei ba banyenyane ba dihlapi, go rarolla bothata bjo bo akgofilego bja phepompe le tlhokego ya dijo nageng le seleteng.

Gare ga magato a, lenaneo la go kaonefatša mabokgoni a batho (*Human Capital Development [HCD]*) le tlwaetšo le tšwela pele go etišwa pele go kaonafatša mabokgoni a batho ba nageng ye le go netefatša gore Afrika Borwa e ba le bašomi ba bantši ba dikgwari bao ba kgonago go tliša diphetogo mešomong ya ka mawatleng. Sehlopha sa baithuti ba gona bjale, ba ka godimo ga 85% ke ba go tšwa dihlopheng tše kgethegilego (designated groups), e lego se se bontšhago maikemišetšo a Mokgatlo a le kganyogo ya wona e maatla ya go hlohleletša diphetogo. Mokgatlo wa NRF-SAIAB gape o tšwetše pele o tliša maiteko a go dirišana le Mekgatlo ya Batho Bao ba Kilego ba Kgetholla (*Historically Disadvantaged Institutions [HDIs]*) go dira gore metšhene le didirišwa tša sebjalebja le di hwetšagale le mafapheng a setšhaba ao peleng a bego a kgaphelwa ka thoko. Ge re lebelela pele ngwageng o moswa wa ditšhelete, go logilwe maano a go katološa mokgwa wa go aba didirišwa, go abelana tshedimošo le tirišo ya ditlabela ka go hlongwa ga lenaneo leo le bitšwago *Joint Freshwater Labs* diyunibesithing tša ka gare ga naga.

Ka 2025, Lefapha la Dinyakišišo la NRF-SAIAB le tšweleditše dikgatišo tše 146 tšeo di lekotšwego ke ditsibi tše dingwe, e lego ka godimo ga kakaretšo ya ngwaga le ngwaga ya mengwageng e mehlano. Dikgatišo tšeo di be di bolela ka dikarolo tša bohlokwa kudu tšeo di akaretšago taolo ya tlhago, go swaragana le phetogo ya leratadima, go ithuta ka mehuthuta ya diphedi, ditshekatsheko tša go kgobelana ga dikhemikhale mmeleng le dikotsi tša maphelo. Dikgatišo tše di thuša gore go dirwe diphetho tše di theilwego go bohlatse bja tša saense, di fana ka tlhahlo tseleng ya go swaragana le diphedi tša ka mawatleng, le go hlabollwa ga lefapha la barei ba dihlapi, go hlahla magato a go hlangwa ga dipholisi, go thuša go laola tirišo ya tikologo bakeng sa go šireletša ditirelo tša tlhago tšeo di re holago bakeng sa meloko ya gona bjale le ya nakong e tlogo.

Tšhomišano e matla ya badirišani ba bosetšhaba, ba selete le ba boditšhabatšhaba e tlišetša seemo sa mokgatlo wo bjalo ka lefelo la dinyakišišo tša maemo a godimo le moabi wa ditshepedišo tša moswananoši tšeo di thekgago Tshepedišo ya Bosetšhaba ya Boitlhamelo ka Afrika Borwa (*National System of Innovation [NSI]*), mola e tsenya letsogo go bokgoni bja selete le bja kontinente ka bophara. Ka ditirišano tše tše dibotse, go na le kgatelopele e kgolo tabeng ya go ba le sehlopha sa banyakišiši le bahlokomedi ba kontinenteng ka bophara bao ba šomago ka dilo tša ka mawatleng. Se se bohlokwa kudu ka gobane go swarelela ga dinyakišišo tša ka mawatleng tša Afrika le go bea dilo leihlo go ithekile ka gore re be le ditsebi tša go tšwa kontinenteng ye. Dikganyogo tša lebaka le letelele ke go netefatša gore Afrika e ithokomelele bokamoso bja yona ka go šomiša mahumo a yona a ka mawatleng go hlabolla ikonomi le badudi le go godiša ikonomi ya mawatleng, ge e dutše e tsenya letsogo go hwetšeng le go abelaneng ka tsebo le ditharollo tšeo di holago lefase ka bophara.

Ka morago ga ditiragalo, Lefapha la Thekgo la NRF-SAIAB le fana ka thušo e kgolo yeo e matlafatšago maiteko a mokgatlo wa dinyakišišo ka go šoma ka thata go ipopa ngatana e tee le bakgathatema le badudi, le go ba le bookamedi bjo bobotse go netefatša kobamelo e feletšego ya melao le melawana ya bosetšhaba ditabeng tša taolo ya ditšhelete le go hwetšwa ga baabaditirelo, go kgothaletša tšhireletšego ya bašomi le go hlama lefelo la mošomo leo le bolokegilego le leo le nago le dilo tše bašomi ba di hlokago.

Ge re lebelela pele bokamosong, re tloga re ikemišeditše go matlafatša bokgoni bja rena bjo bo lego gona le go amogela thekinolotši ye mpsha, e le gore mmogo le badirišani ba rena ba bosetšhaba, ba selete le ba lefase ka bophara, re tšwele pele re dira dinyakišišo tša mahlale tšeo di sa oketšego tsebo ya rena feela, eupša gape di tliše khuetsō ye e nago le mohola setšhabeng.

RESEARCH OVERVIEW 2025

‘Bridging the salinity divide’ – NRF-SAIAB platforms strengthen integration of freshwater and marine research

PROF. JULIE COETZEE

Principal Scientist: DSTI/NRF-SAIAB SARChI Tier 1 Chair in Biological Control and Freshwater Alien Invasive Species Management, NRF-SAIAB

Deputy Director of the Centre for Biological Control, Rhodes University

Building on the momentum of 2024, the South African Institute for Aquatic Biodiversity (NRF-SAIAB) entered 2025 with a clear strategic direction focused on the consolidation of infrastructure platforms that strengthen freshwater-marine research integration and, in line with NRF Vision 2030 and the Transformation, Innovation, Excellence and Sustainability for Impact framework (TIES4I), sharpen the way research excellence is translated into practical value for society.

This report highlights how NRF-SAIAB’s mandate goes beyond individual projects. The Institute maintains national capability for aquatic biodiversity science through open-access platforms, national collections, specialist laboratories, observation systems and field infrastructure. In 2025, these assets were used more deliberately as a connected set of services that enable fundamental research, and support applied work in conservation, policy, management and innovation. This infrastructure-led approach ensures that investment in aquatic biodiversity research is matched to South Africa and the continent’s research priorities and user needs.

Advancing TIES4I through infrastructure

In 2025, the NRF’s TIES4I framework was used not only as a reporting lens, but also as a guide for the use of NRF-SAIAB’s national research infrastructure to facilitate meaningful research.

Transformation was advanced by widening access to platforms and data, enabling postgraduate students, early-career researchers and partners, particularly from Historically Disadvantaged Institutions (HDIs), to participate in aquatic biodiversity research. Initiatives such as the Joint Marine Laboratories Programme (JMLP), expanded freshwater field capability, and user-centred access models helped embed transformation in the day-to-day operation of the research system. The result is a growing and more diverse cohort of researchers trained within, and supported by, national infrastructure.

Innovation was strengthened through the integration of long-term data, technology and interdisciplinary expertise across platforms. The growing use of genomics, remote imagery, acoustic telemetry, artificial intelligence and decision-support tools illustrates how infrastructure investment can turn biodiversity knowledge into practical tools for policy development. NRF-SAIAB’s research moved beyond problem description toward the provision of tools and options that can be taken up by decision-makers and address biological invasions, inland fisheries, coastal resilience, freshwater biodiversity loss, pollution and climate change.

Excellence remained foundational. NRF-SAIAB’s national collections, genomics facilities, observation systems and analytical platforms once again supported internationally competitive science in taxonomy, systematics, ecology and evolutionary biology. In 2025, excellence was reflected not only in outputs, but also in stewardship through the maintenance of world-class reference collections and ensuring that platforms remain reliable and accessible.

Sustainability was ensured both ecologically and institutionally. NRF-SAIAB’s research supports healthier rivers, estuaries and oceans, which are essential for water security and livelihoods. In addition, NRF-SAIAB keeps national research infrastructure running reliably through long-term planning and investment, including energy resilience, so that researchers can depend on these services year after year.

Strengthening freshwater–marine integration

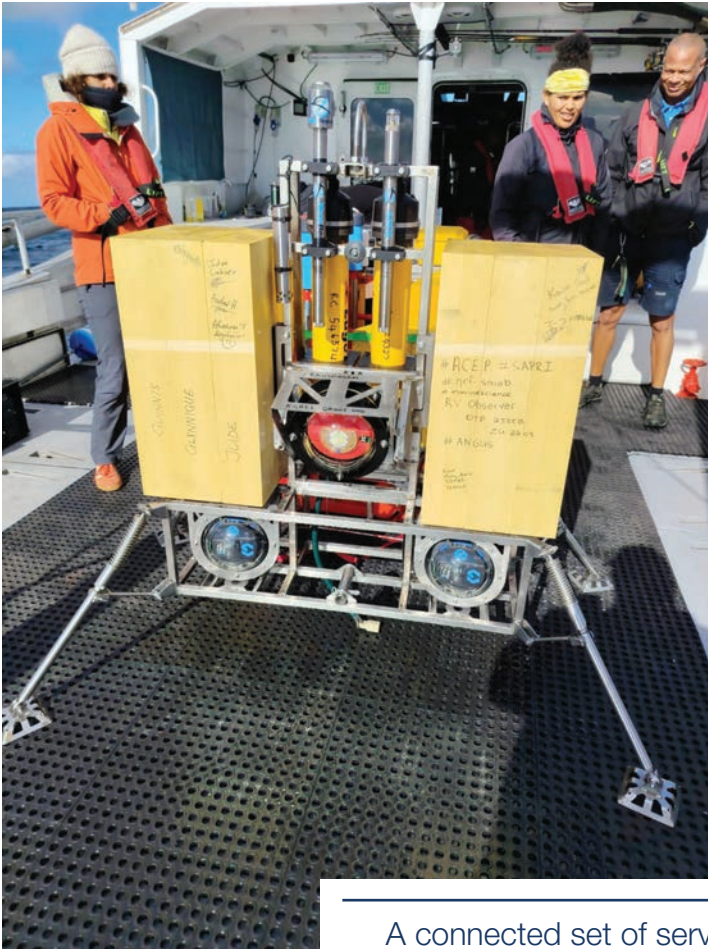
A key development in 2025 was stronger integration of freshwater and marine research within a single infrastructure framework – described by Acting NRF CEO, Dr Angus Paterson, as “bridging the salinity divide”. Long-standing marine platforms were increasingly complemented by freshwater field units, biodiversity information systems and genomics capability. This combination allowed NRF-SAIAB to address land-sea linkages as connected socio-ecological systems. Work on inland fisheries, biological invasions, connectivity of rivers and estuaries and coastal processes increasingly informed policy and management across sectors, and reinforced the Institute’s role in supporting whole-system approaches to aquatic ecosystem sustainability.

From outputs to outcomes

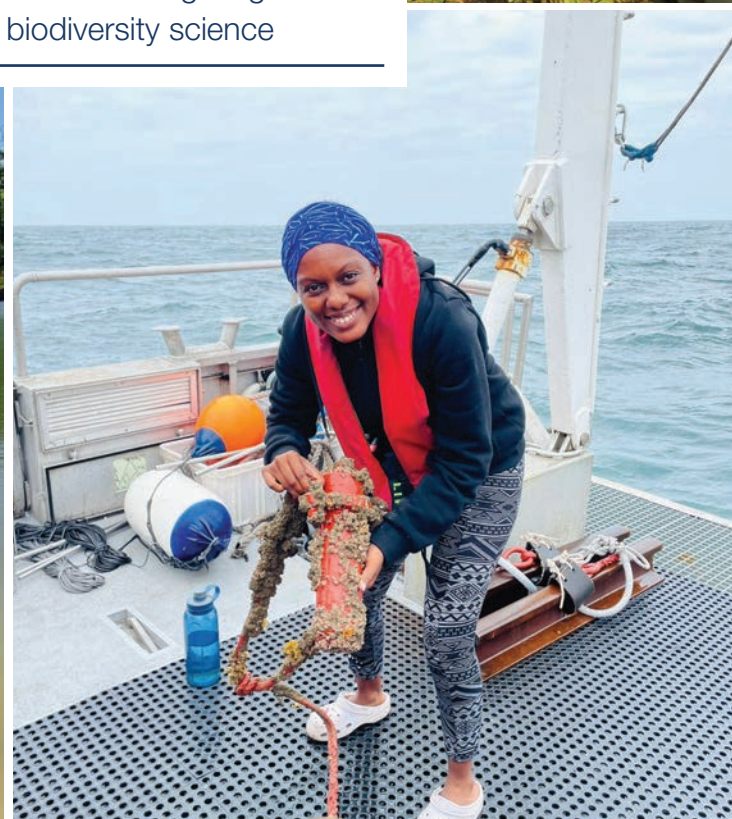
In 2025, the pathways from research to outcomes were clearer and more deliberate. Infrastructure-enabled work contributed to policy development and conservation planning, management interventions, and capacity-building initiatives across government, academia and civil society. Research platform provisioning ensured that the Institute’s impact is cumulative and nationally strategic, rather than isolated to individual projects.

Through its role as a National Research Infrastructure Platform, NRF-SAIAB continues to demonstrate that it is well positioned to deliver long-term value from aquatic biodiversity science. The Institute continued to advance the NRF Vision 2030: Research that works for Society, by embedding TIES4I in the way it makes infrastructure accessible. As pressures on freshwater and marine systems intensify, NRF-SAIAB’s focus on sustained infrastructure, inclusive capacity development and evidence-based solutions provides a strong base for supporting South Africa’s aquatic future.

RESEARCH OVERVIEW 2025



A connected set of services delivering long-term value from aquatic biodiversity science



Clockwise from top left: NRF-SAIAB's new deep-water lander was deployed to 2 350 m offshore of East London. Wandisile Mdiza releasing biological control agent *Cyrtobagous salviniae* (Florida biotype) onto common salvinia (*Salvinia minima*) at Vaalkop Dam. PhD student (RU), Dinah Mukhari, assisting with an acoustic receiver rollover in Algoa Bay. University of Fort Hare student sampling irrigation impoundments in the Sundays River Valley for *Gambusia affinis* and *Glossogobius callidus*, to assess the effect of water temperature on their aerobic scope.

COMMUNICATIONS AND ENGAGEMENT 2025



A fascinated delegate at the Science Forum South Africa poses behind a shark jaw specimen from NRF-SAIAB's dry collection.

Strengthening the connection between aquatic biodiversity research and society

LUCKY DLAMINI, WITH COMMUNICATIONS TEAM
Communications and Stakeholder Relations Manager

Keywords: public engagement, research dissemination, science communication, stakeholder relations, strategic partnerships

COMMUNICATIONS TEAM MEMBERS

Lucky Dlamini, Siyamthanda Ndinisa, Mbali Ngulube

NRF-SAIAB INTERNS

Siyamthanda Ndinisa, Mbali Ngulube

In 2025, NRF-SAIAB continued its wide-ranging programmes of science communication, stakeholder relations and public engagement in order to strengthen the connection between aquatic biodiversity research and society. These efforts were grounded in close collaboration between researchers, postdoctoral fellows, students, interns and the communications team. Engagement initiatives were designed to translate complex aquatic biodiversity research into accessible narratives and create meaningful opportunities for dialogue with society. Exhibitions formed a central pillar of this approach, providing interactive platforms to engage learners, educators, policymakers and the broader public on career pathways in aquatic science, biodiversity research and related fields. These efforts directly supported transformation and human capital development by promoting scarce and critical skills within South Africa's science system.

NRF-SAIAB's communications impact was further strengthened through strategic international collaborations. Working alongside the Ocean Census (<https://oceancensus.org/>), an initiative of Nekton (<https://nektonmission.org/>), the communications team profiled collaborative biodiversity research conducted in the Comoros. Through joint storytelling, multimedia outputs and coordinated digital dissemination, this collaboration highlighted species discovery, regional capacity development and the importance of Indian Ocean biodiversity for global ocean science. The partnership amplified the visibility of African-led marine research within an international exploration framework and positioned NRF-SAIAB researchers as key contributors to global biodiversity discovery efforts.

NRF-SAIAB also strengthened communications collaboration with the Food and Agriculture Organization of the United Nations (FAO) through the EAF-Nansen Programme. This partnership supported science communication outputs and a notable public engagement milestone was the Programme's World Fisheries Day outreach event hosted at the Andrew Moyake School of Excellence in Makhanda, where learners engaged with scientists on marine ecosystems, fisheries sustainability and ocean stewardship. NRF-SAIAB's communications team provided strategic content development, media support and

COMMUNICATIONS AND ENGAGEMENT 2025

Storytelling, multimedia outputs
and coordinated digital dissemination
amplify the global visibility of African-led
marine research

coordination to ensure that scientific knowledge was translated into accessible learning experiences. These collaborations demonstrate how coordinated communications can strengthen multilateral partnerships and enhance the societal reach of research programmes.

In 2025, the communications team further expanded its science communication training and development footprint through the ACEP Phuhlisa Programme. The team extended its training offerings to two of the four ACEP Phuhlisa HDIs, with dedicated workshops delivered to Zoology and Entomology Honours students at the University of Zululand and the University of Fort Hare. These workshops focused on translating research for public and policy audiences, media engagement, digital science storytelling and communicating impact beyond academia. The communications team will be extending this training programme in 2026 to offer it to all four of the ACEP Phuhlisa HDIs.

Internationally, NRF-SAIAB played a visible role in South Africa's historic leadership of the G20. At the Ocean20 Launch, researchers showcased the IMIsEE project, which integrates marine science with indigenous knowledge systems to support ecosystem restoration. NRF-SAIAB further strengthened its international profile at the G20 Ministerial Research and Innovation Meeting, held at the CSIR under the theme 'Open Innovation'. The Institute led an exhibition that engaged international delegates on science, research and innovation, and highlighted how aquatic biodiversity science contributes to the Blue and Ocean Economies. Exhibits aligned with key sub-themes including the Circular Economy, Energy, Education, the Future of Society and Health, and demonstrated the relevance of aquatic research to global sustainability challenges.

Public engagement was further amplified at the Science Forum South Africa, where NRF-SAIAB showcased specimens from the National Collection Facility and cutting-edge research that addresses Africa's freshwater and marine challenges. Postdoctoral fellows led interactive discussions on integrative taxonomy, climate resilience and biological control, to illustrate how research informs conservation and sustainable ecosystem management across the continent.

At a national level, NRF-SAIAB strengthened collaboration within the National System of Innovation (NSI) by co-hosting a hybrid workshop on Biodiversity Status and Future Research Needs with the Water Research Commission (WRC). Hosted in Makhanda, the workshop attracted over 200 participants from academia, government and civil society, and enabled knowledge exchange and the support of policy-relevant research agendas.

These efforts illustrate how NRF-SAIAB's engagement supports the NRF Vision 2030 TIES4I framework. **Transformation** was advanced by promoting access and career pathways for underrepresented students. **Innovation**



NRF-SAIAB Postgraduate Funding Fair exhibition: Engaging students from Eastern Cape universities on aquatic science career pathways.



Ocean20 Launch Exhibition: Dr Nokubonga Mbandzi-Phorego (NRF-SAIAB PDP Postdoctoral Research Fellow) leads an NRF-SAIAB exhibition showcasing the IMIsEE project and how it is blending science with Indigenous knowledge to restore marine habitats. The exhibition engaged a diverse audience – from Khayelitsha fishers to early-career scientists – highlighting that keeping our coastal areas functional requires new ideas and co-creating materials with local communities to help marine animals find habitat and shelter. The exhibition focused on promoting community-driven solutions for coastal resilience.

and **Impact** were realised through actionable research dissemination at national and international forums. **Excellence** and **Sustainability** were highlighted through high-quality, rigorously curated exhibitions, workshops, collaborative communications partnerships and capacity-building initiatives. Collectively, these engagements ensured NRF-SAIAB's research actively informs decision-making, fosters collaboration to build a more informed and resilient society.

NRF-SAIAB will expand its science engagement footprint through hybrid and digital platforms, enhanced capacity-building workshops and strategic partnerships with local, national and international stakeholders, particularly community and inter- and transdisciplinary partners. To continue NRF-SAIAB's alignment with the NRF Vision 2030 TIES4I framework, these initiatives aim to further integrate aquatic biodiversity research with societal needs, foster the next generation of scientists and contribute to sustainable aquatic systems.



Kaylee Smit and Sheena Talma (in the distance) observing Danielle Julius as she tests the equipment on the new deep-water stereo-BRUVs lander. This was part of an international training workshop working off RV *Observer*, collecting samples from offshore East London. This lander was deployed to 2 350 m.

Leading deep-sea exploration and building marine biodiversity monitoring capacity across South Africa and the Western Indian Ocean

DR KAYLEE SMIT

NRF-SAIAB Honorary Research Associate (until May 2025)

NRF-RIPP Postdoctoral Research Fellow (from June 2025)

Keywords: benthic underwater observation, capacity sharing, deep-sea exploration, stereo-BRUVs landers, technological innovation

NRF-SAIAB COLLABORATOR

Anthony Bernard

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NRF-SAIAB-BASED STUDENTS

Angus Van Wyk (PhD), Luther Adams (PhD), Sphume Memela, Abigail Eddy

ADDITIONAL COLLABORATIONS

Jean Harris (Wild Trust), Sean Fennessey (Oceanographic Research Institute), Department of Forestry, Fisheries and Environment (DFFE), Stuart Laing (BERI-University of Seychelles), Seychelles Ministry of Agriculture, Climate Change and Environment (MACCE), Nekton Foundation, Comoros Government, Sheena Talma (Oxford University), Seychelles Parks and Gardens Authority (SPGA), Rosabella Mangroo (Seychelles Fishing Authority), Robert Bullock (Save our Seas Foundation), Eleanor Brighton

(Blue Safari), Global Vision International (GVI), Martin Lindegren/Esther Beukhof (DTU Aqua, Denmark), Kerry Sink (SANBI), Amanda Lombard (NMU), Russel Symcox (Wild Alliance Africa), Durban Undersea Club (DUC), Nico Booyens (The Shark Research Unit), Sharklife, (Rick Stuart-Smith/Antonio Cooper) Reef Life Survey (RLS), Christy Pattengill-Semmens (REEF)

Marine ecosystems are under increasing pressure from habitat degradation, overfishing, and climate change. Effective resource management, spatial planning and protection require robust scientific observations to inform evidence-based decision-making, yet we still face critical challenges: insufficient technical infrastructure for long-term monitoring and inadequate human capacity to mobilise knowledge effectively.

In 2025, I transitioned from Honorary Research Associate to a Postdoctoral Research Fellow at NRF-SAIAB under the NRF Research Infrastructure Professionals Programme (RIPP), focusing my efforts on expanding deep-sea research capacity and training the next generation of marine scientists.



I contributed to technological advances in marine biodiversity monitoring that helped position South Africa at the forefront of African deep-sea research. Through the Marine Remote Imagery Platform (MaRIP), I co-led an international stereo-BRUVs landers training workshop where we tested the newly developed deep-water lander by deploying it to 2 350 meters offshore of East London – one of the deepest benthic remote imagery surveys ever conducted. I further led the lander component of the prestigious Nekton First Descent Mission to the Comoros, completing 44 deployments on previously unexplored seamounts and deepsea habitats. Through training programmes, research outputs and international collaborations, my research directly supports marine managers, conservation practitioners and students while advancing evidence-based ocean governance.

My research focused on advancing the use of stereo-BRUVs and deep-water lander systems through the MaRIP to address critical gaps in biodiversity observation from shallow reefs to previously inaccessible deep-sea habitats. This work contributed to method development, field deployment, training and knowledge mobilisation. A major milestone was the first deployment of NRF-SAIAB's new deep-water lander (affectionately known as "Karel") to 2 350 m offshore of East London during a dedicated training workshop to demonstrate South Africa's capacity to access and observe deep benthic ecosystems.

I further led the lander component of the Nekton Foundation First Descent mission to the Comoros, completing 44 lander deployments across seamounts and deep-sea habitats that had never before been visually surveyed, and which will inform MPA management processes. Other fieldtrips in which I participated contributed 229 stereo-BRUVs and lander samples collected from MPAs across the east coast of South Africa, which has contributed to foundational biodiversity datasets.

This research is foundational in that it strengthens the research infrastructure, technical protocols and human capacity required for long-term marine biodiversity observation. By refining lander-BRUVs methods, training new users and standardising workflows, the work supports a wide range of downstream research, including ecological indicators, MPA effectiveness assessments, marine spatial planning and biodiversity baselines for poorly known offshore areas. These data supported the publication of my research paper on fish functional traits and spatial patterns in Marine Environmental Research.

The work is strongly aligned with national and international agendas, including South Africa's National Biodiversity Assessment, Marine Spatial Planning processes and global priorities under the UN Ocean Decade and GOOS BioEco frameworks for sustained biological ocean observations. An important contribution of this work is that it positions South Africa as a leader in deep-sea remote imagery research and capacity and simultaneously builds regional collaboration across the WIO through practical training, shared expeditions and stakeholder engagement.

Clear pathways from research to impact were established



Kaylee Smit (RIPP Postdoc), Danielle Julius (Marine Science Technician) and Louis Van Wyk (MaRIP skipper) at sea on the MaRIP research vessel, *Hispidus*, to collect stereo-BRUVs samples from the uThukela Marine Protected Area.

through training workshops, field-based mentoring, conference presentations, stakeholder engagements and active collaboration with management authorities and regional partners. Engagements with a wide diversity of stakeholders, from research and government organisations, NGOs and management authorities, increased interest and uptake of stereo-BRUVs and particularly stereo-BRUVs landers for applied monitoring and management. The reach of this work spans South Africa and the broader WIO.

Quantitative evidence of impact includes:

- One scientific article published in international peer-reviewed Journal (*Marine Environmental Research*).
- Contributed to the collection of 229 stereo-BRUVs and landers samples.
- More than 20 individuals trained across fieldwork and fish identification workshops.
- Three Seychellois students trained in underwater survey methods and co-supervised.
- Multiple stakeholder engagement sessions, enhancing regional collaboration.
- Presentations at four national/international conferences and one additional co-authored presentation.

More than three public engagement events, and other press releases, reaching approximately 180 people.

Collectively, this work demonstrates measurable progress in what has changed: increased national deep-sea observation capability, increased regional human capacity to undertake monitoring, expanded biodiversity datasets from previously unobserved habitats and strengthened pathways for science to inform marine conservation and governance.

In June 2025, I joined NRF-SAIAB as a research infrastructure platform professional and will continue to strengthen stereo-BRUVs research, capacity-building initiatives and knowledge mobilisation. By integrating our findings into broader national and regional programmes, our research will contribute to evidence-based policy and management strategies, ensuring sustained impact for marine conservation.



Participants and experts involved in the 2025 Post-Survey Taxonomic Research Workshop for West African countries.

Strengthening African marine taxonomy through strategic partnerships

DR YONELA SITHOLE

NRF-SAIAB PDP Postdoctoral Research Fellow

DR PETER NICK PSOMADAKIS

NRF-SAIAB Honorary Research Associate

EAF-Nansen Programme of FAO

Keywords: biodiversity conservation, capacity development, marine taxonomic impediment

COLLABORATIONS

Norwegian Institute of Marine Research (IMR), Norwegian Agency for Development Cooperation (Norad), The Nippon Foundation-Nekton Ocean Census, Iziko Museum of South Africa

Marine biodiversity knowledge is essential for the sustainable use and management of ocean resources, yet many African countries face a severe shortage of taxonomic expertise, data and infrastructure. This shortage, referred to as the “taxonomic impediment”, limits biodiversity monitoring, fisheries management and conservation decision-making. To address this challenge, NRF-SAIAB, in partnership with the FAO EAF-Nansen Programme and The Nippon Foundation-Nekton Ocean Census, hosted a Post-Survey Workshop on Taxonomy Research in November 2025.

The workshop aimed to build practical taxonomic capacity among African scientists and to strengthen regional and international research partnerships. Ten scientists from

eight West African countries were trained through hands-on, mentored research projects using integrative taxonomy approaches that combined morphology and DNA barcoding. Participants gained skills in species identification, data analysis, scientific writing and the use of global biodiversity platforms such as Specify, GBIF, BOLD Systems and GenBank.

The primary beneficiaries are early-career researchers, national fisheries and biodiversity institutions and, by extension, the broader scientific community. The workshop directly improved participants’ ability to identify potential new species and geographic records, contribute as lead authors to international science and produce publishable research. More broadly, the strengthened partnerships and skills contribute to improved biodiversity knowledge, which support sustainable fisheries management and conservation across the region.

The research that led to this impact was carried out through the EAF-Nansen Post-Survey Workshop on Taxonomy Research, held from 10 to 21 November 2025 at NRF-SAIAB. The workshop was designed to address long-standing gaps

Many African countries face a severe shortage of taxonomic expertise, data and infrastructure

in marine taxonomic capacity across Africa. Many countries lack trained taxonomists, adequate infrastructure and access to research collections. This limits their ability to identify, document and monitor marine biodiversity. This situation affects fisheries management, conservation planning and the sustainable use of ocean resources.

The workshop brought together 10 participants from eight West African countries: Angola (2), Ghana (1), Guinea (1), Liberia (1), Mauritania (1), Namibia (2), Senegal (1), and Sierra Leone (1). These participants were supported by experts from Cabo Verde (1), France (1), Iran (1), Italy (1), Norway (1), and South Africa (4) to conduct taxonomic research. The workshop used biodiversity data collected during ecosystem surveys conducted in 2024 in West Africa and transformed this foundational research into applied taxonomic outputs. Participants worked on case studies based on survey material and were guided through the full taxonomic research process. They received training in identifying species using physical characteristics (morphology) and molecular methods (DNA

A key strength of this initiative was the partnership between institutions

barcoding), analysing data, taking photographs for scientific papers, mapping species distributions, line drawing using the camera lucida, managing museum collections and writing scientific papers. Each participant was paired with experienced experts who provided mentorship and guidance, ensuring skills transfer, research quality and ethical practice. The workshop helped strengthen the scientific evidence needed for ecosystem-based management and conservation, particularly in regions where biodiversity information is limited. Additionally, the knowledge acquired during the workshop will help participants to continue applying these skills in their everyday work.

A key strength of this initiative was the partnership between institutions. NRF-SAIAB provided access to its National Collection Facility of over one million specimens, specialised



Mr Ofer Gon, NRF-SAIAB Honorary Research Associate and Fish Taxonomist, sharing knowledge with workshop participants.

laboratory facilities, equipment and taxonomic expertise. The EAF-Nansen Programme provided access to survey data, regional networks, links to fisheries management needs and funding to implement the workshop. The Nippon Foundation-Nekton Ocean Census supported broader species discovery efforts. Together, these partners created a shared research and training platform that no single institution could have delivered alone.

The impact of the research was achieved through practical training, mentoring and direct use of biodiversity collections and data. Several research outputs are currently being developed for peer-reviewed publication, with participants positioned as lead or co-authors. The workshop strengthened skills, confidence and professional networks among scientists and built stronger links between African and international institutions. This is important in building long-term capacity for biodiversity research, species discovery and sustainable management of marine resources.

Building on this success, a third Post-Survey Taxonomy Research Workshop for East African countries will be hosted at NRF-SAIAB in July 2026. Over the next two to five years, the Nansen Programme aims to expand regional participation, increase publication outputs led by African scientists and strengthen sustainable biodiversity research capacity in line with Vision 2030.



Dr Yonela Sithole (NRF-SAIAB) with Ms Veronica Dipebe and Mr Aobakwe Letus (BIUST MSc students) after a seine-net sampling training session during fieldwork.

Building regional capacity through science: NRF-SAIAB's research visit to BIUST

DR YONELA SITHOLE

NRF-SAIAB PDP Postdoctoral Research Fellow

DR THETHELA BOKHUTLO

Botswana International University of Science and Technology lecturer

MR DANIEL NKOSINATHI MAZUNGULA

NRF-SAIAB National Collection Facility

Keywords: aquatic biodiversity, collaboration, conservation, taxonomy

COLLABORATION

Botswana International University of Science and Technology

A major challenge facing freshwater conservation in southern Africa is the lack of taxonomic expertise and limited information on fish diversity, especially in transboundary river systems such as the Limpopo River catchment. This limits effective biodiversity monitoring, fisheries management and conservation planning. To address this challenge, NRF-SAIAB undertook a two-week research and training visit to the Botswana International University of Science and Technology (BIUST) from 24 November to 6 December 2025. The visit focused on hands-on training, knowledge exchange and strengthening regional scientific collaboration. The research directly benefited BIUST MSc students, academic staff and local fishermen by providing practical training in fish sampling, biodiversity assessment and research design. The impact of this work includes improved local capacity to monitor freshwater fish biodiversity, strengthened collaboration between South African and Botswana institutions and increased involvement of

local fishing communities in scientific research. By equipping students and fishermen with skills, tools and knowledge, the project supports long-term, evidence-based conservation of aquatic biodiversity in the region.

The research was conducted during a two-week field-based survey in collaboration with BIUST. NRF-SAIAB was represented by Dr Yonela Sithole, PDP Postdoctoral Research Fellow in Fish Taxonomy and Systematics, and Mr Daniel Nkosinathi Mazungula, Collections Manager of the National Collection Facility. Fieldwork took place at several dams and tributaries in Palapye, Mmadinare and Selibe-Phikwe within the Limpopo River catchment. Fish diversity was assessed using multiple sampling methods, including hand throw casting nets, fyke nets, seine nets and D-nets, and specimens were identified to species level.

This research visit provided foundational biodiversity data for

African-led collaborations to address conservation challenges that extend beyond national borders

a region where freshwater fish diversity is poorly documented. The specimens and tissue samples collected were deposited in the NRF-SAIAB National Collection Facility and the National Aquatic Biodiversity Biobank, ensuring long-term preservation and access for future taxonomic, genetic and ecological research. These collections support broader research programmes in aquatic genomics, systematics and conservation biology.

The visit was well aligned with national and regional biodiversity priorities, particularly the strengthening of African-led research capacity and the promotion of transboundary collaboration. The distinct contribution of the NRF-SAIAB team was the transfer of practical skills in fish taxonomy and field research through direct training and engagement. This included completing standardised field datasheets, recording site coordinates and environmental data and operating essential equipment such as GPS devices and water-quality meters. Two BIUST MSc students, Ms Veronica Dipebe and Mr Aobakwe Letus, received intensive hands-on training in field safety, ethical fish handling, data collection, specimen labelling, photography and tissue sampling for DNA analysis, as well as the use of identification guides and taxonomic keys and the field preservation of specimens for morphological studies. Local fishermen, Mr Onalenna Mlenga and Mr Ephraim Modise contributed valuable knowledge of fishing sites and commonly encountered species while they learned scientific approaches to species identification, which strengthened links between scientific and indigenous knowledge systems.

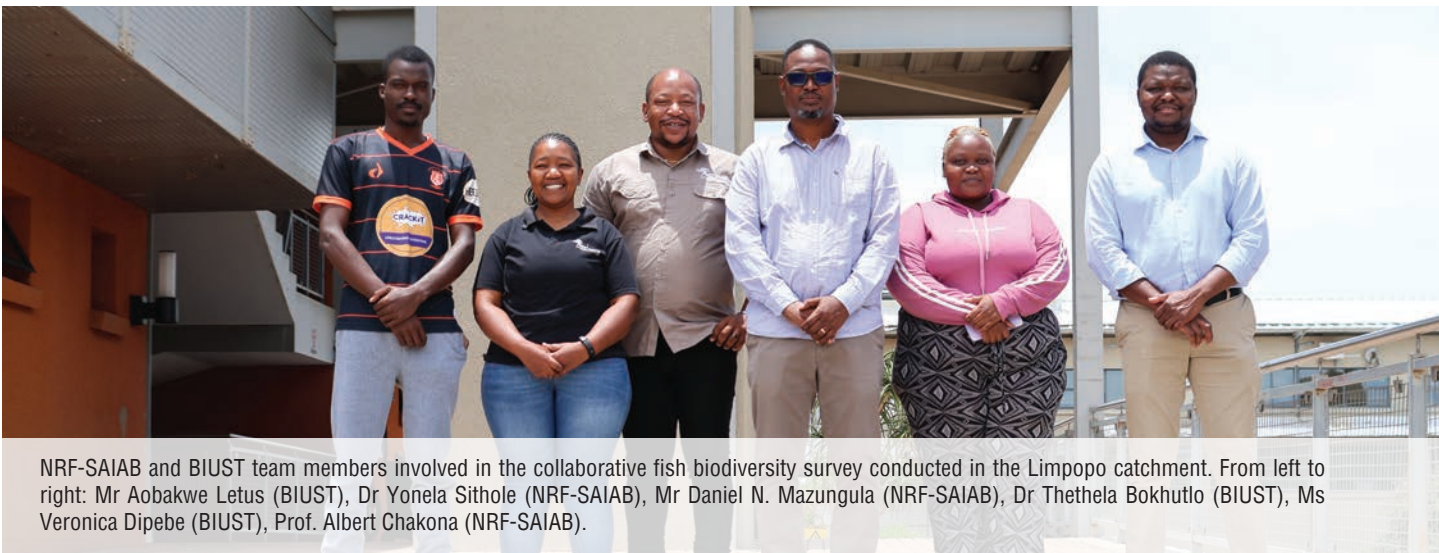
During the final week of the research visit, an institutional lecture was delivered by Prof. Albert Chakona, Managing Director of NRF-SAIAB, titled “Cataloguing for conservation: Safeguarding lives and livelihoods.” The lecture highlighted key challenges facing freshwater fish conservation in southern Africa, particularly limited knowledge of species diversity and distribution, together with declining taxonomic capacity. Prof.



Dr Yonela Sithole (NRF-SAIAB) demonstrating fish measurement techniques to BIUST MSc students in the laboratory.

Chakona emphasised the importance of building regional expertise through the training of students, field biologists, and local communities, as demonstrated during the NRF-SAIAB/BIUST field survey. The lecture stimulated discussion on the need for African-led collaborations to address conservation challenges that extend beyond national borders. Indicators of impact from the research include the number of people trained (two MSc students and two local fishermen), multiple field sites surveyed, the loan of sampling equipment to BIUST for a six-month period and plans for joint MSc projects and a student exchange visit in 2026. The research was conducted in partnership with BIUST and coordinated by Dr Thethela Bokhutlo, Lecturer, BIUST Department of Biological Sciences and Biotechnology.

Over the next two to five years, NRF-SAIAB and BIUST plan to continue joint field surveys, co-supervise postgraduate students and expand genetic and taxonomic research. These activities will strengthen regional capacity and support Vision 2030 through African-led freshwater biodiversity conservation.



NRF-SAIAB and BIUST team members involved in the collaborative fish biodiversity survey conducted in the Limpopo catchment. From left to right: Mr Aobakwe Letus (BIUST), Dr Yonela Sithole (NRF-SAIAB), Mr Daniel N. Mazungula (NRF-SAIAB), Dr Thethela Bokhutlo (BIUST), Ms Veronica Dipebe (BIUST), Prof. Albert Chakona (NRF-SAIAB).



Dr Lubabalo Mofu, Mr Collins Mashilwane, Dr Mandla Magoro, Dr Archiebold Hlungwani and Dr Phumza Ndleni conducting fishery resource assessments at Flag Boshielo Dam.

Inland fisheries and community livelihoods: Lessons from the Flag Boshielo and Glen Alpine Dams, Limpopo Province

DR ARCHIEBOLD HLUNGWANI

DFFE

DR MANDLA MAGORO

NRF-SAIAB

Keywords: community livelihoods, ecological restoration, food security, freshwater governance, inland fisheries

COLLABORATIONS

Albert Chakona (NRF-SAIAB), Lubabalo Mofu (NRF-SAIAB), Dumisani Khosa (SANParks), Phumza Ndleni (SANBI)

This report highlights the story of two dams and the communities that depend on them for livelihoods. At Flag Boshielo Dam and Glen Alpine Dam in Limpopo Province, inland fisheries have long supported food security and household income for rural families. However, decisions on the management and utilisation of these dams continue based on limited scientific evidence. The project aimed to contribute to the implementation plan of the National Freshwater (Inland) Wild Capture Fisheries Policy (NFWCFP). By combining ecological surveys with social and economic insights, the study revealed that fish stocks at both dams are severely depleted and unable to support sustainable harvesting under current conditions. The findings exposed how water-level mismanagement, illegal

fishing gear and weak governance have steadily eroded both ecosystems and livelihoods. Most importantly, the study gave voice to small-scale fishers whose reliance on these fisheries is often overlooked in policy development debates. The project provides the first integrated evidence base to support the implementation of the NFWCFP by translating science into practical guidance. The research equips decision-makers with the knowledge they need to rebuild fish populations, protect vulnerable communities and chart a more sustainable future for inland fisheries in Limpopo Province.

Inland fisheries sustain millions of people worldwide, yet the sector's value is often overlooked by policymakers. While rural communities increasingly depend on inland fisheries resources for food security and income generation, the sector remains informal, weakly governed and poorly understood. Limpopo Province, marked by high unemployment and food insecurity, is a province where the promise of sustainable inland fisheries is real but fragile. The Flag Boshielo Dam and Glen Alpine Dam are known to support fishing activities, however, there is a

Site-specific information essential to mitigate the collapse of ecosystems and livelihoods

lack of up-to-date site-specific information on their ecological condition and social importance. Without such evidence, implementing the NFWCFP will be difficult. The study set out to close this gap by carefully observing the status of the targeted fish stocks and the impact of the fisheries resources in the communities residing in close proximity.

Seasonal surveys conducted between May 2024 and February 2025 revealed a troubling picture. Fish populations that once formed the backbone of these fisheries had collapsed. Species such as *Labeo rosae* and *Oreochromis mossambicus*, previously dominant and economically important, had declined sharply or disappeared altogether (Hlungwani et al. 2023). Their absence signals disrupted breeding, overexploitation and environmental stress (Sara et al. 2017). At Glen Alpine Dam, poor water-release decisions led to a dramatic drop in water levels and a mass fish kill, wiping out most species almost overnight. However, the results are not only ecological as the project documented how deeply communities rely on these fisheries. Many small-scale fishers are unemployed and depend on fishing for daily nutrition or modest income. In contrast, recreational anglers, often travelling long distances, experience the dams differently. These unequal patterns of access and benefit reveal social tensions that cannot be ignored if fisheries are to be managed fairly.

Communication and engagement were central to the project's impact. Through field-based interactions, surveys, and dialogue with fishers and local stakeholders, the research ensured that scientific findings reflected lived realities. The resulting reports and recommendations were shared with institutions such as the Water Research Commission (WRC) and the Department of Forestry, Fisheries and the Environment (DFFE), creating a bridge between communities, scientists and policymakers. The findings show clearly that inland fisheries in Limpopo hold promise, but they are at a breaking point. Recovery will require restoring habitats, stabilising water management, regulating harmful fishing practices and building inclusive governance systems that recognise both ecological limits and human needs.

Future work will focus on long-term monitoring, restoration-focused management and strengthening co-management partnerships to support fish population recovery and responsible inland fisheries development.



A view from the launching site at Flag Boshielo Dam, where regular recreational fishers target bass.



The ecological condition of the Glen Alpine Dam after the low water levels that resulted in the wiping out of most species almost overnight.

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- Sara, J.R., Weyl, O.L.F, Marr, S.M., Smit, W.J., Fouché P.S.O. & Luus-Powell W.J. 2017. Gill net catch composition and catch per unit effort in Flag Boshielo Dam, Limpopo Province, South Africa. *Water SA* 43, 464–469.



An example of a reprint from a box dated 1764/1, titled - Photographs of fishes taken from MF 1764.1. Linnaeus. Mus. Adolph. Fred.

Margaret Smith Library: A user-centric hub for research, teaching and training

MADITABA MELTAF

Senior Librarian

Keywords: access to obscure literature, archival material, digitisation of literature, images, specialised library

PLATFORM

Margaret Smith Library

USERS

Rhodes University Library, RU DIFS, NRF-SAIAB HRAs, SANBI, SANParks, CapeNature

METRICS

Books circulated: 950

Articles supplied: 350

New books accessioned: 25

Web of Science (WOS) peer-reviewed publications: 118

Peer-reviewed publications with Rhodes University: 88

Open Access articles published: 102

COLLABORATIONS

Rhodes University Library, Partners of the International Association of Aquatic and Marine Science Libraries and Information Centers (IAMSLIC), Food and Agriculture Organisation of the United Nations – Aquatic Sciences and Fisheries Abstracts (FAO-ASFA), SALB (South African Library for the Blind)

The Margaret Smith (MS) Library is a specialised platform that provides valuable resources shared with the Rhodes University Library. As part of the Rhodes University community, postgraduate students hosted at NRF-SAIAB have the same level of access to the university's e-learning resources as students registered with the university. With its specialised literature collection focused on ichthyology, aquaculture and fisheries, the Margaret Smith Library serves as the primary library for the Rhodes University Department of Ichthyology and Fisheries Science (RU DIFS).

As a sister library to the Rhodes University Library, the Margaret Smith Library was involved in the migration of library systems from Sierra to Alma and Primo. In 2025 a series of workshops provided background and training for users of the Alma system as all data was to be migrated and the system set to go live in January 2026. The new system has advantages as it means equal access for all, no IP identification or different passwords for off-campus users, which was burdensome for users situated off the RU campus. The new system uses an institutional login whereby a RU email address and Single Sign On (SSO) password are used across



Breaking barriers – data migration and open access to aquatic sciences, fisheries and aquaculture research

databases through OpenAthens. This is a breakthrough for the university, as it breaks barriers to access due to IP issues that limited accessibility for the NRF-SAIAB community for a long time (https://www.ru.ac.za/library/latestnews/the_library_has_left_the_building_breaking_down_barriers_for_rhodes_university_.html).

In April 2025, Ms Maditaba Meltaf was invited to become a contributing member to FAO-ASFA. ASFA is a network of partnering United Nations Agencies, international organisations and national institutions focused on promoting and making accessible aquatic sciences, fisheries and aquaculture research (<https://www.fao.org/asfa/en>). So far, the Margaret Smith Library has contributed six titles to the OpenAsfa database. The ASFA partnership consists of over sixty institutions worldwide who each give their time voluntarily to contribute to the ASFA information system.

In November 2025 NRF-SAIAB hosted an FAO Fish Taxonomy Research Workshop with delegates from Mozambique, Tanzania and Kenya. The purpose of the workshop was to advance knowledge in the fish taxonomy field in the continent. These visiting researchers kept the library busy as they consulted our literature collection for their daily activities. (For more about this workshop see page 3, *Strengthening African marine taxonomy through strategic partnerships* by Dr Yonela Sithole and Dr Peter Nick Psomadakis.)

NRF-SAIAB archives are now fully listed, open and accessible

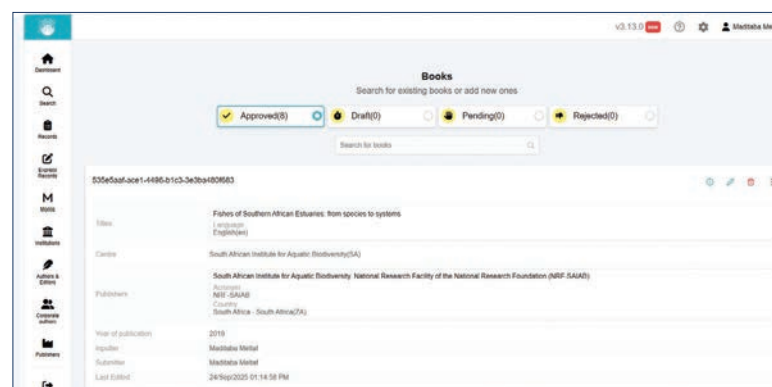
The Margaret Smith Library has purchased books costing over ZAR 40k for the 2025/26 financial year. Most titles were suggested by staff and students. Some of these titles were obscure and covered the Red Sea for the Eritrean Honours students hosted by the RU DIFS. The library also hosted a review session on new books. Attendees and reviewers enjoyed the event and suggested that a book review session become a regular event.

The Margaret Smith Library also bid farewell to Intern, Ms Siya Mnguni who started a new job at Rhodes University Law Library as an Assistant Librarian. Ms Mnguni has been instrumental in organising and transforming our archives. After many years, the archives are now fully listed, open and accessible. We are grateful for the contribution she made and wish her everything of the best in her future endeavours.

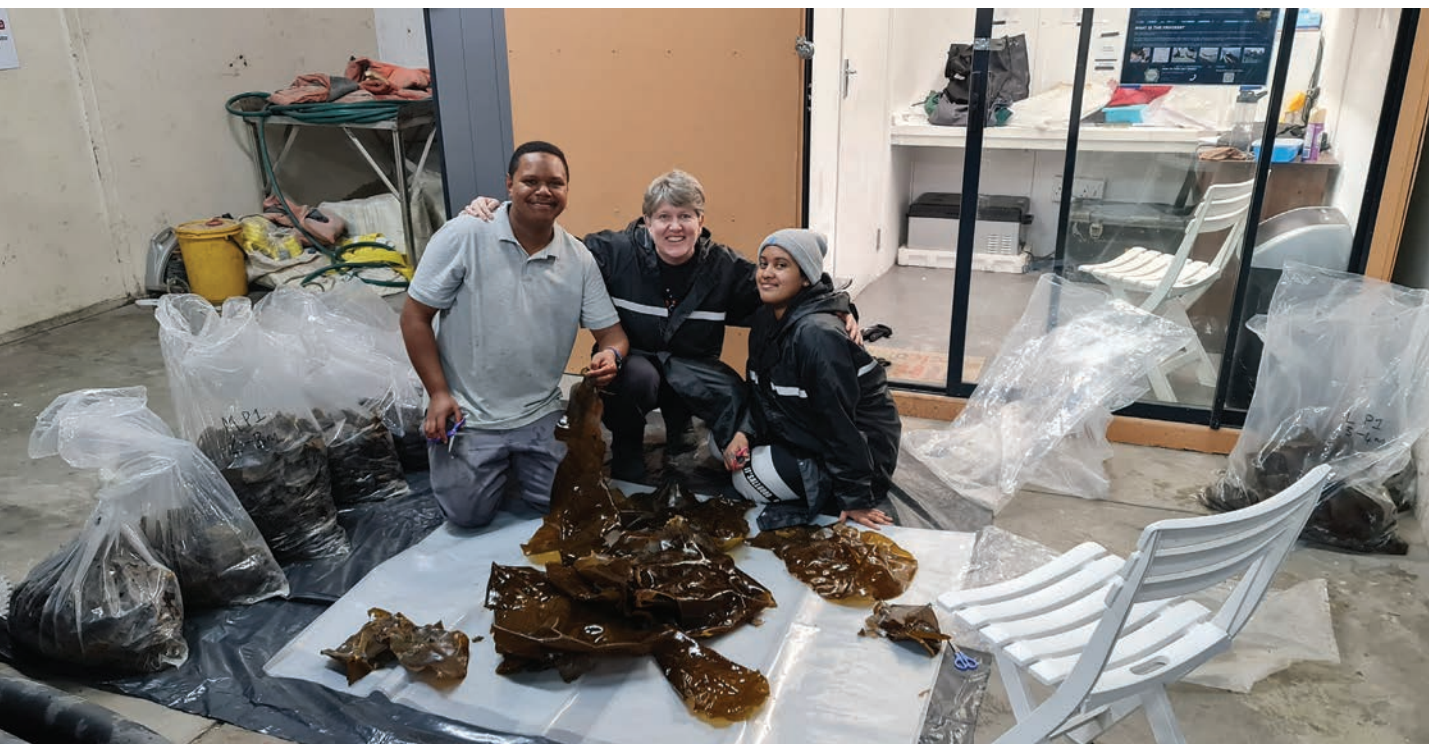
We are planning to digitise the reprint collection that dates from 1764. Digitally preserving this collection will advance the knowledge heritage of NRF-SAIAB and inspire our new generation of scientists.



NRF-SAIAB Postdoctoral student, Dr Tadiwa Mutizwa (above) and PhD student, Siphelele Bantu Dyantyi (below), review new books at the successful book review session organised by the library.



D4Science software used by FAO for OpenAsfa showing approved records uploaded by Ms Maditaba Meltaf for NRF-SAIAB.



From UWC, (left to right) Mr Musadiq Schalkwyk (Farming Project Assistant), Dr Lizeth Botes (Co-supervisor) and Ms Waqeeh Moosa (MSc student) examine blades of juvenile *Laminaria pallida*, sampled in September 2025, to determine percentage fouling of the harvested sporophytes.

Sustained capacity development and a unique network of marine laboratories at HDIs

GARTH VAN HEERDEN
Transformation Manager

KWANELE ZINGELWAYO
HSRC Intern

Keywords: ACEP, capacity building, HDI, Joint Marine Laboratories, platforms and research expertise

PLATFORM

ACEP Phuhlisa Programme and DSTI/NRF Joint Marine Laboratories Programme (JMLP)

NRF-SAIAB TEAM MEMBERS

Garth van Heerden, Kwanele Zingelwayo

NRF-SAIAB STUDENTS & INTERNS

Kwanele Zingelwayo (HSRC Intern)

USERS

Graeme Bradley (UFH), Anusha Rajkaran (UWC), Ntuthuko Masikane (UNIZULU), Thembinkosi Dlaza (WSU)

METRICS

Students receiving support through ACEP Phuhlisa in 2025: 67

Supervisors: 19

HDIs represented: 4

Joint Marine Laboratories: 4

PhD students graduated: 3

Conferences attended: 5

Field trips: 5

Schools outreach and engagement: 2



The ACEP Phuhlisa Programme is a targeted intervention within the Department of Science, Technology and Innovation (DSTI) transformation agenda, aimed at strengthening Marine Science capacity at Historically Disadvantaged Universities (HDIs) and to accelerate diversity within the marine research community. Implemented through collaboration between NRF-SAIAB, the University of Fort Hare (UFH), the University of Zululand (UNIZULU), the University of the Western Cape (UWC) and Walter Sisulu University (WSU), the programme supports Marine Science researchers at HDIs by leveraging NRF-SAIAB's expertise to enhance research capabilities at these institutions. This initiative plays a crucial role in training black and female South African postgraduates in the marine sector, ensuring that Marine Science is firmly embedded within HDIs.

Two-thirds of ACEP funding is allocated through an open call, with one-third ring-fenced for HDIs. The programme provides access to national research platforms, including offshore research vessels, specialised field equipment, dive teams and technical support, alongside operational funding and bursaries.

To address articulation gaps, Phuhlisa delivers tailored academic support and professional development to students and their supervisors. This includes scientific writing, supervision, training and accredited life-skills courses. Student participation grew from inception in 2012 to a peak of 107 in 2020. Numbers declined to 56 in 2023 following COVID-19 disruptions. Growth remained constrained in 2024, but the Phuhlisa Programme has sustained its impact and in 2025, 67 students received direct support. The success of the programme hinges on our commitment to an HDI researcher-centred approach that recognises that true capacity building happens with direct investment in emerging researchers at these HDIs.

In 2025, the ACEP Phuhlisa Programme delivered targeted postgraduate training to strengthen research quality, technical competence and science communication skills.

A two-day Research Proposal Writing Workshop (5 to 6 March 2025) was held at Hogsback for 18 delegates (14 MSc, 3 PhD students and 3 lecturers). The workshop focused on conceptualising feasible research projects, defining research questions and hypotheses, selecting appropriate methodologies, and structuring theses and dissertations. Participants also received guidance on project management, academic writing conventions and proposal development, with practical exercises to strengthen applied skills.

Students from the University of Zululand attended advanced analytical training (16 to 20 March 2025) through the national Biogeochemistry Research Infrastructure Platform (BIOGRIP) at Stellenbosch University. Training covered water and soil biogeochemistry, including blue carbon, stable isotopes, trace metals and contaminants of emerging concern. Students gained hands-on experience in field sampling, laboratory preparation, analytical instrumentation and quality control procedures.

A Science Communication Workshop (17 to 20 June 2025) hosted at the University of Zululand supported nine Honours students. The workshop laid a foundation for postgraduate success and broader societal impact through developing their skills in audience-focused messaging, oral and written



UNIZULU students determine the distribution of microplastics in sediment and water along the length of the uMlalazi Estuary.

Training the next generation of researchers is imperative to secure a better future

presentation, digital engagement and ways to communicate complex science to non-specialist audiences.

Conference attendance provides valuable opportunities for students and supervisors to network and contribute to their academic growth and professional development. ACEP Phuhlisa students and researchers participated actively in several major scientific conferences during 2025, which enhanced their visibility and strengthened academic networks.

At the Southern African Society of Aquatic Scientists (SASAqS) Conference in Pietermaritzburg, eight students from UFH and UNIZULU presented their research, with five delivering oral presentations and two presenting posters. The poster by Sazi Nzame (PhD) and Muzi Cele (MSc) was awarded first prize for Best Student Poster, reflecting the high quality of student research.

At the South African Marine Science Symposium (SAMSS) in Cape Town, 18 postgraduate students and eight supervisors



Enhancing academic growth, visibility and professional development

from UWC, UFH, UNIZULU and WSU represented the programme through oral and poster presentations, contributing to discussions on ocean resilience and conservation.

The Phuhlisa Programme was also represented at the 13th WIOMSA Scientific Symposium in Mombasa, where Principal Investigators presented postgraduate research, and at the 7th Annual NRF-SAIAB Student Symposium, where Prof. Anusha Rajkaran delivered a keynote address on estuarine resilience in the Anthropocene. Prof. Rajkaran highlighted how estuaries respond to human pressures and what they reveal about ecological resilience.

Supervised field trips enable students to contribute to the knowledge enterprise. In 2025 field trips included the following:

UFH – Collection, sorting, storage, identification, analysis and testing of red algae samples using standardised field-to-lab protocols for collection and handling of macroalgae.

UNIZULU – Collection of water and sediment samples to determine the health and ecology of Algoa and St Francis Bays; using the abundance and biomass of the sandprawn *Kraussillichirus kraussi* to determine the health status of Richards Bay Harbour; and determining the distribution of microplastics in sediment and water along the length of the uMlalazi Estuary.

UWC – The assessment of the comparative biomass and species richness at a control site and three planted sites on the Berg River Estuary of the invasive wetland reed, *Phragmites australis*; and collecting water samples from various sites

in Mossel Bay to determine microplastics abundance and characteristics.

WSU – Schools' outreach and engagement is a key component of developing young scientists' communication skills and fostering scientific enquiry and curiosity among learners. ACEP Phuhlisa students were involved in a collaborative beach cleanup, hosted by the Dwesa MPA, with local schools, ECPTA and Blue Wild Coast. They explored the importance of marine protected areas and the causes of conflicts between society and marine protected areas and the external factors that affect marine life, with special reference to the impact of solid waste on marine biota and the human health impacts of consuming contaminated marine species. Thereafter, a beach cleanup was conducted along the MPA and the scholars from each school were challenged to design a marine concept from the collected solid waste. WSU also successfully hosted a National Marine Week programme at Zamele High School.

ACEP Phuhlisa Programme will be extended to include black marine scientists at other South African universities who need the prioritised support for themselves and their students that the Phuhlisa Programme provides. NRF-SAIAB is also in the process of developing an online IT system to bridge the gap between NRF-SAIAB and HDIs. This IT system will greatly improve the efficiency of programmes and allow real time tracking of supervisor activities and development as well as student progress and alumni tracking.



ACEP Phuhlisa students and their supervisors attending the SAMSS Conference.



Honours student, David Rispel (UWC), collects sediment cores from the Berg River Estuary to determine changes in sediment organic carbon before and after planting of *Phragmites australis*. He is assisted by Prince Ubisi and Philipp Grundlingh from Birdlife South Africa.

GRADUATIONS

Doctor of Philosophy in Zoology was conferred upon **Ziyanda Brightness Mzozo**. Her thesis, titled “*Factors influencing the larval settlement of abalone (Gastropoda: Haliotis midae): considerations for stock enhancement and ranching,*” was supervised by Associate Professor Niall Vine. Ziyanda Mzozo (pictured right, front row in red gown) has three DHET-accredited journal articles that have been published from this research, one article is under review, and another is in the final stages of preparation for submission.

In September 2025, a further two students under the ACEP Phuhliisa Programme proudly graduated. **Faith Mshiywa**, (pictured right, below) UFH Faculty of Science and Agriculture, achieved a Doctor of Philosophy (PhD) in Biochemistry after a remarkable academic journey. She has been part of the ACEP Phuhliisa Programme since her BSc Honours in Biochemistry, continuing through to her MSc degree and ultimately her doctoral studies. Her PhD research, titled “*Exploring the Antioxidant Activity and Anti-Cancer Potential Against Triple-Negative Breast Cancer of Red Algae Species Found Along the Coastline of the Eastern Cape Province,*” highlights both her dedication and the scientific significance of her work.

Mrs Aphiwe Lugongolo-Mpayipheli from WSU – Department of Zoology was awarded her MSc degree in September 2025, demonstrating exceptional research capability and academic excellence. She has subsequently registered for her Doctor of Philosophy (PhD) within the same department.

Their accomplishments reflect the dedication and excellence fostered within the programme.





DSTI/NRF Joint Marine Laboratory platform: Supporting home-grown marine research for profound societal impact

As a logical extension of ACEP Phuhlisa, the Joint Marine Laboratories Programme (JMLP) established in 2022, aims to advance marine research that has profound societal impact. To enhance and facilitate home-grown research, the JMLP has facilitated the establishment of state-of-the-art research laboratories at four HDIs – University of Fort Hare (UFH), University of Zululand (UNIZULU), University of the Western Cape (UWC) and Walter Sisulu University (WSU). These labs expand on existing research and laboratory activities at the universities and provide university staff access to ACEP infrastructure, such as coastal vessels and research equipment. The partner universities and NRF-SAIAB jointly coordinate these laboratories.

This has created a collaborative platform that merges the expertise of these universities with that of NRF-SAIAB and its extensive research network. The DSTI/NRF Joint Marine Labs Programme (JMLP) aims to address significant marine, social, and economic opportunities and challenges in South Africa. This includes developing technical skills to co-manage these joint research platforms.

These laboratories provide researchers and students access to advanced National Facility infrastructure, leading edge technology and equipment, to enhance research quality and foster continuous growth.

A collaborative platform that merges the expertise of four HDIs with that of NRF-SAIAB and its extensive research network

The JMLP addresses key marine, social, and economic challenges and opportunities in South Africa. Progress includes formal MOAs and established laboratories at partner institutions. At UFH, a bio-discovery tissue culture laboratory equipped with an Ultra High-Pressure Liquid Chromatography (UPLC) system is operational, with seed funding from the Technology Innovation Agency (TIA) secured for intellectual property development. UWC has launched a microplastics clean laboratory with an operational Fourier Transform Infrared Spectroscopy (FTIR) system. UNIZULU has upgraded its Marine Ecotoxicology Laboratory with TOC/TN and ICP-OES analytical systems. WSU has established a Rural Coastal Sustainability Laboratory, including a mobile field station and specialised field and histology equipment.

UFH – Bio-economy and Bio-discovery Laboratory – Applying marine resources to target diseases and develop technical expertise

Dr Ntombekhaya Nqumla-Gwebu and Prof. Graeme Bradley lead the lab's primary research project which focuses on identifying

and isolating bioactive compounds from Eastern Cape red algae with anti-diabetic and anticancer potential. Research targets the inhibition of alpha-amylase and alpha-glucosidase enzymes and uses both in vitro and in silico approaches to evaluate cytotoxic effects on prostate, lung and breast cancer cell lines. Key activities include species collection and DNA barcoding, compound extraction and purification, enzyme inhibition assays, molecular docking and cytotoxicity testing (see report by Dr Ntombekhaya Nqumla-Gwebu on page 27).

Dr Ntombekhaya Nqumla-Gwebu will take on the role as instrument technician and is being mentored to assume laboratory management when Prof. Graeme Bradley steps down. The facility is advancing transformation, with four black female lab assistants in training. Seven (7) Honours students (five (5) female and two (2) male) were supported by the lab in 2025, contributing to research outputs, skills development and publication success. In May and September 2025, degrees were conferred upon UFH students in Zoology and Biochemistry who successfully completed their studies at various levels, including Honours (8), Masters (3), and PhD (2). Their research and academic achievements have contributed significantly to the advancement of knowledge in Zoology and related fields.

UNIZULU – JML Marine and Estuarine Ecotoxicology Laboratory – Understanding toxic ecosystems by quantifying metal concentrations in coastal environments and organisms

The Marine and Estuarine Ecotoxicology Laboratory comprises an Analytical Laboratory, housing major capital equipment (ICP, TOC analyser, microwave digester, AA spectrophotometer and water purification system), and an Exposure Laboratory for ecophysiology experiments and marine and estuarine bioassays. The facility currently quantifies metals in water, sediment and biological tissues and supports ecophysiology research. The lab supports three (3) PhD students and one MSc student. Ongoing projects include studies on metal bioaccumulation and neurotoxicity in estuarine crabs, meiofauna diversity as a habitat quality indicator, metal contamination in Mzingazi Lake, and microplastics in Algoa and St Francis Bays. Staff capacity was strengthened through a productivity and quality management workshop, enhancing good laboratory practices and quality systems awareness. A 28-day amphipod experiment was completed, with data analysis underway, and several manuscripts are in preparation, submitted or under review.

UWC – Microplastics and Coastal Research Laboratory – Understanding microplastics to improve ecosystems

The Joint Marine Laboratory for Microplastics and Coastal Research (MCR), led by Prof. Anusha Rajkaran, is advancing research on microplastic pollution in South African estuaries and coastal systems. The laboratory is equipped with specialised filtration systems, flow cabinets, microscopes and a Bruker LUMOS II FT-IR imaging microscope, enabling low-contamination extraction, enumeration and polymer

identification of microplastics from water, sediment and fauna. Current research establishes baseline datasets for estuaries and evaluates microplastic loads in ecologically and socio-economically important species, including crabs, snails, birds, fish and aquaculture systems. The JML has been instrumental in enabling high-quality analyses, student training and capacity development. One peer-reviewed article was published in *Marine Pollution Bulletin* (2023), with several manuscripts under review or in preparation for 2025. The laboratory currently supports multiple MSc and PhD students, contributing significantly to transformation and human capital development in marine and coastal science (see report by Prof. Anusha Rajkaran on page 25).

WSU – JML Rural Coastal Sustainability Laboratory – Addressing challenges faced by rural communities, focusing on food security and climate change adaptation

Under the leadership of Dr Thembinkosi Steven Dlaza, the laboratory comprises microscopy facilities, temperature-controlled rooms, a histology unit, aquaculture tanks and dedicated field equipment including a vehicle and boat. The lab conducts research in aquaculture for food security, taxonomy, reproductive biology, physiology, and tissue damage and stress responses.

Through the JMLP, the laboratory acquired high-resolution microscopes, histology equipment, a spectrophotometer, a centrifuge, a vehicle and a boat, significantly expanding its capacity

for laboratory-based experimental and tissue analysis studies.

The laboratory currently supports six (6) PhD, five (5) MSc students and 11 Honours students. Current projects include morphometric analyses of the brown mussel (*Perna perna*), limpet-algal interaction networks, crustacean-holdfast associations, and estuarine crab digestive morphology. Outputs include manuscripts submitted to accredited journals and active community engagement on marine resource co-management and awareness initiatives along the Wild Coast.

In 2025, the laboratory embarked on taxonomic studies and community outreach programmes related to marine science. The community outreach programmes included a meeting with small-scale fishing cooperatives, community leaders, Blue Wild Coast, Eastern Cape Parks and Tourism Agency (ECPTA) and DFFE on co-management of marine resources at Dwesa-Cwebe MPA. The other community engagement programme was a Marine Awareness Campaign for scholars and community members at Mbotyi Village in Lusikisiki.

Over the next 2 to 5 years, the NRF-SAIAB Joint Marine Laboratories programme will enter an optimisation phase to strengthen coordination, standardise operations and maximise the use of shared facilities. This will be followed by a second phase of infrastructure expansion. The programme will also address technical skills shortage through targeted recruitment, training and partnerships to build sustainable operations capacity.



UFH Honours student preparing the UPLC for sample purification.



UFH Honours students doing some molecular work.



PhD candidate, Nobuhle Mpanza, sampling intertidal biodiversity at wave screens at the Queen Anne's Battery, Plymouth, UK.

From grey to green: Engineering with nature for functional urban coasts

PROF. FRANCESCA PORRI, WITH COST TEAM
Senior Scientist, Science Leadership Team

Keywords: coastal armouring, ecological engineering, ecosystem function, mussels, nature-based solutions, transdisciplinarity

RESEARCH PROJECT NAME

Indigenous Marine Innovations for sustainable Environments and Economies (IMIsEE) project AND Operation IMBAsA: Imagining Blue Carbon AlternativeS for climate Action

PRINCIPAL INVESTIGATOR

Francesca Porri

NRF-SAIAB TEAM MEMBERS

Francesca Porri, Kerry-Ann van der Walt, Nokubonga Mbandzi, Suzanne Redelinghuys

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Nature-based and eco-engineered interventions can restore coastal ecosystem functions

Urbanisation is rapidly transforming coastlines, replacing natural habitats with artificial structures that reduce biodiversity, disrupt ecological processes, and compromise the services and benefits these ecosystems provide to society. This body of research addresses a central question: in the Anthropocene, can coastal infrastructure be redesigned or enhanced to support ecological function, human well-being, and climate resilience?

Through integrated field, laboratory and socio-ecological research conducted in South Africa during 2025, our work demonstrates that nature-based and eco-engineered interventions can restore ecosystem functions even in highly

*modified and nutrient enriched environments. By focusing on mussels as ecosystem engineers, microalgal biofilms as early indicators of ecological change and indigenous plant materials such as *Cyperus textilis*, the research shows tangible benefits for water quality regulation, habitat complexity and biodiversity enhancement, food-web support and sustainable livelihoods.*

Beneficiaries of this research include coastal managers and policymakers seeking evidence-based design solutions, local communities reliant on healthy coastal systems for food and income and the scientific community through new insights into how biodiversity and ecosystem functioning can be retained or enhanced in urban coastscapes.

In 2025, our research focused on analysing, synthesising and integrating datasets from multiple projects on urban coastal ecosystems. Doctoral researchers, in the write-up phase, consolidated field, laboratory and cultivation data on plant-based eco-engineered coastal designs, physiological performance of invertebrates, soundscapes and nature-based solutions across natural and urbanised systems. The findings collectively advanced understanding of ecosystem function and resilience in urbanised coastal environments and supported evidence-based eco-engineering and nature-based interventions.

Funding from the Leviathan-Deutsche Bank partnership enabled an international research exchange for PhD candidate Ms Nobuhle Mpanza at the University of Plymouth. Surveys showed that armouring design influences ecological function, with wave screens supporting larger, denser mussel beds and greater epibiont diversity than pontoons. Laboratory experiments further demonstrated that both live mussels and their shells contribute to biofiltration by supporting barnacle feeding, highlighting the importance of retaining biological structure within urban coastal infrastructure.

Complementary work on eco-engineered designs deployed along the Eastern Cape coast demonstrated that nature-based materials seeded with native mussels enhanced microalgal diversity, selected for functional traits linked to water-quality regulation and altered early-stage food-web pathways. Notably, these designs contribute to the bioremediation of metals, provide measurable ecological indicators beyond simple biodiversity counts and offer practical tools for monitoring and management. Innovation was further advanced through research on *Cyperus textilis* (imizi), a culturally significant wetland plant traditionally harvested for weaving. Greenhouse and hydroponic trials demonstrated that high-yield cultivation is feasible, reducing pressure on wild populations while enabling large-scale application in eco-engineering designs. By integrating Indigenous Knowledge, community engagement and modern cultivation technology, this work provides a pathway that links cultural heritage, sustainable livelihoods and green infrastructure development. In parallel, food-web and human health risk assessments revealed that urban coastal contamination poses direct risks to seafood safety and coastal livelihoods. Elevated metal bioaccumulation and trophic magnification (pollutant concentration that increases up the food chain) in edible shellfish at urbanised sites exceeded health thresholds, underscoring the need for risk-informed



PhD candidates, Amirhassan Masoumi (standing, left) and Katleho Mahlope (bent, right), sampling in Kenton-on-Sea for the mussel blue carbon doctorate research.

coastal management to safeguard subsistence and recreational harvesters, particularly in the Global South.

Collectively, these projects align strongly with a growing national agenda on nature-based solutions, climate adaptation and sustainable development as reflected by the invitation to participate at the 2025 Integrated Coastal Management Lekotla 2025 led by DFFE, for a panel discussion on South Africa's approach to Nature-Based Solutions (NbS) and Ecosystem-Based Adaptation (EbA). The team's and collaborators' contribution lies in combining ecological, functional, technological and socio-cultural perspectives to demonstrate how urban coastal infrastructure can be reimagined as multifunctional social-ecological systems. By linking ecological outcomes with food-web dynamics and human health, the research highlights the need for risk-informed coastal management that safeguards both the functional performance of coastal armouring and harvesting activities in adjacent areas. Research findings were disseminated through peer-reviewed publications, national and international conference presentations (including PhD students), which ensured reach across scientific, policy and public audiences.

Clear impacts thus far include improved evidence for eco-engineered coastal design, new monitoring indicators for ecosystem function and practical guidance for sustainable material sourcing. Target audiences reached include coastal town planners, departmental government representatives, international researchers, students and local communities engaged in co-developed solutions.

Over the next five years, the team will quantify mussel-mediated blue carbon contributions and hopes to introduce Living Seawalls eco-engineering modules to Africa to assess their performance in South Africa, generating locally relevant evidence to inform biodiversity-enhancing, climate-responsive coastal infrastructure, a scope of research fully aligned with NRF Vision 2030.



Knysna winter sampling team: (front from left) Lutholwethu Mabaleka (RU), Nicola James (NRF-SAIAB), Amber Childs (RU); (back from left) Bheki Maphanga (SANParks), Phakama Nodo (NRF-SAIAB).

Sublittoral nursery seascapes in a changing world

PROF. NICOLA JAMES

Senior Scientist, Science Leadership Team

Keywords: climate resilience, fish, nursery areas

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COLLABORATORS/PROJECT PARTNERS

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Coastal and estuarine habitats are increasingly threatened by degradation, loss of structural complexity and climate change, which undermine their critical role as fish nurseries and climate change refuges. A key challenge for biodiversity and fisheries management is the lack of fine-scale, spatially explicit evidence that identifies which habitat features most effectively support nursery function and resilience under changing conditions. The NRF-SAIAB Seascape Ecology group addresses this gap using a multidisciplinary approach to identify and value important fish nursery and climate change refuge habitats, and to assess how climate and global change pressures affect coastal seascapes and associated fauna. This research provides actionable evidence to support resource managers in prioritising habitat protection and restoration and preventing further habitat loss. Building on this work and ensuring research sustainability, an NRF Marine and Coastal grant awarded in 2025 supports new projects examining fine-scale habitat features that promote nursery function for exploited sparid species along South Africa's southern Cape coastline. The outcomes will contribute to more resilient fish stocks, improved ecosystem management and long-term benefits for coastal communities dependent on marine resources.

In 2025, research outputs included six peer-reviewed publications and eleven conference presentations. Ten presentations on seascape ecology and climate change were given at the Southern African Marine Science Symposium (Cape Town, 8 to 12 September 2025), with PhD student Thembani Mkhize presenting at the WIOMSA scientific symposium (Kenya, 28 September to 3 October 2025) on the use of natural tags (fish eye lenses, otoliths and muscle tissue) and novel-techniques (combining stable isotopes and micro-chemistry) to assess habitat use and connectivity in coastal seascapes. Key findings published open access (OA) in 2025 were the identification of both seagrass and macroalgal beds with a high degree of complexity (canopy height and density) as important nursery areas for sparids in Algoa Bay (*Estuarine, Coastal and Shelf Science*; <https://doi.org/10.1016/j.ecss.2025.109258>); and the identification of 13 estuaries in the warm-temperate region that provide nursery function and climate change refuge based on their key features (connection to the sea, habitat availability and extent of seagrass) (*Landscape Ecology*; <https://rdcu.be/eZjEt>).

To increase knowledge and societal impact, research outputs are translated into applied decision-making tools and policy-relevant processes. Findings were translated into a policy brief titled *Identification of climate change refuges for climate change adaptation planning* (<https://saiab.ac.za/nrf-saiab-briefing-note-climate-change-and-the-sustainable-ocean-economy/>) and incorporated into the determination of Resource Quality Objectives for fish across Eastern Cape estuaries for the Department of Water and Sanitation (in terms of the National Water Act), directly influencing water resource management and estuarine protection.

Our work further contributed to national biodiversity planning through participation in National Biodiversity Strategic Action Plan (NBSAP) consultations, the DFFE WG7 estuaries and MPAs task team, the DFFE traditional linefish and netfish scientific working groups, the Western Cape Estuary task team and contributions to IUCN Red List assessments for the exploited sparid *Acanthopagrus vagus*, to ensure that scientific evidence underpins national conservation priorities. Principal Investigator Prof. Nicola James was invited to talk on climate change resilience at the iSimangaliso Ecosystem Based Adaptation Framework Stakeholder Workshop (10 November 2025) and WildTrust Ocean Stewards Science Session (25 November 2025). The group also maintains social media platforms (e.g. X and Instagram: @SeascapeEcolSA) and a research webpage (<https://seascapeecologysa.wixsite.com/seascape-ecology-res>) to disseminate research to stakeholders and society.

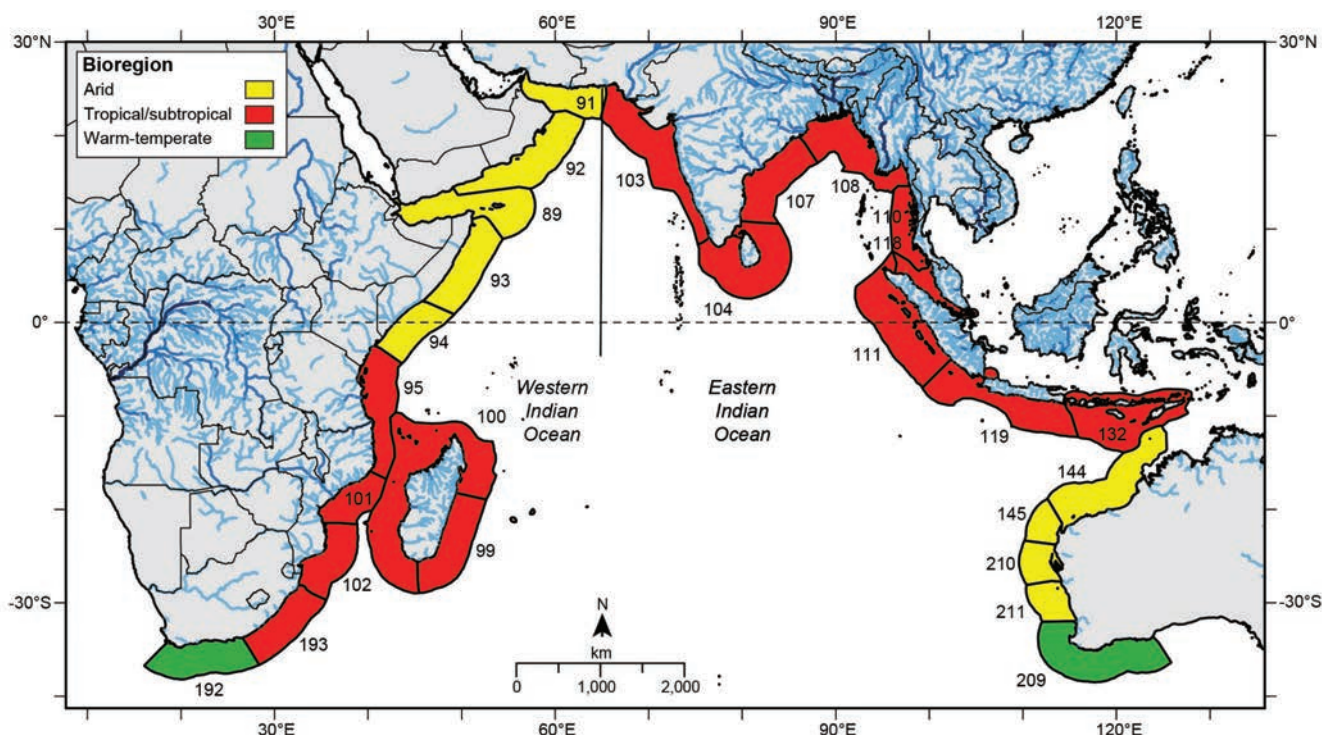
Our team makes a substantial contribution to transformation, capacity development and knowledge generation with a fully transformed postgraduate cohort of eight female (three African, one coloured, one Indian and three white) and two male (African) students and successful international staff and student exchanges. Eight students presented at the annual NRF-SAIAB Student Symposium, with awards for Best Poster (Michon Du Plessis) and Best Speed Talk (Jessica Seath). We have developed a strong research collaboration with the



Lutholwethu Mabaleka (RU), Amber Childs (RU), Kyle Smith (SANParks) and Nicola James (NRF-SAIAB) deploying stereo remote underwater video systems (sRUVs) in the Knysna Estuary.

Swedish University of Agricultural Sciences (SLU), which has strengthened student training through joint supervision, student mobility and the development of international networks. MSc student, Aphiwe Sandi, visited SLU for three months as part of an EU Erasmus+ exchange programme between SLU and Nelson Mandela University. During this visit, he worked with SLU researchers Prof Charlotte Berkström and Dr Maria Eggerston using multiple tools, such as looking at fish condition, feeding ecology and morphological variation to assess and compare the nursery quality of three different juvenile habitats used by the endemic sparid *Rhabdosargus holubi*. Preliminary findings from this work were presented at SLU and NMU and the Supratidal Spring-fed Living Microbialite Ecosystems Colloquium (27 October 2025). The collaboration with SLU was strengthened through a visit to SLU in May 2025 by Prof. Nicola James and Dr Gavin Rishworth. During this exchange, research on climate change and estuaries was presented and future collaborative publications and research initiatives were developed.

In 2026, four MSc and two PhD students will submit their theses for graduation at the end of the year. We also welcome three Honours and one MSc student who will be working on ocean acidification, climate change resilience and the impact of dredging on seagrass and associated fauna in the Kromme Estuary.



Map showing the bioregions around the Indian Ocean and the direction of tropical and subtropical fish colonisation on both sides of the basin. The bioregions where temperate fish species evolution occurred are also shown.

Evolution of global fish assemblages in estuaries

PROF. ALAN WHITFIELD

NRF-SAIAB Chief Scientist Emeritus

NRF-SAIAB Honorary Research Associate

Keywords: continental drift, fish colonisation, species and families

COLLABORATIONS

Mario Barletta (University of Pernambuco, South America), Trevor Harrison (Department of Agriculture, Environment and Rural Affairs (DAERA), Northern Ireland, UK), James Tweedley (Murdoch University, Australia)

The origins and evolution of fish assemblages in estuaries around the world were the topic of a trilogy of scientific reviews in 2025.

*This report highlights a series of three scientific reviews published in the international scientific journal *Estuarine, Coastal and Shelf Science* and covers the evolution and movements of fish families and species around the Atlantic, Pacific and Indian Ocean basins. How and why fish species ended up where they are today is an important topic of scientific and fishery interest, particularly during an era of climate change when species distributions are rapidly changing in response to global warming and other climate related drivers.*

Marine and estuarine fish species have been moving around the world for millions of years. During the Early

Cretaceous (120 million years ago), Gondwanaland began to break up as a result of continental drift and by the Late Cretaceous (90 million years ago) Africa and South America were moving apart (see figure on opposite page). Coastal fish families between the two continents were similar and colonised the newly formed estuaries to create a rich diversity of species that were not the same. As the Atlantic increased in size due to further continental drift during the Early Eocene, the estuary-associated fish species differences between western Africa and eastern South America became more apparent (Whitfield et al. 2025a). Currently, very few species are able to transit the ocean between the two continents, especially as ‘island hopping’ across this wide basin is not an option.

A detailed examination of fish speciation processes operating around the Indian Ocean showed that colonisation of estuaries on the eastern and western rim was facilitated by the northern coastal waters that allowed tropical fish taxa to move from the north-eastern ‘hotspot’ to western coastal waters and thence down the eastern coast of Africa towards the south (see map above). Hence both family and species similarities of tropical estuarine taxa were high on the eastern and western shores of the Indian Ocean (Whitfield et al. 2025b). However, the arid coastlines of northwestern Australia and the Arabian Peninsula

do restrict the movements of certain estuary-associated fish species. Temperate fish species then evolved separately along the south coast of Africa and southwestern coast of Australia, resulting in very different species assemblages in temperate waters on the two continents.

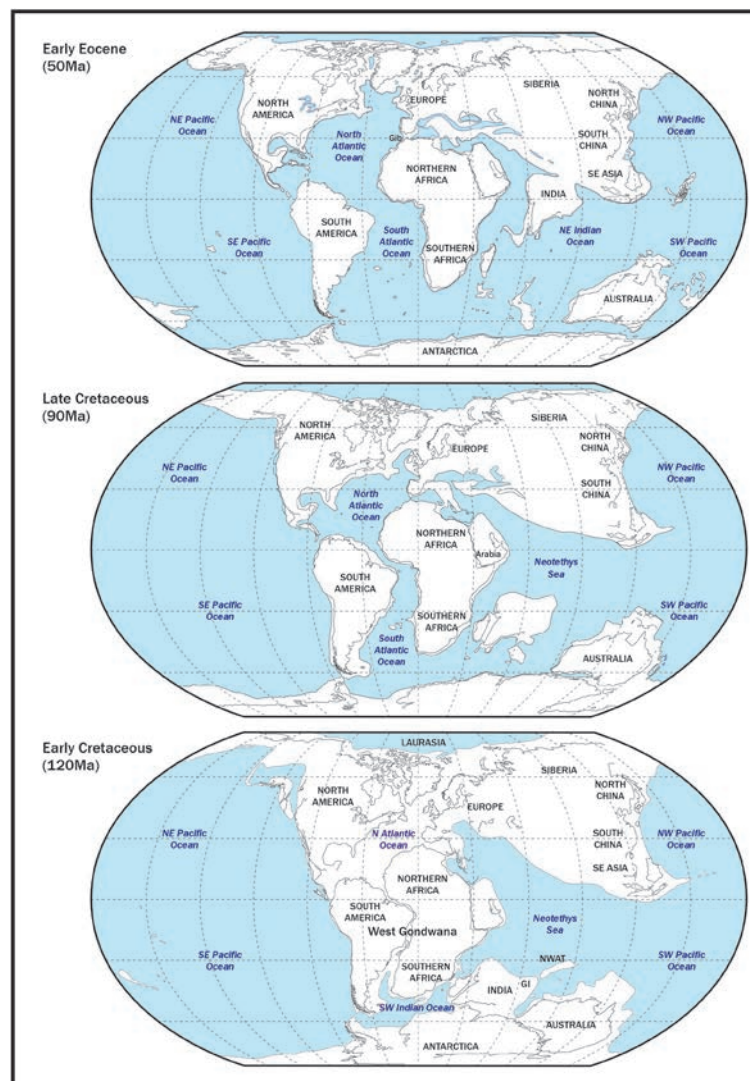
The third review by Whitfield et al. (2026 [published online 2025]) examines the family and species composition around the Pacific Ocean rim. The highest species richness was recorded in tropical estuaries of the western Pacific, especially those systems that were in ecoregions close to the northeastern marine fish species ‘hotspot’. Although a few of these tropical species were able to cross the Pacific basin by ‘island hopping’, most were unable to cross this very broad ocean and therefore the fish assemblages of the western and eastern Pacific are very different. Indeed, most of the families and species in tropical eastern Pacific estuaries originate from the Caribbean Sea which was linked to the Pacific Ocean before the Panama Isthmus closed several millions of years ago, and fish movements between the Atlantic and Pacific then ceased.

Not all fishes will be equally affected by climate change

Climate change is going to affect the status and distribution patterns of fish species in estuaries around the world. However, the impacts of climate change on river flow, estuarine functioning and sea-level rise will have differential impacts according to both region and estuary type, and not all fishes will be equally affected. Despite the scarcity of detailed information on the impact of climate change on global estuaries, there is already concrete data that shows how estuary-associated fishes are being impacted by the consequences of climate change, with tropical species likely to expand their distribution into higher latitudes and temperate species retreating polewards. Therefore, fish assemblages are not static in terms of distribution and composition but are actually in a state of constant flux as global climate change continues to impact on estuarine and coastal conditions.

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Maps of the world, showing the break-up of Gondwanaland due to continental drift. The movement of the resulting continents had a major impact on the speciation processes operating in estuaries around the world, a feature that continues to this day.



Aphiwe Sandi catching *Rhabdosargus holubi* for his Masters research at a SSLiME pool at Seaview, Nelson Mandela Bay. Photo: Gavin Rishworth

Stromatolites connect the South African seascape

DR GAVIN RISHWORTH

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Keywords: groundwater-dependent ecosystems, macrofauna, microbialites, seascape connectivity, stepping-stones, stromatolites

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The Supratidal Spring-fed Living Microbialite Ecosystems (SSLiME) Project studies the functional processes and ecosystem services of unique supratidal modern microbialite pools that form where carbonate-rich groundwater emerges on rocky coasts. Microbialites were Earth's earliest ecosystems of shallow coasts from at least 3.4 billion years ago and dominated most Proterozoic aquatic habitats. Microbialites are formed by photosynthetic microbial mats that accrete carbonate and trap sediment as they grow, often forming layered deposits known as stromatolites.

Extant microbialites are rare for several reasons. Foremost among these are that modern marine water chemistry hinders calcification, the emergence of reef builders like macroalgae and sponges outcompete microbialite reefs, and the evolution of metazoans that began to graze, burrow and disrupt microbial mats, hindered the accretion of microbialites after their proliferation in the Phanerozoic.

Along the South African coast several hundred SSLiME locations have been identified and recently captured in a biodiversity celebration paper (Harris et al. 2025). Our SSLiME Project has uncovered important features of these locations over the past decade that are linked to their unique biodiversity, ecosystem services such as nutrient attenuation, connectivity

SSLiME pools provide stepping-stones to connectivity between estuaries

corridors for a range of taxa, important coastal freshwater locations for palaeo- and modern humans, and deep time analogues for understanding evolutionary processes.

Linked to my research with Prof. Nicola James at NRF-SAIAB and her Seascape Ecology project, an important focal point of our SSLiME research revolves around understanding the value of these habitats for connecting organisms along the coast, both as nurseries and connectivity corridors. For example, previous research with Prof. Nadine Strydom has shown that several estuarine-dependent and associated fishes cue towards these systems as if they are estuaries, but it is not known if this translates into successful recruitment into late juvenile or adult habitats.

Invertebrates and microalgae such as diatoms commonly associated with estuaries also occur in high abundance in these microbialite pools and past research suggests that the stepping-stone nature of SSLiME provides an important connectivity corridor for estuarine organisms. For example, on a 50 km stretch of coast west of Gqeberha, approximately 1 000 discrete SSLiME pools occur. Therefore, a focus of our research is to understand how SSLiME and estuaries are connected.

Two students within the team are specifically focused on addressing this question in sparid fishes: Thembanani Mkhize and Aphiwe Sandi. Both had the opportunity to travel to the Swedish University of Agricultural Sciences (SLU) in the past year as part of an Erasmus+ three-month exchange, working with Prof. Charlotte Berkström, Dr Yvette Heimbrand and Dr Maria Eggerstein. Their research involves using natural biomarkers (geochemistry and stable isotopes) in fish tissues as well as abundance and diet data to reconstruct early-stage fish movement patterns between seascape habitats such as estuaries (Thembanani Mkhize) and SSLiME pools and to link this to nursery quality in terms of diet, morphometrics and body condition (Aphiwe Sandi). In May 2025 Prof. James and I had the opportunity to visit Prof. Berkström and her lab in Sweden to facilitate this collaboration, following her visit to Gqeberha the previous year. Some fascinating results are emerging from the research by these students who are entering the final year of their respective degrees in 2026. Both had the opportunity to present at the South African Marine Science Symposium in Cape Town during September 2025, together with several other students from the SSLiME and Seascape Ecology research teams.

Other relevant highlights include hosting the 2nd SSLiME Colloquium in October at the Ocean Sciences Campus, Nelson Mandela University. Here postgraduate students such as Aphiwe Sandi, as well as local and international SSLiME researchers including myself who convened the Colloquium, presented diverse research topics spanning early Earth's oxygenation, microbialite-metazoan evolution, groundwater value, microbialite productivity, next generation sequencing (our team published a paper highlighting this: Emami-Khoyi et al. 2025), and the biodiversity importance of SSLiME. Following this colloquium, a week of fieldwork and collaboration discussions resulted in some clear plans for future research together and new funding applications are already in the pipeline, specifically



The Seascape Ecology team visiting a SSLiME pool at Seaview, Nelson Mandela Bay. Left-front: Thembanani Mkhize; right to left: Gavin Rishworth, Nicola James, Charlotte Berkström. Photo: Carla Edworthy

linked to an existing German Research Foundation (DFG) project on which I am a co-Principal Investigator with colleagues from the University of Oldenburg and University of Johannesburg. Our SSLiME research is disseminated widely across a variety of public engagement forums including field site excursions with learners, public talks, popular articles as well as social media pages (@SASTromatolites – Facebook; @sa_stromatolites – Instagram).

I will be on a research sabbatical during 2026 and am especially looking forward to focusing on my postgraduate team and their research. Our seascape connectivity work also continues as we look to synergise the population-level studies with whole community-level research using tools such as metabarcoding. Our NRF and DFG grants linked to SSLiME will end this year and there are several papers that need writing up as plans for the next iterations of these projects are formulated. A new Water Research Commission project begins in 2026 with Dr Carla Dodd and Dr Lucienne Human, specifically looking at the value of SSLiME as hydrological monitors for society in this drought-stricken region.

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The spread of plastic litter along the lower intertidal zone at Durban Bay mangrove forest.

Understanding the invisible threat: Assessing microplastic impact on South African coastal ecosystems and Blue Carbon stocks

PROF. ANUSHA RAJKARAN

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Keywords: microplastics, Blue Carbon, estuarine ecology, plastisphere, mangroves, coastal management

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ADDITIONAL COLLABORATIONS

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The Microplastics and Coastal Research (MCR) Joint Marine Laboratory (JML) addresses the impact of microplastic (MP) pollution in South Africa's critical estuarine environments. While estuaries are vital for biodiversity and carbon sequestration/storage, they increasingly act as sinks for plastic debris, which impacts habitat health and human food security. This lab aims to establish a comprehensive national dataset on MP concentrations and composition to inform legislative action and promote environmental protection. By investigating the "plastisphere" – the microbial communities colonising plastic – and the impact of MPs and plant revegetation on carbon storage, the project provides data-driven evidence to support Sustainable Development Goals (SDGs) related to Life Below Water and Climate Action. The research is centred on South African estuaries and coastal zones, including the Berg River (and other Western Cape sites), Durban Bay and Mossel Bay. This work aligns with the National Biodiversity Assessment (2019), which identifies microplastics as a primary threat to estuarine health. Internationally, the research feeds into global conversations on plastic management, drawing comparisons with successful legislative models in countries like Rwanda and Kenya to refine South Africa's own microbead ban and waste strategies.

Microplastics are a primary threat
to estuarine health

The research feeds into global conversations on plastic management

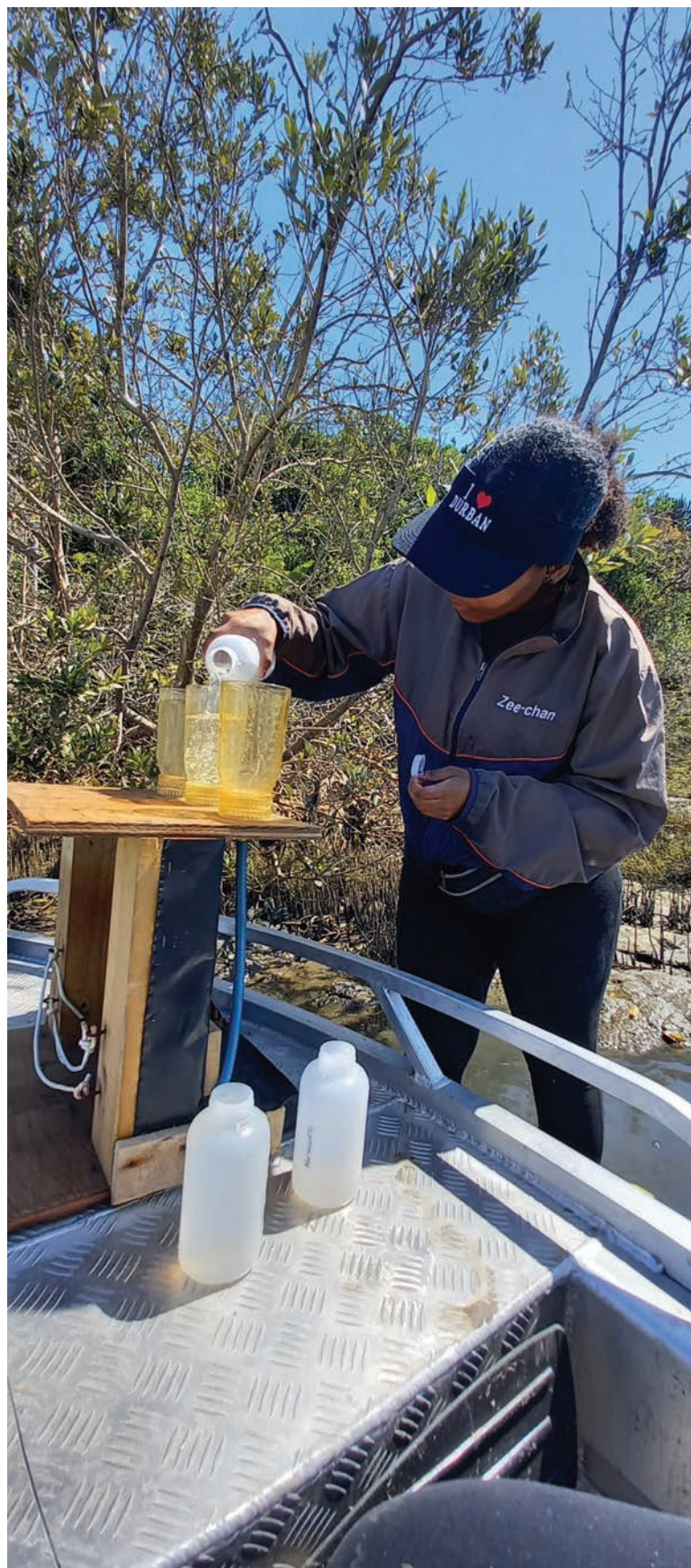
Microplastics have been recorded in rural and urban systems, across terrestrial and marine environments. These MPs vary in their type, category, colour and shape, but some trends are evident such as the dominance of fibres in most samples. Rivers and estuaries provide the main pathways through which MPs are introduced to the marine environment, but additional inputs arise from commercial fishing or maritime activities. The movement and persistence of plastics in aquatic systems threatens the health and integrity of the biota within them and is considered a global risk. Indications are that microplastic ingestion by aquatic fauna, with information existing for mussel and some fish species, include *Oreochromis mossambicus*, *Terapon jarbua*, *Ambassis dussumieri* and *Mugil* sp. Meso plastics have been recorded in sea turtles and seabirds, whereas macroplastics are known to affect whales and seals.

In 2025, three publications on the biodiversity of estuaries were published and four further papers were prepared for publication. The team presented their research at major forums including the South African Marine Science Symposium (SAMSS) where Zenzè George, Stephanie Nicolaidis, Omphemetse Kelebogile Mokwa, Siyanda Buthelezi, Lesego Edith Pheyane Kgatla, Kezia Dreyer and David Rispel presented their work on restoration, carbon sinks, microplastics and seagrass utilisation. Rosemary Eager presented at the International Congress for Conservation Biology in Australia and Anusha Rajkaran presented at the Western Indian Ocean Marine Science Symposium in Kenya. Prof. Rajkaran's contributions to *The Conversation* (<https://theconversation.com/plastic-microbeads-great-in-your-face-wash-bad-in-your-food-how-south-africas-ban-can-work-better-263283>) highlighted the necessity to validate the environmental and economic effects of microbeads through independent science. This resulted in further public engagement via SAFM radio interviews and Moneyweb podcasts which has extended the reach of the research to the general public and policymakers.

To increase knowledge and societal impact, research outputs are translated into a policy brief titled: *Microplastics in aquatic ecosystems, implications for ecosystem services and long-term solutions* (<https://saiab.ac.za/nrf-saiab-briefing-note-microplastics-in-aquatic-ecosystems-implications-for-ecosystem-services-and-long-term-solutions/>).

In 2025, Tashreeqah Nero (MSc), Zenze George (MSc), Aldeen Esau (MSc), David Rispel (Honours) and Lesego Kgatla (Honours) successfully completed their degrees and will graduate in 2026.

In the next two to five years, the laboratory aims to finalise a progressive Plastic Waste Management Strategy for South Africa. Continued collaboration with NRF-SAIAB will focus on expanding FTIR assessments to the Western Indian Ocean region and integrating microplastic data into national blue carbon accounting frameworks.



Zenze George samples chlorophyll as part of her MSc project on the diatom colonisation of plastics at Nahoon Estuary in the Eastern Cape.



UFH MSc student, Zizipo Pupani, sampling red algae from Kenton-on-Sea, Eastern Cape.

Red algae from the Eastern Cape show significant potential for drug discovery and natural therapeutics for cancer and diabetes

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PROF. GRAEME BRADLEY

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Keywords: anticancer activity, antidiabetic activity, antioxidant activity, bioactive compounds, marine red algae, phytochemical and metabolite profiling

PRINCIPAL INVESTIGATOR

Graeme Bradley

PROJECT NAME

Anti-cancer/anti-diabetic activities of red algae species from the Eastern Cape coastline of South Africa

TEAM MEMBERS

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STUDENTS (Student projects are funded by NRF-SAIAB ACEP Phuhliisa Programme)

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COLLABORATION

NRF-SAIAB ACEP Phuhliisa and JML Programme

The DSTI/NRF Joint Marine Laboratories Programme (JMLP) integrates NRF-SAIAB institutional expertise with that of four universities. The laboratories are jointly managed to address key marine-related social and economic challenges. The Bioeconomy and Biodiscovery Laboratory is hosted at the University of Fort Hare in partnership with DSTI/NRF-SAIAB and includes a mariculture component. This particular research project is conducted within the DSTI/NRF-supported ACEP framework through the Phuhliisa human capital development initiative and aligns specifically with the objectives of the Joint Marine Laboratories Programme. By integrating marine biodiversity research with phytochemical, pharmacological, and genomic approaches, the study contributes to national priorities focused on Blue Economy development, capacity building at historically disadvantaged universities, and the translation of marine biological resources into health-related biotechnological innovations. In this context, red algae from the Eastern Cape coastline are investigated as strategic marine resources with significant potential for drug discovery and sustainable bio-economic development.

From ecological resources to clinically relevant natural therapeutics

This multidisciplinary project incorporated in vitro, in silico, phytochemical, pharmacological and genomic approaches to evaluate the therapeutic potential of red algae species from the Eastern Cape coastline of South Africa. Multiple red algae species were taxonomically characterised using morphological traits and validated by DNA barcoding, confirming species such as *Gelidium amansii*, *Plocamium corallorhiza*, and *Gelidium pristoides*.

Extraction and fractionation of these species enabled detailed phytochemical screening, revealing that the algae are rich sources of phenolics, flavonoids, tannins, proanthocyanidins, polysaccharides and related secondary metabolites. Antioxidant assays (DPPH, ABTS, ferric reducing power) demonstrated that these compounds play a critical role in mitigating oxidative stress, with distinct antioxidant mechanisms observed across species.

Cytotoxicity assays provided strong evidence of anticancer activity across multiple cancer models. In lung cancer studies, algae extracts induced G2 phase cell cycle arrest, promoting apoptosis in A549 cells, with the 60% methanol fraction of *P. corallorhiza* showing the strongest antiproliferative effect. In prostate cancer models, all tested fractions significantly reduced DU145 cell viability in a dose-dependent manner, further supporting the broad-spectrum anticancer potential of these species.

Studies targeting triple-negative breast cancer (TNBC) demonstrated selective cytotoxicity of *G. amansii* and *G. pristoides* against HCC70 and HeLa cells. Mechanistic analyses revealed that *G. amansii* induced intrinsic apoptotic pathways, including PARP inhibition and caspase activation, while *G. pristoides* primarily triggered necrotic cell death in HeLa cells. UPLC analysis identified bioactive compounds such as polysaccharides, mycosporine-like amino acids, and phenolic acids associated with these effects.

In parallel, anti-diabetic investigations revealed strong α -amylase and α -glucosidase inhibition by extracts from several red algae species, notably *P. corallorhiza* and *Neuroglossum binderianum*, outperforming the reference drug acarbose. These findings highlight the dual therapeutic relevance of red algae in managing both cancer and metabolic disorders.

Genomic analyses further strengthened the translational value of this research. Whole-genome, plastid, and mitochondrial sequencing of *G. pristoides* produced the first complete reference genome for this species, revealing a compact nuclear genome (40.86 Mb), low repeat content and extensive repertoires of heat-shock and cell wall-associated proteins. This genomic resource supports future bioactive compound discovery, functional genomics, and phylogenetic studies within the Gelidiales.

Overall, this body of work demonstrates that red algae from the Eastern Cape coastline represent a rich reservoir of bioactive compounds with significant antioxidant, anticancer



UFH MSc students, Zizipo Pupani, Ndiphiwe Ndoda, Thozama Tobo, and Thina Skolpad, preparing red algae samples for morphological identification.

Red algae constitute an underexplored reservoir of bioactive compounds

and antidiabetic properties. The integration of phytochemical, pharmacological and genomic data provides a robust pipeline for natural product discovery and supports the continued development of low-toxicity, marine-derived therapeutics aligned with national and global health priorities.

Two of our PhD students have completed (one graduating in May 2026), while the remaining three MSc students are currently finalising their dissertation submissions and are scheduled to graduate in September 2026. Collectively, their findings demonstrate that red algae from the Eastern Cape coastline constitute a valuable and underexplored reservoir of bioactive compounds with multifaceted therapeutic potential. The clear species-specific differences in phytochemical composition, antioxidant mechanisms, cytotoxic responses and genomic architecture highlight the importance of integrating biochemical, cellular and genomic data when evaluating marine-derived natural products. The consistent antiproliferative effects observed across prostate, lung and breast cancer models, together with strong antioxidant and enzyme inhibitory activities, underscore the translational relevance of these species as candidates for low-toxicity, multi-target therapeutic development.

Importantly, the generation of a complete reference genome for *Gelidium pristoides* provides a critical platform for future functional genomics, biosynthetic pathway elucidation and compound optimisation studies. Overall, this work establishes a robust scientific foundation for advancing Eastern Cape red algae from ecological resources to clinically relevant natural therapeutics, with clear implications for drug discovery, biotechnology innovation and public health.



SAIAB students Xiluva Mathebula (MSc) and Nkululeko Zuma (PhD) operating the NRF-SAIAB boat-based electrofisher vessel during a fish sampling expedition at Lake Phobane, Eshowe, in KwaZulu-Natal.

Foundation-Plus: Freshwater fish research promotes evidence-based decision-making for sustainable inland fisheries, aquaculture and conservation

DR MANDLA MAGORO, WITH FRESHWATER FIELD UNIT
Instrument Scientist, Freshwater Field Ecologist

Keywords: aquaculture, ecology, conservation, inland fisheries, taxonomy, systematics

RESEARCH PROJECT

REFRESH: Renewing data and filling knowledge gaps for freshwater species of South Africa to inform species and ecosystem conservation

PRINCIPAL INVESTIGATOR

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The study gave voice to small-scale fishers whose reliance on these fisheries is often overlooked in policy development debates

The protection of South Africa's freshwater ecosystems is of paramount importance as they are limited resources which face various pressures such as pollution, invasive species and over-abstraction. In rural parts of the country, communities residing near rivers and dams rely on these systems for access to

drinking water, as well as additional nutrition and food security. The NRF-SAIAB Freshwater Field Unit undertakes research which helps inform policy across a number of sectors with regard to fisheries management and aquaculture development, water resource management and monitoring, designation of key biodiversity areas and the protection of our biodiversity heritage. Taxonomy and BioDiscovery play a pivotal role in describing and quantifying global biodiversity. NRF-SAIAB is one of the leading research institutions in this field on the African continent and has a longstanding history of advancing our understanding of the biodiversity and distribution of freshwater and marine fishes in southern Africa. Today, the new generation of ichthyologists in the NRF-SAIAB Freshwater Field Unit leverages cutting-edge molecular and morphological techniques to address longstanding gaps in knowledge of the region's fish diversity.

During 2025, we continued our longstanding collaboration with the Department of Forestry, Fisheries and the Environment (DFFE), the Agricultural Research Council (ARC), University of Limpopo, South African National Parks (SANParks) and other stakeholders on a Water Research Commission (WRC) funded project to establish the potential for small-scale inland fisheries in public dams in the Limpopo Province. Data from this project will help inform the implementation plan of the National Freshwater (Inland) Wild Capture Fisheries Policy (NFWCFP). The development of inland fisheries capacity on a national level will help the country to achieve some of the objectives outlined in the NDP 2030, such as adequate nutrition. The findings from this work highlight that water-level mismanagement, illegal fishing gear and weak governance have steadily eroded both ecosystems and livelihoods. Most importantly, the study gave voice to small-scale fishers whose reliance on these fisheries is often overlooked in policy development debates (for more on this project see page 7)

In 2025, our team discovered and formally described 22 new fish species across multiple groups in southern Africa. These discoveries have far-reaching implications: they refine regional species inventories, inform IUCN Red List assessments, guide the designation of protected areas and underscore the critical role of African-led research institutions such as NRF-SAIAB in filling the continent's biodiversity knowledge gaps. Research outputs from the group have been published in international peer-reviewed journals and disseminated through presentations at local and international conferences. Our team is steadily expanding its research to incorporate cutting-edge techniques while targeting underexplored fish groups and geographic regions, with the aim of accurately documenting biodiversity, refining species distribution patterns, and producing updated taxonomic keys for southern Africa's freshwater and marine ichthyofauna.

In addition, the team visited the Botswana International University of Science and Technology (BIUST) for two weeks, where the focus was on providing hands-on training to students, staff and local fishers in fish sampling, biodiversity assessment and research design; skills which are critical for long-term regional monitoring and conservation. Additionally, the team



NRF-SAIAB MSc student Xiluva Mathebula using a backpack electrofisher to sample for freshwater fish in the Mnyameni River, Eastern Cape.

Expanding our research to incorporate cutting-edge techniques

loaned sampling gear to BIUST for a six-month period, to support ongoing fieldwork (for more on this visit see page 5).

We are also currently optimising environmental DNA (eDNA) application for use in South Africa's freshwater systems as a more sustainable tool for monitoring of fishes of conservation and socio-economic importance. Although still in its early phase, this WRC-funded project has achieved major milestones such as the development of techniques suitable for eDNA sample collection in the Eastern Cape and Limpopo provinces, as well as the development of a reference library for South Africa's freshwater fishes.

We continue to collaborate on projects with government departments and other organisations in the inland fisheries, aquaculture and conservation sectors to promote evidence-based decision-making. Current projects include optimising protocols for mining DNA from African natural history museum wet collections in order to unlock time-series genetic insights to support the protection of water source areas.



Traditional basket fisherman on the St Paul River, Liberia.

Fish and fisheries survey of the St Paul and Lofa Rivers, Liberia: Providing essential data to inform sustainable development

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Keywords: West Africa, biodiversity, conservation, fisheries, livelihoods

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COLLABORATIONS

Project Implementation Unit (PIU) of the Liberia Electricity Corporation (LEC), Aquatic Ecosystem Services (AES), Liberia National Fisheries & Aquaculture Authority (NaFAA), Cornell University, King's College London, NRF-SAIAB

agriculture and charcoal production, and unsustainable fishing techniques, threaten the fisheries resources. Many of these threats stem from the difficult economic conditions faced by local communities. In light of this, the Government of Liberia (GoL), in collaboration with international partners, is seeking to improve Liberia's power generation capacity to support economic growth. To ensure this is undertaken in a sustainable, data-driven manner, the GoL through the Liberia Energy Corporation (LEC) has commissioned a Fish and Fisheries Early Baseline Study to implement a robust fish and fisheries monitoring programme. The core aim of the study is to gather primary data on the diversity and distribution of fishes and how communities utilise fisheries resources across the St Paul River, and gather comparative data on the adjacent Lofa River.

The St Paul and Lofa Rivers are situated in Liberia, West Africa. These rivers provide essential ecosystem services to Liberia, and to the local communities they support. One primary service is fisheries, which provides an important contribution to household protein provision, livelihood opportunities and regional economies. Large-scale infrastructure projects, unregulated artisanal mining, deforestation from logging,

Historically, few ichthyological surveys and fisheries assessments have been undertaken in the St Paul and Lofa rivers, resulting in knowledge gaps. This lack of information creates uncertainty about species distributions and fishing pressure within and between the basins, hindering sustainable development planning and management. The study's aim was twofold: first, to document fish diversity and abundance in a

standardised manner to ensure comparable methods between stations, and to collect voucher specimens, including genetic material and live-colour photographs, across the St Paul and Lofa Rivers; second, to establish a community-driven fisheries Catch Assessment Survey (CAS) along the St Paul and Lofa rivers to collect monthly catch data from local fishers.

Intensive ichthyological field surveys were undertaken in the low (March–May) and post-high (November–December) water seasons, led by Dr Russell Chalmers (NRF-SAIAB-HRA) and Craig Rennie, with assistance from Harris Mallay and Matthew Dolo of the Liberia National Fisheries & Aquaculture Authority (NaFAA). The surveys targeted the mainstem of the St Paul and Lofa rivers as well as three major St Paul tributaries, the Via River, Galo River and Tuma Creek, and various small swamps and streams.

The field sampling methods consisted of comprehensive multi-habitat, multi-gear sampling (ethics permit NRF-SAIAB 2025-1) undertaken at nine stations across the St Paul River and two stations on the Lofa River. A total of 71 confirmed species were captured during the low water survey, with seven additional forms of further taxonomic interest based on morphometric and meristic characteristics. The fauna of the St Paul and Lofa is largely similar to that of adjacent rivers based on historical sampling, with the exception of basin endemics such as *Coptodon coffea*, which is currently considered endemic to the St Paul. The surveys also documented a range extension of *Labeo curriei* in the Lofa River with voucher specimens curated into the NRF-SAIAB collections. Many species require further genetic comparisons across catchments, including those in the families Mormyridae, Cyprinidae, Cichlidae and Nothobranchiidae. To date, 335 genetic samples and 568 voucher specimens have been lodged at the National Collection Facility at NRF-SAIAB, providing global access to new material from poorly studied catchments, with the post-highwater survey material to be added by March 2026. Voucher material accessioned into NRF-SAIAB from these rivers constitutes several new additions of formally described species that were not previously housed in the collection. The eDNA and Barcode reference libraries are currently being developed in collaboration with Dr Gwynneth Matcher, Jody Oliver and their team at NRF-SAIAB.

Due to the widespread use of mercury by artisanal gold miners, an additional component was added to the low-water survey: the collection of fish tissue samples to investigate existing levels of mercury and other metals. Overall, 396 tissue samples were collected from 34 species. The fish tissue analysis was performed by the London Metallomics Facility at King's College London in collaboration with Prof. Peter McIntyre (Cornell University) and Ass. Prof. Jacqueline Gerson (Cornell University).

The biodiversity surveys were complemented with monthly community CAS data gathering and a Traditional Ecological Knowledge (TEK) survey led by Naomi Richardson. The CAS programme employed up to 20 local community members, trained to use a tablet-based data collection tool, to collect monthly catch data along both rivers. To date (March 2025 to January 2026), over 3 500 CAS interviews have been completed



Two examples of fishing methods utilised along the St Paul River: (top) Women using Tuma nets in a shallow margin, (bottom) Castnet fisherman.

along the two rivers, providing valuable insight into the fisheries methods, species composition and harvest quantities over this period. The data from the TEK survey, together with the results from a Fisher Household Survey which was undertaken in parallel with the CAS survey are combined to provide the socio-economic context of the fishery to local communities in the past and present.

Harnessing freshwater resources while protecting the ecosystem goods they support is critical to ensure sustainable development and long term ecosystem viability. Cumulatively, the information gathered in the present study will contribute to long term planning in the St Paul Basin, aiming to balance the need for economic growth and development with protecting the continued delivery of vital ecosystem goods and services provided by the St Paul River. Through evidence-based design and operation decisions, sustainable large-scale development can be achieved while protecting resources that are central to food security and the livelihoods of people who depend on the St Paul River.



Labeobarbus kylei, a newly described large cyprinid (standard length 39 cm) from the Mzimkulu River, KwaZulu-Natal, South Africa

New insights into hidden diversity of southern Africa's freshwater and estuarine fishes

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PROF. ALBERT CHAKONA

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Keywords: conservation, fishes, freshwater ecosystems, integrative taxonomy, new species, southern Africa

PROJECT NAME

REFRESH: Renewing data and filling knowledge gaps for freshwater species of South Africa to inform species and ecosystem conservation

PRINCIPAL INVESTIGATOR

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Rhodes University, University of the Free State, South African National Biodiversity Institute, Water Research Commission, American Museum of Natural History –

USA, Institute of Vertebrate Biology of the Czech Academy of Sciences – Czech Republic, Kagoshima University Museum – Japan, Muséum National d'Histoire Naturelle – France

Freshwater and estuarine ecosystems in southern Africa support exceptional fish diversity, yet a large proportion of this diversity remains unrecognised or formally undescribed. At the same time, these habitats and their fish communities are among the most threatened on the continent due to anthropogenic activities, invasive species, and climate change. The REFRESH Project and several other ongoing projects led by our team address critical knowledge gaps by documenting and revising freshwater and estuarine fish diversity in the region using modern taxonomic approaches. By improving the accuracy of species identification and revealing previously unrecognised diversity and distribution patterns, our research provides essential baseline data for biodiversity monitoring,

conservation planning, and environmental management. The outcomes directly support national and international biodiversity assessments, including those of the IUCN Red List, and contribute to evidence-based decision-making for the protection of aquatic ecosystems. In addition to advancing globally competitive biodiversity science, these projects strengthen regional research capacity through the training of postgraduate students and early-career scientists and through collaboration with national and international partners. These efforts help ensure that southern Africa's freshwater biodiversity is better documented, understood, and conserved for future generations.

In 2025, the NRF-SAIAB Freshwater Research Unit conducted integrative taxonomic research on southern African freshwater fishes (Galaxiidae, Mormyridae, Cyprinidae, Clariidae and Mochokidae), as well as selected estuarine and marine groups (Oxudercidae and Gobiidae). These studies led to the discovery of 22 new species and the revalidation and redescription of seven additional species, while several cryptic lineages requiring further taxonomic investigation were also identified. Outputs have been published or are in press/under review in peer-reviewed journals, and several findings were presented at the 2025 SASAQS Conference.

Within Cyprinidae, two new large species were described. Genetic analyses revealed that the moggel, *Labeo umbratus*, comprises multiple lineages across the Orange-Vaal system and eight southward-draining river systems in South Africa. Morphological data confirmed that the Eastern Cape lineage, distributed from the Sundays to Nahoon rivers, represents a distinct species, described as *Labeo ngqikai* in honour of King Ngqika. Phylogenetic analysis of the scaly yellowfish, *Labeobarbus natalensis* from KwaZulu-Natal, identified several genetically distinct lineages, including a divergent population from the Mzimkulu River, described as a new and threatened species.

The taxonomic revision of the slender stonebasher complex, *Heteromormyrus ansorgii* (Mormyridae), across major southern African river systems including the Cuanza, Cunene, Okavango, Zambezi, Pungwe, Buzi, and southern Congo tributaries, resulted in six new species and redescrptions of *H. pauciradiatus* and *H. ansorgii*. The Cuanza River system is notable, harbouring five species, some sympatric, while other systems generally contain one or two species.

Significant taxonomic revisions were undertaken within the genus *Galaxias* (Galaxiidae). Africa was long thought to host only a single galaxiid species, *Galaxias zebratus*, endemic to the Cape Fold Ecoregion of South Africa. Recent molecular studies revealed that this taxon represents a complex of at least 15 genetically distinct lineages. Integrative analyses combining molecular and morphological data supported the recognition of two previously synonymised species, the redescription of *G. zebratus*, and the description of four new narrow-range endemic species. Ongoing work led by MSc student Xiluva Mathebula aims to resolve and formally describe the remaining lineages within this complex.

Further work on the orangefin barb, *Enteromius eutaenia*



Heteromormyrus angusticaudata, a newly described mormyrid species from the Cuanza River, Angola



Specimens representing three of the 15 genetic lineages identified within *Galaxias zebratus* in South Africa

(Cyprinidae), across the Cunene River system led to its redescription and the description of two new species: *E. bieensis* (upper Cunene) and *E. ruacanaensis* (lower Cunene). Revision of the snake catfish, *Clarias theodora* (Clariidae), revealed a species complex and identified a new species from the Okavango system. Integrative studies of *Chiloglanis* catfishes (Mochokidae) from the Zambezi River provided evidence for four new species. Estuarine and marine research on gobies supported the recognition of East African populations of *Oligolepis acutipennis* (Oxudercidae) as a distinct species, while revision of the Indo-Pacific genus *Valenciennesa* (Gobiidae) indicated that western Indian Ocean populations of *V. puellaris* and *V. strigata* represent two new species.

Collectively, these findings advance knowledge of southern African fish diversity and provide a foundation for biodiversity conservation and environmental management. The research contributed to transformation by training MSc students and early-career researchers, supports excellence in discovery science, and informs evidence-based conservation planning, including IUCN Red List assessments and sustainable management of freshwater and coastal ecosystems.

Future work will advance taxonomic research and biodiversity discovery in southern Africa, focusing on cyprinids, galaxiids, mochokids, and understudied regions. It will build on WRC-funded projects using environmental and historical DNA (eDNA, hDNA) and additional NRF-FBIP support, strengthening capacity for discovery and conservation science.



Release of the biological control agent *Megamelus scutellaris* onto the dense water hyacinth (*Pontederia crassipes*) mat at Hartbeespoort Dam to support augmentative biological control efforts.

Ecology and management of aquatic invasive species in South Africa

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Keywords: aquatic invasive species, biological control, integrated management, invasion ecology mass-rearing

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PROJECT NAME

NRF-SAIAB SARChI Chair in the Ecology and Management of Freshwater Invasive Species (EMFIS)

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EMFIS leads management of invasive aquatic plants in South Africa

The NRF-SAIAB SARChI Chair in the Ecology and Management of Freshwater Invasive Species (EMFIS) addresses the growing ecological and socio-economic impacts of invasive aquatic plants on freshwater systems. The South African Institute for Aquatic Biodiversity (NRF-SAIAB) and Rhodes University co-host the Chair, which advances sustainable, science-based biological control solutions for managing invasive waterweeds. The programme is led by Prof. Julie Coetzee, who also serves as Deputy Director of the Centre for Biological Control (CBC) at Rhodes University and directs the Biological Control of Aquatic Invasive Plants programme.

Gontse Mokwena (MSc), Naledi Moteka (MSc), Ongeziwe Mzwakali (MSc), Nomzamo Sithole (MSc)

COLLABORATIONS

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During 2025 the EMFIS strengthened and expanded biological control methods to combat invasive aquatic plants throughout South Africa. Post-release surveys evaluated the establishment and effectiveness of biocontrol agents, while lab experiments assessed their effectiveness and host-specificity. The results enabled researchers to improve release strategies and mass-rearing approaches, enhancing establishment and faster control of invasive plant populations. This work aims to create healthier freshwater ecosystems, improve water access and promote more sustainable long-term management of invasive species for communities and water users nationwide.

South African freshwater ecosystems are highly susceptible to invasive alien aquatic plants. South Africa's waterways face two major problems: insufficient water resources and extensive contamination (eutrophication). Dense floating invasive waterweed mats disrupt ecosystem functions, reduce species diversity, block waterways and impact social and economic benefits from ecosystems. A focus of EMFIS is to develop and implement sustainable biological control strategies to suppress invasive plants and support ecosystem recovery. The research integrates mass-rearing and release of host-specific biological control agents, post-release monitoring and complementary studies on ecosystem resilience and restoration.

The Chair's EMFIS aquatic weeds research and biocontrol implementation programme has continued to gain momentum over the past year which has strengthened our national leadership in the management of invasive aquatic plants. The team built on the achievements of 2024 and worked closely with water managers, conservation agencies and local authorities across South Africa to address new and ongoing infestations, which has advanced research on priority biological control agents.

The Vaal River remained a central focus and follow-up interventions reinforced the integrated management approach established in the previous season. Through collaboration with the CBC, our strong partnership with Rand Water, formalised at the end of 2024, has enabled more coordinated responses and

further embedded biological control as a cornerstone of long-term management in this system. Similarly, at Hartbeespoort Dam, sustained releases of *Megamelus scutellaris* once again resulted in meaningful suppression of *Pontederia crassipes*, which demonstrates the value of consistent agent production and release.

National support and capacity-building remain key pillars of the programme. The Waainek Mass Rearing Facility continued to supply large numbers of high-quality biocontrol agents to sites across the country and contributed internationally through shipments of agents to the USA and India to bolster their water hyacinth control efforts. Our submerged and emergent aquatic weed research expanded further this year, with encouraging establishment data for priority agents, viz. *Listronotus appendiculatus* against Delta arrowhead, and important progress in risk assessment and host-specificity testing for species such as *Iris pseudacorus*.

EMFIS monitors new aquatic invaders and existing infestations in high-risk systems

As new aquatic invaders emerge and existing infestations shift in response to climate, hydrology and human activity, the Chair programme continues to monitor high-risk systems across the region. Our work this year has provided valuable insights into the spread of species beyond South Africa's borders, such as *Hydrocharis laevigata* in Zimbabwe, and strengthened the scientific foundation necessary for future biocontrol interventions.

Additionally, EMFIS research investigated environmental stressors affecting agent performance (e.g., heavy metals and pollutants). The MOZIMACS project, an international collaboration involving South Africa, Zimbabwe and Europe, continued its investigation into how invasive aquatic weeds influence mosquito populations and potential disease transmission.

Lastly, recognising that plants are only part of the invasion crisis, 2025 saw increased research into invasive fauna such as the red-claw crayfish and the freshwater snail, *Tarebia granifera*. For example, collaborative studies (including work in the Kruger National Park) investigated how species like the red-claw crayfish alter food webs and impact indigenous biodiversity (see page 37). EMFIS is also actively looking to broaden its scope to include work on invasive fish such as Nile tilapia, carp and bass to capture the full mandate of the project, working across invasions in southern Africa.

EMFIS will continue its work on augmentative release programmes, improve post-release monitoring and provide support to community-based satellite rearing stations. Training of students and partners will build national capacity to sustainably manage freshwater invasions nationwide. The team continues to pursue potential partnerships with Malawi and Tanzania to create a greater impact across Africa.



Dr Lubabalo Mofu (NRF-SAIAB), setting crayfish traps in the Sand River, Kruger National Park.

How are non-native invasive species affecting Africa's people and biodiversity?

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Keywords: aquaculture, biological invasions, crayfish, food security, nutrition, protected area

COLLABORATIONS

Lubabalo Mofu (NRF-SAIAB), Dumisani Khosa (Kruger National Park, SANParks), Takudzwa Comfort Madzivanzira (University of Zimbabwe)

Non-native species have the potential to destabilise biodiversity and disrupt the ecosystem services for people who depend upon them. Understanding and predicting which species will cause which negative impacts is an essential precursor to developing effective biodiversity and biosecurity legislation, at the same time as prioritising human wellbeing. To better inform aquaculture policies, our research team has developed a framework to understand how the introduction of non-native species may exacerbate human health and nutrition inequities. Through collaborative fieldwork campaigns, we have created a baseline to understand and mitigate the impact of invasive crayfish in the flagship conservation area of the Kruger National Park.

Biodiversity and human wellbeing are intricately linked, and non-native invasive species can disrupt their interactions and cause negative human outcomes. For example, South et al. 2025a show that species originally introduced for aquaculture to support food security can disrupt ecological interactions and may increase the quantity of toxins to which people are exposed or decrease the nutritional value of their diet. Aquatic biological invasions are a concern for human wellbeing and sustainability because the re-wiring of ecological interactions has the potential to exacerbate originally existing inequities across demographics.

A second fieldwork campaign was undertaken to assess the redclaw crayfish invasion in the Kruger National Park as a follow up to South et al. 2025b. This involved staff and students from University of Leeds, NRF-SAIAB, Rhodes University, University of Mpumalanga, Charles Sturt University, Albany Museum and SANParks. We re-calculated spread rates throughout the park and the results show that high-water flood events may be facilitating the spread of crayfish at a rate of ~35 km per year in the Sabie River compared to three km per year in the Crocodile

High-water flood events facilitate the spread of invasive species

River. While there is still a window of opportunity to manage the spread before crayfish cause severe ecological impacts in the Kruger National Park, there is already evidence of reduction in fish functional diversity which has negative implications for the resilience of aquatic biodiversity to other perturbations.

Based on these results, a policy brief that emphasises the need to reduce the spread of invasive crayfish around the country (South et al. 2025c), was written to advise and guide legislation to prevent and manage crayfish invasions in South Africa. The field campaign has also been publicised on the NRF-SAIAB and water@Leeds news: <https://saiab.ac.za/a-race-against-invasion-exploring-the-hidden-life-of-krugers-rivers/>, <https://water.leeds.ac.uk/news/race-against-invasion-the-hidden-life-of-krugers-rivers/>.

Aquatic biological invasions are a concern for human wellbeing and sustainability

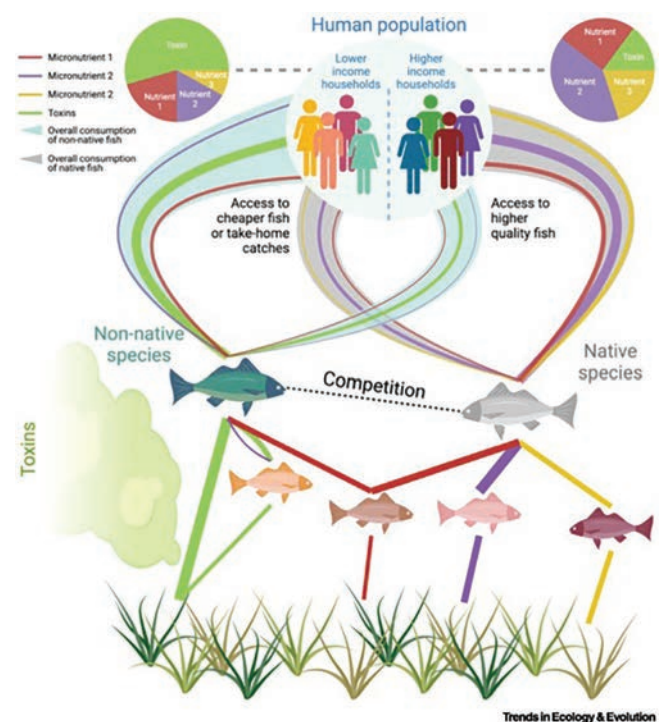
Stable isotope samples from 2024 and 2025 are being processed to determine the role of invasive crayfish and hydrological change on fish food webs in the Kruger National Park. Following reports of new populations of *Procambarus clarkii*, the red swamp crayfish, in the Western Cape, and in an effort to inform provincial biosecurity legislation, we will use genetic analysis to assess the invasion in order to understand where the origin population came from both within and outside of South Africa. A field campaign in the Barotse floodplain, Zambia, in collaboration with University of Zambia, NRF-SAIAB and the Zambian Ministry of Fisheries and Livestock, is also planned to assess how the invasion has changed over time and to better predict the outcome of future invasions in Africa.

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Dr Josie South (University of Leeds), Dr Lubabalo Mofu (NRF-SAIAB), Dr Dumisani Khosa (SANParks) before sampling in the Mala Mala concession of the Greater Kruger National Park.



A hypothetical socio-ecological network that shows how changes to fisheries interactions can cascade into human health and nutrition. Access to better quality fish is often linked to higher household income, which may result in paucity of some nutrients or increased toxin accumulation in the diets of people with lower household income, and increased dependence on, for example, lower quality invasive species (South et al. 2025a).



Strategic Science Missions: African Coelacanth Ecosystem Programme (ACEP)

DR ANTHONY BERNARD

Interim Marine Platforms and ACEP Manager

Keywords: marine infrastructure, marine science, collaborative research, transformation

The Strategic Science Missions (SSM) funding agreement is a formal arrangement between the Department of Science, Technology and Innovation (DSTI) and the National Research Foundation (NRF). Signed in September 2022 as Phase 3 of the SSM programme, it replaced an earlier agreement that had been in place since 2017. The DSTI provides funding; the NRF acts as implementing agent, managing distribution across research programmes, host institutions, grants and bursaries. A First Addendum was signed in September 2025, extending the agreement by one year to 30 September 2026 and providing additional funding for the 2025/26 financial year.

Within the SSM contract, the African Coelacanth Ecosystem Programme (ACEP) is a flagship programme of the DSTI and NRF, managed by NRF-SAIAB as a National Facility of the NRF. The programme was initiated following the discovery of coelacanths off Sodwana Bay in 2000 and was one of the first multidisciplinary, multinational research programmes to facilitate ecosystem-based research in the Southwest Indian Ocean (SWIO). ACEP works through strategic partnerships with key national stakeholders, including the Department of Forestry, Fisheries and the Environment (DFFE), the South African Environmental Observation Network (SAEON), and the Shallow Marine and Coastal Research Infrastructure (SMCRI). It is a key instrument in the implementation of the DSTI-led National Marine and Antarctic Research Strategy (MARS) and is aligned with the Science, Technology and Innovation Decadal Plan 2022 and the UN Decade of the Ocean 2021–2030.

ACEP operates as a marine infrastructure-linked funding instrument with four core components and forms the backbone for research along the east coast and south coasts of South Africa and the SWIO. ACEP is also the largest marine research transformation instrument in the National System of Innovation (NSI) targeting black students, researchers and Historically Disadvantaged Institutions (HDIs). The four components are:

ACEP Open Call. A nationally advertised competitive call managed through the NRF's Research, Innovation, Impact Support and Advancement funding division (NRF-RIISA), that provides funded research projects with access to ACEP marine platforms. This is one of the few calls that links all facets of research – infrastructure access, bursaries, running costs and technical support.

ACEP Marine Platforms. Four national research platforms are supported through ACEP:

- Coastal Craft (CC): Three large coastal craft based in Gqeberha (1) and Durban (2).
- Acoustic Tracking Array Platform (ATAP): The largest

TEAM MEMBERS

Ryan Palmer, Anthony Bernard, Taryn Murray, Matt Parkinson, Thamsanqa Wanda, Koos Smith, Ferdy Jacobs, Danielle Julius, Mark Gaudin, Thabo Mbuyazi, Lishini Kokose

USERS

Rhodes University, Stellenbosch University, Nelson Mandela University, NRF-SAEON, Africa Environmental Observation Network (AEON), UCT, SANBI, DFFE, UFH, UWC, WSU, UNIZULU

subsurface mooring array in Africa with 299 receivers covering 2 300 km, tracking the movement of 44 fish species, and in situ hourly water temperature at key coastal sites and estuaries (see page 45).

- Marine Remote Imagery Platform (MaRIP): The largest platform in Africa offering various ROVs, landers and stereo baited remote underwater video platforms. The MaRIP deep-sea research platform is operational and in 2025 was successfully tested to 2 350 m (see page 43).
- Geophysics and Mapping Platform (GeMaP): The largest non-commercial seafloor mapping system in South Africa (see page 47).

Shallow Marine and Coastal Research Infrastructure (SMCRI) platforms such as the Airborne Platform, moorings and specialised laboratories are also available through the ACEP Open Call.

ACEP Phuhliisa. The largest directed DSTI/NRF transformation initiative within the NSI that targets researchers and students from HDIs (UFH, WSU, UWC, UNIZULU) and provides platform access, bursaries, running costs and training (see page 11).

ACEP Joint Marine Laboratories (JMLs). Research infrastructure at four HDI campuses, jointly coordinated by NRF-SAIAB and partner universities: UWC (Microplastics), UNIZULU (Marine Ecotoxicology), UFH (Bio-economy), WSU (Coastal Livelihoods). JML research at UFH and UNIZULU together with research implemented through the South African Research Chair Initiative (SARChI) Chair in Marine Natural Products at Rhodes University (NRF-SAIAB Annual Research Report 2024 pp.19–20) is generating new knowledge on marine biological resources with potential biodiscovery applications (see page 15).

ACEP platforms serve 33+ institutions domestically and internationally, building national capacity in deep-



METRICS

Current Open Call projects being funded (Phase 3 2024–2026): 5

Transformation grants awarded: 4

Vessel days during 2025/26: > 86

Researchers gaining access to ACEP Platforms: > 40

Postgraduate students supported: ≥ 19 Open Call students + 26 Marine Platforms students

Postgraduate students supported on the ACEP Phuhlisa Programme: ≥ 67

Peer-reviewed publications acknowledging ACEP support: 16 by designated group researchers; 8 additional papers by ACEP Marine Platforms

Public engagements and awareness events funded or supported: 5

sea observation, broadscale acoustic telemetry, seafloor biodiversity assessments and seabed mapping.

Long-term ATAP monitoring data and MaRIP stereo-BRUV surveys (~4000 samples, > 40 000 occurrence records) provide a robust scientific evidence-base for ocean resource management. Both MaRIP and ATAP are the single biggest investment within the NSI by the DSTI in this type of infrastructure. ATAP fish movement behaviour, MaRIP ecosystems and population assessments and GeMaP seafloor mapping (550 km² during Phase 3) inform fisheries management, MPA monitoring and spatial planning decisions at a national scale.

The ACEP Marine Platforms have been central to internationalising South Africa's marine research during Phase 3 (2024–2026), with both ATAP and MaRIP building active collaborations across the SWIO and beyond – spanning Namibia, Mozambique, the Comoros, Seychelles, the Maldives, and Norway. The Marine Platforms maintained representation on key international bodies, including the GOOS BioEco panel and the SCOR CoNCENSUS Working Group, contributing to global standards in ocean monitoring and visual survey methodology. The ACEP Marine Platforms drove significant technological innovation through MaRIP's development of deep-sea stereo-BRUV landers (tested to 2 350m), procurement of a 1 000m-rated ROV, expansion of the capabilities in GeMaP, and ATAP's expansion to 299 acoustic listening stations, reflecting a step-change in South Africa's marine research infrastructure and providing a solid foundation for future research under the SSM Phase 4 contract.

ACEP research on the coelacanth ecosystem, Agulhas Current dynamics, endemic fisheries resources, deep-sea biodiversity and coastal ecosystems advances SDG 14 (Life Below Water) and South Africa's obligations under international marine agreements.

ACEP-supported research directly contributes to MPA effectiveness monitoring, line-fish stock assessments relevant to food security and baseline ecosystem assessments and mapping relevant to marine spatial planning.

Open Call projects

ACEP Open Call projects, together with broader Marine Platform outputs (e.g. MaRIP Biodiversity Imagery Collection, GeMaP high resolution seafloor maps) directly support South Africa's Marine Spatial Planning framework and ocean governance. ZAR 7 500 000 was awarded for running costs for five projects which show a strong emphasis on benefits to society.

These projects have access to the ACEP Marine Platforms, a fundamental part of the programme that sets it apart from many other funding streams and contributes to its success. The five funded projects are detailed below.

SAFEZone – Area-based management for sustainability

(PI: Prof. Amber Childs – Rhodes University)

Fish populations worldwide are in decline and face increasing threats from overfishing and global change. The status of South African coastal fish populations is no different, with four *Argyrosomus* species (kob) among the most threatened target species in the commercial, recreational and small-scale line fisheries. To address their dire stock status, a kob conservation strategy following the IUCN Strategic Planning for Species Conservation framework was developed collaboratively with experts across the region as part of the ACEP Agulhas Bank Connections project. This strategy identified a list of potential threats, priorities and actions. To improve the governance of kob fisheries and the line fishery as a whole, the SAFEZone project addresses these priority conservation actions using a multimethod approach, that includes mapping (GeMaP), genetic analyses (AGRP), underwater imagery (MaRIP), acoustic telemetry (ATAP) and laboratory experiments (AERP).

Cooler Tropical Forest: Multidisciplinary study of mesophotic kelp-forest in iSimangaliso MPA

(PI: Dr Jean Harris – NMU)

Globally, coastal kelp forests are one of the most studied ecosystems, representing some of the world's most productive and diverse ecosystems in the photic zone. Relatively little is known about mesophotic counterparts, and their role in the wider sub-tropical seascape. The 'Cooler Tropical Forest' project is undertaking the first in-depth study of the recently discovered extensive *Ecklonia radiata* kelp forest within the MPA of iSimangaliso Wetland Park World Heritage Site, providing a comprehensive, multi-disciplinary understanding of the MPA's nature and role in driving food-webs in the wider ecosystem, its biodiversity significance, current threats and its potential value for delivery of ecosystem services and strengthening socio-ecological resilience to climate change, including through carbon storage and sequestration. The integrated results will be reviewed through a lens of socio-ecological resilience in the face of climate change and biodiversity loss, to identify management interventions for protection of the kelp bed ecosystem and the ecosystem services it provides for dependent people.



Marine geological mapping and stable isotope geochemistry of the south-eastern Cape

(PI: Dr Bastien Linol – AEON)

This project focuses on collecting new geological data and stable isotope measurements of various samples including air, water, carbonate minerals and organic matter across Algoa and St Francis Bays. The aim is to contribute to the establishment of a natural baseline in the south-eastern Cape. In order to implement the marine surveys, this builds on the past 10 years' transdisciplinary research of AEON at Nelson Mandela University and multilateral collaborations with NRF-SAIAB, NRF-SAEON, the Council for Geosciences (CGS) and Ifremer (France).

ACEP provides a contribution to the cost of installing and running a light stable isotope laboratory which helps towards the development of local technical capacity of national significance. ACEP further enables the deployment of marine geophysical methods and sediment core-drilling along seven (7) profiles in an area where hydrographic and ecological data are closely monitored (Algoa Sentinel Sites). The results will add meaningfully to fundamental knowledge of key processes, including tectonics, climate, sea level and marine ecosystems. Project activities increase training in the fields of Marine Science, which have important implications for long-term offshore infrastructure development and mining.

The role of the Agulhas Current on the coastal environment

(PI: Prof. Tamaryn Morris – NRF-SAEON)

This project is investigating the role of the Agulhas Current, and in particular, processes and anomalous physical events (such as meanders, trapped cyclonic eddies and upwelling), on the adjacent coastal region and downstream in Algoa Bay. This is being undertaken using underway physical oceanography equipment (underway CTD) and discrete stations to collect water and phyto- and zooplankton samples during the anomalous events. The deployments of a surface satellite tracked unmanned glider and an Argo float in 2024/25 have been very successful and valuable data on physical anomalies have been gathered.

SoundSeas: Linking marine soundscapes to ecosystem condition and health

(PI: Prof. Jaco Versveld – University of Stellenbosch)

The SoundSeas Project advances and integrates multiple knowledge forms to improve ocean technology, address a key knowledge gap, support ecosystem health assessment and associated policy- and decision making and develop a transformed cohort of collaborating emerging researchers. The project aims to determine to which extent the underwater marine soundscape can provide information about the health and condition of marine ecosystems and which tools (systems and methods) can be developed for monitoring these environments and assisting management decision-making and policy. Innovation aspects are two-fold – firstly the development of capacity in underwater soundscape ecology and acoustics research, and secondly, the application of machine learning. This will provide a baseline for further research and monitoring

on marine soundscapes and on impacts of stressors including anthropogenic noise sources on marine biodiversity and soundscapes. Disciplines span acoustic research, biodiversity, ecology, fisheries, geology, oceanography and marine engineering. Focal ecosystems include shelf and shelf break gravel and mud ecosystems, mesophotic reefs and inshore reefs, with a particular focus on Marine Protected Areas, and strategic sampling to address key knowledge and sampling gaps.

Building on previous contracts, ACEP has demonstrated that NRF-SAIAB can effectively design, manage and deliver a complex, multi-component marine research programme at national scale within the constraints of a fixed-term SSM contract. The four programme components – Open Call, Marine Platforms, Phuhlisha and JMLs – function as a coherent and mutually reinforcing system. The programme has consistently exceeded its publication, platform access, researcher throughput, and public engagement targets, while managing its budget adequately.

ACEP has been built upon the Marine Platforms and has proven to be a successful programme that presents particular possibilities for expansion and alignment with the Decade of the Ocean and Decadal Plan, but increasing operational costs will place the programme under financial stress. A number of the platforms will require recapitalisation in 2026–27 or the latest 2027–28, including the Coastal Craft and GeMaP.

As we come to the end of the current SSM contract there is an opportunity to reflect, review and document the continued development and evolution of the programme. In year one of SSM Phase 4, we will critically review the inputs, outputs, outcomes and impacts of the ACEP programme over the last 15 years. This will represent a major stakeholder engagement process that will allow us to map out realised pathways to impact as well as barriers or challenges that we need to mitigate to ensure continued impact from the programme.

NRF-SAIAB's Marine Research Infrastructure Platforms

Serving the marine science community

1

Vessels, equipment on board, head out to sea for sampling.

2

The **Geophysics and Mapping Platform** creates high resolution terrain models of the sea floor and the Remotely Operated Vehicle from the **Marine Remote Imagery Platform** collects samples from the sea floor.

3

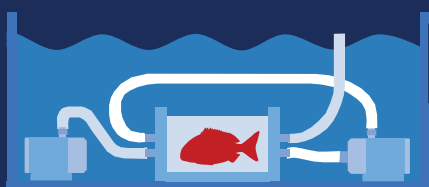
Baited remote underwater stereo-video systems and deep-sea landers from the **Marine Remote Imagery Platform** collect information on fish diversity and abundance.

4

The movements of animals tagged with acoustic transmitters are detected and recorded by the **Acoustic Tracking Array Platform**'s network of acoustic receivers moored on the ocean floor.

5

Responses of fishes to changes in temperatures seen in the field can be confirmed via the use of respirometers in the **Aquatic Ecophysiology Research Platform**. This is important for both management and climate change predictions.



6

Genetic analyses conducted in the **Aquatic Genomics Research Platform**, can reveal fish stock structures along the coastline.





Anthony Bernard and Danielle Julius from MaRIP getting ready to deploy the stereo-BRUVs lander to 900 m from the RV *Observer* working off East London.

Advancing the seafloor biodiversity observation system for sustainable management and ocean governance

DR ANTHONY BERNARD

MaRIP Instrument Scientist

DR KAYLEE SMIT

NRF-SAIAB RIPP Postdoctoral Research Fellow

Keywords: demersal fish, management & decision-making, marine biodiversity, remote imagery observations, ROV, stereo-BRUVs

NAME OF PLATFORM

Marine Remote Imagery Platform

PRINCIPAL INVESTIGATOR

Anthony Bernard

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Danielle Julius, Ryan Palmer, Elodie Heyns-Veale

NRF-SAIAB STUDENTS & INTERNS

Amkhitha Notununu (HSRC Intern), Aphenhule Matyaleni (SAASTA Intern), Luther Adama (PhD), Angus Van Wyk (PhD), Mpilonhle Nyawo (PhD), Maisha Gragnolati Fernandes (PhD), Siphumelele Memela (MSc), Thembelihle Dube (MSc), Tyla Goldman (MSc), Abigail Eddy (Hons)

USERS

Supported projects: 25

Days in field: 143

Survey days: 74

Organisations supported: 50

(South Africa: 19; International: 31)

Researchers supported: 93 researchers from 22 countries

Postgrad students supported: 41

Observation stations: 414

Postgraduate students drive innovation
and research

In South Africa there are fundamental knowledge gaps on the structure and functioning of seafloor ecosystems which creates challenges for evidence-based management of the marine environment. The Marine Remote Imagery Platform (MaRIP) tackles these challenges by deploying non-extractive remote underwater video technologies – stereo-BRUVs, ROVs, drop cameras, DOVs and deep-sea landers – to systematically collect, process and democratise marine biodiversity data. 2025 was a milestone year for MaRIP. Following two years of development

we successfully deployed a deep-water stereo-BRUVs lander to 2 350 m depth off East London, capturing exciting new visual imagery from these depths beneath the Agulhas Current. The deep-sea lander platform was used to survey cold water coral ecosystems off South Africa's south coast and tropical deep-sea ecosystems around the Comoros. This increase in research activity and the technological advancements have placed MaRIP, and South Africa, as regional leaders in deep-sea research.

MaRIP's impact spans multiple scales. Operationally, we supported 25 research projects including 10 major survey trips and 74 sea days, while delivering local and international training workshops to build regional capacity. Our expanding biodiversity database feeds directly into national management processes, as we continue to strengthen our pathway to impact. MaRIP is bridging technical innovation, scientific rigour and knowledge generation to enable evidence-based marine governance from local to regional scales.

2025 was a transformational year for MaRIP, marked by significant technological advancement and expanded operational capacity. Platform provision and scientific collaboration reached 93 researchers from 50 organisations and 22 countries with support provided to an additional 41 postgraduate students.

A pivotal achievement was the first deployments of the new deep-sea stereo-video lander capable of working down to 3 500 m. This was a joint infrastructure development project between NRF-SAIAB, SAPRI and STS to expand our research depth limits from 1 000 m to 3 500 m. This coincided with a collaborative international workshop on stereo-BRUVs and deep-sea landers, hosted by NRF-SAIAB. This intensive training brought together students and researchers from multiple institutions and nations, and provided hands-on training in deployment procedure, data processing and quality assurance. Building on this success, MaRIP led the deep-sea lander and ROV components of the Nekton First Descent Mission to Comoros in October. This multi-partner expedition collected 44 stereo-BRUV lander samples from 250–1 000 m depth and 78 ROV transects between 50 and 250 m depth, generating baseline biodiversity data from unexplored ecosystems while training Comorian marine scientists and students to support expanded marine protected area networks.

Complementary shallow-water operations maintained comprehensive ecosystem monitoring, providing capacity development and support for 41 postgraduate students addressing knowledge gaps relevant to seafloor ecosystems and management. A real highlight has been watching our postgraduate students drive innovation and research. Some examples include exciting work with Luther Adams (PhD) in developing AI and automation tools that are genuinely transforming how we process stereo-BRUV imagery, not only increasing the speed of processing, but also fundamentally improving how we mobilise data for fisheries assessments and management applications. Angus Van Wyk (PhD) tackled the task of mapping the entire remote imagery network at a global scale, unpacking connections and identifying pathways for

Open sharing of data creates clear pathways from research to impact

improved knowledge and community mobilisation. This helps us to understand not only the technical aspects, but the human and institutional dimensions that determine whether data gets used.

MaRIP aligns strategically with national priorities (National Development Plan, National Biodiversity Strategy and Action Plan) and international frameworks (SDG 14, Kunming-Montreal 30x30 targets, UN Decade of Ocean Science for Sustainable Development). Much of MaRIP's research is foundational, generating baseline biodiversity information that underpins downstream ecological analyses, indicator development and applied decision-making. MaRIP data directly benefit national management authorities, including DFFE, SANBI and MPA agencies, by informing marine spatial planning (e.g., Critical Biodiversity Areas – CBA), biodiversity assessments (e.g., National Biodiversity Assessment – NBA) and fisheries-related decision-making. Researchers, students and interns benefit through hands-on training and supervision, contributing to transformation by building a new generation of technically skilled marine scientists. Wider benefits include strengthened research capacity, increased public awareness of marine ecosystems, and improved access to open, high-quality biodiversity data for current and future use.

MaRIP's distinct contribution lies in its ability to collect standardised, high-quality imagery data at scale, while simultaneously enabling others to do the same. In addition to data collection, the platform provides extensive technical guidance, training and methodological support, ensuring that imagery-based observations are fit-for-purpose and comparable across projects and regions. Data are curated through continuously improving management systems and shared openly with national partners, creating clear pathways from research to impact. MaRIP outputs are disseminated through technical reports, peer-reviewed publications, policy-relevant briefs, workshops and national and international conferences, ensuring uptake by both scientific and management communities.

Broader societal impact is achieved through public engagement activities that raise awareness of marine biodiversity, promote stewardship and highlight the role of science in sustaining ocean health. Collectively, MaRIP's 2025 activities demonstrate strong alignment with national priorities and the NRF 2030 Vision, while delivering tangible progress towards more informed, evidence-based ocean governance.

MaRIP will be launching an exciting new three-year project, funded by the NRF Foundational Biodiversity Information Programme (FBIP). We will continue to expand deep-sea technology innovation, moving towards more process-oriented research and advance AI-driven workflows to strengthen knowledge mobilisation and impact pathways. All of this will be driven by transformation, collaboration and capacity development.



Dr Taryn Murray (left) tagging a lesser guitarfish (*Acroteriobatus annulatus*) with an acoustic transmitter with the assistance of BSc Honours student, Reagan Kieck.

Pinging with a purpose: Learning more about the movements of tagged aquatic animals

DR TARYN MURRAY

ATAP Instrument Scientist

Keywords: acoustic telemetry, fisheries management, large-scale network, Marine Protected Area, movement ecology, spatial planning initiatives

PLATFORM

Acoustic Tracking Array Platform

NRF-SAIAB TEAM MEMBERS

Matthew Parkinson, Dinah Mukhari, Bantony Ziko, Lishini Kokose

NRF-SAIAB ATAP STUDENTS & INTERNS

Dinah Mukhari (PhD, RU), Bantony Ziko (PhD, RU), Siphendulwe Zaza (PhD, RU), Nicole Oyetunji (PhD, RU), Jessica Seath (PhD, RU), Natalie dos Santos (PhD, NMU), Thomas Knight (MSc, RU), Khanyisile Mdutyana (MSc, UNIZULU), Masixole Jojo (MSc, RU), Kevin Spiby (Masters in Conservation, Cape Peninsula University of Technology (CPUT), Joshua Frachet (MSc, RU), Reagan Kieck (BSc Hons, RU), Mia Hattingh (BSc Hons, RU)

STUDENTS SUPERVISED BY ATAP PERSONNEL

Jessica Morrison (MSc, RU), Thembelihle Ndlovu (MSc, RU) Melissa Pollard (PhD, NMU)

Understanding the movements and migrations of aquatic animals is not only crucial to learning more about the ecology of a species, but this information is paramount when it comes to establishing one of the most widely accepted methods of spatial management – Marine Protected Areas (MPAs). Through strategically placed equipment (acoustic receivers) deployed along the southern African coastline, the Acoustic Tracking Array Platform (ATAP) produces in excess of one million data points every year on the presence of key fish, shark, ray, skate and turtles species. These data can directly support researchers, conservation practitioners and resource managers by informing spatial planning, conservation strategies and species management plans, including contributions to systematic conservation planning and legislative change.

The ATAP further delivers impact through capacity development and collaboration, providing training opportunities for students, supporting early career and female researchers and facilitating partnerships across institutions. Public engagement activities promote ocean stewardship and awareness of sustainable resource use and, in particular, build excitement and passion about South Africa's incredible



METRICS

Users: 46

Number of fixed array stations managed and operational (NRF-SAIAB only): 146

Number of fixed array stations managed and operational (all ATAP): 306

Number of animals tagged (and species) in 2025: 98 (12)

Number of species being tracked: 43

Number of researchers (and institutions) benefitting from ATAP: 46 (23)

Number of students using ATAP: 13

Data reports in 2025: 23

Social media followers: Facebook – 2350; Instagram – 912

ATAP produces over one million data points every year on the presence of key marine species

endemic species. Collectively, ATAP's outputs translate scientific knowledge into practical management tools, strengthen environmental governance and contribute to socio-economic wellbeing through healthier marine ecosystems and more sustainable fisheries.

The Acoustic Tracking Array Platform (ATAP) is a mature, nationally coordinated and globally recognised research infrastructure that supports innovative, collaborative science across more than 2 300 km of the southern African coastline. As the largest acoustic receiver array on the African continent, ATAP exemplifies excellence in shared research infrastructure, with telemetry data housed in a national database at NRF-SAIAB and shared freely to respective data (i.e. tag) owners. This partnership-driven model enables transformational research by integrating expertise from universities, government, management bodies and non-governmental organisations, while maximising return on investment through shared equipment, standardised operating procedures and collective data generation.

Generating critical information on the movements, habitat use and connectivity of 43 species of fishes, sharks, rays, skates and turtles of ecological and economic importance, the ATAP provides an evidence base for understanding population dynamics, identifying critical habitats, and evaluating the effectiveness of current and proposed marine protected areas.

During 2025, the ATAP facilitated the collection of data for no less than 10 scientific projects, including (but not limited to):

- The residency and estuary-wide movements of the endemic blue stingray in the Knysna Estuary (PI: Dr Chantel Elston, in collaboration with South African National Parks (SANParks), ORI and Rhodes University);
- Understanding small- and largescale movements of Critically Endangered common eagle rays (PI: Dr Michelle Soekoe, in collaboration with Reel Science Co., Rhodes University, SANParks, University of Pretoria, Shark Spotters and Two Oceans Aquarium);
- Understanding the movement behaviour of recreationally

important species along the Port Alfred coastline to contribute to the development of a potential OECM (other effective area-based conservation measures) (PI: Prof. Amber Childs, in collaboration with Rhodes University); and

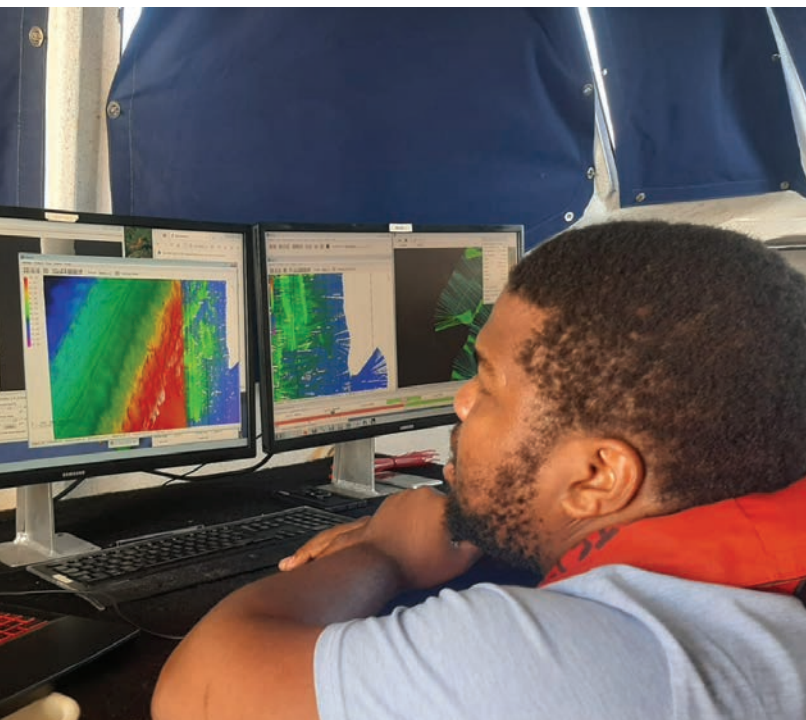
- Understanding more about the coastal movements of commercially targeted shark species in relation to commercial boating activity (PI: Dr Enrico Gennari, in collaboration with Oceans Research Institute, Atlantic Shark Expeditions and Shark Research Foundation).

In addition to these projects, the ATAP currently supports four loaner projects distributed along the coastline in False Bay, the Knysna Estuary and iSimangaliso Wetland Park MPA.

Through its support of diverse projects, the ATAP delivers high-impact science with tangible societal benefits. These collaborative efforts underpin conservation plans and management regulations aligned with the United Nation's Sustainable Development Goals, promoting sustainable resource use, food security and poverty alleviation. Research outputs continue to grow steadily, with dozens of data reports that support student projects, funding applications and management processes, alongside an increasing number of peer-reviewed publications that advance aquatic movement ecology in Africa. The platform actively builds human capacity. Through prioritising the training and support of students from designated groups and female researchers and students, the platform provides pathways into marine science for these emerging researchers. The ATAP also remains invested in public engagement through social media and outreach events, fostering transparency, awareness and participation around movement ecology research in South Africa.

Collectively, ATAP delivers excellence through collaborative infrastructure, innovation through continental-scale telemetry, sustainability through evidence-based stewardship, and impact through strengthened governance and human capacity development, healthier ecosystems and empowered communities, positioning southern Africa as a regional leader in aquatic movement ecology.

The ATAP will continue to provide world-class service, facilitating the collection of movement data on tagged fishes, sharks, rays, skates and turtles. With growth in global recognition of this service, our ambition is to provide an interactive online portal through which data can be easily accessed.



Left: GeMaP Instrument Technician, Thamsanqa Wanda, conducting marine fieldwork and operating the multibeam echosounder system on RV *uKwabelana*. Right: GeMaP launching on a slipway to conduct freshwater surveys and deploying the Lowrance 'fish-finder' system off the Small Craft vessel *Ichthos*.

A glimpse of what lies beneath the waters: Application of hydroacoustic surveys

THAMSANQA WANDA

Multibeam Instrument Technician

Keywords: bathymetry, biodiversity, management, marine spatial planning, monitoring, multibeam echosounders

PLATFORM NAME

Geophysics and Mapping Platform (GeMaP)

PLATFORM USERS

Bastien Linol (AEON), Kyle Smith (SANParks), Lucy Woodall (Nekton in Comoros), ACEP Seascape Project, Amber Childs (RU)

METRICS

43 survey days in 2025

746 km² surveyed and processed for associated projects
15 km² from five (5) freshwater (lakes and river-estuaries) coastal surveys

731 km² marine multibeam echosounder surveys

The ocean is an interconnected system that requires a holistic understanding of the contribution of abiotic components (e.g., geology) on the existing ecosystem and biodiversity, within an appropriate spatial scale, to ensure sustainable management. The Geophysics and Mapping Platform (GeMaP) seeks to address the spatial data gap by providing high-resolution bathymetric mapping to develop an understanding of the association of species within benthic habitats. The collected data addresses conservational concerns by contributing to improved management and effective monitoring of aquatic systems.

The GeMaP comprises two multibeam echosounder (MBES) systems which are fixed on the RV *Phakisa* (7101 Teledyne Reson) and RV *Observer* (R2 Sonic 2026) in Durban and Gqeberha, respectively. These MBES are used for marine hydroacoustic surveys to map the seabed from depths of -5 to -900 m below mean sea level. The GeMaP also has a Lowrance Elite 9Ti2 system that is used to conduct surveys in freshwater systems. The generated maps have been used in observatory site-selection for observatory studies (video and imagery), including marine protected areas (MPA) such as uThukela Banks MPA and Isimangaliso MPA, which in turn will influence

GeMaP seeks to address the spatial data gap by providing high-resolution bathymetric mapping to develop an understanding of the association of species within benthic habitats.



These initiatives highlight the role that abiotic components such as geology play in the interconnected bigger picture in marine and freshwater systems

future marine spatial plan revision and/or development. The data from lakes and estuaries has been used by South African National Parks (SANParks) to improve their management and monitoring framework.

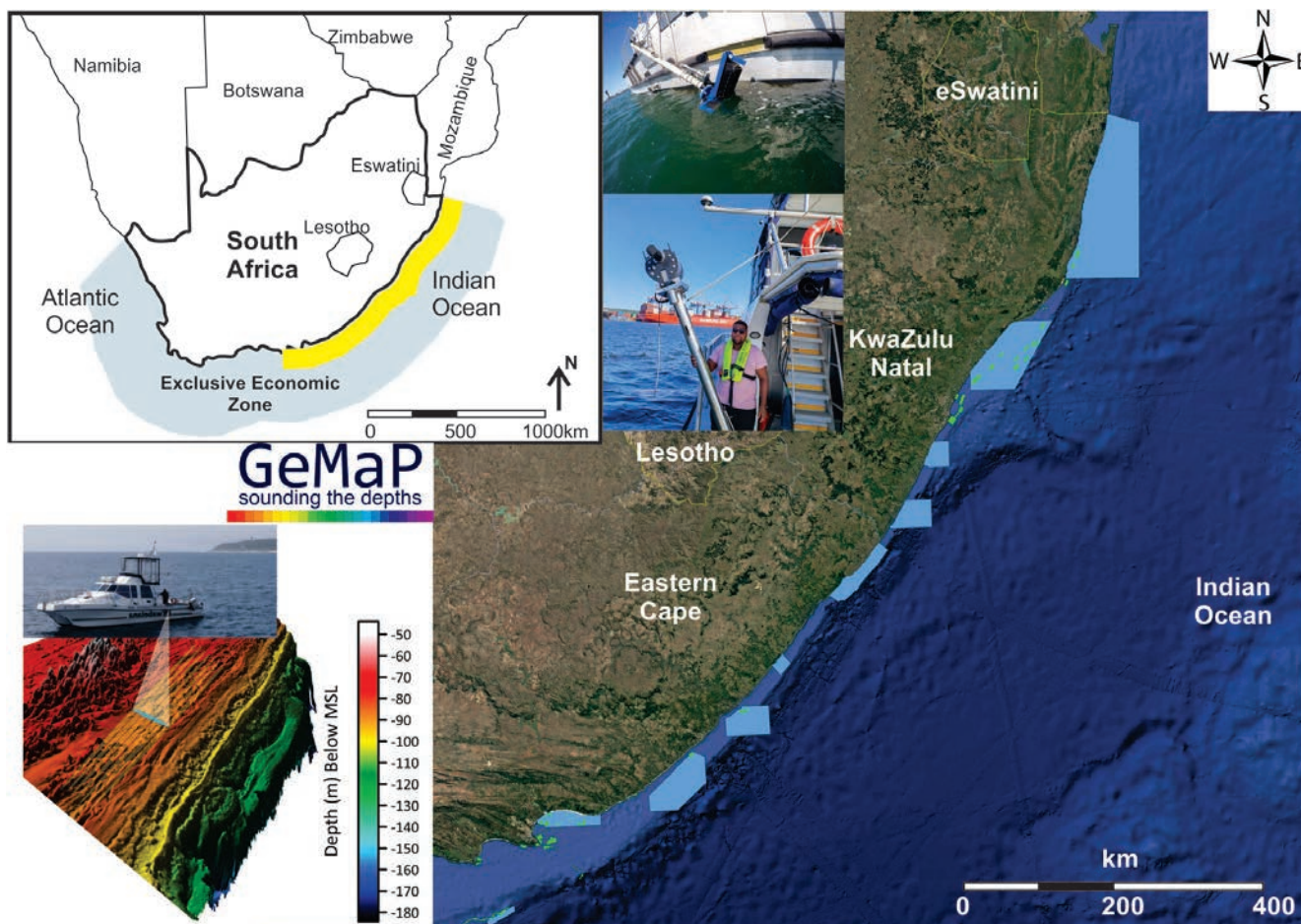
Through the ACEP Open Call, the GeMaP provides equipment, technical assistance and data (in the user's preferred data format) to support several projects along the east coast of South Africa and provide them with essential hydroacoustic data. These baseline data are fundamental for future studies that involve management and monitoring of the systems that exist in the surveyed regions. The availability of baseline data informs decision-making that can be applied to improved management and monitoring of associated ecosystems and biodiversity, ensuring a better chance of sustainability. The GeMaP has also further developed from being a solely marine focused platform and is now also serving freshwater, coastal systems (lakes and estuaries) by contributing bathymetry maps to their management and monitoring initiatives. These

initiatives highlight the role that abiotic components such as geology play in the interconnected bigger picture in marine and freshwater systems.

Highlights:

- International collaboration: The Geophysics and Mapping Platform (GeMaP) supported the Nekton First Descent Mission in the Comoros. A live presentation of the equipment and data was made to officials and other delegates aboard Research Yacht, *Angra Pequena*
- Submission of a PhD to NMU by Thamsanqa Wanda (currently awaiting reviews)

GeMaP will continue to keep up with advancing technologies to map the continental shelf with the likelihood of going beyond the shelf break and mapping the poorly studied deep-sea environments. This will provide information that is essential to the development of the Blue Economy initiative. The platform seeks to continue tackling spatial data gaps for spatially-related issues and/or research questions, to disseminate knowledge in publications and to supervise students making use of an interpreting data collected by GeMaP. Through the integration of geospatial maps with ecosystem and biodiversity within respective scales, future marine spatial planning and management of marine protected areas will be influenced by informed decisions.



The data coverage for GeMaP along the South African east coast and the available MBES systems used to conduct surveys with an example inset of a mapped layer.



Shirwin Pillay, a senior laboratory staff member from the University of Limpopo, attending the whole genome sequencing training workshop hosted by AGRP.

Advancing aquatic genomic science

DR GWYNNETH MATCHER
AGRP Instrument Scientist

PLATFORM

Aquatic Genomics Research Platform (AGRP)

TEAM MEMBERS

Gwynneth Matcher, Jody Oliver, Etienne de Villiers

INTERNS

Lukanyo Makhabane, Sibusiso Mahlangu

Keywords: aquatic genomics, biodiversity management, bioeconomy, environmental monitoring, transformation and access

AGRP is a national hub for aquatic genomics research

The Aquatic Genomics Research Platform (AGRP) at NRF-SAIAB is a national hub for aquatic genomics research which is rapidly extending its reach and impact. The AGRP provides access to essential infrastructure, specialised equipment, high-performance computing resources and dedicated laboratory space for researchers from South Africa and other countries. This support enables genomic research that aligns with national strategic focus areas including biodiversity conservation, environmental monitoring, bioeconomy development, sustainable resource use and capacity building in genomics.

In the past year, the AGRP supported a wide range of research activities across both freshwater and marine biomes including, but not limited to, early detection of environmental change,

identification of threatened and invasive species and improved understanding of ecosystem health. These outputs directly inform national priorities such as the National Biodiversity Economy Strategy, Operation Phakisa and climate adaptation planning. The platform also drives innovation by supporting research that underpins emerging bioeconomic opportunities, including biotechnology and bioprospecting.

Beyond knowledge generation, the AGRP strengthens national capacity in genomics by providing training opportunities, internships and technical support. Through targeted training and access to infrastructure, the platform helps to develop South Africa's next generation of genomics researchers, reduces reliance on external services and promotes more equitable participation in the knowledge economy.

South Africa's freshwater and marine ecosystems provide essential services, including food security, livelihoods, water quality regulation and cultural value. These systems face



METRICS

Total number of users of the AGRP platform: 154

Number of institutions making use of the AGRP platform: 45 (Agricultural Research Council, Albany Museum Department of Freshwater Invertebrates, Aquatic Ecosystem Services, Biosfera, Centre National des Sciences Halieutiques Boussoura CNSHB Guinee, CRODT – Senegal, DFFE, DIPLOMICS, Durban University of Technology, Food and Agriculture Organization of the United Nations, Fisheries Commission of Ghana, Hungarian University of Agriculture and Life Sciences, INIP-CIPM-NAMIBE, IMROP (Mauritania), INIPM (Angola), Iziko Museum, Ministry of Agriculture, Fisheries, Water and Land Reform (Namibia), Ministry of Fisheries and Marine Resources-Sierra Leone, Muséum national d'Histoire naturelle (France), National Fisheries & Agriculture Authority (Liberia), Nature Metrics, North-West University, Ocean Census, Olabisi Onabanjo University, Oceanographic Research Institute (ORI), Rhodes University, NRF-SAEON, NRF-SAIAB, South African National Biodiversity Institute (SANBI), University of Cape Town, University of Exeter, University of Fort Hare, University of Johannesburg, University of KwaZulu-Natal, University of Limpopo, University of Pretoria, University of South Africa, University of Stellenbosch, University of the Free State, University of the Western Cape, University of Zululand, Walter Sisulu University, University of the Witwatersrand, Wollo University (Ethiopia)

Presentations by AGRP staff: 3

Sequence reactions processed: 3 221 barcode reactions, 520 metabarcoding libraries, 12 whole genomes (ONT sequencing)

Journal articles published (using AGRP platform infrastructure): 18

Training workshops hosted by AGRP: 6

increasing pressure from climate change, pollution, habitat degradation and invasive species. Effective policy responses require accurate information on species presence, ecosystem condition and emerging risks. The AGRP addresses this need by providing a national facility for aquatic genomics research that supports both foundational science and applied, policy-relevant outcomes.

Hosted at NRF-SAIAB, the AGRP offers access to specialised laboratory facilities, advanced DNA sequencing technologies and large dataset analysis capabilities. By integrating these resources with the NRF-SAIAB National Collection Facility, biobank, and other monitoring platforms, the AGRP enables genomic analyses that inform biodiversity assessments, conservation planning and environmental management. The platform supports research aligned with national and international commitments, including the National Biodiversity Economy Strategy, Operation Phakisa and the Sustainable Development Goals related to water, climate and biodiversity.

A growing area of strategic importance supported by the AGRP is research on microorganisms and invertebrates as sources of natural products with high innovation potential. Genomic analyses enable the identification of biosynthetic gene clusters associated with the production of bioactive compounds and provide a foundation for the discovery of novel antimicrobials, anticancer agents and other high-value biomolecules. This work positions South Africa's aquatic ecosystems as a significant resource for biotechnology and pharmaceutical development within the national bioeconomy and at the same time supports responsible and sustainable use of biodiversity.

In addition to bioeconomic innovation, the AGRP supports genomic research relevant to environmental monitoring and resource management; this includes studies that improve understanding of ecosystem health, species distributions and biological invasions. Approaches such as environmental DNA contribute to these efforts because they complement traditional monitoring methods and improve detection efficiency in selected applications.

Transformation and sustainability of the research system are central to the AGRP's mandate. In 2025, the platform continued to provide one-on-one training and hosted six hands-on training workshops that covered fundamental molecular techniques, next-generation sequencing, bioinformatics and bacterial metabarcoding. These initiatives empower early-career researchers, postgraduate students and professionals with essential genomic skills. In collaboration with DIPLOMICS, the AGRP also expanded national access to genomics research by establishing Enabling Access to Genomics Research (EAGR) laboratories at the University of Fort Hare, Walter Sisulu University and the University of Zululand that partner with NRF-SAIAB through the DSTI/NRF Joint Marine Laboratories Programme administered through ACEP. The EAGR laboratories provide local access to essential genomics equipment for DNA extraction, PCR and library preparation, which enable researchers and students at historically disadvantaged institutions to participate equitably in genomics-based research. This decentralised model strengthens regional capacity, supports skills development and enhances the long-term resilience of South Africa's national science system.

In summary, the AGRP not only furthers capacity development in South Africa but also enables high-impact research in policy-relevant science and innovation in aquatic biodiversity genomics. As demand for genomic tools in environmental monitoring and sustainable resource use grows, the AGRP continues to expand its national and international relevance through partnerships, training and data-driven discovery.

The AGRP aims to strengthen its role as a national resource for aquatic genomics by expanding infrastructure, deepening collaboration with government and conservation agencies and embedding genomic tools in environmental monitoring to support informed policy. By 2030, it seeks to be a flagship platform advancing biodiversity conservation, innovation and skills development aligned with national and global priorities.



The cushion star, *Parvulastra exigua*, taken at Kidd's Beach, South Africa. Photo: C.I. Green 2025

The digital tide: Decoding the genomes of marine invertebrates through the 1KSA initiative (DIPLOMICS)

DR SUZANNE REDELINGHUYS

NRF-SAIAB Postdoctoral Research Fellow

Keywords: biodiversity, rocky shore ecology, whole genome sequencing

RESEARCH PROJECT NAME

The 1,000 South African Biodiversity Genome Sequencing Project (1KSA)

PRINCIPAL INVESTIGATOR

Francesca Porri

NRF-SAIAB TEAM MEMBERS

Francesca Porri, Gwynneth Matcher

NRF-SAIAB STUDENTS & INTERNS

Cornel Mari du Preez (PhD student)

COLLABORATIONS/PROJECT PARTNERS

Arsalan Emami-Khoyi (Hungarian University of Agriculture and Life Sciences), Anja Le Grange (DIPLOMICS), Shane Murray (DIPLOMICS), Jeanne Korsman (DIPLOMICS)

South Africa's intertidal rocky shores harbour some of the world's richest marine invertebrate biodiversity, yet much of this diversity remains undocumented at the genomic level. This lack of foundational molecular data represents a critical gap in our ability to understand, monitor and conserve coastal biodiversity in a rapidly changing environment.

Addressing this challenge, the DIPLOMICS (Distributed PLatform in OMICS) research infrastructure programme, funded by the Department of Science, Technology and Innovation (DSTI), has launched a national initiative to sequence 1 000 South African genomes using Oxford Nanopore Technologies' (ONT, UK) nanopore-based platform (PromethION 2 Solo). Through this platform, the costliest component of genome sequencing is supported. The Coastal Ocean Sciences Team (COST) at NRF-SAIAB has thus far successfully nominated 20 coastal marine invertebrate species, including sea snails, barnacles, limpets, starfish, sea urchins, red bait, reef worms and oysters, which has contributed to a range of student-led and collaborative systematics projects.

Beneficiaries of this work include conservation practitioners and policymakers requiring robust genomic reference data for biodiversity monitoring; researchers seeking to understand population resilience and adaptive potential; and coastal

The genomic datasets generated will strengthen molecular monitoring tools



communities whose livelihoods depend on sustainable marine resource harvesting. This project lays essential groundwork for conservation, restoration and sustainable use, to ensure that South Africa's marine heritage is both represented and mobilised in national and global biodiversity initiatives.

This project focuses on generating and integrating whole-genome data for ecologically and socio-economically important intertidal marine invertebrates from South Africa's rocky shores and sandy beaches, globally recognised biodiversity hotspots that remain largely undocumented at the molecular level. These species, which dominate and structure intertidal ecosystems, function as key ecological taxa and ecosystem engineers, and simultaneously support coastal subsistence fisheries, food security, informal markets and cultural heritage, particularly in under-resourced coastal communities. Despite their importance, the absence of genomic reference data has limited South Africa's ability to monitor biodiversity, manage harvested species sustainably and contribute meaningfully to global biodiversity initiatives.

Through the generation of high-quality whole-genome sequences, this project contributes directly to South Africa's biodiversity information systems by delivering the first complete genomes for selected intertidal species, of which two species have already been sequenced successfully (*Parechinus angulosus* and *Parvulastra exigua*). These genomic resources capture the genetic diversity that underpins population fitness, resilience and adaptive potential under environmental change. The production of reference-quality genomes for coastal species establishes a quantitative foundation for biodiversity assessment, sustainable use and ecological restoration. Sequencing outputs will be deposited in public repositories such as GenBank and mined for high-quality mitochondrial genomes. The result will be annotated mitogenomes that complement traditional taxonomy at no additional cost.

The genomic datasets generated will strengthen molecular monitoring tools by enhancing taxonomic resolution and advancing the implementation of DNA barcoding, environmental DNA (eDNA) frameworks, and population-level analyses using SNPs and microsatellites. These tools enable cost-effective, non-invasive biodiversity monitoring and provide robust ecological baselines necessary for conservation planning and adaptive management. By filling critical data gaps for non-model species, the research aims to improve biodiversity assessments, inform management strategies and link science-based evidence directly to the stewardship of species that support coastal livelihoods.

In parallel, the project supports national bioeconomy and sustainable development priorities by enabling future applications in environmental monitoring, sustainable resource management, and biodiversity-based innovation. Addressing long-standing deficits in molecular reference data will also enhance South Africa's scientific visibility and capacity to engage in international biodiversity research and policy frameworks. With sequencing support secured through the DIPLOMICS 1000 South African Genomes (1KSA) initiative, this project builds on existing national infrastructure and momentum to deliver



The Cape sea urchin, *Parechinus angulosus*, taken at Kidd's Beach, South Africa. Photo: C.I. Green 2024

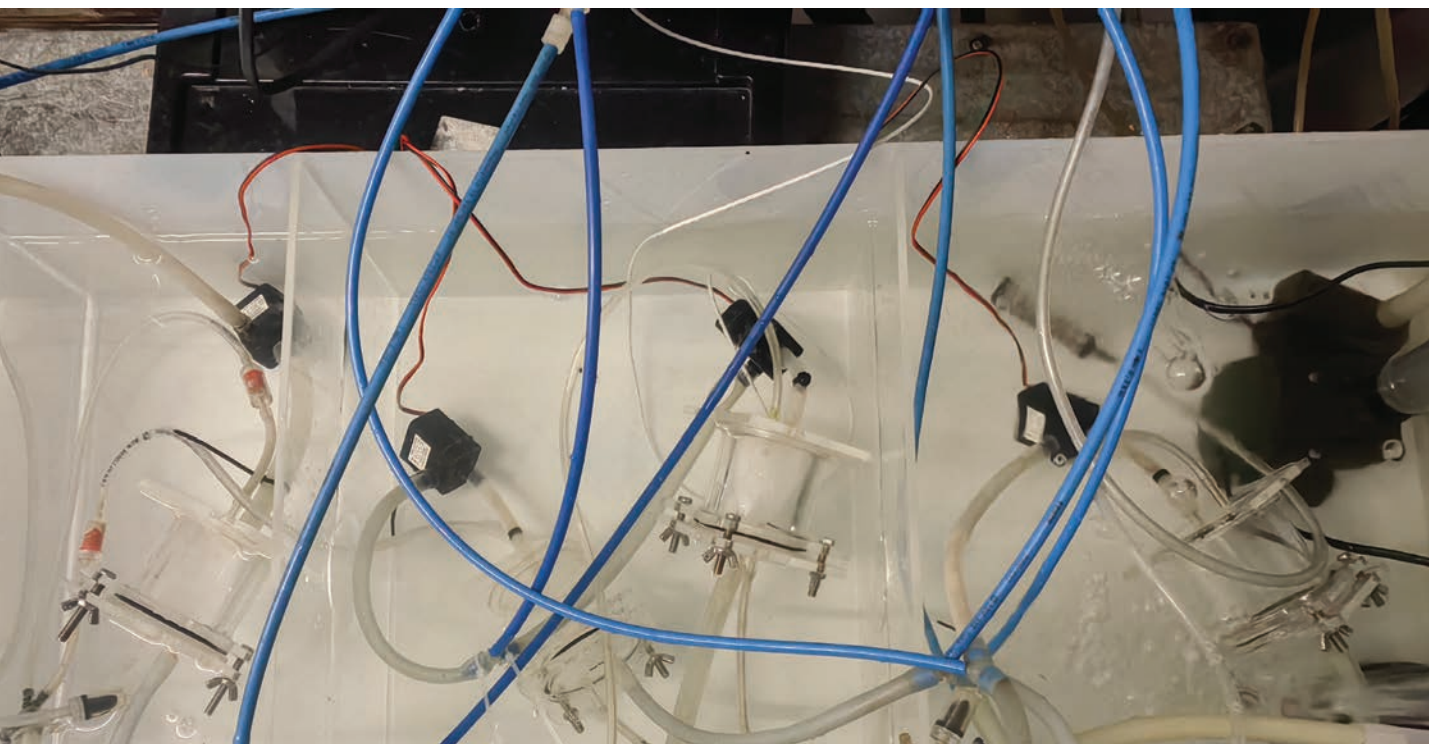


The 12S ribosomal RNA of *Parechinus angulosus* derived from the mitochondrial genome.

a comprehensive, nationally relevant and globally significant genomic resource for marine invertebrates. By integrating whole-genome sequencing with biodiversity monitoring and conservation objectives, the project moves beyond marker-based approaches to provide enduring, foundational datasets capable of informing species identification, climate resilience modelling, population health assessments and long-term conservation planning.

Collectively, this research addresses a critical barrier to effective marine conservation and sustainable coastal management in South Africa. Clear anticipated impacts include improved capacity for biodiversity monitoring, enhanced evidence-based conservation planning, strengthened contributions to global biodiversity knowledge and better alignment between ecological stewardship and coastal livelihoods. By making South Africa's intertidal biodiversity visible at the genomic level, the project lays the groundwork for scientific leadership, sustainable development and conservation at scale.

Using Oxford Nanopore Technology (ONT), over the next two years, sequencing will be conducted for the remaining 18 species for which funding is secured. These sequences will then be used to construct a high-resolution phylogenetic tree, with the possibility of annotating the genome for functionality of genes. This information will also be used to create a reference library, and sequences will be deposited into public repositories to address the significant lack of genomic baseline data on marine invertebrates.



The Aquatic Ecophysiology Research Platform general laboratory provides respirometry chambers which are used for assessing the Standard Metabolic Rate (SMR) and Maximum Metabolic rate (MMR) of fishes.

Physiological and ecological responses of aquatic organisms to climate change and human actions

DR LUBABALO MOFU

Instrument Scientist, and Freshwater Field & Lab Ecologist

OKUHLE CEMBI

NRF-SAIAB

FULUFHELO MULAUDZI

NRF-SAIAB

Keywords: climate change, fish, invasion, physiology

The AERP facilitates studies that provide pivotal knowledge on the impacts of human actions and climate change on the physiology of aquatic organisms

PLATFORM

Aquatic Ecophysiology Research Platform (AERP)

NRF-SAIAB TEAM MEMBERS

Lubabalo Mofu with Okuhle Cembi and Fulufhelo Mulaudzi

NRF-SAIAB STUDENTS & INTERNS

Fulufhelo Mulaudzi (MSc), Okuhle Cembi (Intern)

Studies conducted in the Aquatic Ecophysiology Research Platform (AERP) provide pivotal knowledge on the impacts of human actions and climate change on the physiology of aquatic organisms. Some of the work conducted includes a study by a Postdoctoral Fellow (Dr Suzanne Redelinghuys) from the Coastal and Ocean Science Team (COST), which is assessing the morphometric analyses of sea urchins using mainly mouth parts. Members of the Southern African Fisheries Ecology Research (SAFER) team are simulating a catch and release

*event to determine the peak physiological stress response delay for blacktail, *Diplodus capensis*. This will be analysed through blood glucose and blood lactate after the simulated catch and release event. The Rhodes University Department of Entomology is conducting a study to provide data on microplastic accumulation in sediments, surface water and in fish. Finally, students from University of Fort Hare assessed the effect of water temperature on the aerobic scope of the non-native Western mosquitofish, *Gambusia affinis*, and the native river goby, *Glossogobius callidus*, from the Sundays River Valley irrigation ponds, Eastern Cape, South Africa.*

The Aquatic Ecophysiology Research Platform (AERP) is facilitating experimentation to assess the aerobic scope of a non-native fish species and a native fish species, and this has significant impact for understanding how climate change affects the aerobic scope of freshwater fishes.



METRICS

Users: 27

Tours & Visitors: 7 – Fort Cox – Rural Development, Khutliso Daniels Secondary School, Rhodes University student tour, Samuel Ntlebi Primary School, University of Leeds, Victory Youth Group, Rhodes University (Journalism students & Zoology students), Swartvlei Voortrekkers

Popular article: Cembali, O., Mutshekwa, T. & Mofu L. 2025. Nature's Memory Chips: How fish otoliths record a lifetime. *Quest* 21(4), 17–18

In 2025, three main research themes were prioritised:

- Fish performance in warming environments.
- Quantifying emerging pollutants in artificial impoundments.
- Assessing the physiology of a native species under different microplastics concentrations.

Research projects undertaken by the Coastal and Ocean Science Team in the AERP, include a study on the biodiversity of South Africa's largest natural bay, False Bay, in the Western Cape. For this purpose, destructively collected samples are sorted to separate the taxonomic groups present (e.g. barnacles, mussels, polychaetes, etc.). This study provides a critical baseline of benthic biodiversity in South Africa's largest natural bay, enabling detection of changes in community composition in a system under increasing environmental pressure. The inclusion of larval recruitment data links adult biodiversity patterns with population replenishment processes, offering insight into ecosystem resilience and long-term sustainability. The second project is focusing on the morphometric measurements of the complex mouth parts (Aristotle's lantern) of sea urchins. This research quantifies functional variation in sea urchin feeding structures, providing a sensitive indicator of individual condition, feeding ecology and environmental influences. Given the keystone role of sea urchins as grazers, these data have broader implications for understanding benthic ecosystem functioning and responses to environmental change.

Human activities such as inter-basin water transfer schemes pose significant effects on recipient ecosystems which include not only the introduction of species, but also the transportation of emerging pollutants such as microplastics. Microplastic (MP) pollution is a significant global environmental issue, with MPs defined as plastics measuring ≤ 5 mm. These MPs have gained considerable attention due to their extensive surface area and enhanced ability to absorb pollutants. Microplastics are ubiquitous and can either be inert or cause negative impacts on biota.

Microplastic pollution in sediment, surface water and fish within artificial impoundments of the Sunday's River Valley, Eastern Cape, South Africa is a critical area of study due to its potential implications for environmental health and agricultural practices. The presence of MPs within these artificial ponds allows us to test how microplastics affect the trophic interactions between co-occurring fishes. In addition, understanding the types and concentrations of microplastics within these impoundments will allow us to determine the effects of microplastics and hydrological patterns on fish aerobic scope.

Global mean temperatures and the rate of global warming

have both increased drastically during the last century, driven by human activities that increase greenhouse gas concentrations, especially the burning of fossil fuels, deforestation and industrial emissions. Freshwater bodies like ponds, rivers, lakes and streams are expected to warm 1.5–3°C before the end of the century, depending upon the level of carbon dioxide (CO₂) emissions. Changes in water temperatures make freshwater fish vulnerable to the consequences of climate change, including increasing water temperatures, variations in water levels and habitat loss. Aerobic scope is the distinction between the minimum rate of oxygen consumption (standard metabolic

Measuring the aerobic scope of fish is crucial since it directly impacts their survival and success

rate) in unfed animals at rest at a constant temperature in a controlled environment and the maximum rate of oxygen consumption (maximum metabolic rate). It is measured to help understand the fish's overall performance, health and ability to survive in changing environments and provide insight into how animals allocate energy for essential behaviours such as escaping predators and reproduction. Measuring the aerobic scope of fish is crucial since it directly impacts their survival and success. A reduced aerobic scope indicates that a fish has less energy for metabolism and becomes more vulnerable to diseases, predators and environmental changes. Furthermore, if water temperatures increase, fishes' aerobic scope can be reduced so that they cannot function properly, which in turn leads to population declines. Students from the University of Fort Hare (UFH) assessed the standard and maximum metabolic rates of *Gambusia affinis* (non-native fish) and *Glossogobius callidus* (native fish) under different water temperatures. Findings from their studies showed that a progressive increase in water temperatures resulted in a broader aerobic scope, allowing *G. affinis* to sustain its performance activities.

Using the results of prior physiology experiments the AERP aims to create a database on:

- Thermal tolerance and aerobic scope of native species.
- Hypoxia tolerance of native and non-native species under eutrophication.
- Baseline data on the current concentrations of emerging pollutants (microplastics and pharmaceuticals residues).
- Growth efficiency and feed conversion physiology.



Mr Vuyani Hanisi, Collections Assistant, holding a jar with a holotype of *Glossogobius hanisii*, a new species named after him.

National Collection Facility: A scientific goldmine advancing aquatic biodiversity research

NKOSINATHI MAZUNGULA

Collections Manager

Keywords: aquatic biodiversity collections, open-access research infrastructure, taxonomy and species discovery, genomic resources and biobanking

PLATFORM NAME

National Collection Facility

NRF-SAIAB TEAM MEMBERS

Nkosinathi Mazungula, Roger Bills, Willem Coetzer, Seshnee Reddy, Amanda Gura, Nonkoliso Mgibantaka, Mzwandile Dwani, Zinzi Sinazo Somana, Siphamandla Mceleli, Vuyani Hanisi, Sinxolo Fiki

NRF-SAIAB STUDENTS & INTERNS

Xiluva Mathebula (MSc), Nkululeko Zuma (PhD), Esihle Ndeleni (MSc) and Sinxolo Fiki (HSRC Intern)

The National Collection Facility (NCF) of the South African Institute for Aquatic Biodiversity (NRF-SAIAB) is a strategic, open-access research infrastructure that underpins aquatic biodiversity science in southern Africa and contributes at a global scale. As part of the NRF National Research Infrastructure Platforms (NRIP), the NCF operates as a discovery-driven knowledge asset – a well curated scientific repository that continues to generate new taxa, datasets and research

opportunities across taxonomy, systematics, genomics, ecology and conservation science.

Embedded within the Natural Science Collections Facility (NSCF) and the Biodiversity Biobank South Africa (BBSA), the NCF functions as an integrated national asset designed to promote equitable, transparent access to biodiversity resources. Researchers, postgraduate students and international collaborators gain access to expertly curated collections, specialised laboratories, digitisation platforms and technical support. This integrated infrastructure ensures that collections are not static archives, but actively managed research tools that support innovation and skills development.

The NCF houses more than 1.3 million preserved specimens and associated genomic resources spanning the National Fish Collection, National Aquatic Biodiversity Biobank, amphibian holdings and a specialised cephalopod collection. Together, these collections document over a century of aquatic biodiversity exploration across freshwater, estuarine and marine systems. Beyond their historical importance, the collections represent significant unrealised scientific value. Many specimens remain under-studied, offering high-impact opportunities for taxonomic revision, species discovery, phylogenetic and



METRICS

Number of specimens catalogued & deposited in the NFC: 2 301

Number of tissue samples catalogued & deposited in the Biobank: 1 422

Specimen loans for research: 5 000

Tissue sample gifts for research: 1 081

Number of whole genome sequences: 3

Number of high-quality images produced for the type catalogue: 1 179

phylogeographic research, environmental monitoring and evidence-based conservation planning in a region recognised for both endemism and biodiversity vulnerability.

The NCF plays a central role in mobilising biodiversity data and ensuring that aquatic biodiversity resources are globally interoperable. Specimen records from the collections are made openly accessible through the Global Biodiversity Information Facility (GBIF), greatly increasing the visibility and reuse of South African biodiversity data. In addition, genomic and tissue resources from the NRF-SAIAB Biobank were published for the first time through the Global Genome Biodiversity Network (GGBN), contributing 6 487 curated records. By aligning with international data standards and open-access principles, the NCF ensures that biodiversity assets housed in South Africa are discoverable, interoperable, and integrated into global research infrastructures. This strengthens international collaboration, increases research citation and reuse, and enhances the value of collections-based science for policy development, conservation planning and biodiversity monitoring.

The NCF plays a central role in mobilising biodiversity data and ensuring that aquatic biodiversity resources are globally interoperable

As a trusted open-access research platform, in 2025 the NCF continued to attract collaborative research projects, training initiatives and specialised taxonomy workshops. The facility hosted several regional and international programmes, including a post-survey taxonomy workshop linked to the EAF Nansen Programme and a species-discovery workshop associated with Ocean Census and the Nekton Foundation (see page 3). These initiatives integrated field survey outputs with collections-based taxonomy, strengthening capacity development, skills transfer and collaborative research networks. Specimens generated during these workshops were deposited in the NRF-SAIAB collections, significantly expanding institutional holdings and enhancing the long-term research value of the facility.

In 2025, the NCF also completed the digitisation of its entire type collection. During the same period, the first portion of the Pennsylvania State University cichlid collection was transferred to NRF-SAIAB, with more than 300 type specimens expected once the donation is fully incorporated. Additional material

from Liberia was received through a donation from Aquatic Ecosystem Services (see page 31), further strengthening the geographic representation of the collections.

The NCF facilitated extensive research access through specimen loans, material transfers and scientific visits from national, regional and international collaborators. Researchers from institutions such as Kagoshima University in Japan and the Museum and Art Gallery of the Northern Territory in Australia, among others, visited the facility to examine specimens and access associated data for taxonomic and evolutionary studies. These engagements reinforce the NCF's role as a global reference centre for aquatic biodiversity and support the development of new research outputs and species descriptions. Several recent publications have used NCF specimens, with some being designated as type material. Notably, one publication described a new species named in honour of Mr Vuyani Hanisi, a Collections Assistant who has dedicated 17 years of service to the National Collection Facility.

Methodological innovation remains a core focus of the facility. In 2025, the NRF-SAIAB Aquatic Biodiversity Biobank initiated research to determine optimal short- and long-term tissue storage protocols capable of preserving high-molecular-weight genomic DNA suitable for modern genomic applications. These efforts are essential for ensuring that archived tissues remain compatible with rapidly advancing sequencing technologies. In collaboration with the Aquatic Genomics Research Platform, the Biobank generated three whole-genome sequences that are currently being prepared for public release, with a target of producing 34 genomes in the next phase.

Through the integration of physical collections, genomic resources and digital biodiversity data infrastructure, the NCF is transforming historical specimens into an increasingly powerful research platform. This integrated approach supports cutting-edge biodiversity science, strengthens regional research capacity, informs conservation and fisheries management and contributes to a global understanding of aquatic biodiversity in the context of accelerating environmental change.

We will continue to position the NCF as a forward-looking, innovation-driven research infrastructure. By combining genomic expansion, advanced imaging technologies, backlog reduction and conservation leadership, the facility will not only preserve biodiversity heritage but actively shape the scientific and policy landscape of aquatic biodiversity research in a rapidly changing environmental context.



Taxonomic sorting of a deepwater fish catch on board RV *Dr. Fridtjof Nansen* during a research cruise off northern Mozambique in November 2007. Local cruise leader Dr Bernardino Malauene (Instituto Oceanográfico de Moçambique, Maputo, Mozambique) (left) using fish identification keys to assist in the processing. Specimens representing taxonomically interesting or challenging taxa were then selected and prepared for inclusion in the NRF-SAIAB fish collection. Photo: Franz Uiblein

Research vessel- and scientific collection-supported advancements towards taxonomic coverage of the specious goatfish genus *Upeneus* (Mullidae)

PROF. FRANZ UIBLEIN

IMR, Norway

NRF-SAIAB Honorary Research Associate

NONKOLISO MGIBANTAKA

NRF-SAIAB

Keywords: alpha taxonomy, NRF-SAIAB fish collection, RV *Dr. Fridtjof Nansen*, taxonomic species groups

RESEARCH PROJECT

The taxonomy of goatfishes (Mullidae, Mulliformes)

COLLABORATIONS

Nonkoliso Mgibantaka (NRF-SAIAB)

The genus Upeneus is the most diverse among the six genera of the goatfish family (Mullidae, Mulliformes) with currently 53 valid species, representing more than half of all known goatfishes (n = 105 species; Uiblein et al. 2024, 2025). In recent years, efforts in basic alpha-taxonomy of Upeneus have been intensified, resulting in the description of 30 new species since 2010 (Uiblein et al. 2024, 2025). In total 28 new Upeneus species were described by the first author (FU), nine with co-authorship of NRF-SAIAB employees and/or Honorary Research Associates (HRAs) Dr Gavin Gouws, Dr Phil Heemstra and Mark Lisher.

*For nearly all new species descriptions collection material from NRF-SAIAB had to be studied, either being eventually assigned as type material after detailed body structure and colour investigations or used as comparative material required for the description of new species encountered in other scientific collections. A large number of Upeneus specimens made available for this research at the NRF-SAIAB fish collection were from cruises with three successively deployed research vessel versions of the IMR-operated RV *Dr. Fridtjof Nansen*, which since the early 1980s succeeded in collecting both demersal and pelagic fish species off southeastern Africa and other areas of the Indian Ocean, and provided selected subsamples for later taxonomic investigations (see photo above).*

Many of the *Upeneus* specimens collected during RV *Dr. Fridtjof Nansen* cruises have been made available at NRF-SAIAB for detailed studies during about 20 research visits by Prof. Uiblein, initially as invited collaborator and from 2010

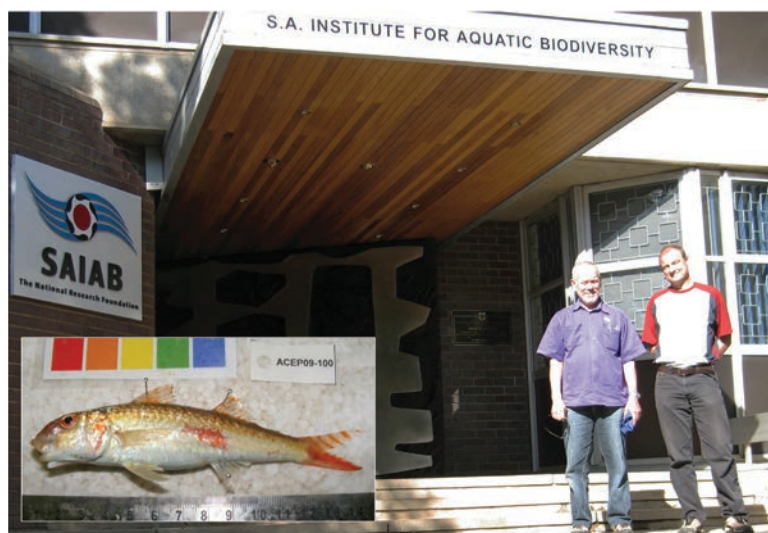


onwards as an NRF-SAIAB Honorary Research Associate (HRA) (see photo on opposite page). More recently, he also studied selected specimens on loan at the fish collection of the Natural History Museum Vienna, Austria (NMW), at which he is also an HRA. During the many research visits at NRF-SAIAB and when later receiving loaned material at NMW, invaluable assistance by the NRF-SAIAB fish collection staff was provided. The most recent result of this collaboration is the publication project summarised below which features new species descriptions, synonymisations and/or resurrections towards finalising his alpha-taxonomic revision of the goatfish genus *Upeneus*. Naturally, RV *Dr. Fridtjof Nansen*-collected specimens will again play a crucial role, as they have done in the past (see the overview of former new goatfish species descriptions and use of RV *Dr. Fridtjof Nansen*-collected material overleaf).

Three *Upeneus* specimens collected during the RV *Dr. Fridtjof Nansen* research cruise in July 2023 off Tanzania, which were initially studied during a research visit at NRF-SAIAB in November 2023 and later on loan at NMW, have been found to belong to an undescribed species. While the preliminary identification of these specimens indicated considerable similarity with *Upeneus quadrilineatus* (Cheng & Wang 1963), using data obtained from comparative material collected in Indonesia (Uiblein & White 2015), further steps had to be taken involving the examination of types and additional comparative material. However, this process to arrive at a definitive conclusion regarding the occurrence of a new species of *Upeneus* was not straightforward because it was necessary to consider other congeners which earlier had been included in a taxonomic group together with *U. quadrilineatus* which Uiblein & Heemstra (2010) had called the “*moluccensis* species group”.

In 2025, the “*sulphureus*-species group” was established as a new taxonomic group for the genus *Upeneus* consisting of three former *moluccensis*-group species and two newly described species which clearly differ in fin-colour pattern from the remaining species of the *moluccensis* group (Uiblein et al. 2025). One striking difference between these two groups is the absence versus presence of dark oblique bars on the upper tail-fin lobe. Splitting into two taxonomic groups also allowed the researchers to focus in more detail on *U. moluccensis* (Bleeker, 1855), the nominator species of the tail-fin bar-bearing group, which shows variation in body form among populations (this primarily Indo-Pacific species is also known as a so-called “Lessepsian migrant” which has colonised the Mediterranean through the Suez Canal).

Late in 2024, Prof. Uiblein used the opportunity of an invited research visit in China to study the unique types of *U. quadrilineatus* at the Marine Biological Science Museum in Qingdao. In 2025, additional comparisons with specimens received on loan at NMW from two museums in Japan and Taiwan were carried out, resulting in a sufficiently large data set to allow clear distinction and reliable identification of the three specimens from Tanzania as belonging to an undescribed species. This and Prof. Uiblein’s previous publication projects featuring 31 new goatfish descriptions in total, will form part of an invited lecture programme at the National Kaohsiung University, Taiwan, in November 2026.



Franz Uiblein in front of NRF-SAIAB on 1 December 2007, during the first of 20 research visits, following an invitation by Dr Phil Heemsta (left), shortly after both had participated in the RV *Dr. Fridtjof Nansen* cruise off Mozambique. During the cruise they had collected fish specimens, including goatfishes, for detailed taxonomic studies at the NRF-SAIAB National Fish Collection. Photo: Franz Uiblein. Insert: Holotype of *Upeneus saiab* Uiblein & Lisher, 2013 (SAIAB 188298, 10.2 cm SL), collected by RV *Dr. Fridtjof Nansen* off Angoche, northern Mozambique (14 August 2008). Photo Mark Lisher

The description of the new species, with NRF-SAIAB Fish Collection Assistant and co-author of this report, Nonkoliso Mgibantaka, is currently underway as an element of three publication projects aiming to finalise the revision of the genus *Upeneus*. Additionally, the completion of ongoing revisions by Prof. Uiblein of the other five genera of goatfishes *Mulloidichthys*, *Mullus*, *Parupeneus*, *Pseudupeneus*, and *Upeneichthys*, are also planned.

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Author	n species described	Author	n species described	Author	n species described
Uiblein	31 (31*)	Valenciennes	2	Lisher	1 (1*)
Randall	12 (4*)	Amaoka	1	Maclaine	1 (1*)
Lacepède	8	Bailly	1 (1*)	Marini	1
Guézé	7	Bennett	1	McGrouther	1 (1*)
Cuvier	6	Ben-Tuvia	1	Nakaya	1
Heemstra, Phil	6 (6*)	Boonphienphol	1 (1*)	Ogilby	1
Motomura	6 (4*)	Bos	1	Pavlov	1 (1*)
Bleeker	5	Causse	1 (1*)	Peristiwady	1 (1*)
Fourmanoir	3	Cheng	1	Platell	1
Gledhill	3	Clarke	1	Poey	1
Golani	3	Day	1	Potter	1
Heemstra, Elaine	3 (3*)	Fahmi	1 (1*)	Rajan	1 (1*)
Jordan	3	Forsskal	1	Quoy	1
Bloch	2	Fowler	1	Seale	1
Gill	2	Gaimard	1	Shaw	1
Gouws	2 (2*)	Gilbert	1	Smith, J.L.B.	1
Kim	2	Günther	1	Smith, Margaret	1
Lachner	2	Hoang	1 (1*)	Steindachner	1
Linnaeus	2	Houttuyn	1	Wang	1
Myers	2	Hubbs	1	White	1 (1*)
Richardson	2	Jenkins	1	Williams	1 (1*)
Schlegel	2	King	1 (1*)	Yamashita	1
Temminck	2	Kulbicki	1		

Taxonomic authorities of valid goatfish species (family Mullidae; $n = 105$; status April 2026), in descending order according to number of new species described. The star symbols indicate species descriptions involving type, voucher or comparative material collected during cruises with RV *Dr. Fridtjof Nansen* and now curated at the NRF-SAIAB fish collection. The 20 authors having used RV *Dr. Fridtjof Nansen*-collected and NRF-SAIAB-curated goatfish specimens in their species descriptions as type, reference or comparative material are emphasised in bold letters. Background image: RV *Dr. Fridtjof Nansen* at Pemba quay, northern Mozambique, November 2007. Photo: Franz Uiblein



Providing a 'window to the past and a door to the future', the coelacanth has been an icon of marine research in South Africa since the discovery of live coelacanths off the coast of KZN in 2000 and the inception of ACEP in 2002. Photo: ACEP ROV

Sustainability, stewardship and institutional resilience

PROF. ALBERT CHAKONA

NRF-SAIAB Managing Director

Supporting environmental sustainability through science

The South African Institute for Aquatic Biodiversity (NRF-SAIAB) promotes environmental sustainability through research that supports healthier rivers, estuaries and oceans. The Institute's work contributes to biodiversity conservation, fisheries management, water security, climate adaptation and the long-term sustainability of livelihoods linked to aquatic ecosystems across South Africa and the African continent.

Research findings are translated into scientific publications, policy briefs and collaborative engagements with government, academic institutions and civil society organisations, helping strengthen responses to biodiversity loss and environmental change. The Institute also supports interdisciplinary scientific engagement around emerging sustainability themes such as One Health, which recognises the interconnectedness of environmental, animal and human wellbeing.

Developing future African scientists

Building scientific capacity remains central to NRF-SAIAB's long-term sustainability contribution. The Institute provides postgraduate supervision, technical training and mentorship across a range of aquatic science disciplines, contributing to the development of future African scientists, ecologists, taxonomists and environmental managers.

The Institute also continues to contribute to the development of a transformed and internationally connected cohort of African scientists through postgraduate supervision, regional training initiatives and early-career professional development programmes.

Transformation and broadening participation in science remain important institutional priorities, supporting a more inclusive and representative aquatic science community in South Africa. Sustaining a vibrant scientific environment that attracts and supports skilled researchers, students and technical specialists also remains important to NRF-SAIAB's long-term institutional sustainability.

Maintaining national research infrastructure

NRF-SAIAB maintains nationally and regionally important biodiversity collections and specialised scientific infrastructure that support long-term environmental monitoring, biodiscovery and conservation research. The Institute's aquatic biobank and biodiversity collections now contain more than one million specimens, contributing to species discovery, biodiversity assessment and the preservation of scientific knowledge for future generations.



Continued investment in scientific platform renewal, specialised research infrastructure and shared scientific capabilities remains integral to the support of long-term environmental monitoring and aquatic biodiversity research.

The Institute continues to strengthen its scientific capabilities through advanced molecular, genomic, remote imaging and environmental monitoring technologies that support research into biodiversity change, ecosystem resilience and emerging environmental threats.

Expanding marine research capacity

Since the inception of the African Coelacanth Ecosystem Programme (ACEP) in 2002, in response to the discovery of living coelacanths off the coast of South Africa near Sodwana Bay, NRF-SAIAB has supported marine research, and developed and shared a specialised Marine Platform serviced by a purpose-built fleet of coastal research vessels and scientific infrastructure across South Africa. Through a cyclical competitive Open Research Call the programme provides researchers and students with access to specialised marine research platforms, acoustic telemetry systems, remotely operated imaging technologies and geophysical mapping capabilities.

These platforms strengthen national and regional research collaboration while enabling and providing long-term monitoring of marine ecosystems and aquatic biodiversity beyond the scope of any individual entity in South Africa. The cumulative result of this contribution is improved understanding of ecosystem change, resilience and emerging environmental threats affecting a variety of aquatic environments.

To ensure the sustainability of this enterprise, since 2012 the ACEP Phuhliisa Human Capital Development Programme, a targeted intervention within the Department of Science, Technology and Innovation (DSTI) transformation agenda, has advanced demographic transformation in the marine research sector. Implemented through collaboration between NRF-SAIAB and four coastal HDIs, the programme provides access to national research platforms, including offshore research vessels, specialised field equipment, dive teams and technical support, alongside operational funding and bursaries.

Strengthening regional collaboration

There is growing recognition of the need to strengthen regional and continental collaboration in order to connect Africa's 'islands of excellence' into integrated platforms to advance scientific growth and contribute to environmental sustainability and human wellbeing. NRF-SAIAB continues to play a key role in fostering this integration through establishment of strategic continental and international partnerships. One of the most recent initiatives is a collaborative effort between NRF-SAIAB, FAO EAF-NANSEN and Ocean Census that has culminated in the establishment of annual training workshops that aim to strengthen marine biodiscovery capacity on the African continent. By combining long-term survey material with world-class collections, molecular infrastructure, and expert mentorship, the partnership has begun to accelerate biodiversity research, develop African taxonomic expertise and establish a sustainable, continent-wide network for marine biodiscovery and monitoring. A similar initiative will be established to advance biodiscovery capacity to service Africa's diverse freshwater ecosystems. The purpose of these efforts is to contribute meaningfully to building an interconnected African scientific community.

Looking ahead

Africa faces numerous and interconnected challenges, with food insecurity and malnutrition, reflected in persistently high levels of stunting among children under five, projected to intensify in the coming years. In parallel, the continent is grappling with the escalating crisis of antimicrobial drug resistance, which constitutes a growing threat to public health. This poly-crisis compounds existing vulnerabilities across health systems, unemployment and inequality. Africa's rich marine and freshwater resources represent an immense, largely untapped and sustainable opportunity to address some of the continent's multiple challenges.

Looking ahead, NRF-SAIAB aims to continue to provide access to its integrated cutting-edge research infrastructure platforms to unlock the continent's full potential through capacity development, scientific innovation and knowledge generation to support responsible stewardship of biodiversity resources to benefit current and future generations.

As sustainability considerations continue to evolve globally, the Institute also recognises the value of progressively and intentionally strengthening institutional awareness around responsible resource use, environmental stewardship and operational sustainability practices that support its long-term scientific mission.

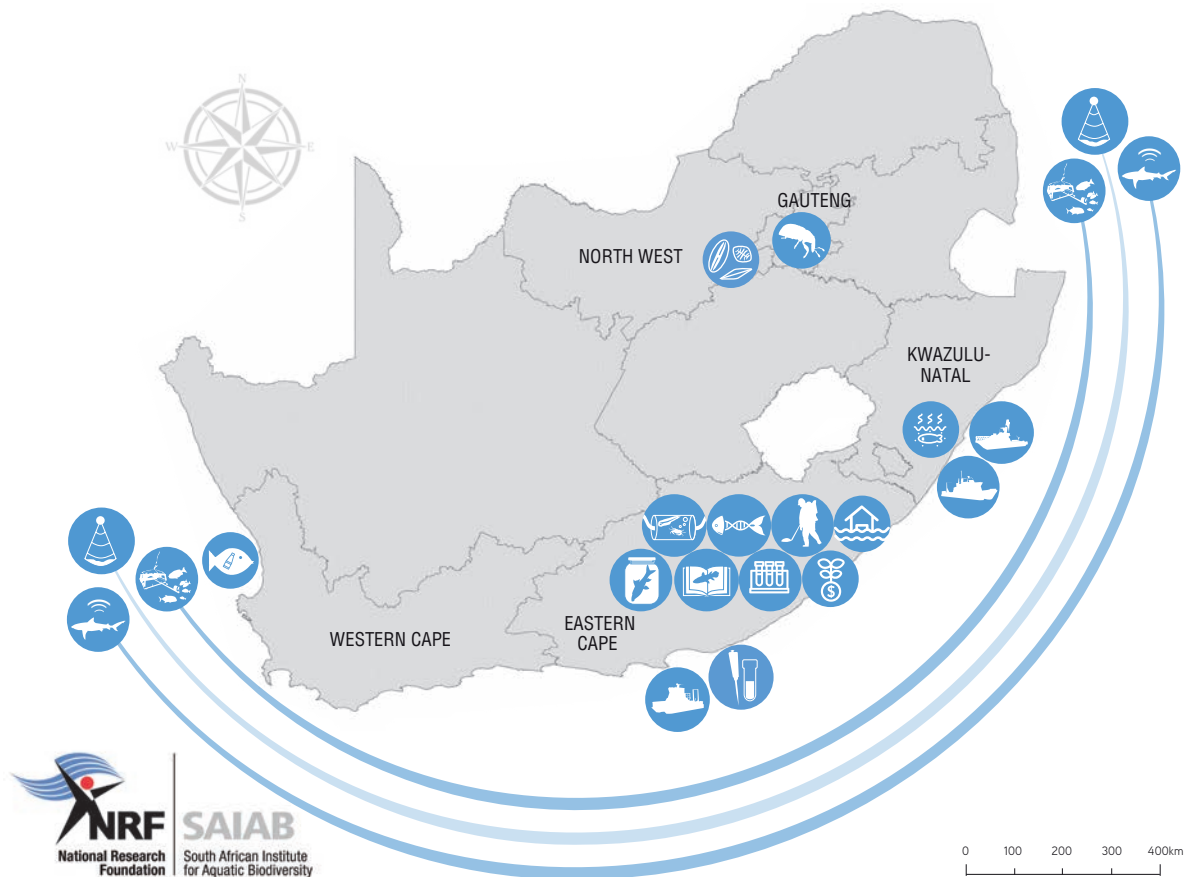
NRF-SAIAB PLATFORMS SERVING SOUTH AFRICA IN 2025



9 PLATFORMS



270 PLATFORM USERS



Marine Platforms

-  Acoustic Tracking Array Platform (ATAP)
-  Geophysics and Mapping Platform (GeMaP)
-  Marine Remote Imagery Platform (MARIP)
-  Coastal Craft – RV *Observer*
-  Coastal Craft – RV *Phakisa*
-  Coastal Craft – RV *uKwabelana*

Freshwater Platforms

-  Ecology and Management of Aquatic Invasive Species – South African Research Chairs Initiative (SARCHI)
-  Freshwater Field Unit (FFU)

Information Platforms

-  Margaret Smith Library (MSL)

Collections & Specialist Laboratories

-  Aquatic Ecophysiology Research Platform (AERP)
-  Aquatic Genomics Research Platform (AGRP)
-  National Collection Facility (NCF)
-  Biobank
-  Bioprospecting for Pharmaceuticals
-  National Diatom Collection

ACEP Joint Marine Laboratories

-  Ecotoxicology – University of Zululand
-  Coastal Livelihoods – Walter Sisulu University
-  Bioeconomy – University of Fort Hare
-  Marine Microplastics – University of Western Cape



NRF-SAIAB IN NUMBERS

HUMAN CAPITAL



58

EMPLOYEES



17

RESEARCHERS



107

STUDENTS

SCIENCE AND SOCIETY



146

SCIENTIFIC PUBLICATIONS



28

POPULAR ARTICLES



15

PUBLIC PRESENTATIONS



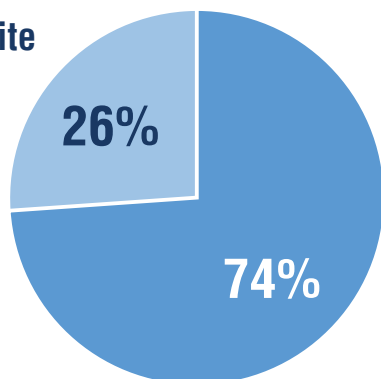
1

BOOK

STUDENT DEMOGRAPHICS

RACE

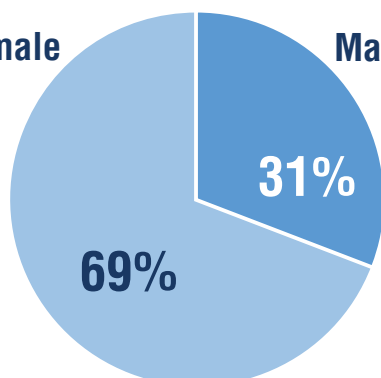
White



Black
(African,
Coloured,
Indian)

GENDER

Female



Male

SOCIAL MEDIA



2 382

X FOLLOWERS



2 819

FACEBOOK FOLLOWERS



1 426

INSTAGRAM FOLLOWERS



973

LINKEDIN FOLLOWERS



356

YOUTUBE SUBSCRIBERS

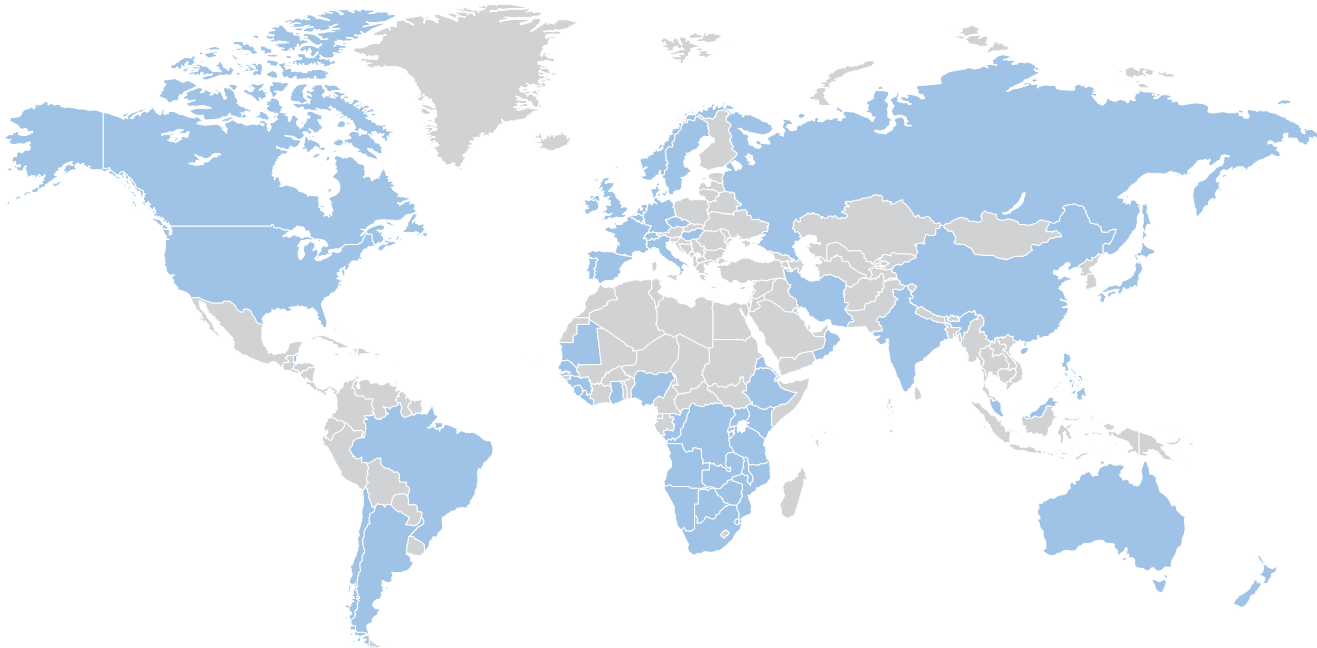
NRF-SAIAB IN NUMBERS cont.

INTERNATIONALISATION			
	CONFERENCES	COLLABORATIONS	FUNDERS
			
LOCAL	5	54	16
GLOBAL	7	107	15

FUNDERS 2021–2025

Local	International
Agricultural Research Council Aquatic Ecosystem Services Bayworld Centre for Research and Education Department of Science, Technology and Innovation (DSTI) DIPLOMICS DST Centre of Excellence for Invasion Biology GroundTruth cc Nelson Mandela University Rhodes University SANBI South African National Convention Bureau The WWF Nedbank Green Trust TLC Partnership University of Mpumalanga Water Research Commission Wildlands Conservation Trust	Canadian Institute for Advanced Research European Education and Culture Executive Agency (SAMOS) Food & Agriculture Organisation of the UN iAtlantic Kon Museum Midden-Afrika KU Leuven Mohamed Bin Zayed Foundation LTD National University of Science Ocean Census c/o Nekton Foundation Oppenheimer Generations Research and Conservation Royal Museum for Central Africa Save our Seas Foundation Sustainable Oceans Alliance Inc The Ocean Foundation Wildlife Conservation Society

GLOBAL REACH





NRF-SAIAB RESEARCH OUTPUTS 2025

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REPORTS AND THESES

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REELS/ SHORT VIDEO FORMATS

Celebrating World Oceans Day under this year's theme: "Wonder: Sustaining What Sustains Us":

In celebration of World Oceans Day 2025, NRF-SAIAB is sharing stories of students whose work connects science with wonder. In this video, Katleho Mahlopho reflects on what inspires awe in the ocean and how their research contributes to sustaining what sustains us. Link: https://www.youtube.com/watch?v=1fSrLU-RzI&ab_channel=SouthAfricanInstituteForAquaticBiodiversity

In this video, Jabulani Ndaba reflects on what inspires awe in the ocean and how their research contributes to sustaining what sustains us. Link: https://www.youtube.com/watch?v=9x23hR8LRlk&ab_channel=SouthAfricanInstituteForAquaticBiodiversity

Meet one of NRF-SAIAB's passionate research intern Cornel-Mari du Preez as she shares what fills her with wonder about the ocean. Link: https://www.youtube.com/watch?v=0mXeelj60WQ&ab_channel=SouthAfricanInstituteForAquaticBiodiversity

There's more to the ocean than meets the eye. In this final video of our #WorldOceansDay student series, Siphelele Buntu Dyantyi shares how his marine research not only reveals the hidden beauty of the ocean but also helps us understand how to sustain it. Link: https://www.youtube.com/watch?v=wSRqlq-m4Qc&ab_channel=SouthAfricanInstituteForAquaticBiodiversity

Podcast interview on Beyond Jaws (<https://www.speakupforblue.com/show/beyond-jaws/>) with Dave Ebert and Andrew Lewin, https://www.youtube.com/watch?v=ny8VIS2LW_o

PRESS RELEASES

Invitation to the release of a weevil species to target an invasive alien aquatic plant. <https://www.nrf.ac.za/invitation-to-the-release-of-a-weevil-species-to-target-an-invasive-alien-aquatic-plant/> (Published 13 March 2025)

CONFERENCE AND SYMPOSIUM PRESENTATIONS

Moshani, A., Aggrey-Fynn, J., Hyder, K., Francis, B., Ansah, J., Wilhelm, M.R., Acheampong, E., Winkler, A., Farthing, M., Potts, W., Gusha, N., 2025. Fisheries definitional misfits: A comparative analysis from Ghana, Namibia and South Africa, 13th WIOMSA Symposium. 27 September–04 October 2025, Mombasa, Kenya.

Bute, T.F., Wasserman, R. and Coetzee, J. 2025. The effect of heavy metals from acid mine drainage on the gut microbiome of *Megamelus scutellaris* (the water hyacinth planthopper) in the biological control of water hyacinth. 24th Congress of the Entomological Society of Southern Africa. 8–11 July 2025. University of the Free State, Bloemfontein.

Coetzee, J.A. 2025. Ecological impact and efficacy of weed biological control in South Africa. XI Argentine Congress of Limnology, Corrientes, 28 July to 1 August 2025. Plenary address.

Coetzee, J.A. 2025. Biocontrol in motion: tackling aquatic invasions in Africa through science, collaboration, and stewardship. 17th International Conference on the Ecology and Management of Alien Plant Invasions. Lincoln, New Zealand, 2–5 September 2025. Plenary address.

Edworthy, C.E., Vine, N., James, N.C. 2025. Refuge in the reef: sea urchins as models for understanding ocean acidification refugia. Southern African Marine Science Symposium, Cape

Town, 8–12 September 2025.

James, N.C., Edworthy, C.E., Lamberth, S., Adams, J., Whitfield, A.K., Deyzel, S. 2025. Healthy estuaries serve as a refuge for fish within coastal seascapes ensuring resilience against climate change. Southern African Marine Science Symposium, Cape Town, 8–12 September 2025.

Labuschagne, R., Naidoo, T and Coetzee, J. 2025. The effects of two common plastic leachates on the survival and reproduction of *Neochetina bruchi* and *Megamelus scutellaris*, the biological control agents of water hyacinth (*Pontederia crassipes*). 24th Congress of the Entomological Society of Southern Africa. 8–11 July 2025. University of the Free State, Bloemfontein.

Le Roux, C., Cook, C.A., Netherlands, E.C., Truter, M., Smit, N.J. 2025. Molecular and morphological insights into novel fish-parasitic *Trypanosoma* species from South Africa's southern coast. 11th International Symposium on Fish Parasites, Mérida, Mexico, 20–24 January 2025.

Mabaleka, L., James, N.C., Nodo, P., Child, A-R., Smith, K. 2025. Fish habitat associations in the marine bay region of the Knysna Estuary. Southern African Marine Science Symposium, Cape Town, 8–12 September 2025.

Mkhize, T., James, N.C., Rishworth, G., Berkstrom, C., Heimbrand, Y. 2025. Linking juvenile nurseries to adult stocks in sparid fishes using microchemistry of multiple tissues. Southern African Marine Science Symposium, Cape Town, 8–12 September 2025.

Mokwa, O., James, N.C., Rajkaran, A. 2025. Genetics, morphology and resource availability of two morphologies of eelgrass in the Kromme Estuary, South Africa. Southern African Marine Science Symposium, Cape Town, 8–12 September 2025.

Mpanza, N.P., Patrick, P., Porri, F. 2025. Weaving Indigenous Knowledge Systems with ecological engineering to enhance the functionality and biodiversity of urbanised ecosystems along the southeast coast of South Africa. International Temperate Reefs Symposium took place in Brittany, France, Brest, 1–5 July 2025.

Mukhari DL, Childs AR, Ziko BA, Parkinson MC, Murray TS. Using acoustic telemetry to link movement patterns and thermal drivers of *Mugil cephalus* in a warm temperate South African estuary. 7th International Conference on Fish Telemetry, 8–13 June 2025, Traverse City, USA. Oral presentation

Murray TS, Daly R, Bennett R, Elston C, Boujea, J, Mourier J, Forget F, Diamante S, Cullain N, Venables S, Cerutti F. Regional connectivity in the Southwest Indian Ocean begins to be unravelled through the growth of a regional acoustic telemetry array. 13th Western Indian Ocean Marine Science Association Symposium, 28 September–03 October 2025, Mombasa, Kenya. Oral presentation

Murray TS, Cerutti F, Daly R, Bennett RH, Elston C, Forget F, Boujea J, Diamante S, Cullain N. 2025. Ontogenetic range expansion: The growth of a regional acoustic telemetry array in the Southwest Indian Ocean starts to unravel regional connectivity. 7th International Conference on Fish Telemetry, 8–13 June 2025, Traverse City, USA. Oral presentation

Mxo, R.V., Porri, F., Riddin, T., Adams, J.B. 2025. Eco-friendly coastal infrastructure: sustainable growth of *Cyperus textilis* for ecological engineering applications. Southern African Society of Aquatic Scientists Congress, Pietermaritzburg, 29 June–3 July 2025.



- Naicker, A., Edworthy, C.E., James, N.C., Steyn, P., Human, L. 2025. The impact of warming and acidification on red algae. Southern African Marine Science Symposium, Cape Town, 8–12 September 2025.
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- Nodo, P., James, N.C., Mkhize, T. 2025. Identifying core shallow water nursery habitats within Nelson Mandela Bay's sheltered and wave-exposed coastlines. Southern African Marine Science Symposium, Cape Town, 8–12 September 2025.
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- Sandi, A., Edworthy, C.E., Rishworth, G., James, N.C. 2025. Does exposure to natural pH variability influence the tolerance of urchin offspring to future coastal acidification. Southern African Marine Science Symposium, Cape Town, 8–12 September 2025.
- Smit, N.J., Schaeffner, B.C., Truter, M. 2025. A new frontier for fish parasitology: Aquatic Parasite Conservation. 11th International Symposium on Fish Parasites, Mérida, Mexico, 20–24 January 2025.
- Smit, N.J., Truter, M., Hadfield, K.A. 2025. Citizen sciences in fish parasitology: Resolving the *Anilocra capensis* (Isopoda: Cymothoidae) species complex in southern Africa. 11th International Symposium on Fish Parasites, Mérida, Mexico, 20–24 January 2025.
- Smit, K.P., Bernard, A.T.F. 2025. BRUVs in Stereo: what is remote imagery all about? Plett Marine Symposium. Plett, 11–13 July 2025.
- Smit, K.P., Bernard, A.T.F., Harris, J., Mann, B., Heyns-Veale, E., Lombard, A.T. 2025. Trait-Based Biogeographic Patterns in Demersal Fish: Insights from a decade of stereo-BRUVs data. Southern African Marine Science Symposium, Cape Town, 8–12 September 2025.
- Smit, K.P., Laing, S.C.S., Fassbender, N., Koester, A., Bullock, R., Grimmel, H., Brighton, E., Mangroo, R., Accouche, W., Bernard, A.T.F. 2025. Patterns in shark and ray diversity and abundance across Seychelles: A synthesis from stereo-BRUVs surveys. 8th Southern African Shark and Ray Symposium. Makhanda, 15–19 September 2025.
- Smith, K., Meiklejohn, A., Child, A.-R., Meiklejohn, I., James, N.C. 2025. Protecting estuarine nurseries: A case study on spatial patterns and stakeholder perspectives from the Knysna Estuary. Southern African Marine Science Symposium, Cape Town, 8–12 September 2025.
- Truter, M., Yong, R.Q.-Y., Schwelm, J., Malherbe, W., Luus-Powell, W.J., Chakona, A., Smit, N.J. 2025. From snails to scales: Trematode life cycle links in southern African freshwaters. 11th International Symposium on Fish Parasites, Mérida, Mexico, 20–24 January 2025.
- Van Niekerk, L., Taljaard, S., Adams, J., James, N.C., Lamberth, S., Lemley, D., Rishworth, G., Weerts, S. 2025. African estuaries cycle through complex physical states at annual to decadal scales that need protection in planning and management. Southern African Marine Science Symposium, Cape Town, 8–12 September 2025.
- Yell, L., van Steenderen, C., Paterson, I., Coetzee, J. and Hill, M. 2025. One, the other, and/or both? Unanswered questions about the establishment of water hyacinth biocontrol agent species, *Eccritotarsus* spp. and *Neochetina* spp., in South Africa 24th Congress of the Entomological Society of Southern Africa. 8–11 July 2025. University of the Free State, Bloemfontein.
- Porri, F. Mpanza, N., Ndaba, J., Dyantyi, S., Mxo, V., Malebatja, M., Cockburn, J., Mbandzi-Phorego, N., Redelinghuys, S., Patrick, P., Human, L., Cotiyane-Pondo, P., McConnachie, B., Puccinelli, E., Betani, N., Howse, M., Mvubu, C., Moyo, V., Dlamini, L., Ncapai, L., Tyekela, S., Riddin, T., Adams, J., van der Walt, K.-A., Wynberg, R. 2025. Weaving science and traditional practices: reflections on transdisciplinary research on coastal ecological engineering of urban shorelines. 13th WIOMSA Symposium. 27 September–04 October 2025, Mombasa, Kenya.

SEMINAR AND WORKSHOP PRESENTATIONS

- James, N. 2025. Climate change resilient estuaries and associated fish. SLU Aqua Seminar – South African seascapes. Uppsala, Sweden, 12 May 2025.
- James, N. 2025. Biodiversity and estuaries. Panel discussion as part of workshop on biodiversity status and future research needs. Makhanda, 11 June 2025 (panelist).
- Matcher, G. 2025. Beyond the Surface: Using environmental DNA for marine biodiversity exploration. BlueBiobankBiotech Teacher Workshop. 12 April 2025.
- James, N. 2025. Climate change and South Africa's estuarine fish. NMU Zoology honours workshop on change in the ocean. Gqeberha, 21 August 2025.
- Porri, F. 2025. From larvae to impact: how a blue science career shapes blue action. Invited speaker at the 2025 NMU CMR Research Symposium. Gqeberha, 13 November 2025.
- James, N. 2025. Healthy estuaries serve as a refuge for fish within coastal seascapes ensuring resilience against a changing climate. Invited speaker at the iSimangaliso EbA framework stakeholders workshop. iSimangaliso, 10 November 2025 (online).
- James, N. 2025. Healthy estuaries serve as a refuge for fish within coastal seascapes ensuring resilience against a changing climate. Invited speaker at the Wildtrust Ocean Stewards Science Session. Durban, 25 November 2025.

PUBLIC PRESENTATIONS

- Baso, N. 2025. Lessons from Rwanda: CIFAR Women in Research Leadership Development Symposium. NRF-SAIAB Seminar Series presentation. 26 February 2025.
- Botha, H. 2025. From the last meal to first breath: Developmental insights into the temporary parasitic isopod, *Gnathia pantherina* Smit & Basson, 2002. NRF-SAIAB Seminar Series presentation. 21 August 2025.

- Gusha N. 2025. From Deserts to Lakes & Rivers to The Ocean. Launch of the Oppenheimer Chair in Environmental Justice for Coastal and Inland Fisheries – Rhodes University, 19 November 2025.
- Makhalanyane, T. & the African Microbiome Group. 2025. How One Health Underpins the African Microbiome. NRF-SAIAB Seminar Series presentation. 7 May 2025.
- Martin, M. 2025. Beyond Borders: Strengthening Global Networks for Aquatic Biodiversity Conservation. NRF-SAIAB Seminar Series presentation. 6 March 2025.
- Mbandzi-Phorego, N. 2025. Ecological risk assessment of metal pollution in shellfish along the south coast of South Africa: implications for healthy and sustainable coastal ecosystem. NRF-SAIAB Seminar Series presentation. 4 June 2025.
- Mthombeni, V. 2025. Evaluating perceptions of co-management on small-scale fisheries in the Wild Coast of South Africa. NRF-SAIAB Seminar Series presentation. 6 February 2025.
- Murray, T. 2025. Ontogenetic Range Expansion: The Growth of a Regional Acoustic Telemetry Array in the Southwest Indian Ocean starts to unravel Regional Connectivity. NRF-SAIAB Seminar Series presentation. 26 June 2025.
- Mutizwa, T. 2025. Hidden in the Riffles: The Amazing Diversity of Suckermouth Catfishes (*Mochokidae*, *Chiloglanis*) in the Zambezi River, Southern Africa. NRF-SAIAB Seminar Series presentation. 14 August 2025.
- Ndalen, P.M. 2025. Role of morphology in structuring the feeding niches of dominant fish species inhabiting the Glen Alpine Dam, Limpopo River system, South Africa. NRF-SAIAB Seminar Series presentation. 10 July 2025.
- Porri, F. 2025. From Blue Science to Blue Action: a journey shaped by larval ecology. Invited online seminar for the Institute of Ocean Sciences, Ocean Sciences, Fisheries and Oceans, Canada. 28 November 2025.
- Reddy, S and Gura, A. 2025. Biobank Hour: Inside the NRF-SAIAB Aquatic Biobank. NRF-SAIAB Seminar Series presentation. 10 April 2025.
- Sithole, Y. 2025. The making of a taxonomist: From specimens to species. NSCF Virtual Forum 2025. 25–28 March 2025.
- Smit, K.P. & Laing, S.C.S. 2025. Sharing our ocean adventures and a glimpse of the underwater world. Plett Ocean Festival, Plettenberg Bay. 10 July 2025.
- Waiho, K. 2025. Gold in the mud: A global overview of mud crab (*Scylla* spp.) fishery. NRF-SAIAB Seminar Series presentation. 8 May 2025.



NRF-SAIAB RESEARCH DIVISION 2025

RESEARCH AND MANAGEMENT STAFF 2025

Name	Position
Prof. A. Chakona, PhD (Rhodes University)	Managing Director
Prof. J. Coetzee, PhD (University of the Witwatersrand)	Principal Scientist, SARChI Chair
Prof. N. James, PhD (Rhodes University)	Senior Scientist
Prof. F. Porri, PhD (Rhodes University)	Senior Scientist
Dr A. Bernard, PhD (Rhodes University)	MaRIP Instrument Scientist
Dr G. Matcher, PhD (Rhodes University)	AGRP Instrument Scientist
Dr T. Murray PhD (Rhodes University)	ATAP Instrument Scientist
Dr M. Magoro, PhD (Rhodes University)	Instrument Scientist, Freshwater Field Ecologist
Dr L. Mofu, PhD (Rhodes University)	Instrument Scientist, Freshwater Field & Lab Ecologist
Dr W. Coetzer, PhD (University of KwaZulu-Natal)	Biodiversity Information Manager
Dr E. de Villiers, PhD (Utrecht University)	AGRP Bioinformaticist
Mr I. Bills, MSc (Rhodes University)	Senior Curator
Mr D. Mazungula, MSc (Rhodes University)	Collections Manager
Ms S. Reddy, MSc (Rhodes University)	Biobank Coordinator
Mr R. Palmer, MSc (Rhodes University)	Marine Platform Manager
Mr M. Parkinson PhD (Rhodes University)	ATAP Instrument Technician
Mr T. Wanda, MSc (University of KwaZulu-Natal)	Multibeam Instrument Technician
Ms D. Julius, MSc (Cape Peninsula University of Technology)	SAPRI Seafloor Instrument Technician
Ms J. Oliver, MSc (University of Johannesburg)	AGRP Laboratory Technician
Mr K. Smith	ACEP Marine Technician
Mr F. Jacobs	Marine Field Assistant
Mr T. Mbuyazi	Coastal Craft Deckhand
Mr L. Kokose	General Assistant
Mrs V. Rouhani, MSc (Rhodes University)	Research Support Administrator

POSTDOCTORAL FELLOWS

Name	Primary Research Area	Institute Collaborator
Dr N. Baso	Freshwater ecology	Prof. J. Coetzee
Dr R. Cawood	Invasive freshwater snail	Prof. J. Coetzee
Dr C. Elston	Fish movement studies	Dr T. Murray
Dr K. English	Ecology and biological control	Prof. J. Coetzee
Dr R-L. Gibb	Algal blooms in estuarine ecosystems	Dr G. Matcher
Dr N. Gusha	Marine ecology	Prof. A. Chakona
Dr N. Mnbandzi-Phorego	Marine ecology (marine pollution)	Prof. F. Porri
Dr D. Mukhari	Estuarine movement ecology	Dr T. Murray
Dr T. Mutizwa	Systematics and taxonomy	Prof. A. Chakona
Dr P. Ndalen	Ecology	Mr R. Bills
Dr P. Nodo	Coastal and estuarine ecology	Prof. N. James
Dr T. Ntokoane	Freshwater systematics	Prof. A. Chakona
Dr S. Redelinguys	Coastal ecology	Prof. F. Porri
Dr M. Scheepers	Freshwater taxonomy and ecology	Prof. A. Chakona
Dr D. Singh	Ecology and biological control	Prof. J. Coetzee
Dr Y. Sithole	Taxonomy and systematics	Prof. A. Chakona
Dr K. Smit	Marine and coastal ecology	Dr A. Bernard
Dr M. Truter	Invasions and freshwater ecology	Prof. A. Chakona
Dr K-A. van der Walt	Larval ecology	Prof. F. Porri
Dr F. Zarei	Systematics and taxonomy	Prof. A. Chakona



HONORARY RESEARCH ASSOCIATES

Name	Status
Prof. E. Abwe, PhD (KU Leuven University)	Honorary Research Associate
Dr E. Anderson, PhD (College of William & Mary)	Curator Emeritus
Dr R. Bennett, PhD (Rhodes University)	Honorary Research Associate
Mr S. Bogorodskiy, Diploma in Engineering (Polytechnic University, Omsk)	Honorary Research Associate
Dr G. Bradley, PhD (University of Port Elizabeth)	Honorary Research Associate
Dr M. Bruton, PhD (Rhodes University)	Honorary Research Associate
Dr R. Chalmers, PhD (Rhodes University)	Honorary Research Associate
Prof. A. Channing, PhD (Natal University)	Honorary Research Associate
Prof. A-R. Childs, PhD (Rhodes University)	Honorary Research Associate
Mr W. Conradie, MSc (North-West University)	Honorary Research Associate
Dr R. Cuthbert, PhD (Queen's University of Belfast/University of Reading)	Honorary Research Associate
Dr T. Dalu, PhD (Rhodes University)	Honorary Research Associate
Dr R. Daly, PhD (Rhodes University)	Honorary Research Associate
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Dr T. Dlaza, PhD (University of Cape Town)	Honorary Research Associate
Prof. R. Dorrington PhD (University of Cape Town)	Honorary Research Associate
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Dr B. Ellender, PhD (Rhodes University)	Honorary Research Associate
Dr C. Elston, PhD (Rhodes University)	Honorary Research Associate
Dr J. Filmatter, PhD (Rhodes University)	Honorary Research Associate
Dr E. Gennari, PhD (Rhodes University)	Honorary Research Associate
Dr J. Glass, PhD (Yale University)	Honorary Research Associate
Mr O. Gon, MSc (University of Jerusalem)	Curator Emeritus
Dr G. Gouws, PhD (University of Stellenbosch)	Honorary Research Associate
Prof. A. Green, PhD (University of KwaZulu-Natal)	Honorary Research Associate
Mrs E. Heemstra, Dip. Ed. (University of Rhodesia)	Honorary Research Associate
Prof. E. Henschel de Lima Costa, PhD (Federal University of Viçosa)	Honorary Research Associate
Dr E. Heyns-Veale, PhD (Rhodes University)	Honorary Research Associate
Dr A. Hlungwani, PhD (University of Limpopo)	Honorary Research Associate
Mr W. Holleman, MSc (Rhodes University)	Honorary Research Associate
Dr F. Jacobs, PhD (University of KwaZulu-Natal)	Honorary Research Associate
Dr M. Jordaan, PhD (Stellenbosch University)	Honorary Research Associate
Dr W. Kadye, PhD (Rhodes University)	Honorary Research Associate
Dr C. Keates, PhD (Rhodes University)	Honorary Research Associate
Dr D. Khosa, PhD (Rhodes University)	Honorary Research Associate
Dr A. Kock, PhD (University of Cape Town)	Honorary Research Associate
Dr M. Lipinski, DSc (University of Lodz)	Honorary Research Associate
Prof. T. Makhalanyane, PhD (University of the Western Cape)	Honorary Research Associate
Dr N. Mandrak, PhD (University of Toronto)	Honorary Research Associate
Dr S. Marr, PhD (University of Cape Town)	Honorary Research Associate
Dr M. Martin, PhD (Australian Maritime College/University of Tasmania)	Honorary Research Associate
Dr N. Masikane, PhD (University of KwaZulu-Natal)	Honorary Research Associate
Prof. P. McIntyre, PhD (Cornell University)	Honorary Research Associate
Dr T. Miya, PhD (Rhodes University)	Honorary Research Associate
Dr M. Mlambo, PhD (University of Oulu)	Honorary Research Associate
Dr S. Motitsoe, PhD (Rhodes University)	Honorary Research Associate
Mr V. Mthombeni, MSc (Rhodes University), MBA (Rhodes University)	Honorary Research Associate
Dr T. Næsje, DSc (University of Trondheim)	Honorary Research Associate



Dr T. Naidoo, PhD (University of KwaZulu-Natal)	Honorary Research Associate
Dr F. Ottoni, PhD (Universidade Federal do Rio de Janeiro)	Honorary Research Associate
Dr S. Parker-Nance, PhD (Nelson Mandela University)	Honorary Research Associate
Dr J. Pegg, PhD (Bournemouth University)	Honorary Research Associate
Dr W. Potts, PhD (Rhodes University)	Honorary Research Associate
Dr P. Psomadakis, PhD (Polytechnic University of Marche)	Honorary Research Associate
Dr E. Puccinelli, PhD (Rhodes University)	Honorary Research Associate
Dr A. Rajkaran, PhD (Nelson Mandela Metropolitan University)	Honorary Research Associate
Dr M. Ramoejane, PhD (Rhodes University)	Honorary Research Associate
Dr T. Rogers, PhD (University of Cape Town)	Honorary Research Associate
Dr G. Rishworth, PhD (Nelson Mandela University)	Honorary Research Associate
Dr B. Russell, PhD (Macquarie University)	Honorary Research Associate
Dr U. Schliewen, PhD (Ludwigs-Maximilians-University)	Honorary Research Associate
Prof. R. Schmidt, PhD (Tulane University)	Honorary Research Associate
Dr J. Shelton, PhD (University of Cape Town)	Honorary Research Associate
Prof. P. Skelton, PhD (Rhodes University)	Managing Director Emeritus
Dr N. Smit, PhD (University of the Free State)	Honorary Research Associate
Dr J. South, PhD (Queens University Belfast)	Honorary Research Associate
Dr J. Stauffer, PhD (Blackburg State University)	Honorary Research Associate
Dr M. Tagliarolo, PhD (Université de Bretagne Occidentale)	Honorary Research Associate
Dr J. Taylor, PhD (North-West University)	Honorary Research Associate
Mr D. Tweddle, BSc (University of Wales)	Honorary Research Associate
Dr F. Uiblein, PhD (University of Vienna)	Honorary Research Associate
Dr S. Viana, PhD (University of São Paulo)	Honorary Research Associate
Dr N. Vine, PhD (Rhodes University)	Honorary Research Associate
Dr L. Vorsatz, PhD (Rhodes University)	Honorary Research Associate
Dr E. Vreven, PhD (KU Leuven)	Honorary Research Associate
Dr R. Wasserman, PhD (Rhodes University)	Honorary Research Associate
Prof. A. Whitfield, PhD (University of Natal), DSc (Rhodes University)	Chief Scientist Emeritus
Dr E. Wiles, PhD (University of KwaZulu-Natal)	Honorary Research Associate
Prof. L. Woodall, PhD (University of London)	Honorary Research Associate
Dr D. Woodford, PhD (University of Canterbury)	Honorary Research Associate

NRF-SAIAB SUPERVISED STUDENTS GRADUATED – 2025

Name	Degree	Higher Education Institution	Institute Supervisor/Co-supervisor
Mr T. Botha	MSc	North West University	Prof. L. du Preez
Ms S. Janse van Rensburg	MSc	North West University	Dr L. de Necker
Mr F. Khaebab	MSc	Rhodes University	Dr J. Pegg
Ms T. Masalesa	MSc	Rhodes University	Prof. J. Coetzee
Mr S. Zaza	MSc	Rhodes University	Prof. M. Atemkeng, Dr T. Murray
Mr W. Kipandula	PhD	Rhodes University	Prof. R. Dorrington, Dr G. Matcher
Mr M. Kajee	PhD	University of Cape Town	Dr J. Pegg

ABBREVIATIONS, ACRONYMS AND DEFINITIONS

1KSA	1000 South African Genomes	FAO	Food and Agriculture Organization of the United Nations
ACEP	African Coelacanth Ecosystem Programme	FBIP	Foundational Biodiversity Information Programme
Acoustic receiver	A piece of equipment that is placed into a water body that then records the sound signals released from an acoustic transmitter that has been placed either onto or into an animal. The receiver, on hearing the sound signal emitted by the acoustic transmitters, records the date, time and unique ID code of the transmitters.	FTIR	Fourier Transform Infrared Spectroscopy
Acoustic transmitter	A small tag placed either into (internally tagged) or onto (externally tagged) an animal, which then emits a sound signal that is recorded by acoustic receivers	GBIF	Global Biodiversity Information Facility
AERP	Aquatic Ecophysiology Research Platform	GBIF	Global Biodiversity Information Facility
AES	Aquatic Ecosystem Services	GoL	Government of Liberia
AI	Artificial Intelligence	GVI	Global Vision International
ARC	Agricultural Research Council	HDI	Historically Disadvantaged Institution
ATAP	Acoustic Tracking Array Platform	HRA	Honorary Research Associate
BBSA	Biodiversity Biobank South Africa	HSRC	Human Sciences research Council
BERI	Blue Economy Research Institute (University of Seychelles)	ICP-OES	Inductively Coupled Plasma – Optical Emission Spectrometry
BIOGRIP	Biogeochemistry Research Infrastructure Platform	IUCN	International Union for Conservation of Nature
BOLD	Barcode of Life Data Systems	JML	Joint Marine Laboratory
BRUVs	Baited Remote Underwater Video System	JMLP	Joint Marine Laboratories Programme
CAS	Catch Assessment Survey	KT	Keiskamma Trust
CBA	Critical Biodiversity Areas	MACCE	Ministry of Agriculture, Climate Change and Environment (Seychelles)
CBC	Centre for Biological Control	MaRIP	Marine Remote Imagery Platform
CORDIO	Coastal Oceans Research and Development - Indian Ocean	MBES	Multibeam Echosounder
COST	Coastal and Ocean Science Team	MCR	Microplastics and Coastal Research
CU	Cork University	MMF	Marine Megafauna Foundation
DEDEAT	Eastern Cape Department of Economic Development, Environmental Affairs and Tourism	MOAs	Memoranda of Agreement
DFFE	Department of Forestry, Fisheries and the Environment	MP	Microplastic
DFG	German Research Foundation (Deutsche Forschungsgemeinschaft)	MPA	Marine Protected Area
DNA	Deoxyribonucleic acid	MW	Magalies Water
DOV	Diver Operated Video	NaFAA	Liberia National Fisheries & Aquaculture Authority
DSTI	Department of Science, Technology and Innovation	NBA	National Biodiversity Assessment
DTU Aqua	National Institute of Aquatic Resources, Technical University of Denmark	NBSAP	National Biodiversity Strategic Action Plan
DUC	Durban Undersea Club	NCF	National Collection Facility
EAF	Ecosystem Approach to Fisheries	NIOZ	Royal Netherlands Institute for Sea Research
EAGR	Enabling Access to Genomics Research	NMU	Nelson Mandela University
ECPTA	Eastern Cape Parks and Tourism Agency	NRF	National Research Foundation
eDNA	environmental DNA	NRF-FBIP	National Research Foundation – Foundational Biodiversity Information Program
EMFIS	Ecology and Management of Freshwater Invasive Species	NRIP	National Research Infrastructure Platforms
FAIR	Findable, Accessible, Interoperable, Reusable	NSCF	Natural Science Collections Facility
		NSI	National System of Innovation
		ONT	Oxford Nanopore Technologies
		ORI	Oceans Research Institute
		PI	Principal Investigator
		PU	Plymouth University
		REEF	Reef Environmental Education Foundation
		RIPP	NRF Research Infrastructure Professionals Programme
		RLS	Reef Life Survey
		ROV	Remotely Operated Vehicle

ABBREVIATIONS, ACRONYMS AND DEFINITIONS cont.

RU DIFS	Rhodes University Department of Ichthyology and Fisheries Science	SSLiME	Supratidal Spring-fed Living Microbialite Ecosystems
RU	Rhodes University	STS	Sea Technology Services
RW	Rand Water	SU	Stellenbosch University
SAAMBR	South African Association for Marine Biological Research	TEK	Traditional Ecological Knowledge
SAEON	South African Environmental Observation Network	TIA	Technology Innovation Agency
SAFER Lab	Southern African Fisheries Ecology Research Laboratory	TOA	Two Oceans Aquarium
SAIAB	South African Institute for Aquatic Biodiversity	TOC/TN	Total Oxygen and Carbon/Total Nitrogen
SAMSS	Southern African Marine Science Symposium	UCT	University of Cape Town
SANBI	South African National Biodiversity Institute	UFH	University of Fort Hare
SANParks	South African National Parks	UJ	University of Johannesburg
SAPRI	South African Polar Research Infrastructure	UNIZULU	University of Zululand
SASaQS	South African Society of Aquatic Scientists	UP	University of Pretoria
SASC	South African Shark Conservancy	UTSC	University of Toronto Scarborough
SCUBA	Self-Contained Underwater Breathing Apparatus	UVC	Underwater Visual Census
SDG	Sustainable Development Goal	UWC	University of the Western Cape
SLU	Swedish Agricultural University (Sveriges Lantbruksuniversitet)	WCS	Wildlife Conservation Society
SNP	Single Nucleotide Polymorphisms	WIO	Western Indian Ocean
SPGA	Seychelles Parks and Gardens Authority	WIOMSA	Western Indian Ocean Marine Science Association
		WRC	Water Research Commission
		WSU	Walter Sisulu University





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