



science, technology
& innovation

Department:
Science, Technology and Innovation
REPUBLIC OF SOUTH AFRICA



SAIAB
South African Institute
for Aquatic Biodiversity

NRF-SAIAB RESEARCH PLATFORMS



RESEARCH INFRASTRUCTURE IN SUPPORT OF SOUTH AFRICA'S BLUE ECONOMY

From rivers and estuaries to coastal waters and deep-sea ecosystems, the National Research Foundation–South African Institute for Aquatic Biodiversity (NRF-SAIAB) is South Africa's leading aquatic biodiversity research institute. It delivers the scientific knowledge needed for the sustainable use and protection of aquatic resources. Through specialised research platforms, national infrastructure and strategic partnerships, NRF-SAIAB provides the evidence base for fisheries management, biodiversity conservation, climate adaptation, aquaculture development and marine spatial planning. By linking science with policy and implementation, the Institute strengthens South Africa's capacity to build a resilient, inclusive and globally competitive Blue Economy.

AFRICAN COELACANTH ECOSYSTEM PROGRAMME (ACEP) MARINE PLATFORM

Funded by the Department of Science, Technology and Innovation (DSTI), the African Coelacanth Ecosystem Programme (ACEP) has established a world-class marine research platform comprising state-of-the-art scientific infrastructure and equipment. Through a competitive open-call process, re-advertised every three years, ACEP facilitates access to this infrastructure for researchers and institutions across South Africa.

The ACEP provides access to advanced research infrastructure that is typically beyond the reach

of individual projects or institutions. The platform is managed and operated by a dedicated team of technicians and instrument scientists at NRF-SAIAB, who provide technical, training and academic support across their areas of expertise. Designed to strengthen marine and coastal research capacity in South Africa, the platform supports collaborative, multidisciplinary research and enables scientists to undertake innovative studies in marine ecosystems, biodiversity, ocean mapping and ecological monitoring.

The platform currently comprises the following research infrastructure:

- **Coastal Craft Platform**
Three 13–15 m coastal research vessels: R/V Observer, uKwabelana and Phakisa
- **Marine Remote Imagery Platform**
Seaeye Falcon Remotely Operated Vehicle (ROV), Stereo Baited Remote Video Systems (stereo-BRUVS), and deep-water landers
- **Geophysics Mapping Platform**
Multibeam echo sounder system and dedicated survey vessel
- **Acoustic Tracking Array Platform**
National marine telemetry network



COASTAL CRAFT PLATFORM

The Coastal Craft Platform is a nationally accessible fleet of three 13–15 m research vessels — R/V Observer, uKwabelana and Phakisa — that provides the seagoing capability underpinning offshore and coastal research across South Africa. Based in Gqeberha and Durban, the fleet is fundamental to ACEP's science programme and supports the broader national marine research infrastructure, including SMCRI and SAPRI. In 2025/26 the vessels recorded 88 days at sea, covered 4 451 nautical miles and supported 14 projects and 136 users — from ACEP Open Call fisheries and biodiversity research to deep-sea lander trials, seafloor mapping and long-term ecosystem monitoring.

Socio-economic implications

- Enables fisheries, biodiversity and ecosystem research supporting food security and the Blue Economy
- Underpins MPA monitoring, marine spatial planning and evidence-based ocean governance
- Provides shared national seagoing capacity beyond the reach of individual institutions

Users

- ACEP Open Call projects (four of five supported in 2025/26)
- National research infrastructure programmes (SMCRI, SAPRI) and the DSTI Science Mission Contract
- Government departments (DFFE), universities (NMU, University of Exeter) and international partners (National Geographic Society Pristine Seas)
- 136 users across 14 projects in 2025/26

Functionality

- Three 13–15 m coastal research vessels based in Gqeberha and Durban
- Deployment of

deep-sea landers, ROVs, moorings and stereo-BRUV systems

- Sonar, biodiversity, vibracoring and sediment-sampling surveys
- Platform for Algoa Bay and Durban Sentinel Site long-term monitoring

Capacity development

- Sea-going training and practical experience for postgraduate and early-career researchers
- Vessel and equipment operations training exercises
- Support for experiential learning and outreach, including the ACEP Summer School

Future direction

- Major refurbishment of Phakisa and Observer, and re-engining of uKwabelana
- Fleet recapitalisation to address ageing vessels and equipment
 - Strengthened Durban-based operations for east-coast and SWIO research
 - Continued support for ACEP Open Call, lander surveys and SMCRI Sentinel Site monitoring



GEOFYSICS AND MAPPING PLATFORM (GEMAP)

GeMaP uses hydroacoustic surveys to map South Africa's seabed and freshwater habitats at depths ranging from -1 to over -850+ meters. The platform generates high-resolution spatial data that supports biodiversity monitoring, marine spatial planning, and global ocean mapping initiatives, including contributions to Seabed 2030. GeMaP also supports partners such as NRF-SAEON, Wildtrust, UniZulu, AEON, and international missions including the 2025 NEKTON First Descent Mission in the Comoros.

Socio-economic implications

- Provides foundational data for the Blue Economy
- Supports sustainable development of fisheries, offshore energy, and marine mining
- Contributes to coastal risk management, including erosion monitoring and mitigation

Users

- Seven core partner institutions, with a growing network of collaborators across science and conservation sectors

Functionality

- Multibeam echosounder and advanced navigation systems
- High-resolution 3D seabed and habitat mapping
- Hydroacoustic data supporting marine and freshwater spatial analysis

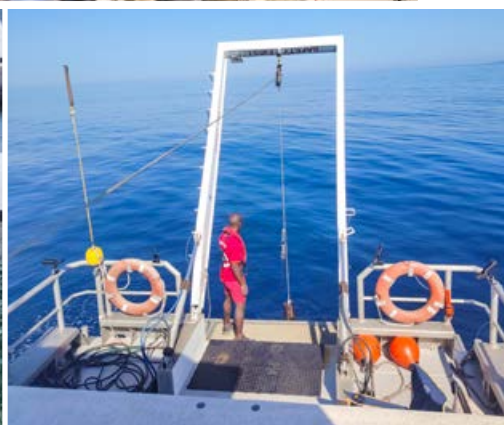
Capacity development

- Contributes to growth of an under-resourced geophysics and marine mapping discipline

- Training and skills development in hydroacoustic survey and spatial analysis

Future direction

- Expansion of depth survey capabilities
- Development of sub-surface profiling capacity
- Integration of side-scan sonar technology for enhanced habitat mapping



ACOUSTIC TRACKING ARRAY PLATFORM (ATAP)

The ATAP is South Africa's national acoustic receiver network, generating long-term movement data of selected species across more than 2300 km of coastline. Since 2011, this collaborative network has produced over 30 million data records for more than 60 marine and estuarine species, including fish, sharks, rays and turtles – among them Critically Endangered species. The data support evidence-based management of marine ecosystems and ocean resources.

Socio-economic implications

- Supports sustainable fisheries and food security
- Improves marine resource management and development
- Informs marine spatial planning and conservation decisions

Users

- Around 60 researchers and students from universities, research

institutes and NGOs globally

Functionality

- Africa's largest acoustic receiver array.
- 285+ sub-surface acoustic receivers along 2,300 km of coastline
- National database linked to the global Ocean Tracking Network
- Long-term tracking of animal movement and water temperature

Capacity development

- Postgraduate and early career researcher training and support; skills transfer through data processing workshops

Future direction

- Expansion along South Africa's west coast
- Strengthening collaboration in the Western Indian Ocean, including Mozambique
- Integration with the NRF-South African Environmental Observation Network (NRF-SAEON) coastal temperature array



Photo credit: Ryan Daly

MARINE REMOTE IMAGERY PLATFORM (MARIP)

MaRIP uses advanced underwater camera systems to document marine biodiversity and habitats, supporting monitoring, fisheries assessments and conservation across South Africa's oceans. The platform has supported 96 researchers and 30+ postgraduate students from 18 countries, generating more than 50 000+ biodiversity records across approximately 600 species. In 2025, MaRIP conducted one of South Africa's deepest benthic surveys (to 2 350 meters) and contributed to the NEKTON First Descent Mission in the Comoros, strengthening regional and international marine research capacity.

Socio-economic implications

- Provides critical, verifiable data for the Blue Economy
- Supports sustainable development of fisheries, offshore energy, marine mining and transport sectors
- Strengthens evidence-based ocean governance and conservation planning

Users

- Over 96 researchers from national and international organisations, and 30+

postgraduate students from 18 countries

Functionality

- Africa's largest underwater visual observation platform
- Remotely operated vehicles (ROVs)
- Baited remote underwater stereo-video systems (stereo-BRUVS)
- Drop cameras and diver-operated imaging systems
- Stereo-video lander systems
- Data management for Western Indian Ocean imagery datasets
- Development and innovation of new visual survey technologies
- Access to deep-sea and previously unexplored ecosystems

Future direction

- Expansion of deep-sea imaging capabilities
- Application of artificial intelligence for video and image analysis
- Strengthening regional leadership and collaborative research networks



AQUATIC ECOPHYSIOLOGY RESEARCH PLATFORM (AERP)

AERP investigates how aquatic organisms respond to environmental stressors such as climate change, oxygen limitation and pollution. Through experimental and field-based research, the platform identifies resilience thresholds in key species, informing climate adaptation strategies, conservation planning and sustainable resource management.

Socio-economic implications

- Assesses impacts of climate and environmental change on aquatic organisms
- Informs sustainable management of marine and freshwater resources
- Supports evidence-based conservation and adaptation planning

Users

- NRF-SAIAB, South African universities (Rhodes University, University of the Witwatersrand, University of Fort Hare, University of Mpumalanga), government departments (DFFE, SANParks), museums and international partners (e.g. University of Leeds)

Functionality

- Controlled-environment housing for fish and invertebrates (all life stages)
- High- and low-volume respirometry for metabolic and physiological studies
- Water quality monitoring (temperature, pH, salinity)

Capacity development

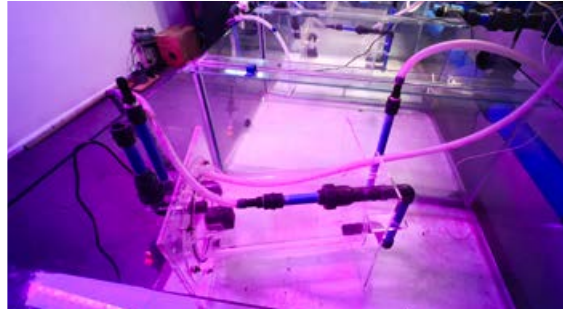
- Postgraduate and postdoctoral

research training

- Skills transfer through hands-on equipment use and data analysis training

Future direction

- Linkage with the DSTI/NRF-SAIAB Joint Marine Laboratory at the University of Fort Hare
- Facility upgrades to expand user access and platform integration
- Development of global-standard protocols for climate change and ocean acidification research
- Expansion into bioeconomy, food security, and energy security applications



AQUATIC GENOMICS RESEARCH PLATFORM (AGRP)

AGRP uses DNA barcoding, environmental DNA (eDNA) and genomic sequencing to support biodiversity monitoring, fisheries science and aquatic ecosystem research. It plays a key role in conservation, aquaculture, biosecurity and Blue Economy innovation.

Socio-economic implications

- Supports discovery of bioactive marine compounds with potential health applications
- Strengthens sustainable fisheries and aquaculture development
- Enhances biodiversity monitoring and evidence-based conservation
- Builds national capacity through training and equitable access to genomics infrastructure
- Contributes to food security and ecosystem resilience

Users

- Universities, museums and research organisations across Africa
- Over 100 users annually, including universities, colleges, government bodies and NGOs

Functionality

- DNA extraction, PCR/qPCR, and barcoding
- Environmental DNA (eDNA) analysis

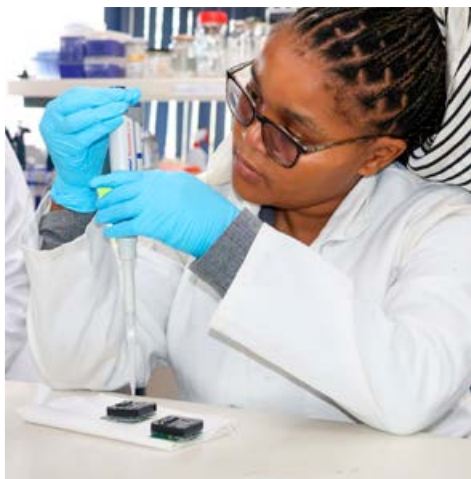
- Sanger and next-generation sequencing (Illumina and Oxford Nanopore Sequencing)
- Bioinformatics and genomic data analysis

Capacity development

- Training workshops in molecular biology and bioinformatics
- Postgraduate and early-career researcher support
- Hands-on genomics laboratory assistance and up-skilling
- School and outreach engagement

Future direction

- Expansion of bioinformatics and sequencing capacity
- Strengthening national genomics and eDNA research hub status
- Enhanced collaboration with national and international partners
- Expansion of applied research in fisheries, aquaculture and biodiversity monitoring



NATIONAL COLLECTIONS FACILITY

The National Collections Facility preserves Africa's aquatic biodiversity through curated voucher specimens of fish, frogs, diatoms, snails and cephalopods. Integrated with the National Aquatic Biodiversity Biobank, it also maintains linked tissue and DNA samples, extending the value of collections into the genomic era and supporting long-term biodiversity research and conservation.

Socio-economic implications

- Contributes to IUCN Red List assessments and biodiversity status reporting
- Supports environmental impact assessments, water use licensing and biodiversity management
- Strengthens biosecurity and invasive species management

- Internship programmes (including DSTI, Groen Sebenza and WWF-SA)

Future direction

- Expansion into advanced imaging and CT scanning capabilities
- Continued modernisation of collections and digital access systems

Users

- Global taxonomic research community
- Universities, NGOs and private consultants
- Functionality
- Major reference collection for sub-Saharan freshwater and marine taxa
- Curated and fully databased collections management system
- Access through specimen loans and visitor facilities

Capacity development

- Postgraduate research and training
- Development of future collections scientists and curators



SARCHI CHAIR: BIOLOGICAL CONTROL & FRESHWATER ALIEN INVASIVE SPECIES MANAGEMENT

The SARCHI Chair focuses on developing sustainable biological control solutions to manage invasive freshwater species, including aquatic weeds. Through research and the large-scale release of effective control agents, the programme is reducing invasive plant infestations in dams and rivers, improving ecosystem health, water security and infrastructure resilience.

Socio-economic implications

- Improves water security and reliability of freshwater systems
- Reduces economic costs of invasive species management
- Supports ecosystem restoration and biodiversity conservation
- Enhances resilience of dams, rivers and water infrastructure

Users

- Water resource and environmental management agencies
- National and provincial government departments
- Conservation organisations and research institutions
- Stakeholders involved in invasive species control and freshwater management

Functionality

- Development and testing of biological control agents for invasive aquatic plants
- Field-based release and monitoring of control organisms

- Assessment of ecological impacts and recovery of freshwater systems
- Long-term invasive species management and evaluation

Capacity development

- Training of postgraduate students and researchers in invasion biology and biocontrol
- Knowledge transfer through applied research and field programmes
- Strengthening national expertise in freshwater invasive species management

Future direction

- Expansion of biological control programmes for emerging invasive species
- Improved monitoring and evaluation of ecosystem recovery outcomes
- Strengthening national and regional collaboration on invasive species management
- Enhancing sustainable, long-term solutions for freshwater ecosystem resilience



COASTAL AND OCEAN SCIENCES TEAM (COST)

COST focuses on improving the design and management of urban and heavily modified coastlines by combining ecological engineering, Indigenous Knowledge Systems, and community partnerships. The team develops solutions integrated into coastal infrastructure to restore ecosystem function, enhance biodiversity, and increase resilience of degraded marine environments through eco-engineered designs that promote marine life. The work also investigates mussel beds as potential blue carbon habitats, examining their role in carbon storage alongside their importance as key biodiversity-supporting foundation species.

Socio-economic implications

- Improves coastal water quality and reduces contamination risks
- Supports biodiversity recovery in urban and modified coastal systems
- Contributes to sustainable livelihoods and climate-resilient coastal development

Users

- Municipal and national government partners
- Environmental management and planning agencies
- Academic and community-based research collaborators

Functionality

- Ecological engineering of coastal and urban marine environments
- Integration of Indigenous and local knowledge systems
- Design and testing of nature-based and hybrid infrastructure solutions
- Monitoring of ecosystem response and recovery

Capacity development

- Training and collaboration with students, researchers and practitioners
- Skills development in ecological engineering and applied coastal science

Future direction

- Expansion of eco-engineered coastal solutions in urban environments
- Strengthening integration of Indigenous knowledge in coastal design
- Scaling climate-resilient infrastructure approaches across South African coastlines



FRESHWATER FIELD UNIT

The Freshwater Field Unit conducts biodiversity assessments and field-based monitoring across South Africa's inland water systems. Its work supports conservation planning, fisheries policy, aquaculture development and sustainable water resource management. Through national and regional partnerships, the Unit generates critical data on inland fisheries potential, invasive species distribution and freshwater biodiversity, contributing to food security and rural livelihoods.

Socio-economic implications

- Supports rural livelihoods and food security through inland fisheries research
- Provides legislated biodiversity data for sustainable development planning
- Enhances understanding of freshwater biodiversity and ecosystem health

Users

- South African universities, government departments and specialist research centres

- International and SADC fisheries research institutes and museums

Functionality

- Field sampling from headwater streams to large rivers and reservoirs
- Electrofishing equipment (backpack and boat-based systems)
- Underwater video and water quality monitoring systems
- Specialised 4x4 vehicles and boats for inland water research

Capacity development

- Student training and postgraduate research support
- Postdoctoral fellowships and skills development in freshwater ecology

Future direction

- Continued generation of data to support sustainable development, food security and livelihoods
- Strengthening inland fisheries research and biodiversity monitoring capacity



Photo credit: Jeremy Shelton



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SEASCAPE ECOLOGY RESEARCH GROUP

The Seascape Ecology Research Group investigates how fish and other marine organisms interact with their habitats, and how climate change and human pressures shape coastal and estuarine ecosystems. By identifying critical nursery areas and climate-refuge habitats, the group provides key insights that inform fisheries management and national biodiversity planning. Its work strengthens the link between science and policy to support ecosystem resilience and sustainable marine resource use.

Socio-economic implications

- Supports sustainable fisheries management and coastal resource use
- Informs biodiversity planning and marine spatial decision-making
- Contributes to climate adaptation strategies for coastal communities

Users

- National and international researchers and collaborating institutions
- Government departments and conservation agencies
- Academic and policy partners involved in marine spatial planning

Functionality

- Field-based coastal and estuarine ecosystem monitoring

- Habitat mapping and ecological data analysis
- Research on fish-habitat interactions and environmental drivers
- Identification of nursery grounds and climate-refuge areas

Capacity development

- Training of postgraduate students and early-career researchers
- Integration of ecological science with policy-relevant skills development

Future direction

- Strengthening links between seascape ecology, climate adaptation and fisheries management
- Expanding research on ecosystem resilience under changing environmental conditions



MARGARET SMITH LIBRARY

The Margaret Smith (MS) Library is a specialised academic library dedicated to fish and aquatic biodiversity literature. As part of the Biodiversity Heritage Library (BHL), the Library contributes to a global initiative that digitises and freely shares biodiversity books and journals online. To date, the Library has contributed 12 titles to the BHL platform.

The Library works closely with Rhodes University Library and supports students and researchers from the Department of Ichthyology and Fisheries Science through access to specialised collections and academic databases.

Socio-economic implications

- Provides access to essential aquatic biodiversity knowledge and research resources
- Supports education, scientific research and biodiversity conservation
- Contributes to global open-access knowledge sharing initiatives

Users

- Scientists, students and visiting researchers
- Department of Ichthyology and Fisheries Science at Rhodes University
- International aquatic science library networks and collaborators

Functionality

- Specialised collections focused on fish and aquatic biodiversity
- Access to academic databases through Rhodes University Library partnership
- Participation in the Biodiversity Heritage Library (BHL)
- Global information sharing

through IAMSILIC networks

Capacity development

- Supports student learning and academic research
- Provides access to specialised scientific literature and information resources

Future direction

- Expansion of digital collections and open-access resources
- Continued collaboration with national and international library networks



CLOSING STATEMENT

Through integrated science platforms, national research infrastructure and strategic partnerships, NRF-SAIAB provides the knowledge systems that enable sustainable growth across South Africa's aquatic environments.

By aligning biodiversity protection with economic opportunity, NRF-SAIAB advances a Blue Economy built on resilience, innovation and evidence-based stewardship.

**NRF-SAIAB – Providing Research Infrastructure
in Support of South Africa's Blue Economy.**



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