SANBI
Biodiversity for Life
South African National Biodiversity Institute

National Biodiversity Assessment 2018

TECHNICAL REPORT EXECUTIVE SUMMARY

Volume 4:

Marine

CITATION FOR THIS REPORT:

Sink KJ, van der Bank MG, Majiedt PA, Harris LR, Atkinson LJ, Kirkman SP, Karenyi N (eds). 2019. *South African National Biodiversity Assessment 2018 Technical Report Volume 4: Marine Realm*. South African National Biodiversity Institute, Pretoria. South Africa. http://hdl.handle.net/20.500.12143/6372

Many people have contributed their expert knowledge to particular chapters or boxes in this report. We encourage you to **cite the specific chapters** rather than the full report, where relevant.

CHAPTER CITATIONS:

Chapter 1: Sink KJ, Skowno AL, Green A, Landschoff J, Lamont T, and Franken M. 2019. Chapter 1: Introduction and Approach. In: Sink KJ, van der Bank MG, Majiedt PA, Harris LR, Atkinson LJ, Kirkman SP, Karenyi N (eds). 2019. *South African National Biodiversity Assessment 2018 Technical Report Volume 4: Marine Realm*. South African National Biodiversity Institute, Pretoria. South Africa. http://hdl.handle.net/20.500.12143/6372

Chapter 2: van der Bank MG, Poole CJ, Sink KJ, Perschke M, Franken M, Rylands S, Miza SA, Majiedt PA, Sibanda SM, Harris LR, Whitehead TO, Dunga LV, Adams R. 2019. Chapter 2: Benefits of Biodiversity in the Marine Realm. In: Sink KJ, van der Bank MG, Majiedt PA, Harris LR, Atkinson LJ, Kirkman SP, Karenyi N (eds). 2019. *South African National Biodiversity Assessment 2018 Technical Report Volume 4: Marine Realm*. South African National Biodiversity Institute, Pretoria. South Africa. http://hdl.handle.net/20.500.12143/6372

Chapter 3: Sink KJ, Harris LR, Skowno AL, Livingstone T, Franken M, Porter S, Atkinson LJ, Bernard A, Cawthra H, Currie J, Dayaram A, de Wet W, Dunga LV, Filander Z, Green A, Herbert D, Karenyi N, Palmer R, Pfaff M, Makwela M, Mackay F, van Niekerk L, van Zyl W, Bessinger M, Holness S, Kirkman SP, Lamberth S, Lück-Vogel M. 2019. Chapter 3: Marine Ecosystem Classification and Mapping. In: Sink KJ, van der Bank MG, Majiedt PA, Harris LR, Atkinson LJ, Kirkman SP, Karenyi N (eds). 2019. *South African National Biodiversity Assessment 2018 Technical Report Volume 4: Marine Realm*. South African National Biodiversity Institute, Pretoria. South Africa. http://hdl.handle.net/20.500.12143/6372

Chapter 4: Majiedt PA, Holness S, Sink KJ, Reed J, Franken M, van der Bank MG, Harris LR, Adams L, Perschke M, Miza SA, Currie J, Dunga LV. 2019. Chapter 4: Pressures on Marine Biodiversity. In: Sink KJ, van der Bank MG, Majiedt PA, Harris LR, Atkinson LJ, Kirkman SP, Karenyi N (eds). 2019. *South African National Biodiversity Assessment 2018 Technical Report Volume 4: Marine Realm*. South African National Biodiversity Institute, Pretoria. South Africa. http://hdl.handle.net/20.500.12143/6372

Chapter 5: Miza SA, Robinson TB, Peters K, Majiedt PA, Jackson L, Hampton SL, Sink KJ. 2019. Chapter 5: Alien and Invasive Species. In: Sink KJ, van der Bank MG, Majiedt PA, Harris LR, Atkinson LJ, Kirkman SP, Karenyi N (eds). 2019. *South African National Biodiversity Assessment 2018 Technical Report Volume 4: Marine Realm*. South African National Biodiversity Institute, Pretoria. South Africa. http://hdl.handle.net/20.500.12143/6372

Chapter 6: Kelly C, Foden W, Midgley G, Porter S, Lamberth S, van der Lingen C, Atkinson LJ, Robinson J. 2019. Chapter 6: Climate Change. In: Sink KJ, van der Bank MG, Majiedt PA, Harris LR, Atkinson LJ, Kirkman SP, Karenyi N (eds). 2019. *South African National Biodiversity Assessment 2018 Technical Report Volume 4: Marine Realm*. South African National Biodiversity Institute, Pretoria. South Africa. http://hdl.handle.net/20.500.12143/6372

Chapter 7: Sink KJ, Holness S, Skowno AL, Franken M, Majiedt PA, Atkinson LJ, Bernard A, Dunga LV, Harris LR, Kirkman SP, Oosthuizen A, Porter S, Smit K, Shannon L. 2019. Chapter 7: Ecosystem Threat Status. In: Sink KJ, van der Bank MG, Majiedt PA, Harris LR, Atkinson LJ, Kirkman SP, Karenyi N (eds). 2019. *South African National Biodiversity Assessment 2018 Technical Report Volume 4: Marine Realm*. South African National Biodiversity Institute, Pretoria. South Africa. http://hdl.handle.net/20.500.12143/6372

Chapter 8: Sink KJ, Sibanda SM, Fielding P, Skowno AL, Franken M, Harris LR, Adams R, Baleta T. 2019. Chapter 8: Ecosystem Protection Level. In: Sink KJ, van der Bank MG, Majiedt PA, Harris LR, Atkinson LJ, Kirkman SP,

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Chapter 9: van der Bank MG, Adams R, Raimondo DC, Sink KJ, van der Colff D, Makhado A, Kock A, Porter S, Seakamela SM, Louw S, Mann BQ, Bürgener M. 2019. Chapter 9: The State of Indigenous Species. In: Sink KJ, van der Bank MG, Majiedt PA, Harris LR, Atkinson LJ, Kirkman SP, Karenyi N (eds). 2019. *South African National Biodiversity Assessment 2018 Technical Report Volume 4: Marine Realm*. South African National Biodiversity Institute, Pretoria. South Africa. http://hdl.handle.net/20.500.12143/6372

Chapter 10: da Silva J, van Vuuren B. 2019. Chapter 10: The genetic perspective on marine biodiversity. In: Sink KJ, van der Bank MG, Majiedt PA, Harris LR, Atkinson LJ, Kirkman SP, Karenyi N (eds). 2019. *South African National Biodiversity Assessment 2018 Technical Report Volume 4: Marine Realm*. South African National Biodiversity Institute, Pretoria. South Africa. http://hdl.handle.net/20.500.12143/6372

Chapter 11: Sink KJ, Harris LR, van der Bank MG, Franken M, Skowno A, Driver A, Atkinson LJ, Fairweather TP, Kerwath S, Majiedt PA, Robinson T, Pfaff M, Rikhotso W, Smith C. and van Niekerk L. 2019. Chapter 11: Key findings, priority actions and knowledge gaps. In: Sink KJ, van der Bank MG, Majiedt PA, Harris LR, Atkinson LJ, Kirkman SP, Karenyi N (eds). 2019. *South African National Biodiversity Assessment 2018 Technical Report Volume 4: Marine Realm*. South African National Biodiversity Institute, Pretoria. South Africa. http://hdl.handle.net/20.500.12143/6372

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This report forms part of a set of reports that make up the South African National Biodiversity Assessment 2018:

NBA SYNTHESIS REPORT NBA 2018

For reference in non-scientific publications: South African National Biodiversity Institute (SANBI). 2019. National Biodiversity Assessment 2018: The status of South Africa's ecosystems and biodiversity. Synthesis Report. South African National Biodiversity Institute, an entity of the Department of Environment, Forestry and Fisheries, Pretoria.

For reference in scientific publications: Skowno AL, Poole CJ, Raimondo DC, Sink KJ, Van Deventer H, Van Niekerk L, Harris LR, Smith-Adao LB, Tolley KA, Zengeya TA, Foden WB, Midgley GF, Driver A. 2019. *National Biodiversity Assessment 2018: The status of South Africa's ecosystems and biodiversity. Synthesis Report*. South African National Biodiversity Institute, an entity of the Department of Environment, Forestry and Fisheries, Pretoria. http://hdl.handle.net/20.500.12143/6362

TECHNICAL REPORTS NBA 2018:

1. Terrestrial

Skowno AL, Raimondo DC, Poole CJ, Fizzotti B, Slingsby JA (eds). 2019. *South African National Biodiversity Assessment 2018 Technical Report Volume 1: Terrestrial Realm*. South African National Biodiversity Institute, Pretoria. http://hdl.handle.net/20.500.12143/6370

2. Inland Aquatic (Freshwater)

Van Deventer H, Smith-Adao L, Collins NB, Grenfell M, Grundling A, Grundling PL, Impson D, Job N, Lötter M, Ollis D, Petersen C, Scherman P, Sieben E, Snaddon K, Tererai F, Van der Colff D. 2019. *South African National Biodiversity Assessment 2018: Technical Report. Volume 2: Inland Aquatic (Freshwater) Realm*. CSIR report number CSIR/NRE/ECOS/IR/2019/0004/A. South African National Biodiversity Institute, Pretoria. http://hdl.handle.net/20.500.12143/6230

3. Estuarine

Van Niekerk L, Adams JB, Lamberth SJ, Mackay F, Taljaard S, Turpie JK, Weerts S, Raimondo DC. 2019 (eds). *South African National Biodiversity Assessment 2018: Technical Report. Volume 3: Estuarine Realm.* CSIR report number CSIR/SPLA/EM/EXP/2019/0062/A. South African National Biodiversity Institute, Pretoria. Report Number: SANBI/NAT/NBA2018/2019/Vol3/A. http://hdl.handle.net/20.500.12143/6373

4. Marine

Sink KJ, Van der Bank MG, Majiedt PA, Harris LR, Atkinson LJ, Kirkman SP, Karenyi N (eds). 2019. *South African National Biodiversity Assessment 2018 Technical Report Volume 4: Marine Realm*. South African National Biodiversity Institute, Pretoria. South Africa. http://hdl.handle.net/20.500.12143/6372

5. Coast

Harris LR, Sink KJ, Skowno AL, Van Niekerk L (eds). 2019. *South African National Biodiversity Assessment 2018: Technical Report. Volume 5: Coast*. South African National Biodiversity Institute, Pretoria. http://hdl.handle.net/20.500.12143/6374

6. Sub-Antarctic territory

Whitehead TO, Von der Meden C, Skowno AL, Sink KJ, Van der Merwe S, Adams R, Holness S (eds). 2019. *South African National Biodiversity Assessment 2018 Technical Report Volume 6: Sub-Antarctic Territory*. South African National Biodiversity Institute, Pretoria. http://hdl.handle.net/20.500.12143/6375

7. Genetics

Tolley KA, Da Silva JM, Jansen van Vuuren B. 2019. *South African National Biodiversity Assessment 2018 Technical Report Volume 7: Genetic Diversity*. South African National Biodiversity Institute, Pretoria. http://hdl.handle.net/20.500.12143/6376

OTHER ANNEXURES

Each technical report listed has a number of annexures such as inventory reports, method explanations, and both spatial and non-spatial datasets, available at http://nba.sanbi.org.za/ . Three other independent annexures exist as supplementary material for NBA 2018:

SANBI. 2019. *National Biodiversity Assessment 2018 Supplementary Material: Compendium of Benefits of Biodiversity*. South African National Biodiversity Institute, Pretoria.

SANBI. 2019. *South Africa's National Biodiversity Assessment: Contextual and Operational Framework. Released as supplementary material to the National Biodiversity Assessment 2018*. South African National Biodiversity Institute, Pretoria.

SANBI. 2019. *National Ecosystem Classification System. Released as supplementary material to the National Biodiversity Assessment 2018*. South African National Biodiversity Institute, Pretoria.

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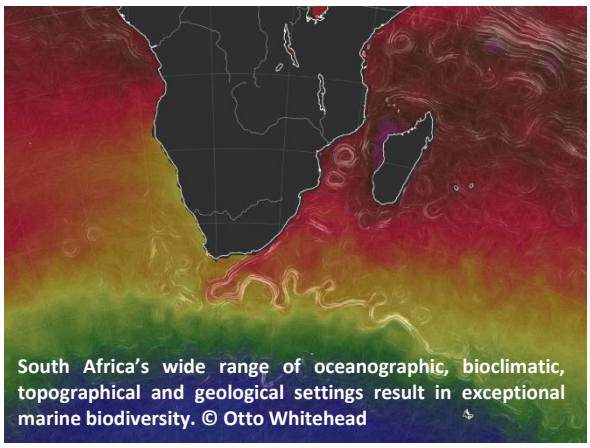
EXECUTIVE SUMMARY

The National Biodiversity Assessment (NBA) 2018 is a collaborative effort to synthesise the best available science on South Africa's biodiversity. The overarching aim of the NBA is to **inform policy and decision-making** in a range of sectors, and contribute to national development priorities. The NBA is used to inform policy in the biodiversity sector and other sectors that rely on and / or impact the environment and associated natural resources, such as agriculture and fisheries, water, mining, transport and human settlements. The NBA provides information to help prioritise effort and resources for managing and conserving biodiversity, and provides context and information that underpins biodiversity inputs to marine and coastal planning processes. A range of national and international level monitoring, reporting and assessment processes rely on information gathered during the NBA. The NBA is also a key reference and educational product relevant to scientists, students, consultants and decision makers, and acts as a national level platform for collaboration, information sharing and capacity building in the biodiversity sector in South Africa. This report focusses on the Marine Realm with similar reports covering the Terrestrial, Inland Aquatic (Rivers and Wetlands) and Estuarine Realms respectively. There is a dedicated Coastal report that is cross- realm and presents the integrated results for South Africa's first ecologically-determined map of all coastal ecosystem types. The state of coastal ecosystems is thus determined in this assessment, the estuarine assessment and in the case of coastal vegetation types, in the terrestrial. There are also technical reports on Genetic Diversity and on the Prince Edward Islands and surrounding seas in South Africa's sub-Antarctic territory.

The **marine realm** covered by this report is defined from the dune base, effectively a decadal scale high water mark, to the outer boundary of South Africa's Exclusive Economic Zone (EEZ), an ocean area of 1.1 million km^2. This report covers the ecosystem, species and genetic levels of marine biodiversity, the pressures and threats to this marine biodiversity and the key actions to maintain the benefits from South Africa's marine biodiversity. The threat status of both ecosystems and species is reported and progress in ecosystem protection levels is examined. Trends in ecosystem threat status between previous biodiversity assessments and 2018 are not examined due to differences in ecosystem classification and mapping, pressure mapping and the assessment methodology. There is insufficient species data to produce species relist trends but key changes in stocks are noted. The effect of recent expansion in protected areas is examined by comparing 2018 and 2019 Protection Level Results. Generally, this assessment provides a new baseline to track the state of marine biodiversity into the future although further refinements in ecosystem classification and assessment are anticipated.

A total of **21 key findings** were distilled from this assessment and these are presented below. To address these findings and recognised limitations in this assessment, a number priority actions were identified including a top ten priority actions which are presented below the key findings.

South Africa's exceptional marine biodiversity is globally recognised



South Africa's wide range of oceanographic, bioclimatic, topographical and geological settings result in exceptional marine biodiversity. © Otto Whitehead

South Africa is globally recognised for its marine biodiversity and high levels of endemism.

South Africa's wide range of oceanographic, bioclimatic, topographical and geological settings have not only resulted in high species diversity and endemism, but also high ecosystem diversity. South Africa's marine ecosystems support more than 13 000 species (identified to date) with estimates of marine endemism for different groups of taxa ranging between 26 and 33%. South Africa is reported as having the third highest marine endemism after New Zealand (51%) and Antarctica (45%). Highest marine endemicity has consistently been reported for the warm temperate Agulhas ecoregion on the south coast which lies entirely within South Africa's territory and is geographically very isolated from other warm temperate regions. Endemic species and ecosystems should be a focus in management efforts to ensure safeguarding of unique biodiversity. It is South Africa's sole responsibility to manage, protect and avoid significant loss of habitats for those species and ecosystems found nowhere else on earth. The current lack in taxonomic expertise and foundational biodiversity information limits the evidence base for science to support management of this unique marine biodiversity heritage. Given the unique South African marine environment, biodiversity and endemism patterns, it is important that local taxonomic expertise is strengthened to capitalise on strategic research opportunities that can strengthen biodiversity science, research outputs and marine biodiversity management.

Marine biodiversity provides a wide array of benefits to South Africans

Benefits from biodiversity include the food and job security provided through fisheries. © Jaco Barendse

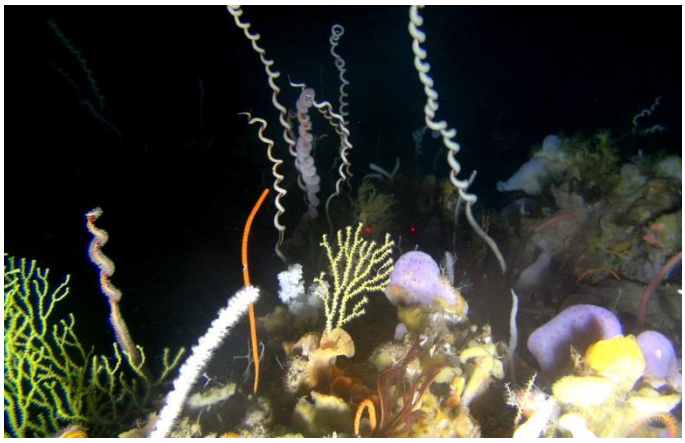
South Africa's exceptional marine biodiversity provides a wide array of benefits to the economy, society and human wellbeing.

Healthy marine biodiversity is central to South Africa's national objectives of increased economic growth and job creation. Tangible benefits include the direct harvesting of food and medicinal resources, and the recreational, tourism and educational benefits of the marine realm. Less tangible benefits include the spiritual and cultural values of South Africa's oceans and coasts and their likely role in modern human evolution. Naturally functioning ecosystems that generate or deliver valuable services to people and thereby enhance human wellbeing are referred to as ecological infrastructure, the nature-based equivalent to build infrastructure. Beaches, reefs, kelp forests and seamounts are marine ecosystems of limited extent that provide disproportionate benefits. Maintaining the health of marine biodiversity at the ecosystem species and genetic levels helps humans adapt to climate change. The continued supply of the many marine biodiversity benefits relies on healthy ecosystems and well managed species.

Effective communication of the value of South Africa's marine biodiversity through improved co-ordinated messaging that articulates benefits is vital to mobilise people to sustainably use marine biodiversity. Increased research to improve social and economic statistics regarding marine biodiversity benefits should be prioritised. This chapter clearly illustrates that marine biodiversity is central to South Africa's national objectives of increased economic growth and job creation, and plays a vital role in the wellbeing of coastal communities and South African society.

Advances in marine ecosystem mapping supports assessment, planning and management

Increased investment in research has improved ecosystem classification and mapping to support effective spatial assessment, planning and management



Whip and spiral wire corals found on the deep reefs of the Amathole Offshore MPA © ACEP Imida Project

A revised Marine Ecosystem Classification and Map showcasing South Africa's 150 marine ecosystem types in six marine ecoregions was produced. Key advances in the map of marine ecosystems included very fine-scale shore mapping with alignment between marine, terrestrial and estuarine realms in the coastal zone; the inclusion of kelp forests, bays, fluvial fans and stromatolite shores as distinct ecosystem types and the introduction of finer depth strata across shelves and on the slope. This was as a result of major efforts to collate or increase relevant historic and current data sets to support improved ecosystem classification and mapping. Marine ecosystem types that are coastal (including all shore types, ecosystem types on the inner shelf and all river influenced ecosystem types) were identified to produce the first ecologically determined map and assessment of coastal ecosystem types for South Africa. The development of an integrated map of ecosystems for all of South Africa's territory, including the terrestrial, marine and other aquatic ecosystem types in both mainland South Africa and the territory in the Southern Ocean is one of the major achievements of the NBA 2018. Key areas for future improvement include refined bathymetric data, updated wave-exposure data for shores, additional reef mapping, improved classification and mapping of bays and muds, and the collection of data to improve the understanding of biodiversity pattern in South Africa's deep-sea. Model-based approaches should be considered for future improvements, and validation of ecosystem types is a priority. Further data-driven approaches that can integrate large datasets covering multiple ecosystem components collected by multiple methods are encouraged.

Pressures impact all levels of marine biodiversity

Pressures are impacting marine biodiversity at all levels: ecosystems, species and genes

There is evidence that pressures on marine biodiversity exert impacts at the ecosystem, species and genetic levels. These impacts are most clearly demonstrated for fishing, the most established marine activity with the longest history in South Africa's oceans. Ecosystem effects from fishing range from impacts on the seabed, trophic changes and behavioural changes. These ecosystem changes impact

on species. For example, seabirds are affected by food availability and there is commercial species and other species caught as bycatch or incidentally and (food availability, behavioural…d trophic effects. At the species level, dramatic declines in target and other species have been attributed to fishing in some cases leading to overexploitation and threatened status. Despite limited genetic research, there is evidence of impacts from fishing on several fish species.

Fishing, reduced freshwater flow, pollution, coastal development, mariculture and mining are key marine pressures (*well established*).

Marine ecosystems and species face pressures from an increasing range, extent and intensity of human activities, threatening the societal benefits from marine biodiversity. These pressures include 22 recognised fisheries sectors, petroleum activities, mining, shipping, freshwater flow reduction, coastal development, ports and harbours, mariculture, and pollution. The extent and intensity of pressures, and the impacted components of biodiversity, all warrant consideration in determining key pressures. Coastal development, mining, trawling and mariculture have the highest impact scores among the 31 pressures on marine ecosystem types included in this assessment. Fishing and shipping are pressures with the greatest extent. Emerging pressures of greatest concern include land-sourced pollution (e.g. plastic pollution and chemical runoff), increased underwater noise and desalination impacts. High levels of organochlorine pesticide accumulation in corals in the iSimangaliso were recently reported along with evidence that microplastics are no ubiquitous across the South African coastline. Fishing is the greatest cause of biodiversity degradation in the offshore environment whereas both coastal development and fishing are the greatest pressures on inshore ecosystems. A meta-analysis of the key pressures impacting on species of conservation concern revealed that fishing remains the greatest pressure on marine species. The impacts of key emerging pressures, including land-sourced pollution (e.g. plastic pollution and chemical runoffs), light pollution, increased underwater noise and desalination impacts require further research. Mapping of climate change impacts could strengthen future assessments.

Pressure distribution is uneven with hotspots in bays, bights and the shelf edge

The distribution of pressures is uneven with pressure hotspots in bays, bights and the shelf edge.
Pressures are unevenly distributed across the seascape with some areas experiencing high concentrations of pressures. A key pattern that emerged during the NBA 2018 marine assessment was the high cumulative pressures in bays and this is linked to the development of ports and harbours. These pressure hotspots require strategic planning and focused management. Other high pressure areas include the area offshore of the Orange River, the shelf edge on the west and south coast, large portions of the Cape inner and middle shelf, the Agulhas Bank and the KwaZulu-Natal Bight. The new Coastal and Marine Critical Biodiversity Area Map can support and inform Marine Spatial Planning in pressure hotspots.

Ports and harbours are drivers of cumulative impacts and degradation.

Ports and harbours are key drivers of cumulative impacts and ecological degradation by providing points of access to the sea, increasing coastal development, changing local shoreline orientation, and being pressure hotspots.

South Africa's coast is generally exposed to high wave energy; therefore, artificially constructed ports and harbours are necessary transport infrastructure, but are also key drivers of impacts to biodiversity. The development of ports and harbours and associate effects include the impacts of construction, concentration of pressures due to increased access, the introduction of alien and invasive species and the impacts of dredge disposal. As such port and harbours are drivers of significant cumulative pressures that require careful spatial planning and effective management. The highest cumulative pressure mapped in the NBA 2018 marine assessment was recorded in Saldanha Bay with all bays facing high cumulative pressures. Further, ports and harbours have high risks of biological invasions from ship fouling and ballast water, pollution from various chemicals and waste, and disasters such as oil spills. The main points of introduction and refugia for marine alien and invasive species are ports, harbours and marinas; which is where most introduced species (62 taxa) have been recorded. In addition, harbour breakwaters interrupt the natural flow of sand in longshore currents in the surf and inner shelf around the country and contribute to the loss of sand on beaches. If not appropriately located and managed, the natural sand movement corridors ("sand rivers") that once supplied beaches with sand, can be cut off from their sand-bank reserves that beaches need during periods of heightened erosion. For these reasons, the location of ports and harbours should be carefully planned.

Marine invasive species are increasing despite limited survey effort

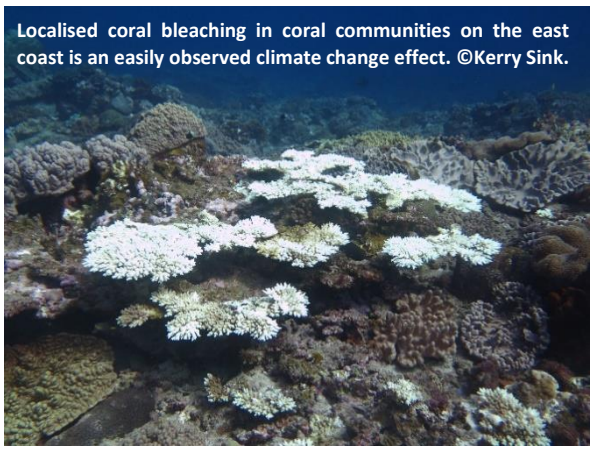
Marine invasive species are increasing in South Africa with 96 alien species and 55 invasive species reported, despite limited survey effort

In 2011, the NBA reported that the known number of marine alien species had expanded from 17 in 1992 to 84, only 8 of which were considered as invasive. Based on recent research, the number of marine alien species has been amended to 96 including 55 that are considered to be invasive. Invasive species were more prevalent in rocky shores than in other broad ecosystem groups, and in the Southern Benguela than in other ecoregions. Crustaceans and molluscs are the taxonomic groups most often recorded as invasive. The main points of introduction and refugia for marine alien and invasive species are ports, harbours and marinas as reported above. The main vectors of accidental introductions remain ship fouling and ballast water. Recreational boating has also been identified as a significant contributor to the intra-regional spread of invasive species, and the expanding aquarium trade is an emerging vector of introduction. Gaps in taxonomic knowledge, capacity and opportunities for systematic surveys limit the ability to detect and understand marine introductions and invasions in South Africa. The impacts of marine invasive species on global ocean economies and ecosystems signal the risks to South Africa's ocean economy, biodiversity and coastal communities. Ambitious plans to increase port and harbour development, maritime transport, oil and gas activities, aquaculture and coastal tourism in the interests of growing the ocean economy in South Africa, have the potential to increase the introduction and spread of alien species unless adequate biosecurity measures are implemented. A risk assessment protocol for transfer and introduction is needed to identify pathways that constitute the highest risk of introductions. Monitoring, early detection and

rapid response protocols, that include clear roles and responsibilities and sufficient resources, are needed to ensure appropriate invasive species management for the marine realm. The highest priority action is to secure resources and develop capacity to enable rapid management action for preventing potential invasive species from becoming established when detected through monitoring programmes.

Climate change worsens pressure impacts, decreasing resilience of people and biodiversity

Climate change exacerbates impacts of pressures on marine ecosystems and species, decreasing resilience and threatening coastal communities and livelihoods.

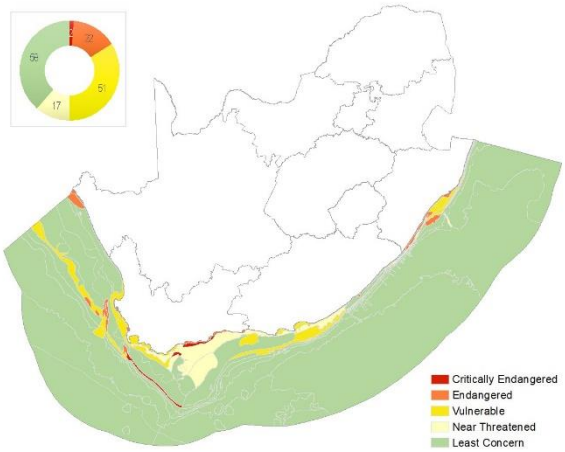


Localised coral bleaching in coral communities on the east coast is an easily observed climate change effect. ©Kerry Sink.

South Africa has experienced significant oceanographic changes over the past few decades. Parts of the Agulhas Current have warmed more rapidly than 90% of the world's oceans, while upwelling on the west and south coasts has increased due to intensified winds, leading to inshore cooling. These shifts are accompanied by increases in sea level, changes in ocean currents (which affect regional climate, energy transfer, and species dispersal), wave height, ocean acidification, low oxygen events and increasingly frequent storms. Such changes are already having marked impacts across a wide variety of South Africa's marine taxa including sponges, kelp, fish, seabirds, molluscs, corals, crustaceans and foraminifera. Resulting shifts in species distribution, abundance, physiology and behaviour are causing changes in community composition, hybridisation, and the spread of alien species. Coastal fisheries most at risk in the short to medium term include those for small pelagics, linefish, netfish and West Coast Rock Lobster. Marine tourism may also be impacted. The complexity and variability of South Africa's marine systems, aggravated by anthropogenic stressors (including historical overexploitation of some marine resources), make future impacts difficult to predict. However, there is high certainty that impacts on biodiversity, ecosystem function, food security and economically valuable industries will continue to intensify. South Africa needs to maintain and increase research and consistent uninterrupted monitoring to track and understand climate change impacts on marine systems, including their interactions with the impacts of other pressures. Also, it is essential to assess the effectiveness of adaptive measures for both human communities and natural systems. South Africa's unique position and rich history of marine research, combined with the variety, speed and scale of predicted changes, offers a rare opportunity to facilitate global learning of the development and application of adaptation pathways.

Half of South Africa's marine ecosystem types are threatened

A first assessment of marine ecosystems using IUCN Red List Criteria found, that half of South Africa's marine ecosystem types are threatened (*established but incomplete*).



A systematic assessment of South Africa's 150 marine ecosystem types using a method aligned to that of the International Union for Conservation of Nature (IUCN) Red List of Ecosystems found that 50% are threatened. By area this equates to only 5% of the ocean space around South Africa, reflecting that many smaller ecosystem types are threatened, with larger deep ocean ecosystem types under less threat. More inshore and shelf ecosystem types are threatened than those of the slope and abyss. Only two ecosystem types (1% of types) are Critically Endangered; the Agulhas Muddy Mid Shelf and Browns Bank Rocky Shelf Edge. A further 22 types are Endangered (15%) and 51 types are Vulnerable (34%). The 2018 results are not directly comparable to the 2011 NBA results because of changes to the ecosystem maps and pressure data, and also differences in assessment methods. To improve this assessment, better data on ecosystem condition is needed, while further international collaboration is required to determine the appropriate spatial scale for ecosystem red listing and to refine thresholds for national assessments.

Bays, islands, muds and rocky shelves are most threatened

The most threatened broad ecosystem groups include bays, islands, muddy ecosystem types and rocky ecosystems on the shelf

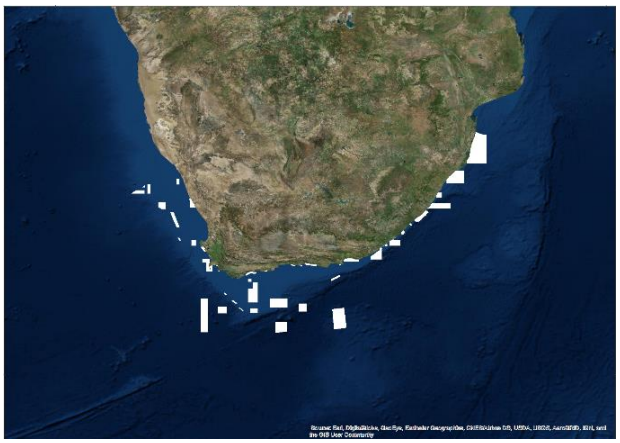
To provide an overview of patterns in ecosystem threat status, ecosystems were grouped into several broad types. Bays, muddy ecosystem types and rocky ecosystems on the inner shelf and shelf edge experience amplified levels of threat due to cumulative pressures. Of the different ecoregions, the cold temperate Southern Benguela has more threatened ecosystem types than the warm temperate Agulhas ecoregion, and the ecoregions with the fewest threatened ecosystem types are the subtropical Natal and Delagoa ecoregions. Areas where pressures are concentrated such as bays are priorities for strategic spatial planning and focused management. To sustainably develop South Africa's ocean economy, the new maps of Coastal and Marine Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) can help inform planning and decision making. These are designed to be spatially efficient and to avoid conflict with non-compatible land and ocean uses wherever possible, and therefore align with the goal of growing South Africa's marine economy. It is possible to combine a range of economic activities and maintain healthy ecosystems through careful placing of intensive sea uses. Additional tools such as the Department of Environment, Forestry and Fisheries (DEFF's) recently developed Environmental Screening Tool can strengthen environmental impact assessment and environmental authorisations to avoid further impacts on threatened ecosystems. There are also opportunities to restore marine and coastal ecosystems and a coastal restoration program that strategically prioritises intervention to maintain and increase coastal biodiversity benefits is advocated.

Need for further cross-realm integration in shore assessments highlighted

Assessment of shores needs to improve in resolution and better account for cross realm connections

Although there has been excellent progress in mapping and alignment of ecosystems in the land-sea interface, a number of limitations were recognised in the mapping and assessment of shore ecosystems. In terms of ecosystem classification and mapping, the classification of mixed shores needs research attention and emerging new wave exposure data sets can improve mapping of rocky shore ecosystem types. Mismatches in the scale of ecosystem and pressure mapping limit the assessment of ecosystem types within the seashore and higher resolution and finer scale analyses may be needed. Considering the large extent of the terrestrial and marine realms, the current resolution of the assessments is generally appropriate except for the highly linear and small seashore ecosystem types. Coastal development impacts may have been underestimated and updated, improved data on recreational, subsistence and small scale fishing; invasive species and sea level rise are needed. Although there is evidence of beaches losing sand and eroding due to a legacy of poor management of connected beach, dune and estuarine systems, a lack of national scale data and a limited spatial understanding of degradation due to disruption of sediment movement corridors prevented consideration of these pressures in this assessment. As such, the ecosystem threat status of seashore ecosystem types, particularly sandy shores, is probably underestimated. In some places, South Africa is losing beaches as they erode to bedrock. Climate-change impacts are exacerbating these impacts, with increased frequencies and intensities of extreme storms eroding beaches further, and sea-level rise interacting with seawalls defending inappropriately located development, causing gradual inundation and loss of beaches through coastal squeeze. Losing beaches has the potential to impact tourism, especially because beach visiting is one of the most popular tourist activities, and favoured urban beaches are most at risk of habitat loss given that their resilience is undermined by inappropriate coastal development. The cross realm connections should be considered in the assessment of adjacent coastal ecosystem types where poor ecological condition could influence the status of adjacent linked coastal ecosystem types. Iterative improvements in cross-realm integration can improve the assessment of shores.

Marine ecosystem protection advanced from less than 0.5% in 2018 to 5.4% in 2019



In 2019, the South African government declared 20 new MPAs advancing marine ecosystem protection from less than 0.5% in 2018 to 5.4% in 2019 *(well established)*.

South Africa's number of MPAs increased from 26 in 2018 to 42 in 2019, inclusive of the Prince Edward Islands MPA in the Southern Ocean and noting that some MPAs were expanded or merged and expanded in the new network. With this, protection of the marine environment around mainland South Africa increased from less than 0.5% (approximately 4 900 km^2) in 2018 to 5.4 % (57 900 km^2) in 2019 with the addition of approximately 53 000 km^2 of protected area estate. This expanded MPA network is helping to sustain

South Africa's emerging ocean economy, protect marine ecosystems, rebuild fish stocks and support climate resilience.

Protected area expansion provides first protection for 51 ecosystem types

South Africa's MPA expansion provided the first protection for 51 previously Not Protected ecosystem types reducing the number of ecosystem types within this category from 47% to 13%.

The proclamation of 20 new MPAs in 2019 significantly improved marine ecosystem protection levels with 51 types receiving their first protection. Most of the ecosystem types that are Not Protected are located in the deeper offshore environment, particularly on the slope, with most of the slope and abyssal ecosystem types still Poorly Protected. Thirteen previously Not Protected and 4 Moderately Protected ecosystem types advanced to Well Protected, an improvement from 20% to 31% of ecosystem types in this category, and 87% of the 150 marine ecosystem types now have at least some representation in the MPA network. The MPA expansion translates into higher levels of protection for the marine realm than for any other realm in terms of ecosystem type representation. The placement of these new MPAs not only resulted in a marked improvement in ecosystem protection levels for many ecosystem types but also contributed to better representation of all ecoregions in the MPA network. A total of 41 marine ecosystem types were downgraded from Well Protected to Moderately Protected because although 20% of the extent of these ecosystem types are protected, insufficient area is in good ecosystem condition within MPAs due to legal and illegal fishing, flow reduction, waste water discharge and historical cumulative pressures. To increase the number of Well Protected ecosystem types, improvements in MPA governance are urgently needed. These include the development and implementation of management plans, innovative MPA financing arrangements, and improved stakeholder liaison and compliance. Also, degradation inside MPAs must be reduced to improve ecosystem condition, particularly for bays, kelp forests and shallow rocky shelves.

Seven priority marine ecosystem types are threatened and Not Protected

There are 7 priority marine ecosystem types that are both threatened and not protected

Although South Africa has significantly improved ocean protection, there are still seven threatened but unprotected ecosystem types that need protection. The highest priority are the Endangered ecosystems: two muddy ecosystem types on the shelf off the Orange River and a reef complex in the mid-shelf of the KwaZulu-Natal Bight. Reef mosaic and deep coral habitats in the trawl grounds of the Agulhas ecoregion are Vulnerable and need protection. In the Southern Benguela ecoregion, St Helena Bay, a unique ecosystem type that faces cumulative pressures as well as the slope component of the Cape Canyon need representation in South Africa's MPA Network. This assessment identified priority ecosystem types for improved protection through MPA expansion and by improving condition in existing and new MPAs.

Stock status is known for less than 10% of harvested species: 39% are overfished


Dageraad is one of South Africa's Collapsed Linefish stocks

Updated stock assessments are available for less than 10% of South Africa's harvested marine species and more than a third (39%) of the assessed resources are Overexploited or Collapsed *(established, incomplete).*

South Africa's oceans provide a high diversity of marine resources with more than 770 marine species that are harvested. Updated stock status is available for only 54 stocks covering at least 42 species. Of these, 39% stocks are Overexploited or Collapsed. Effective science-based management has supported recovery of Deep Water Hake *Merluccius paradoxus* and some linefish species, such as Carpenter *Argyrozona argyrozona*. The recovery of Red Steenbras *Petrus rupestris* and Dageraad *Chrysoblephus cristiceps* should be prioritised. Improved data collection and data management systems and strategic focused research to address critical knowledge gaps can help streamline and update stock assessments.

Abalone and West Coast Rock Lobster are in crisis with escalating poaching

Abalone and West Coast Rock Lobster resources are severely overexploited with escalating poaching preventing recovery of these valuable resources *(well established).*

High value inshore resources are in crisis with illegal and unregulated fishing contributing to the drastic declines in stocks of Abalone *Haliotis midae* and West Coast Rock Lobster *Jasus lalandii.* Illegal Abalone trade is estimated to be almost double the volume of legally caught abalone or that produced by aquaculture operations**.** Resource recovery plans need to be implemented and fishing quotas need to be allocated in line with scientific recommendations that account for the realities of resource abundance.


Abalone stocks are in crisis. ©Steve Benjamin.

Approximately 18% of marine species are threatened


The African Penguin is one of South Africa's Endangered seabirds. © Peter Chadwick

Despite limited effort in assessing marine species threat status in South Africa, 376 species have been assessed using IUCN criteria, of which approximately 18% are considered threatened.

To date, 376 South African marine species have been assessed by a combination of national, regional and global assessments using the IUCN redlisting approach. Of these, 70 taxa were assessed to be threatened. While this is a relatively high percentage, it may not be truly representative of actual threat patterns because the selection of taxa for redlisting assessment was biased towards taxa that were perceived to be under threat. Seabirds**,** endemic sparids and marine reptiles are particularly threatened. Fishing remains the greatest driver of extinction risk in marine species. Climate change, underwater noise, alien species, problematic native species and plastic pollution constitute significant threats to marine mammals, birds and reptiles. Poor catchment management resulting in freshwater flow reduction and reduced estuarine function is increasing the extinction risk of many commercially important estuarine-dependent fish species. The development and implementation of science based fisheries management plans that account for ecosystem effects and impacts on threatened species can help improve marine species status and avoid extinctions in the future.

Marine species are most Data Deficient

Marine species have the highest levels of data deficiency across all realms (*well established*).

Thirty-four percent (34%) of 121 commercially important bony fish and 50% of 26 cartilaginous fish were assessed as Data Deficient. The high level of data deficiency for fish is due to knowledge gaps in life history, lack of long-term fisheries catch and effort data, impaired data integrity and challenges in data management. The lack of IUCN assessments for marine invertebrates is due to inadequate taxonomic knowledge, limited distribution data, a lack of systematic surveys and limited capacity to advance species' redlisting. Knowledge gaps in taxonomy, long-term population trends and life history limit our understanding of marine species' status and threatened species may be undetected. Strategic research to address key knowledge gaps, improve species monitoring and assess priority taxa can reduce uncertainty and support early warnings to guide management interventions.

Knowledge gaps limit the assessment of genetic biodiversity

A lack of knowledge and techniques limits our ability to assess the risks to the genetic component of marine biodiversity


Kingklip are a high value resource species with fisheries impacts on genetic diversity ©SAEON

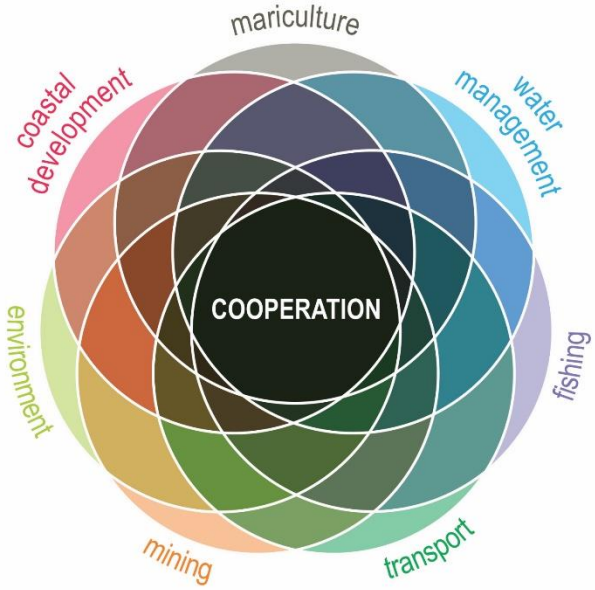
The maintenance of genetic diversity is important for retaining evolutionary potential and the ability of species or populations to adapt to change. Risks to genetic diversity include genetic erosion through overfishing and reduced population sizes, loss of connectivity, hybridization and inbreeding and the disruption of co-adapted gene complexes and disease epidemiology through translocations. South Africa has increasingly invested in genetic research and is establishing a baseline understanding of spatial patterns, particularly inshore. There is evidence in South Africa of fisheries impacts on the genetic diversity of some fished species such as Cape Hakes *Merluccius* spp., Kingklip *Genypterus capensis* and Dusky Kob *Argyrosomus japonicus*. There is an absence of temporal genetic data sets and a lack of genetic diversity indicators and thresholds against which the state of genetic diversity can be assessed. A genetic monitoring framework is required that outlines a strategic approach to prioritise species for monitoring, identifies appropriate genetic markers and metrics, and specifies the frequency of monitoring. High priority resource species, overexploited and threatened taxa, endemic species, species identified as being especially sensitive to climate change and species farmed in mariculture are priorities for genetic monitoring. Spatial patterns in genetic biodiversity need to be taken into account in marine spatial planning and protected area design.

Priority Actions and Knowledge Gaps

The last chapter of this report distils the priority actions to address the key findings of this assessment with links to existing policy, plans and frameworks. The links between the NBA, the National Biodiversity Strategy and Action Plan (NBSAP) and the National Biodiversity Framework (NBF) are explained. Key priority actions related to each finding are presented, drawing from a review of progress against priority actions reported in the NBA 2011 and three expert workshops. Priority actions span the knowledge-action continuum and cover a wide range of actions to improve ecosystem and species status and avoid further ecosystem degradation and impacts on priority species. A key biodiversity response is the emerging first marine Critical Biodiversity Area (CBA) map that can inform Marine Spatial Planning, environmental authorisations and future protected area expansion. The top 10 priority actions to improve the state of marine biodiversity are identified and linked to the strategic objectives of the NBSAP and the NBF. Building on a brief review of progress against research priorities identified in the NBA 2011 marine assessment, key gaps and limitations from the NBA 2018 marine assessment are identified and discussed. Additional monitoring and research priority actions to address these knowledge gaps are communicated. Research priorities span foundational marine biodiversity research at the ecosystem, species and genetic level, to applied research for improving our understanding of the impacts of key pressures on ecosystem condition.

The top 10 Priority Actions to improve the state of marine biodiversity are:

- **Apply the Coastal and Marine Critical Biodiversity Area Map** in Marine Spatial Planning and Environmental Impact Assessments to mitigate pressures in priority areas.
- **Enhance co-operative governance** for improved, coordinated compliance and marine biodiversity management.
- **Modernise and integrate data collection, storage and access** to improve marine biodiversity, fisheries, and climate data for better assessment, analysis, and monitoring, and to improve compliance with and evaluation of management actions.
- **Restore marine biodiversity assets** to strengthen climate resilience and sustain key benefits.
- **Ensure sufficient quantity and quality of fresh water flow** to marine ecosystems.
- **Strengthen MPA financing and governance** to enhance MPA protection and the equitable flow of benefits from South Africa's MPA network.
- **Develop and implement effective fisheries management plans** to secure food and job security and reduce ecosystem impacts of fisheries.



- **Catalyse research to address critical knowledge gaps** that limit the assessment of marine biodiversity and decision-making for a sustainable oceans economy.
- **Effectively communicate the value of South Africa's marine biodiversity** through improved co-ordinated messaging that articulates benefits, in order to build support for marine conservation, mainstream biodiversity into key production sectors and mobilise people to sustainably use marine biodiversity.
- **Prevent new marine invasions** through response planning, ring-fenced resources and rapid action.