South African
NATIONAL PARKS

NAMAQUA NATIONAL PARK MARINE PROTECTED AREA STATE OF KNOWLEDGE REPORT 2026

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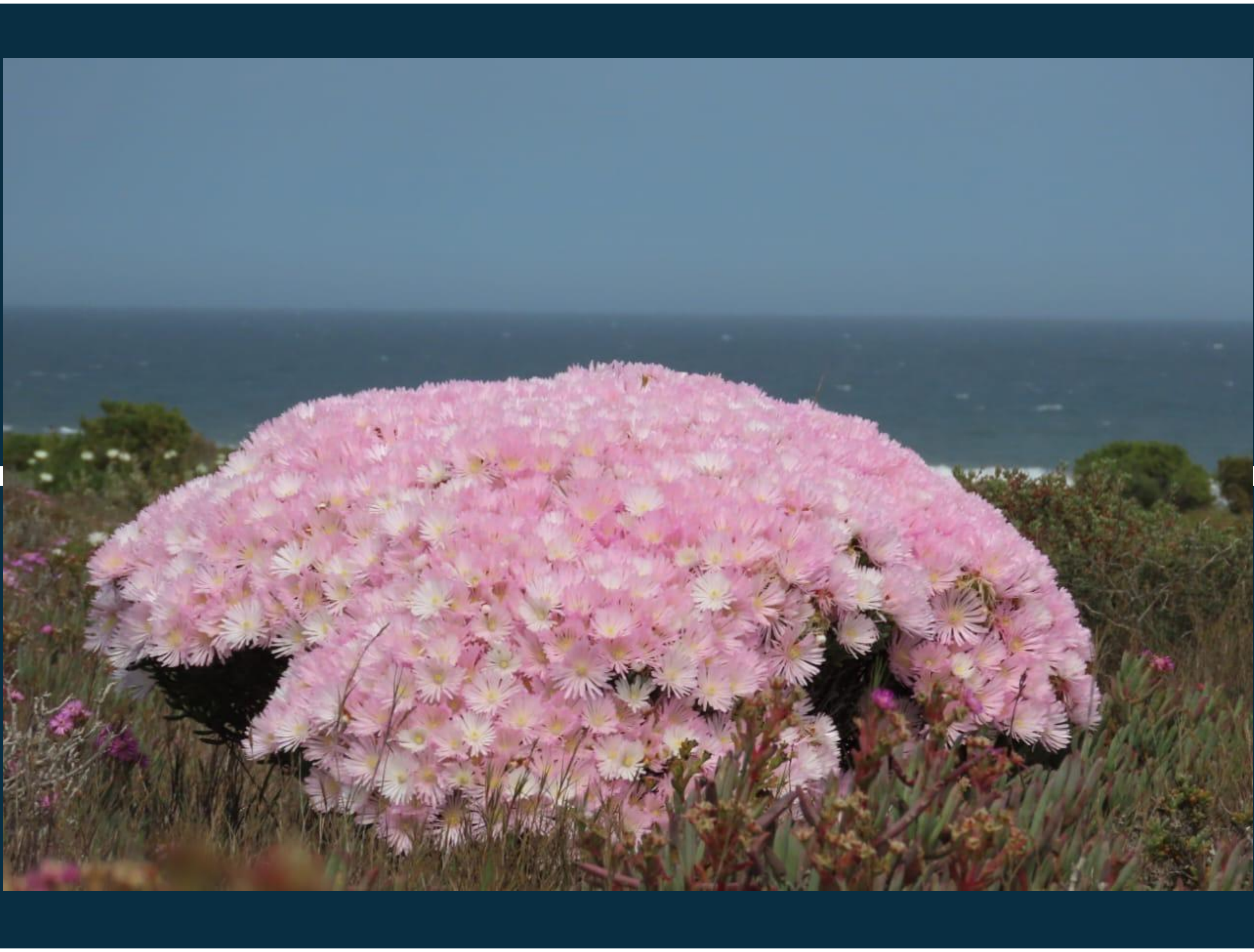


ACRONYMS AND ABBREVIATIONS

BCLME	Benguela Current Large Marine Ecosystem
CBD	Convention on Biological Diversity
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
DAFF	Department of Agriculture, Forestry and Fisheries
DALRRD	Department of Agriculture, Land Reform and Rural Development
DEA	Department of Environmental Affairs
DEAT	Department of Environmental Affairs and Tourism
DFFE	Department of Forestry, Fisheries and the Environment
EBSA	Ecologically or Biologically Significant Area
HAB	Harmful Algal Bloom
IBA	Important Bird and Biodiversity Area
ICES	International Council for the Exploration of the Sea
ICMA	Integrated Coastal Management Act
IMMA	Important Marine Mammal Area
IUCN	International Union for Conservation of Nature
KBA	Key Biodiversity Area
MAR	Mean Annual Runoff
METT	Management Effectiveness Tracking Tool
MLRA	Marine Living Resources Act
MPA	Marine Protected Area
NBA	National Biodiversity Assessment
NNP ICZ	Namaqua National Park Inshore Controlled Zone
NNP IRZ	Namaqua National Park Inshore Restricted Zone
NORZ	Namaqua National Park Offshore Restricted Zone
NEM:PAA	National Environmental Management: Protected Areas Act
NEMA	National Environmental Management Act
NEMBA	National Environmental Management: Biodiversity Act
NGO	Non-Governmental Organisation
SAEON	South African Environmental Observation Network
SABAP2	Southern African Bird Atlas Project 2
SAIAB	South African Institute for Aquatic Biodiversity
SAM	Strategic Adaptive Management
SANBI	South African National Biodiversity Institute
SANCCOB	Southern African Foundation for the Conservation of Coastal Birds
SANParks	South African National Parks
SDG	Sustainable Development Goal
SOK	State Of Knowledge
TAC	Total Allowable Catch
TAE	Total Allowable Effort
UCT	University of Cape Town
UNESCO	United Nations Educational, Scientific and Cultural Organization
WCRL	West Coast rock lobster

1. INTRODUCTION

Namaqua National Park (NNP) lies in the Northern Cape along South Africa's remote northwestern coastline, where the arid landscapes of the Succulent Karoo meet the nutrient-rich Atlantic Ocean. Internationally recognised as a biodiversity hotspot with the world's highest concentration of succulent plant species, the park is famed for its spectacular spring flower displays. Equally remarkable, though less widely known, are its marine and coastal ecosystems, protected within the Namaqua National Park Marine Protected Area (NNP MPA). This MPA safeguards an exceptional diversity of habitats, including expansive sandy beaches, rugged rocky shores, kelp forests, subtidal reefs, dynamic estuaries, and the highly productive pelagic waters of the Benguela upwelling system. Together, these habitats support rich assemblages of fish, seabirds, marine mammals, invertebrates, and seaweeds characteristic of South Africa's west coast.

Stretching between the Groenrivier and Spoegrivier estuaries and extending several nautical miles offshore, the NNP MPA plays a critical conservation role as the only MPA along the Northern Cape coast. This region represents one of South Africa's last relatively undeveloped coastal wilderness areas, where ecological connectivity between land, estuaries, shoreline, and ocean remains largely intact. Both estuaries are ecologically important, providing habitat and feeding areas for estuarine-dependent fish, waterbirds, and other species, and are culturally significant as sites of long-standing human use. Together with the surrounding coastal and marine habitats, they form part of a connected system that sustains nursery areas for fish and invertebrates, and support significant seabirds and marine mammal populations, and underpins recreational and small-scale fisheries and eco-tourism opportunities.

Beyond its biodiversity importance, the area holds long-standing cultural significance through generations of human use and connection to the coast. It also supports opportunities for small-scale fisheries, recreation, nature-based tourism, and scientific research. Despite its remoteness, the NNP MPA faces growing pressures from climate change, resource harvesting, offshore mining and diamond prospecting, adjacent agriculture, and other industrial activities. Managed by South African National Parks (SANParks), the MPA aims to conserve biodiversity, protect cultural heritage, and promote the sustainable use of these unique and dynamic ecosystems.

This document seeks to provide a comprehensive state of knowledge of the area and focuses on the marine socio-ecological systems surrounding the NNP MPA. Available literature indicates that, compared with many other South African MPAs, this area has received relatively limited scientific attention, largely due to its remoteness and associated logistical challenges. Where site-specific information is scarce, relevant data and insights from adjacent or ecologically comparable areas have been used to provide broader context and inform understanding of this nationally significant coastal and marine system.

The report provides an overview of several keys components of the MPA including:

Biotic and Abiotic characteristics
History and Marine Cultural Heritage
Pressures and Threats
Management
Research and Monitoring initiatives
An inventory of key species

This synthesis aims to inform a broad audience and to lay the groundwork for future collaboration, research, and effective marine management that supports both biodiversity conservation and the communities reliant on a healthy NNP MPA.

2. ACCOUNT OF AREA

2.1 LOCATION

The NNP MPA is located in the Northern Cape of South Africa, adjacent to and south of NNP (SANParks 2023). The MPA extends from just south of the Spoegrivier in the north to past Groenrivier in the south, encompassing an inshore area from the coast out to a depth of 150 m (Figure 2-1). The MPA includes the seabed, subsoil and the water column within its boundaries. The MPA encompasses a mosaic of habitats, including sandy and rocky shores, kelp forests, subtidal reefs, estuaries (notably the Groen and Spoeg rivers) and offshore pelagic zones.

2.2 DECLARATION AND LEGISLATION

Multi-scale biogeographic and ecological analyses showed that the near-pristine Groen–Spoeg coast is highly representative of the Namaqua province, globally distinctive, and a high-priority conservation site (Emanuel et al. 1992). In 1977, the Marine Reserves Committee recommended the declaration of an MPA along the Northern Cape coastline. The MPA has since been the subject of debate and conflict among conservation authorities, the diamond mining industry and the fishing and farming sectors. The NNP MPA was formally declared by the Department of Forestry, Fisheries and Environment (DFFE) in 2019 as part of 20 new MPAs declared under 'Operation Phakisa' . It was declared under the Marine Spatial Planning and Biodiversity Conservation objectives of South Africa's Marine Protected Areas Network Expansion Strategy (DEA 2016), where 42 MPAs now represent habitats, ecosystems and species across South African territorial waters (proclaimed in Government Gazette No. 42479, No. R. 794, in terms of Section 22A of the National Environmental Management: Protected Areas Act (NEM:PAA), Act No. 57 of 2003).

The declared purposes of the MPA under NEM:PAA are:

a) To contribute to a national, regional and global representative system of marine protected areas by conserving and protecting coastal and offshore benthic and pelagic ecosystems of the Namaqua region, including threatened ecosystem types;

b) To protect coastal ecosystems through a contiguous conservation area that protects connected marine and terrestrial ecosystems, their associated biodiversity and ecological processes;

c) to protect and regulate a scenic area to support sustainable nature-based tourism and retain a land-ocean 'sense of place';

d) To protect cultural heritage sites, including archaeological middens and other features;

e) To facilitate species management by protecting nursery areas and allowing stock recovery of fish, limpets and West Coast rock lobster and enhancing intertidal and subtidal resource abundance in adjacent areas; and

f) To protect and provide an appropriate reference environment for research and monitoring, including archaeological research, climate change research and research to assess biodiversity state and resource recovery, and also to promote and contribute to environmental education.

The NNP MPA is subject to the regulations set out in NEM:PAA and its associated MPA regulations (2019) and the Marine Living Resources Act (MLRA), Act No. 18 of 1998, which outlines permitted and restricted activities, zonation, enforcement and compliance mechanisms. The MPA includes a combination of restricted and controlled zones, each with varying levels of protection to balance biodiversity conservation with sustainable use. Activities such as commercial fishing, recreational angling, diving, boating, and estuarine access are regulated through a permitting system, while extractive industrial activities like mining, trawling, and petroleum extraction are strictly prohibited.

Other pertinent legislation is the Integrated Coastal Management Act (ICMA) (Act No.24 of 2008), which deals with coastal access, management, off-road vehicles and slipway regulations, and the Sea Birds and Seals Protection Act (Act No.46 of 1973), which deals with the management of seabirds and seals.

The declaration of the NNP MPA forms part of South Africa's commitment to international conservation targets, including Aichi Target 11 of the Convention on Biological Diversity, which calls for the protection of at least 10% of coastal and marine areas. It also supports Sustainable Development Goal 14 (Life Below Water) by aiming to conserve marine ecosystems and promote sustainable use of marine resources.

2.3 BOUNDARIES

The NNP MPA covers a total area of approximately 550 km² (Sink et al. 2019). It stretches for about 47 km along the western boundary and 56 km along the eastern boundary of the park. Offshore extent varies, reaching around 4.5 km from the coast in the north and up to 28 km in the south, with depths ranging from the intertidal zone to roughly 150 m at its furthest offshore point (Sink et al. 2019).

2.4 ZONES

The main purpose of zonation within an MPA is to safeguard biodiversity while enabling sustainable and compatible activities and resource use, thereby reducing conflict and upholding the conservation goals of the area. Zonation is formally established in the Government Gazette alongside the MPA regulations at the time of declaration, and any amendments can only be made through a Ministerial process. This process differs from that of national parks, where zonation is determined as part of the management plan development or its periodic revision (SANParks 2023).

A controlled zone is an area within the MPA where fishing or other activities may take place if authorised and with the required permits. A restricted zone refers to an area within an MPA where no fishing, harvesting or extractive use is permitted. Other activities are generally restricted but may be authorised by the relevant authorities (SANParks 2023). The NNP MPA consists of one offshore restricted zone, six inshore controlled zones and five inshore restricted zones (Figure 2-1).

Zones and their names:

- Namaqua National Park Offshore Restricted Zone (NORZ):
- Namaqua National Park Inshore Restricted Zones (IRZs):
    - Several inshore restricted zones fall within the MPA, all extending 200 m seaward from the high-water mark, where no resource use is allowed.
- Namaqua National Park Inshore Controlled Zones (ICZs):
    - Inshore controlled zones also extend 200 m seaward from the high-water mark, but resource use is permitted here under specific regulations and permit conditions.

2.5 MANAGEMENT AUTHORITY

SANParks is the designated management authority of the NNP MPA. The DFFE is also involved in the management of the MPA, and is responsible for issuing permits, allocating fishing quotas, and enforcing fisheries-related legislation, while SANParks undertakes administrative management, coastal law enforcement, monitoring, and environmental education activities. Scientific services from both SANParks and DFFE conduct research and monitoring within the MPA. In addition, the South African Police Service, environmental officers, and DFFE fisheries authorities either collaborate with SANParks or operate independently along the coast to ensure compliance and effective law enforcement (Brill & Raemaekers 2013).

SANParks developed the first management plan for the NNP MPA during 2023 for 2024-2033. The management plan focuses on achieving the declared purposes of the MPA, while considering broader stakeholder inputs on the vision for the MPA (SANParks 2023).

2.6 ACCESS AND FACILITIES

Visitors can access the NNP MPA from several directions. Those travelling via Upington can take the N14 to Springbok and then continue south on the N7 to Kamieskroon, while visitors from Cape Town or Vioolsdrif can reach the park by following the N7 to either Kamieskroon or Garies. Entry to the MPA is through the coastal section of the NNP at two controlled access points, including the Groenrivier office, which is reached via a gravel road from Garies along the Hondeklipbaai road. Access through these gates is generally limited to 08:00–17:00, and visitors arriving outside of these hours must make prior arrangements with the park office. There are no formal slipways along the NNP coastline that provide direct boat access to the MPA; the nearest registered launch site is at Hondeklipbaai, approximately 20 km north of the Spoegrivier mouth boundary. Accommodation within the coastal section of the park is limited, with eight designated camping areas offering 31 individual campsites.

Figure 2-1 Namaqua National Park, its Marine Protected Area boundaries and zonation

3. ABIOTIC CHARACTERISTICS

3.1 CLIMATE

Namaqua National Park experiences an arid to semi-arid climate, typical of the Succulent Karoo biome (Desmet & Cowling 1999). Summers are hot and dry, with daytime temperatures often exceeding 30°C, while winters are cooler and bring most of the region's limited rainfall, usually between 100–200 mm annually (Desmet & Cowling 1999). The area is strongly influenced by coastal fog and the cold Benguela Current along the Atlantic Ocean, which provides the moisture which sustains the unique vegetation despite low rainfall. Seasonal variation is most striking in spring (August to September), when winter rains trigger the famous wildflower displays that carpet the landscape in vibrant colours, contrasting with the otherwise dry environment (Desmet & Cowling 1999).

3.1 BIOGEOGRAPHY

The distribution of marine life along the South African coast is strongly influenced by large-scale oceanographic and biogeographic patterns. Numerous attempts have been made to understand and map marine biogeographic patterns around the coast of South Africa (Stephenson & Stephenson 1972, Brown & Jarman 1978, Engledow et al. 1992, Stegenga & Bolton 1992, Emanuel et al. 1992, Bustamante & Branch 1996, Stegenga et al. 1997, Turpie et al. 2000, Sink 2001, Bolton et al. 2004, Lombard et al. 2004). Most of these studies recognized three coastal regions: a cool-temperate west coast, a warm-temperate south coast and a subtropical east coast region. Marine biogeographic patterns around the South African coast were recently reviewed, and several new ecoregions were described (Sink et al. 2019). According to these divisions, the NNP MPA falls within the Namaqua Inshore ecozone, which is nested within the Southern Benguela Ecoregion.

The Southern Benguela Ecoregion is characterized by the cold, nutrient-rich waters brought about by upwelling events. It is South Africa's most productive ecoregion, characterised by rich biodiversity supporting major commercial fisheries, such as hake trawling and longline fisheries, a small pelagic fishery, large pelagic longline fishing, commercial line fishing, as well as the West Coast rock lobster and abalone fisheries (Sink et al. 2019).

The Southern Benguela Ecoregion is divided into two subregions, the Cape subregion, south of Cape Columbine/Donkin Bay, and the Namaqua subregion to the north, within which the NNP MPA is situated. The division between these two subregions extends from the inshore region to the middle shelf. The Namaqua subregion is characterized by distinct seaweed and intertidal invertebrate communities and is more prone to oxygen-deficient bottom waters than the Cape region. There are no distinctive differences between these areas past the middle shelf (Sink et al. 2019).

3.2 OCEANOGRAPHY AND HYDROGRAPHY

The type of marine life found in an area is primarily shaped by the ocean's physical conditions, such as water temperature, nutrient and oxygen levels, and how exposed the area is to wave action. In the Namaqua region, these factors create a unique marine environment that supports a wide variety of species adapted to the cool, nutrient-rich waters of the West Coast.

Local-scale oceanographic data for the NNP MPA are limited, but the broader Benguela Current Large Marine Ecosystem (BCLME), in which the MPA lies, has been extensively studied (Shannon & Pillar 1986). The MPA falls within the influence of the northern sector of the Southern Benguela upwelling system, one of the most productive coastal upwelling regions globally. The naturally cool Benguela Current (10–14°C on average) is further cooled by the upwelling of cold, nutrient-rich deep water (Branch & Branch 2018).

The area experiences strong southerly and south-easterly winds which, under the influence of the Coriolis effect (earth's rotation), drive surface waters offshore and draw deep, nutrient-rich waters to the surface (Branch & Branch 2018). Phytoplankton bloom when the nutrients reach the surface waters, where plenty of light is available for photosynthesis. The phytoplankton is then preyed upon by zooplankton, which is in turn eaten by filter-feeding fish such as anchovies or sardines. This makes the West Coast one of the richest fishing grounds in the world, also supporting apex predator communities including large colonies of seabirds and Cape fur seals (Branch & Branch 2018). The NNP MPA, located near the core of the Namaqua upwelling cell, therefore is strongly influenced by these oceanographic processes.

Upwelling intensity and water temperature variability influence both the distribution of benthic (seabed) and pelagic (water column) communities within the MPA. Cold, nutrient-rich conditions favour kelp forest development, dense invertebrate assemblages and high productivity in nearshore waters, while seasonal and interannual fluctuations in upwelling affect species composition and abundance.

3.3 BATHYMETRY

The west coast of South Africa can be separated into three distinct shelf areas: the inner, middle and outer shelf. The NNP MPA encompasses a range of both hard and unconsolidated seabed types, both inshore and offshore. On the inner continental shelf, sediments are predominantly sandy, while the mid-shelf exhibits a mosaic of muddy and sandy substrates interspersed with hard grounds. Despite a lack of sediment sampling in this region, a survey conducted near Platbaai (12 km south of the NNP MPA) recorded coarse and fine sands along the shore, mostly muddy sediments at 118 m depth (85% mud), predominantly sandy sediments between 135 m and 165 m (85% sand), and mixed sediments around 200 m (50% mud and 50% sand) (Karenyi 2014).

The continental shelf adjacent to the NNP MPA is broad (over 200 km) due to the extensive Orange Basin sedimentary delta, which underlies the shelf from the Lüderitz Arch to the Olifants Valley submarine canyon (Figure) (Wet & Myburgh 2013). The inner shelf is relatively narrow (~3–5 km), rocky, and follows the 80 m isobath, whereas the middle to outer shelf is wide, gently sloping, and largely featureless (Dingle et al. 1987, de Wet & Compton 2021). A thick, narrow mud belt occurs on the inner part of the middle shelf, forming part of the muddy inner-shelf mosaic ecosystem of the NNP MPA benthos (Wet & Myburgh 2013).

3.4 COASTAL MORPHOLOGY

The coastline within the NNP MPA is predominantly moderate to highly exposed rocky shores, interspersed with stretches of sandy beaches and occasional mixed rocky-sandy habitats. Roughly two-thirds of the shoreline consists of high-energy rocky platforms and headlands, with only a small proportion of the more sheltered rocky shore type (Jackson et al. 1984). The sandy beaches are generally coarse-grained and reflective to intermediate in profile, reflecting the strong wave action and high-energy conditions typical of the West Coast. These beaches are composed primarily of well-sorted coarse to medium sands, with gravel and cobble occasionally present. Unlike the sheltered bays of the south and east coasts, the Namaqua shoreline is open and exposed, with limited natural protection from wave action. Estuarine systems, notably the Groenrivier and Spoegrivier mouths, interrupt the otherwise continuous rocky and sandy shorelines and contribute to localized sediment dynamics.

3.5 ESTUARIES

South Africa has 290 functional estuaries (Van Niekerk et al. 2020). Estuaries are highly productive ecosystems due to the combination of high nutrient and sediment input derived from river water and seawater, as well as the shallow, sheltered habitats they provide (Robins et al. 2006, Savage et al. 2012). This high productivity drives their importance as nursery grounds for juvenile marine fish and invertebrates, which recruit to these protected, and nutrient-rich areas during their developmental stages (Beck et al. 2001). Despite their importance, estuaries are impacted by poor catchment management upstream, including erosion, pollution, and water abstraction. This, along with the development of harbours, has resulted in the majority of these estuarine ecosystems becoming severely degraded, raising concerns about the biota within the systems and the loss of ecosystem services that estuaries provide.

The local geomorphology, mean annual runoff from the catchment, sediment movement, marine and estuarine water currents and wave action all play a role in determining the shape and nature of an estuary (Chilton et al. 2021). The Namaqua region features primarily "Arid Predominantly Closed" estuaries, characterized by low fluvial inputs and high evaporation rates leading to hypersaline conditions. Marine connectivity is limited but occurs due to over-washing, seepage and occasional breaching events (Van Niekerk et al. 2020).

There are two estuaries in the NNP MPA: Groenrivier (near the southern boundary of the park) and Spoegrivier (on the northern boundary of the park) estuaries, as well as a Predominantly Closed Coastal Outlet/Seep – the Bitterrivier (central section). The Groenrivier and Spoegrivier estuaries have been identified as national "Priority" estuaries - estuaries considered especially important for biodiversity conservation, ecological functioning, fisheries support, waterbird habitat, and/or because they are threatened and require focused management (DWS 2017, Van Niekerk et al. 2020). Both systems support unique and diverse saltmarsh species, which thrive in the hypersaline conditions, as well as providing valuable habitat for waterbirds and waders, with 25 species recorded at the Spoegrivier estuary and 40 at the Groenrivier estuary (DWS 2017). Fish diversity is relatively low, with up to three species recorded in the Spoegrivier estuary: two mullet species (*Mugil cephalus* and *Chelon richardsonii*), along with gobies (*Caffrogobius* sp.), while the Groenrivier estuary hosts the two mullet species (DWS 2017).

Groenrivier

The Groenrivier Estuary, situated within the NNP, is a Predominantly Closed estuary that plays an important ecological role in this arid region (Turpie et al. 2012). Although small and seasonally variable, it provides critical habitat for estuarine and coastal species, including fish, invertebrates, and a variety of waterbirds (Van Niekerk & Turpie 2012). The estuary is strongly influenced by episodic freshwater inflows from the Groenrivier, which are typically limited given the low rainfall of the surrounding landscape, resulting in long periods of closure and hypersaline conditions (Van Niekerk & Turpie 2012). These hypersaline conditions provide important habitat for brine shrimp (*Artemia* sp.), which, in turn, is an important food source for several bird species, such as pelicans and flamingos (DWS 2017, Van Niekerk et al. 2020).

The Groenrivier Estuary is considered to be in relatively good ecological condition (Near Natural (B)) and has been identified as a national Priority for estuarine protection due to its biodiversity value and relatively undisturbed state (Turpie et al. 2012, Van Niekerk et al. 2020, Oosthuizen et al. 2024). It contributes to the broader ecological connectivity of the Namaqua coastline, linking terrestrial, riverine and marine ecosystems in a largely undeveloped and protected setting (SANParks 2023).

Spoegrivier

The Spoegrivier Estuary, located near the northern boundary of the NNP, is an Arid Predominantly Closed estuary of High ecological importance (Van Niekerk & Turpie 2012). Fed by the ephemeral (temporary) Spoegrivier, freshwater inflows are rare and highly seasonal, meaning the estuary is closed for much of the year, with fluctuating salinities and periods of hypersaline conditions (Van Niekerk et al. 2019). The estuary is regarded as being in good ecological condition ("Near Natural (A/B)") and has been identified as a national priority for estuarine protection due to its rarity, relatively intact state and biodiversity value (Van Niekerk et al. 2019). It provides critical habitat for a range of aquatic invertebrates, fish, and waterbirds, including as the giant pill bug *Tylos granulatus*, which is listed as Endangered (Harris et al. 2025). The estuary makes an important contribution to the connectivity of terrestrial, riverine, and marine ecosystems on the Namaqua coastal zone.

Bitterrivier

The Bitterrivier Estuary is a micro-system (small-scale ecological unit or sub-environment within the larger estuarine system) located along the central stretch of the NNP coastline and is classified as a Coastal Outlet/Seep (Van Niekerk et al. 2019). Its catchment is small and situated in the semi-arid Namaqualand region, resulting in highly

episodic freshwater inflows and long periods of closure at the mouth (Van Niekerk et al. 2019). This leads to fluctuating salinity conditions and a relatively simple estuarine habitat compared to larger systems. The Bitterrivier Estuary is considered to be in a more modified ecological state than the Groenrivier and Spoegrivier estuaries, with reduced overall biodiversity and estuarine function (Van Niekerk et al. 2020). The Bitterrivier Estuary's more modified ecological state is primarily due to its hydrological characteristics, greater human impact and less stable ecological functioning compared to the more pristine and resilient Groenrivier and Spoegrivier estuaries (Van Niekerk et al. 2020). Despite this, it provides habitat for estuarine biota and supports important ecological linkages between freshwater and marine environments along this otherwise arid and undeveloped coastline. While it has not been identified as a national Priority estuary, it remains ecologically significant as part of the broader estuarine mosaic within the NNP (DWS 2017, Van Niekerk et al. 2020). Important arid estuarine saltmarsh species found near the mouth of Groen, Spoeg and Bitter rivers include the submerged macrophyte *Stuckenia pectinata*, tidal marsh species (*Bassia diffusa, Cotula coronopifolia, Triglochin striata, Salicornia meyeriana, Juncus kraussii, Sporobolus virginicus, Ficinia nodosa, Juncus acutus* and *Juncus rigidus*) and supratidal terraces (*Salsola zeyheri, Suaeda fruticosa, Psilocaulon dinteri, Odyssea paucinervis* and *Phragmites australis*) (DWS 2017).

4. BIOTIC CHARACTERISTICS

The NNP MPA encompasses a largely pristine stretch of South Africa's west coast, characterized by a diverse range of environments that support a rich assemblage of marine life. (Griffiths et al. 2010, Blamey et al. 2015). Recognising the exceptional ecological value of this region, the Namaqua Ecologically or Biologically Significant Area (EBSA) was designated to encompass the diverse coastal and offshore habitats that underpin high species richness, unique assemblages and critical ecological processes (MARISMA EBSA Workstream 2023). The NNP MPA was declared within the boundaries of the Namaqua EBSA. The NNP MPA plays an important role in maintaining ecological processes and connectivity along the northern Benguela coastline, thereby enhancing the resilience of coastal and marine ecosystems.

4.1 MARINE ECOSYSTEMS

The NNP MPA protects twelve benthic and coastal ecosystem types, including five rocky shore-associated ecosystem types currently classified as Endangered (Harris et al. 2026). The MPA makes a significant contribution towards national conservation targets, protecting a substantial proportion (approximately 60-100%) of the national extent of several Namaqua rocky shore ecosystem types, including Namaqua Exposed Rocky Shore, Namaqua Mixed Shore, and Namaqua Very Exposed Rocky Shore (SANParks 2023). The area is recognised as containing some of the most pristine rocky shore habitats in South Africa, contributing to the protection of ecosystems in relatively good ecological condition (Sink et al. 2012).

4.1.1 INTERTIDAL (AREA BETWEEN THE HIGH- AND LOW-TIDE MARKS)

Rocky shores

Rocky shores are a dominant habitat type along the Namaqua coastline, with the NNP incorporating Very Exposed, Exposed, Mixed and Sheltered Rocky Shore ecosystems as defined in the NNP MPA management plan. These ecosystem types were previously classified as Vulnerable (Sink et al. 2019), but recent updates from the National Biodiversity Assessment (NBA 2025) indicate that all West Coast rocky shore ecosystem types are now considered Endangered, reflecting increasing ecological pressure along this coastline. As such, rocky shores represent a priority conservation feature within the NNP MPA (Harris et al. 2026).

Despite this, rocky shores remain vulnerable due to their accessibility and position at the land-sea interface (Branch et al. 2008). Key threats identified include subsistence and illegal harvesting disturbance from coastal access, and the spread of invasive alien species such as Mediterranean mussel *Mytilus galloprovincialis*. In addition, climate-driven changes, including shifts in upwelling dynamics and sea temperature, are likely to alter community structure over time. These pressures are consistent with drivers underpinning the recent reclassification of some rocky shore ecosystem types from Vulnerable to Endangered in the NBA 2025 (Harris et al. 2026).

On the Northern Cape coast, intertidal biomass is exceptionally high, particularly on shores exposed to strong wave action. Rocky shore communities in the Namaqua region are shaped by the cold, nutrient rich waters of the Benguela Current system, resulting in high productivity and biomass (Bustamante & Branch 1996). Exposed and semi-exposed rocky shores are typically dominated by the mussels *Aulocomya ater* and the invasive *Mytilus galloprovincialis*, together with macroalgae such as *Champia lumbricalis*, *Ecklonia maxima* and *Plocamium* spp. Limpets including *Scutellastra argenvillei, S. cochlear* and *S. granularis*, as well as anemones, nereid polychaetes and the reef-building worm *Gunnarea capensis,* are also characteristic components of these systems (Bustamante & Branch 1996).

Rocky shores in the Namaqua region exhibit clear vertical zonation driven by tidal exposure, wave energy and desiccation stress. These zones range from the upper littoral, dominated by hardy gastropods and barnacles, to the infratidal fringe, where conditions support more diverse assemblages (Mcquaid & Branch 1985, Branch & Branch 2018). Common species found within the infratidal fringe include articulated coralline algae, sea urchins such as *Parechinus angulosus* and a range of algae (e.g. *Gigartina* spp. and *Champia lumbricalis*). These habitats also support predators such as *Octopus vulgaris* and nearshore fish species (e.g. "klipvis"), which utilise rock pools and crevices for feeding and refuge (Branch et al. 2010a, Branch & Branch 2018).

These rocky shore ecosystems play a critical ecological role in coastal productivity and trophic functioning (Bustamante & Branch 1996). Habitat-forming species such as mussel beds and macroalgal assemblages provide structural complexity and support diverse assemblages of grazers, filter feeders and predators.

The current zoning of the NNP MPA affords strong protection to these threatened intertidal ecosystems. Zoning regulations and restricted areas are intended to reduce harvesting pressure and limit disturbance; however, ongoing monitoring is required to assess the ecosystem condition, track invasive species spread and evaluate climate change impacts.

Sandy beaches

The NNP MPA is known for its pristine sandy beaches composed of fine sands, which are typically rich in sandy macrofaunal invertebrate species (McLachlan 1980, Souza & Gianuca 1995, Calliari et al. 1996, Pulfrich 2011). Biomass values reported from beaches along the Benguela coastline rank among the highest in the world (Bally 1987), likely due to their position alongside a highly productive upwelling region.

The definition of sandy beaches includes the sandy intertidal zone, surf zone and the sandy dunes associated with them (Bally 1987). The coastal plain is characterised by large, active dune systems and sand movement corridors, which are integral to the region's ecological dynamics. In particular, the NNP protects the Bitterrivier aeolian sand dunes, which create unique microhabitats for several threatened and endangered coastal vegetation (SANParks 2023). Sandy beaches are dynamic coastal environments, with three morphodynamic beach types described: dissipative, reflective and intermediate (McLachlan et al. 1993), all of which are found within the NNP MPA. Generally, dissipative beaches are relatively wide and flat with fine sands and low wave energy. These beaches usually harbour the richest intertidal faunal communities.

The Southern Benguela Dissipative-Intermediate Sandy Shore ecosystem is a type of dissipative beach and is classified as "Least Concern". It is the least threatened of the three beach types (Harris et al. 2026). Reflective beaches, in contrast, have low wave energy and are coarse grained (>500 μm sand) with narrow and steep intertidal beach faces. The relative absence of a surf zone causes waves to break directly on the shore, leading to a high turnover of sand and resulting in depauperate faunal communities. The Southern Benguela Reflective Sandy Shore ecosystem type is classified as Endangered and emphasises the importance of the NNP MPA in protecting this heavily threatened beach type (Harris et al. 2026). Intermediate beach conditions exist between these extremes and have a variable species composition (McLachlan & de Ruyck 1993). For example, beaches with a high input of kelp wrack have a rich and diverse drift-line fauna, which would be sparse or absent on beaches lacking a drift-line (Branch & Griffiths 1988). The Southern Benguela Intermediate Sandy Shore beach type is classified as a "Near Threatened" habitat type and is protected by the NNP MPA (Harris et al. 2026).

In the NNP MPA, a rich outer turbulent surf zone (10-33 m from the shore) supports cnidarians (anemones), tube-building polychaetes and amphipods, while the less diverse inshore turbulent zone (3-5 m from the shore) is typified by deep burrowing polychaetes and crustaceans (McLachlan & Dorvlo 2005). Poor species diversity and abundance, as well as the presence of cumaceans (hooded shrimps), characterise the inner turbulent part of the surf zone (0-1 m from the shore). Fish such as galjoen *Dichistius capensis*, white and west coast steenbras (*Lithognathus lithognathus* and *L. aureti*) and southern mullet or harder *Chelon richardsonii* frequent turbulent surf zone waters off the West Coast, where they swim over submerged beaches at high tide and feed on small crustaceans (Branch & Branch 2018). Surf zone habitats, particularly medium to low energy beaches, are widely recognised as important nursery areas for fish (Lenanton et al. 1982, Clark et al. 1996).

The intertidal zone of a Namaqua sandy beach is typified by mysids, scavenging gastropods (*Bullia* spp.), amphipods, isopods and polychaetes. The upper drift line is typified by air-breathing amphipods (*Talorchestia* spp.) and giant isopods *Tylos granulatus*, as well as insects. The presence of the endangered *T. granulatus*, suggests the beach habitats are relatively undisturbed as they are sensitive to human impacts. Populations of these invertebrates have shown decreasing population trends across their range (Brown & Odendaal 1994).

Birds such as African black oystercatchers *Haematopus moquini*, white fronted plovers *Charadrius marginatus* and sanderlings *Calidris alba* feed on sandy beach organisms along the West Coast within the NNP MPA.

4.1.2 SUBTIDAL (AREA BELOW THE LOW-TIDE MARK)

Soft sediment

The subtidal soft sediment habitats within the NNP MPA are represented by several ecosystem types, including Namaqua Sandy Inner Shelf, Namaqua Muddy Shelf and Namaqua Muddy Mid Shelf Mosaic (Harris et al. 2026). These habitats occur across the inner and mid-shelf and are characterised by unconsolidated sediments ranging from sand to mud (Harris et al. 2023). They support diverse infaunal communities dominated by polychaetes, bivalves and crustaceans, which fulfil key ecological roles as deposit feeders, suspension feeders and predators, contributing to nutrient cycling and trophic functioning (Castro & Huber 1997). Soft sediment habitats are particularly vulnerable to physical disturbance from activities such as bottom trawling, seabed mining and offshore resource extraction Harris et al. 2023). Within the NNP MPA, protection of these ecosystems, including areas in relatively good ecological condition and supporting national biodiversity targets.

Rocky reef

Temperate rocky reefs are found below the low water mark, where they experience disturbances, such as wave action and sedimentation, from surrounding unconsolidated sediments. Many large predators, such as fish and sharks, are attracted to rocky reefs and, as such, represent an important component of these ecosystems (Pinto et al. 2021). Reefs also provide a stable substratum for kelp species, such as sea bamboo *Ecklonia maxima* and split-fan kelp *Laminaria pallida*, on which to anchor, forming extensive kelp forests in this area. *E. maxima* thrives at depths of up to approximately 12 m, while *L. pallida* extends to depths of about 30 m (Branch et al. 2010b). These forests offer food and shelter to a diverse array of marine organisms. Beneath the canopy, encrusting coralline algae dominate, accompanied by understorey algae and epiphytic species growing on the kelp itself. Previous surveys conducted by DFFE using a tow-camera have also recorded large patches of red algae and encrusting coralline algae at depths of around 30 m (SANParks 2023). Filter feeders such as mussels, red bait *Pyura stolonifera* and sea cucumbers *Holothuroidea* comprise a large part of the faunal community on subtidal rocky reefs (Branch et al. 2010b). Grazers include dominant sea urchins *Parechinus angulosus*, limpets, isopods (e.g. *Paridotea reticulata*) and amphipods (e.g. *Ampithoe humeralis*) (Branch & Branch 2018).

4.1.3 PELAGIC HABITAT

The open ocean, or pelagic environment, is the expanse of water beyond the nearshore seabed, and it plays a critical role in the functioning of marine ecosystems. This environment within and adjacent to the NNP MPA forms part of the highly productive Southern Benguela ecosystem, characterised by strong coastal upwelling that drives high primary productivity. These upwelling areas support abundant plankton communities, which in turn sustain important forage fish species such as sardine and anchovy, forming the basis of pelagic food webs.

A key objective of the NNP MPA is the protection of important fishery resources, including the conservation of hake (*Merluccius* spp.) nursery areas within the pelagic and shelf environment. This highlights the importance of the pelagic zone in supporting early life stages of commercially important species and maintaining ecosystem functioning.

The pelagic environment supports a diverse range of higher trophic level predators, as reflected in the MPA management plan, including seabirds and marine mammals. These species rely on the productivity of the pelagic system and the availability of prey resources within and around the MPA. See Section 4.6 below for more information on these communities.

The ecological importance of the pelagic environment in the NNP MPA is therefore closely linked to its role in supporting trophic connectivity between plankton, forage fish and top predators, as well as contributing to the persistence of key fisheries resources. Protection of these pelagic processes within the MPA contributes to broader ecosystem.

4.2 PLANKTON

Plankton communities form the foundation of the marine food web, supporting a wide range of fish, invertebrates, and larger predators. Influenced by seasonal upwelling and estuarine inputs, these communities exhibit high productivity and play a crucial role in nutrient cycling and ecosystem functioning (Walker & Peterson 1991). Plankton includes both phytoplankton (microscopic algae) and zooplankton (microscopic animals). Phytoplankton are microscopic photosynthetic organisms and are primary producers in marine ecosystems (Jahan & Singh 2023). In temperate seas like those off the South African west coast, phytoplankton exhibit distinct seasonal growth cycles influenced by nutrient availability, oxygen, temperature and sunlight (Montoya-Maya & Strydom 2009).

While literature specifically addressing plankton within the NNP MPA is limited, studies from the broader southern Benguela upwelling system, which includes the Namaqua region, provide relevant insights. The plankton communities of the NNP MPA are likely dominated by highly productive Benguela upwelling assemblages, with diatom-driven phytoplankton blooms and abundant zooplankton forming the energetic base of coastal food webs that support fish, seabirds, marine mammals and benthic ecosystems.

Sandy beach ecosystems in the NNP MPA are all exposed, high-energy systems characteristic of the West Coast. In the absence of macroalgae on these sandy shorelines, surf diatoms (phytoplankton such as *Anaulus australis*) provide the primary source of production, forming dense blooms in the surf zone that underpin coastal food webs (Lamberth et al. 2022). Their distribution now is believed to extend northwards along the Namaqua and Northern Cape coastline, where suitable high-energy sandy beach habitats and upwelling conditions occur. However, compared with the southern West Coast, the ecology and spatial dynamics of surf diatom blooms in the Northern Cape remain relatively poorly studied. The representative plankton taxa recorded in the NNP MPA are listed in Appendix G.

Currents and the freshwater inflow into the surf zone drive the formation of dense aggregations of diatoms, which undertake daily vertical migrations to maintain their position in the nutrient-rich surf zone (Talbot & Bate 1988). By adhering to air bubbles during daylight, they are maintained in the surface waters where they photosynthesise. Their position in the surf zone is maintained by wave action and the physical barrier it creates (Talbot & Bate 1988). However, at night, they settle on the seafloor. Although this process allows the formation of dense aggregations in the surf zone, periodic losses may occur due to offshore winds and strong rip currents. Primary productivity is, therefore, transported to the nearshore, forming an important food source for filter feeders (Campbell & Bate 1988).

Zooplankton communities in the Namaqua coast region are likely rich and seasonally abundant, dominated by copepods, euphausiids (krill), gelatinous plankton, fish eggs and larvae, and the larval stages of crabs, lobsters, molluscs and other invertebrates, which collectively transfer high phytoplankton production generated by Benguela upwelling to fish, seabirds and marine mammals. Although direct studies within the NNP MPA are limited, there is relevant regional research from the adjacent Namaqua shelf and broader southern Benguela system. Studies on the southern Namaqua shelf have examined plankton dynamics, harmful algal bloom development, and dinoflagellate production, confirming this coastline as an active and productive planktonic environment. Long-term Benguela studies also show that copepods are key mid-trophic organisms linking primary production to sardine, anchovy and other predators (Hays et al. 2005).

4.3 ALGAE

The diversity of intertidal macroalgal species in the region is relatively low (Bustamante et al. 1997). Nevertheless, a range of algal species is present within this environment including *Gigartina* spp., *Champia lumbricalis*, *Ralfsia verrucosa, Porphyra capensis,* and *Ulva* spp., scattered patches of encrusting brown algae, and articulated coralline algae.

The shallow inshore area of the MPA supports approximately 7.4 km² of macroalgal kelp forest dominated by *E. maxima* and *L. pallida*. Rocky reefs provide the substratum to which kelp attaches, and these extensive forests offer both food and shelter for numerous marine organisms.

Beneath the floating kelp canopy, many algal species thrive, particularly in inshore areas where light penetration is high and the water is shallow. In deeper zones, a sub-canopy of *Laminaria* grows beneath *Ecklonia* and dense assemblages of red algae are commonly found beneath this layer. Several algal species, including *Carradoria virgata, Suhria vittata, and Carpoblepharis flaccida,* grow epiphytically on the kelp fronds. Representative understorey algae include *Botryocarpa prolifera, Neuroglossum binderianum, Botryoglossum platycarpum, Hymena venosa, Rhodymenia obtusa* and various coralline algae (Biccard et al. 2025). The representative algae recorded in the NNP MPA are listed in Appendix F.

Such habitats provide habitat and shelter for a wide diversity of marine organisms, making algae an important foundation for the island's nearshore ecological dynamics.

4.4 MARINE INVERTEBRATES

The invertebrate communities of the NNP MPA are highly diverse and structured along distinctive environmental gradients from the upper intertidal zone to the deeper offshore habitats. These assemblages play critical roles in maintaining the ecological functioning of coastal ecosystems, contributing to nutrient cycling and primary productivity (Griffiths et al. 2010). Research conducted by Anchor Environmental Consultants in 2014 identified various invertebrates within the NNP MPA. The inshore area of the MPA hosts a wide array of kelp associated invertebrates such as sponges, limpets (e.g. granular limpet *Scutellastra granularis*), mussels (e.g. ribbed mussel *Aulacomya atra*), sea urchins (e.g. Cape urchin *Parechinus angulosus*), sea anemones (e.g. sandy anemone *Bunodactis reynaudi*), star fish (e.g. dwarf cushion star *Parvulastra exigua*), polychetes (e.g. Cape reef-worm *Gunnarea* *gaimardi*) octopi (e.g. common octopus *Octopus vulgaris*), barnacles and various crustaceans (e.g. West Coast rock lobster *Jasus lalandii*) (Biccard et al. 2025). The representative marine invertebrates recorded in the NNP MPA are listed in

Appendix *E*. In total, 30 invertebrate taxa have been recorded, dominated by Mollusca (n=12), Arthropoda (n=6) and Echinodermata (n=6), with additional contributions from Cnidaria (n=5) and Annelida (n=1). This taxonomic composition reflects the strong dominance of molluscan grazers and filter feeders within rocky shore and kelp-associated habitats, alongside diverse echinoderm and crustacean assemblages.

The upper shore sandy beach habitat is a highly exposed, harsh environment with high exposure to desiccation, wave action, wind, and fluctuating temperatures. Only a few invertebrates can withstand these stresses. This habitat is also home to the giant isopod *Tylos granulatus*, which has recently been listed as "Endangered" on the IUCN Red List due to declining numbers (Brown & Odendaal 1994, Harris et al. 2025). Another isopod found within this habitat is the horned isopod *Deto echinata*, which often feeds on drift-cast kelp (Biccard et al. 2025). Although diversity is relatively low in this habitat, these species are well-adapted to tolerate desiccation and play a crucial role in the ecological functioning (Bustamante & Branch 1996).

The upper rocky shore habitats are subjected to high desiccation stress and are mostly dominated by the South African periwinkle *Afrolittorina* sp. Moving down to the mid and lower intertidal rocky areas, invertebrate abundance and diversity increase markedly. Common species found along these rocky shores include various species of algae (seaweeds, such as *Ralfsia verrucosa*, *Ulva* spp. and *Hildenbrandia* spp.), gastropods (limpets, such as *Helcion pectunculus*, *Scutellastra cochlear,* and *Oystele tigrina*, false limpet *Siphonaria capensis* and sea snails), bivalves (mussels, such as *A. atra*), echinoderms (sea stars, sea cucumbers and sea urchins), tunicates (ascidians and sea squirts), cnidarians (sea anemones, such as *B. reynaudi* and *Anthothoe chilensis*), sea sponges and crustaceans (amphipods, shrimps, prawns, barnacles, such as *Octomeris angulosa* and *Tetraclita serrata*, and crabs). More tolerant species capable of withstanding desiccation are found near the high-water mark, while those unable to withstand prolonged exposure are found near the low-water mark or subtidally.

The low shore/shallow subtidal areas on exposed shores are home to dense stands of limpets *Scutellastra argenvillei* and *S. cochlear*, while more sheltered shores are defined by high densities of granite limpet *Cymbula granatina*. The invasive mussel *Mytilus galloprovincialis* is particularly abundant along this coast, often outcompeting native species and altering community structure (Bustamante & Branch 1996, Griffiths et al. 2010). Below this, the infratidal zone, only exposed during spring low tide, is inhabited by species that cannot withstand long periods of exposure and desiccation. These include several species of algae and coralline algae, sea urchins *P. angulosus* and the Mediterranean mussel *M. galloprovincialis.*

Below the low-tide mark, shallow subtidal habitat supports diverse reef and kelp-associated communities. These kelp forests provide essential habitat for numerous invertebrate species, including sea urchins, sponges, ascidians and a variety of crustaceans. The West Coast rock lobster (WCRL) *Jasus lalandi* is a keystone species in this zone, exerting top-down control on urchin populations and influencing community structure (Katharoyan et al. 2024).

Within subtidal, sandy unconsolidated habitats, communities are dominated by burrowing and sediment dwelling species such as polychaetes, bivalves and crustaceans (Biccard et al. 2025). These organisms play key roles in sediment turnover, oxygenation and detrital decomposition, forming the basis of benthic food chains that support demersal fishes and rays (Atkinson & Clark 2005). Beyond the shallow reefs and sandy habitats, the deeper benthic environment of the MPA remains less well studied but is expected to host communities typical of the Benguela shelf region. These include echinoderms such as brittle stars (*Ophiura* spp.) and sea cucumbers (Holothuria spp.), as well as deep-water sponges, corals and crustaceans. Such assemblages are important for nutrient recycling and carbon sequestration and may also provide habitat for juvenile fish and other benthic organisms (Welsh 2003, SANParks 2023).

Bryozoan assemblages in the Namaqua marine region show a distinct and coherent biogeographic structure, clearly differentiated from adjacent regions within the Southern Benguela and from areas further south and east (Boonzaaier-Davids et al. 2020). Community composition remains consistent across shallow and mid-shelf depths, indicating strong regional structuring rather than gradual faunal turnover. Recorded bryozoan richness in Namaqua is relatively low, but this is strongly influenced by limited and uneven sampling effort, particularly in deeper offshore habitats, highlighting significant gaps in current knowledge of bryozoan diversity and distribution in the region (Boonzaaier-Davids et al. 2020).

4.5 MARINE VERTEBRATES

4.5.1 FISH

Due to the regions nutrient enrichment, the western coast supports a high biomass of marine biota and therefore several important fisheries. However, the more exposed coast of the Northern Cape is less protected from weather conditions and is more uniform in respect to its coastline. As a result, this coast is less retentive and generally considered less productive. The Northern Cape is also sparsely populated, which contributes to fewer large commercial fisheries in this area. The cold, nutrient-rich waters support various pelagic and demersal fish species such as sardines *Sardinops sagax* and anchovies *Engraulis capensis* (Hutchings et al. 2002, Griffiths et al. 2010, Majiedt et al. 2013, Blamey et al. 2015). The region is also a very important nursery ground for Cape hake *Merluccius capensis* (Hutchings et al. 2002). The shallow inshore area of the NNP MPA is populated by a range of kelp-associated species. The Cape bream[1] *Pachymetopon blochii* is the most common kelp-associated fish. Some other common kelp-associated species are the two-tone fingerfin *Chirodactylus brachydactylus*, milk fish *Parascorpis typus* and galjoen *Dichistius capensis* (Branch et al. 2010a, Branch & Branch 2018). The representative fish recorded in the Namaqua MPA are listed in Appendix D.

Estuaries are highly productive ecosystems due to the combination of high nutrient river water with a shallow, sheltered habitat (Robins et al. 2006). They are also valued for their importance as nursery grounds for juvenile marine fish and invertebrates, which recruit to these protected, and nutrient-rich areas during their developmental stages (Beck et al. 2001). Fish species regularly recorded in the Spoegrivier estuary include two mullet species (*Mugil cephalus* and *Chelon richardsonii*) and gobies *Caffrogobius* sp.) in the Groenrivier estuary (DWS 2017).

4.5.2 SHARKS SKATES AND RAYS

While species-specific data on sharks within the MPA are limited and no area-focused studies have been conducted, the broader marine environment is likely to support a diverse assemblage of demersal and pelagic sharks, skates and rays, including the dark shyshark *Haploblepharus pictus*, broadnose sevengill shark *Notorynchus cepedianus*, St Joseph shark *Callorhinchus capensis*, lesser sandshark *Acroteriobatus annulatus*, biscuit skate *Raja straeleni*, spearnose skate *Rostroraja alba*, blue stingray *Dasyatis chrysonota* and soupfin shark *Galeorhinus galeus* (Branch et al. 2010a). The representative chondrichthyans recorded in the NNP MPA are listed in Appendix C.

Additionally, other species that may migrate through or use the offshore area of the MPA include the mako shark *Isurus oxyrinchus* and blue shark *Prionace glauca*, both of which are highly mobile pelagic species known to undertake large-scale movements across the South Atlantic (da Silva et al. 2010).

Sharks, skates and rays play critical roles in maintaining ecosystem structure and function. Targeted research on these taxa would therefore be valuable, particularly given their high vulnerability to overexploitation, generally slow growth rates, late maturity, and low reproductive output, which collectively increase their susceptibility to population declines and slow recovery once depleted (Dedman et al. 2024).

4.5.3 MARINE MAMMALS

Whales and dolphins

This remote and relatively undisturbed area is part of the Benguela Current ecosystem and supports a rich diversity of marine life, including several species of marine mammals. The Benguela Current region supports a diverse assemblage of cetaceans, including several species of baleen whales and toothed whales. The most abundant baleen whales in the

[1] Cape bream has historically been referred to as "Hottentot". However, this term was originally used by European colonists to refer to the Khoekhoe, the indigenous pastoralists in South Africa, and use of the term is now considered deeply offensive (Hendrickson 1985). Cape bream is now generally accepted as a more appropriate name for *Pachymetopon blochii.*

Benguela system are the humpback whale *Megaptera novaeangliae* and the southern right whale *Eubalaena australis*. Over the past decade, the prevalence of both species along the west coast of South Africa, outside the usual whale season (June to November), has increased, with feeding behaviour observed in upwelling zones (Mate et al. 2011, Barendse et al. 2011, Findlay et al. 2017). Increasing numbers of summer records of both species from the southern half of Namibia suggest that animals may also feed in the Lüderitz upwelling cell (NDP, unpublished data) and could therefore pass through the coastal waters of the NNP MPA (Pulfrich 2021).

Southern right whales migrate annually from sub-Antarctic regions to calve and nurse off the western coast of southern Africa between June and November, often close inshore. Humpback whales are most likely to be sighted during October and November as they migrate southwards from their tropical breeding grounds off West Africa to their Antarctic feeding grounds. The NNP MPA lies within this migratory corridor which may provide important seasonal feeding opportunities for both species and other transient cetaceans.

Schools of over 1,000 short-beaked common dolphins *Delphinus delphis* and dusky dolphins *Lagenorhynchus obscurus* have been recorded within and adjacent to the NNP MPA, particularly in association with areas of elevated productivity. The representative marine mammals recorded in the NNP MPA are listed in Appendix A. The Near Threatened, endemic Heaviside's dolphin *Cephalorhynchus heavisidii* is also frequently observed along this section of the Northern Cape coast, reflecting its strong affinity for the cool, nutrient-rich inshore waters of the Benguela system (Elwen et al. 2010). These conditions support dense shoals of small pelagic fish such as sardines and anchovies, which attract large aggregations of dolphins and other marine predators, underscoring the ecological importance of the NNP MPA for resident and migratory cetacean species.

Seals

The NP MPA supports two expanding colonies of Cape fur seals *Arctocephalus pusillus pusillus*, both of which have become established breeding sites in recent years (Crawford et al. 2018). Strandfontein Point, also referred to as the Namaqua seal colony, lies on the mainland approximately 30 km south of Hondeklipbaai and experienced periods of abandonment in the early 2000s, but was re-occupied by 2014, when aerial surveys done by DFFE recorded 981 pups, with pup production continuing to increase steeply thereafter (DFFE, unpublished data). A second mainland colony occurs south of the Spoegrivier mouth in the Northern Cape within a previously mined and rehabilitated coastal area; this site was identified in 2020, when the first aerial photographic survey recorded around 760 adults and three pups, with seals predominantly occupying rocky and boulder habitats along the southern extent of the bay (DFFE, unpublished data). Occasional vagrant seals, such as the southern elephant seal *Mirounga leonina*, have been recorded hauling out along the coast to rest or undergo moulting (W. Oppel, personal observation). The MPA has been identified as an important foraging ground for the local Cape fur seal population (Crawford et al. 2018). Tracking data and regional studies have shown that seals from the Namaqua colony use the nearshore and offshore reefs, as well as the nutrient-rich upwelling zones within the MPA, for feeding (Kirkman et al. 2013, Botha et al. 2023). These areas provide abundant prey, including pelagic and demersal fish species associated with the Benguela Current system. The proximity of productive foraging areas to secure breeding habitat is likely to support the persistence and potential growth of this colony (Kirkman et al. 2013).

The Cape fur seal, listed as Least Concern by the IUCN, is the only pinniped species breeding along the southern African coast. The number of breeding colonies in South Africa has also increased from 23 in 1970 to approximately 40 (Kirkman et al. 2013). Although the overall population has remained stable since the early 1990s (estimated at 1.5–2.0 million), its distribution varies with prey availability and environmental conditions (Kemper et al. 2007, Kirkman et al. 2013, 2019). In South Africa, seals are protected under the Threatened and Protected Species and Sea Birds and Seals Protection Act (Act No. 46 of 1973), which prohibits hunting, harassment, and disturbance in their natural habitats. The protection afforded by the NNP MPA is therefore significant for maintaining local ecological balance and supporting the ongoing expansion of Cape fur seals along this section of the West Coast.

However, the colony is associated with ongoing conflict with fishers in the area, driven by perceptions that seals significantly impact fish stocks and WCRL. In addition, rabies was confirmed at the colony in 2025, introducing a new conservation and management concern (Maja 2024).

4.5.4 SEABIRDS

The NNP MPA supports a diverse avifaunal assemblage and provides critical habitat for several threatened seabird species, including the Cape cormorant *Phalacrocorax capensis* (Endangered), bank cormorant *Phalacrocorax neglectus* (Endangered), and Cape gannet *Morus capensis* (Endangered) (Crawford et al. 2018). In addition, the MPA supports important coastal and shoreline species such as the African oystercatcher *Haematopus moquini* (Near Threatened), along with several tern and gull species (Crawford et al. 2018). The representative birds and shorebirds recorded in the NNP MPA are listed in Appendix B.

A significant proportion of South Africa's seabird fauna is currently listed as threatened by the IUCN. This includes approximately five coastal seabird species (20%) and 15 pelagic species (25%) (BirdLife South Africa 2024). Multiple anthropogenic pressures continue to threaten these populations, including competition with commercial fisheries for prey resources (Sydeman et al. 2017), incidental bycatch in fishing operations (Dias et al. 2019), as well as noise, oil and chemical pollution (Crawford et al. 2000, Wolfaardt et al. 2009, Pichegru et al. 2017)

Although estuary habitat makes up a small portion of the overall MPA area, and Namaqua estuaries are frequently closed to the sea, the Spoegrivier and Groenrivier estuaries do support high densities of brine shrimp and other invertebrates adapted to hypersaline conditions, which provide rich foraging opportunities for waders and other waterbirds.

Typical estuarine species observed in these systems include the lesser flamingo *Phoeniconaias minor*, curlew sandpiper *Calidris ferruginea*, ruddy turnstone *Arenaria interpres*, grey plover *Pluvialis squatarola* and various tern species (DWS 2017). These estuaries constitute critical habitat for foraging, resting, and refuge for numerous resident and migratory species.

The African penguin *Spheniscus demersus* is endemic to southern Africa and has recently been upgraded from Endangered to Critically Endangered. The African penguin was South Africa's most abundant seabird, historically, but has suffered a massive population decline. It has been reported that the global African penguin population has declined by 65% since 1989 (Sherley et al. 2020). These Critically Endangered seabirds primarily breed on islands off the central Namibian coast to Algoa Bay, with some occurring at coastal colonies like Boulders Beach in Simon's Town and Stony Point in Betty's Bay. Although the penguins have no established breeding areas within the NNP MPA, they regularly occur in the area and benefit from its protected foraging and roosting habitats (Pichegru et al. 2010, McInnes et al. 2017).

The same can be said for the Cape cormorant *Phalacrocorax capensis*. This bird is endemic to southern Africa, historically most abundant along the West Coast. They generally feed within 10–15 km of the shore, preying primarily on small schooling fish such as the pelagic goby *Sufflogobius bibarbatus*, Cape anchovy, sardine and Cape horse mackerel *Trachurus trachurus* (Crawford et al. 2016, Masiko et al. 2021).The species has experienced substantial population declines over the past three generations and is currently classified as Endangered (Cook 2015a, IUCN 2025). Nationally, numbers have decreased by approximately 50% since the late 1970s. Breeding distribution has also shifted south-east over time (Crawford et al. 2007, 2016). Although declines have been largely attributed to reductions in pelagic fish availability, particularly sardine, the persistence of relatively high anchovy biomass in recent decades suggests that additional factors are influencing population trends (Cook 2015b). These include predation by Cape fur seals and kelp gulls (on eggs and chicks), disease, entanglement in fishing gear, oil pollution, human disturbance and shifts in prey distribution, including the eastward displacement of sardines (Crawford et al. 2016). More recently, outbreaks of avian influenza have

emerged as an significant threat, causing large-scale mortality events in coastal seabird colonies since 2018 (Abolnik et al. 2023, Molini et al. 2023).

The bank cormorant *P. neglectus* is a strictly marine seabird endemic to southern Africa, occurring from Namibia to the Western Cape and closely associated with the Benguela Current and the distribution of kelp beds. It is a specialized forager within kelp-dominated rocky reef habitats, feeding primarily on benthic and demersal prey such as rock lobster, 'klipvis', blennies, octopus and other reef-associated species. Individuals typically forage close to shore, usually within 10-15 km of the coastline (BirdLife International 2018). Breeding occurs at localised colonies on offshore islands, rocky headlands and coastal boulders near suitable foraging grounds. This species has undergone significant population declines, from approximately 1,500 breeding pairs in the 1980s to around 800 pairs currently, with fewer than 4,000 mature individuals remaining (Cooper 1981, Crawford et al. 1999, 2015). These declines are linked to reduced prey availability, competition with fisheries, predation, disturbance, entanglement, oiling and displacement by Cape fur seals, with emerging threats such as avian influenza also of concern. As a result, the bank cormorant is classified as Endangered on the IUCN Red List (IUCN 2025). In the Northern Cape, including the NNP MPA, extensive kelp beds provide important foraging habitat, and although breeding has not yet been recorded within the MPA, the area likely plays a key role in supporting regional populations.

The NNP MPA and the shelf edge adjacent to the MPA form key feeding grounds for the Endangered Atlantic yellow-nosed albatross *Thalassarche chlororhynchos* and the black-browed albatross *Thalassarche melanophris*.

5. HISTORY AND MARINE CULTURAL HERITAGE

5.1 ARCHAEOLOGY AND CULTURAL HERITAGE

The coastline of NNP holds a rich cultural and archaeological heritage, with evidence of human occupation dating back to the late Pleistocene and early Holocene (roughly 129,000 to 8,200 years ago) (Orton 2017). Archaeological finds, including hand axes and early pottery fragments, have been uncovered within the park and are believed to have been made and used by early humans (Natural & Cultural History – Namaqua National Park). Middle Stone Age communities are also believed to have been exploiting coastal resources from around 120,000 years ago, at sites such as Brandsebaai, Groenrivier, and Rooiwalbaai (Pether 1994, Hart 2006, Parkington 2006)

It has also been reported that San people inhabited parts of the broader Namaqua region, with evidence of shell middens and stone tools recorded along the Gariep River, in caves, and across rocky outcrops (Dewar 2008). These findings suggest that similar coastal and nearshore resources, including those within the present-day NNP MPA, were likely utilised historically, highlighting the long-standing human dependence on marine ecosystems in this region. These late Stone Age deposits indicate that San hunter- gatherers were heavily reliant on the intertidal zone and its abundant resources (Orton 2017), with archaeological material such as limpet shells, lithic tools, ostrich eggshell fragments, and animal bones widely distributed along the Namaqua coastline (Kyriacou & Parkington 2015). Limpet species, including *C. granatina, S. granularis*, and *S. argenvillei* formed a key part of the San diet, along with shorebirds and Cape fur seals (Kyriacou & Parkington 2015). Studies of shell assemblages reveal changes in resource collection strategies over time as early assemblages appear highly selective, with later foragers adopted more flexible and opportunistic harvesting practices (Kyriacou & Parkington 2015, Orton 2017).

Before large-scale De Beers diamond mining, surveys recorded numerous shell middens left by San hunter-gatherers and Khoekhoen pastoralist ancestors, scattered along the Namaqua coast (Orton 2017). These middens have been radiocarbon dated to between 5,000 and 580 years ago (Orton 2017). Early evidence of pastoralism, specifically sheep herding, has been found in the Spoegrivier Cave, dating to approximately 3,000 years ago (Webley et al. 2001). Several Khoisan burials have also been documented near the Buffelsrivier and Groenrivier (within the national park), as well as at Noup, south of Kleinzee (Orton 2017).

SANParks and regional authorities recognize the archaeological and cultural richness of the Namaqua coast, and many of these sites are protected within the terrestrial NNP. However, research coverage remains uneven, and much of the current site documentation stems from mining-related archaeological impact assessments, rather than systematic academic excavation (Orton 2015, SANParks 2023).

5.2 MARITIME HERITAGE

The maritime history of the NNP coastal section reflects a long record of human interaction with the sea. During the 18th and 19th centuries, the remote and treacherous West Coast served as a frontier for trekboer settlement, as well as a hazardous shipping corridor, with Port Nolloth, to the north, developing as an export point for Namaqualand copper (Blair 2011, Smalberger 2016). From the 18th century, the region's treacherous waters, heavy swells, and dense fog made navigation hazardous, and numerous vessels were wrecked along the wider Namaqualand coast (Smalberger 2016). Wrecks, such as the *Aristea*, near Hondeklipbaai, and others recorded in heritage surveys, are reminders of how this stretch of coastline formed part of South Africa's maritime industry: servicing shipping routes, fishing grounds and mineral transport, despite the risks (Blair 2011, Smalberger 2016). In the 20th century, extensive diamond mining along the shoreline and nearshore waters brought significant industrial activity, while small-scale fishing continued to support local communities (Blair 2011, De La Harpe 2025).


SPOEG RIVER CAVE
THIS SITE IS OF SPECIAL ARCHAEOLOGICAL IMPORTANCE AS IT CONTAINS THE EARLIEST EVIDENCE OF DOMESTIC SHEEP IN SOUTH AFRICA. SHEEP BONES FOUND IN THIS CAVE DATE BACK TO ABOUT 2000 YEARS AGO. THE CAVE IS BELEIVED TO HAVE BEEN USED BY THE KHOIKHOI PEOPLE AS THEY MIGRATED SOUTHWARD WITH THEIR FLOCKS.
THIS SITE IS PROTECTED IN TERMS OF THE NATIONAL MONUMENTS ACT (NO.28 OF 1969 AS AMENDED). IT IS AN OFFENSE TO DESTROY, DAMAGE, ALTER OR REMOVE ANY MATERIAL FROM THIS CAVE WITHOUT A PERMIT FROM THE NATIONAL MONUMENTS COUNCIL.
NO CAMPING
NO FIRES IN THE CAVE
NO DIGGING IN THE CAVE
NO LITTERING
NO VEHICLES IN THE CAVE

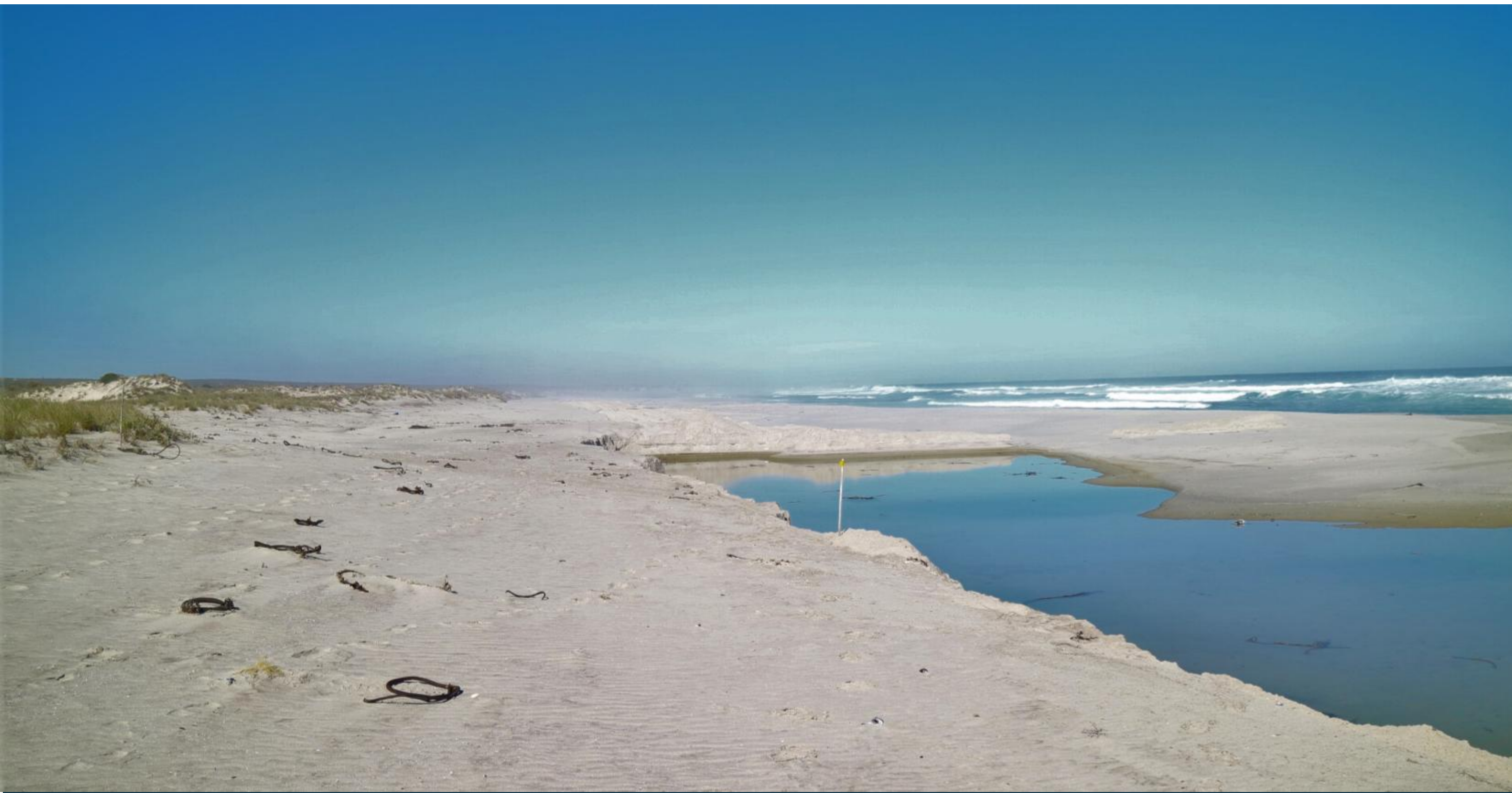
6. EMERGING PRESSURES AND THREATS

6.1 MINING

6.1.1 DIAMOND MINING

Diamond mining along South Africa's West Coast has a long history, beginning with the exploitation of terrestrial alluvial deposits by prospectors in Namaqualand, progressing to large-scale operations and, more recently, to sophisticated marine mining techniques that extract diamonds directly from the coast and the neighbouring seabed (Gurney et al. 1991). Over time prospectors and operators have shifted their focus offshore rather than in terrestrial areas, accelerating the development of nearshore and deepwater diamond mining (Garnett 1995). Today, companies such as Trans Hex and De Beers maintain a significant presence in the Namaqualand region, holding concessions for both onshore and offshore exploration and mining activities (Ryan 2011).

Prior to the proclamation of the NNP MPA, diamond prospecting occurred along this coastline, particularly between the Groenrivier and Spoegrivier regions. These activities resulted in numerous prospecting pits, which were subsequently rehabilitated. Today, most of these sites are no longer readily distinguishable in the landscape. Adjacent to the MPA, historical concessions and exploration blocks issued to companies such as De Beers and Trans Hex included both onshore terrace deposits and subtidal extraction zones (Garnett 1995, Corbett 2002). These activities involved removing beach sediments, altering dune morphology, compacting beaches, and disturbing intertidal habitats. Nearshore operations using crawler systems and dredging equipment (Garnett 1995, Corbett 2002). Environmental impacts associated with beach or coastal diamond mining include habitat destruction, alteration of biotic community composition, biodiversity loss, changes in ecosystem dynamics, associated pollution, smothering and increased turbidity (Smith & Weitz 2006, Van Schalkwyk 2022). Intertidal communities are impacted by tailings deposits, which alter community structure, or in some cases completely cover the rocky shore or sandy beaches. The deposition of tailings significantly impact sheltered intertidal communities where wave action was insufficient



to disperse them (Smith & Weitz 2006, Van Schalkwyk 2022).

In addition to direct habitat removal, the presence of mining infrastructure and vehicle traffic along the coast historically disturbed coastal and beach-nesting bird species (Schlacher et al. 2013). Spoil disposal and sediment plumes from offshore mining likely contributed to the smothering of nearshore reefs and degradation of kelp-bed ecosystems adjacent to mining lease areas (Pulfrich & Branch 2014).

The establishment of the NNP MPA has since restricted active mining within the protected area, but historic impacts remain visible, including altered beach profiles and localized habitat degradation.

6.1.2 NEW MINERAL EXPLORATION

Along South Africa's west coast, including areas adjacent to the NNP MPA, there has been growing interest in mineral and energy exploration. The Namaqua region is part of the historic O'Okiep Copper Belt, where renewed exploration for copper and other base metals is underway to meet global demand for critical minerals. Offshore, the Orange Basin has attracted international oil and gas companies, with seismic surveys and exploratory drilling planned in deep-water areas. In addition, heavy mineral sands continue to be prospected to the north and south of the park. While these activities highlight the economic potential of the West Coast, they also raise concerns for sensitive coastal and marine ecosystems, fisheries, and local communities.

6.1.3 OFFSHORE OIL AND GAS EXPLORATION

Major companies like Shell and TotalEnergies are conducting or planning oil and gas exploration, seeking to replicate significant discoveries in neighbouring Namibia. However, this has led to significant environmental concerns and numerous legal challenges from activists, coastal communities, and fishers who fear negative impacts on marine life and livelihoods. As of July 2025, Shell has been granted environmental authorisation to drill up to five deep-water wells off South Africa's west coast. The oil major plans to drill exploration wells in the Northern Cape Ultra Deep Block (NCUD) in the Orange Basin. The NCUD block is located off the west coast of South Africa. The block is approximately 300 km offshore, in water depths between 2 500 m and 3 200 m, and the proposed area of interest for drilling is roughly 5 254 km^2 in extent (Meissner 2025, Reuters 2025, SLR 2025).

6.2 MICROPLASTICS AND PLASTIC POLLUTION

The problem of litter entering the environment has escalated dramatically in recent decades, with an ever-increasing proportion of litter consisting of non-biodegradable plastic materials. South Africa has laws against littering, on land and in coastal environments. Objects particularly detrimental to aquatic fauna include plastic bags and bottles, pieces of rope and small plastic particles. Large numbers of aquatic organisms are killed or injured daily by becoming entangled in debris or by ingesting small plastic particles (Gregory 2009, Wright et al. 2013). Most at risk are seabirds and fish, including rare or endangered species.

Microplastics and nurdles (small plastic pellets used in manufacturing) also represent a growing threat to marine ecosystems (Wright et al. 2013). Global assessments show that microplastics are now ubiquitous in coastal and estuarine environments, with concentrations often highest near urbanized shorelines (Jambeck et al. 2015, Rochman et al. 2016). These materials enter the ocean via stormwater runoff, riverine discharge, and shipping incidents, and are ingested by a wide range of marine organisms, from zooplankton to seabirds (Ryan 1987, Naidoo et al. 2020). Their persistence and bioaccumulation can cause physical harm, disrupt feeding behaviour, and introduce toxic substances into marine food webs. Emerging research also suggests that microplastics can act as vectors for invasive species and pathogens, further compounding ecological risks (Amaral-Zettler et al. 2020).

A beach clean-up was conducted in August 2018 within the NNP coastal section under the supervision of Professor Peter Ryan (University of Cape Town). A substantial amount of litter was collected from several remote beaches, ranging from cool drink bottles to tyres. Plastic water bottles (both from within and outside South Africa) are among the most common items collected during clean-ups in the MPA (SANParks, personal communication). The presence of such diverse debris on these sparsely populated shores highlights the pervasiveness of plastic pollution, even in regions with minimal human activity. Plastic pollution, particularly microplastics and nurdles (small plastic pellets used in manufacturing), represents a growing threat to marine ecosystems (Wright et al. 2013). These materials enter the ocean via stormwater runoff, riverine discharge, and shipping incidents, and are ingested by a wide range of marine organisms, from zooplankton to seabirds. Their persistence and the bioaccumulation can cause physical harm, disrupt feeding behaviour, and introduce toxic substances into marine food webs (Awe et al. 2025).

6.3 OVEREXPLOITATION OF MARINE RESOURCES

6.3.1 COMMERCIAL FISHING

Commercial fishing has long contributed substantially to the economy of the Benguela Current region, although historical overexploitation has resulted in marked declines in several important pelagic and demersal species, including sardine, Cape hake, snoek and West Coast rock lobster (WCRL). Along the Northern Cape coast, the sparse human population, limited harbour infrastructure, and remote nature of the shoreline have constrained the development of large industrial fishing operations relative to the Western Cape. As a result, fishing activity in the NNP region remains comparatively small in scale and is dominated by nearshore, seasonal, and community-based harvesting. With only 103 registered small-scale fishers in the province, the Northern Cape has one of the smallest formal fishing sectors in South Africa (DFFE 2025).

Within and adjacent to the NNP MPA, local communities have a long history of reliance on marine resources for food security, income generation, and cultural identity. Fishing effort is primarily concentrated in accessible coastal areas and focuses on species such as WCRL, snoek, Cape bream, steenbras, mussels, limpets and other linefish species where regulations permit. Shore-angling, hand collection of intertidal resources, and small-boat fishing from launch sites outside the park are important livelihood activities, particularly in nearby settlements such as Hondeklipbaai and Kleinzee. Seasonal availability of migratory species such as snoek can be especially significant for household income and local food supply.

The NNP MPA provides an important refuge within this exploited coastline by excluding commercial fishing and limiting extractive activities in designated zones. Protection of reef, kelp, sandy beach and offshore habitats may help rebuild spawning biomass, safeguard nursery areas, and maintain ecosystem processes that support surrounding fisheries through spillover and larval export. This is particularly relevant for depleted species such as WCRL and overexploited linefish, whose recovery depends on reduced fishing mortality and the protection of breeding adults.

At the same time, management of the MPA must balance biodiversity conservation objectives with the legitimate needs of neighbouring coastal communities.

6.3.2 WEST COAST ROCK LOBSTER

WCRL *Jasus lalandii* occurs along the southern African coastline, with commercially viable densities found primarily along the west coast of southern Africa extending southwards to Cape Point. Commercial exploitation of this species began in the late 19th century, and since then, populations have undergone a progressive and significant decline due to sustained harvesting pressure (Jones 2008, DFFE 2025), with catches dropping to 1,500 tonnes per annum by 1996 and not recovering thereafter (DFFE 2025). Commercial access to South Africa's WCRL stocks is restricted to a limited number of rights holders, with rights allocated for 15-year periods (the next round of allocations is due in 2033).

In addition to regulated commercial, recreational, and subsistence harvesting, illegal fishing remains a major and persistent threat to this species, substantially reducing stock recovery potential (Brill & Raemaekers 2013, Okes et al. 2018, DFFE 2025). Despite decades of management measures, the WCRL remains one of South Africa's most overexploited marine species. Catches have collapsed to a fraction of historical levels, and stock assessments continue to reveal further declines. Ongoing illegal harvesting and slow recovery rates exacerbate this situation, pushing the population closer to ecological and economic collapse. The most recent WCRL stock assessment revealed that the resource is substantially more depleted than previously estimated. The population is now currently estimated at only 1.2% of "pristine" levels (Johnston & Butterworth 2024). Despite this critical state, the species continues to support a fishing industry worth approximately R500 million per annum (DFFE 2025). The WCRL season generally runs from 16 December to 30 March.

No commercial fishing for WCRL occurs within the NNP MPA. However, substantial recreational harvesting takes place during the 12 permitted fishing days each year, attracting thousands of participants from surrounding areas. To date, no dedicated studies have assessed the status of the WCRL stock within the MPA, quantified the extent and ecological implications of this extraction, or evaluated potential spillover effects into adjacent areas. This represents a significant knowledge gap in understanding the role and effectiveness of the MPA for this species.

6.3.3 RECREATIONAL FISHING

Recreational line-fishing is a popular coastal activity that occurs along the entire South African coastline. According to the Marine Living Resources Act 18 of 1998 (as amended) (MLRA), recreational fishing refers to fishing undertaken for leisure or sport, and not for sale, barter, earnings or gain. Recreational fishing in South Africa includes shore and boat-based line fishing, rock lobster diving and the harvesting of intertidal resources such as mussels, redbait, and oysters (Griffiths et al. 2004, Cooke & Cowx 2006, Lewin et al. 2006, Winker et al. 2014, Parker et al. 2016, Maggs 2017, Kerwath et al. 2019, Steyn et al. 2019). The sector is managed through a permit system, and catches are subject to Total Allowable Effort (TAE) restrictions similar to those applied in commercial fisheries.

During the annual WCRL season, recreational fishers frequently visit the coastal section of the NNP to target this valuable endemic species. For the 2025/2026 season, the Total Allowable Catch (TAC) for WCRL has been set at 800 tonnes, although this limit has not been reached in the past 85 years (DFFE 2025).

6.4 ALIEN AND INVASIVE SPECIES

Alien invasive species are a concern in South Africa's marine environments, including the NNP MPA. While specific findings for the NNP MPA are still emerging, the West Coast within the Benguela ecosystem has been the focus of extensive invasion research synthesized in works such as Coastal Invasions: The South African Context (Robinson et al. 2020). These studies show that the region supports a diverse and growing assemblage of marine alien species, particularly associated with shipping and port activity along the West Coast (Robinson et al. 2020). In contrast to heavily trafficked port environments, the NNP MPA is not situated adjacent to a major commercial port and is therefore likely exposed to lower direct introduction pressure from shipping related vectors (Robinson et al. 2020). However, the absence of a nearby port does not preclude invasion risk. Many marine alien species undergo secondary spread along the via larval dispersal, rafting on natural or anthropogenic debris and movement associated with smaller vessels and fishing activities (Peters et al. 2019).

Rocky shore systems are especially influenced by a suite of invasive ecosystem engineers, notably the Mediterranean mussel *Mytilus galloprovincialis*, the bisexual mussel *Semimytilus patagonicus* and the Pacific barnacle *Balanus glandula*, which together occupy much of the intertidal zone and have substantially altered native community structure (Branch et al. 2023). These species can displace indigenous taxa through competition for space and resources, resulting in shifts in zonation patterns and declines in native species such as *Aulacomya atra*. These species are likely to occur within the MPA at suitable locations

Long-term monitoring programs are essential for the NNP MPA to track the presence and spread of alien invasive species over time. Consistent data collection allows management authorities to identify emerging threats early, detect shifts in species distributions, and understand ecological trends. Such monitoring not only supports the conservation of native species like *A. atra* but also informs timely management interventions to mitigate the impacts of invasive species on these sensitive coastal ecosystems.

6.4.1 KELP HARVESTING

The inshore areas of the NNP MPA support around 7.4 km² of kelp forest (dominated by *Laminaria pallida* and *Ecklonia maxima*, as described earlier) (Sink et al. 2019). Historically, kelp harvesting has been a recognized pressure within the NNP MPA. While some harvesting is still permitted, with regulations including permit requirements and the adoption of sustainable front-cutting practices, and kelp wrack is removed from a few beaches, management is limited and sustainable practices are only partially implemented or enforced (Buschmann et al. 2014, SANParks 2023). Frond-cutting techniques aim to allow kelp plants to regenerate after harvesting, thereby reducing long-term damage to the forest structure, but inconsistent application of these practices can compromise ecosystem resilience, and the removal of kelp wrack can reduce nutrient inputs to adjacent beaches and nearshore systems, diminish habitat and food resources for invertebrates and shorebirds, and disrupt ecological linkages between the kelp forest and surrounding coastal environments.

The Namaqua Kelp Forest shore type is classified as Vulnerable, reflecting its ecological importance and susceptibility to both anthropogenic and environmental pressures (Sink et al. 2019). By encompassing this habitat, the MPA plays a crucial role in conserving kelp forests, safeguarding associated biodiversity, and ensuring that these ecosystems continue to provide ecological, economic, and cultural benefits to local communities (SANParks 2023).

6.5 CLIMATE CHANGE

The Benguela Current ecosystem has experienced significant environmental change in recent decades, including shifts in sea surface temperature, wind patterns, and upwelling intensity. These changes have influenced the distribution and abundance of many marine species, with broader climate processes, such as interactions with the Agulhas Current system, affecting ocean circulation and regional productivity (SANParks 2021). Together, these drivers are altering marine food webs and the biogeography of key species along South Africa's west coast.

At the same time, additional stressors such as sea level rise, ocean acidification (waters becoming more acid), reduced oxygen conditions, and changing storm regimes are increasing pressure on marine ecosystems (SANParks 2021). These changes affect organisms from plankton and shellfish to fish, kelp, seabirds, and marine mammals. In colder upwelling systems like the West Coast, ocean acidification is of particular concern because it reduces carbonate availability, making it more difficult for shell-forming organisms to build and maintain shells, and may also affect fish larvae survival (SANParks 2021).

One of the most visible ecological responses has been the redistribution of small pelagic fish such as anchovy and sardine, which have shifted eastwards in response to environmental change and fishing pressure (Ortega-Cisneros et al. 2024, Brinkman et al. 2025). Because these species are key prey for seabirds, their redistribution has contributed to declines in several seabird populations in the northern Benguela region, including African penguin, Cape gannet, Cape cormorant, bank cormorant, and greater crested tern (Crawford et al. 2007, SANParks 2021).

Estuaries are also highly vulnerable systems. They are among the most productive ecosystems in South Africa but have been heavily modified, with over 60% significantly altered (Lamberth & Turpie 2003). Reduced freshwater inflow and sea level rise are changing salinity regimes, mouth dynamics, and nursery function, disrupting the life cycles of estuary-dependent species (Van Niekerk et al. 2022). Estuarine processes are highly interconnected, meaning that climate change impacts can propagate rapidly through these systems (SANParks 2021).

From an economic perspective, South Africa's fisheries are moderately vulnerable to climate change, with key sectors at risk including WCRL, small pelagic fisheries, and linefish, as well as beach seine and gillnet fisheries (Kirkman et al. 2021). Marine tourism activities such as recreational fishing, and coastal tourism are also sensitive to changing environmental conditions and species distributions.

Overall, there is high confidence that climate change will continue to reshape South Africa's marine ecosystems. Continued monitoring, adaptive management, and ecosystem-based approaches will be essential to improve resilience and support sustainable use of marine resources (SANParks 2021).

7. **SOCIAL ECOLOGY**

7.1 RECREATION AND TOURISM

The NNP is regarded as a valuable tourism asset and, with the decline of the mining sector, has become a key regional attraction (SANParks 2023). The park offers a scenic destination for both local and international visitors seeking to connect with nature, enjoy its spectacular land and seascapes, relax on unspoiled beaches, experience its cultural history, explore its fields of wildflowers or take part in activities such as hiking and 4x4 driving (SANParks 2023).

Tourism in the coastal section of the park is closely linked to the NNP MPA, as the effective management of the MPA is essential for safeguarding marine habitats and species that underpin the park's appeal. The main coastal attractions include the WCRL season and the annual wildflower displays which draw the biggest crowds, but camping, glamping, fishing, and hiking also contribute (SANParks 2023). Coastal tourism activities are guided by the internal rules of the park's Management Plan, while marine-based activities are subject to the MPA's zonation and regulations.

Marketing of the NNP MPA remains limited, partly due to its relatively recent proclamation in 2019 and to broader lack of public awareness of South Africa's MPAs.

Looking ahead, partnerships between SANParks, local tourism operators, NGOs, and community organisations could support the development of low-impact marine tourism opportunities. Such initiatives would align with conservation goals, positioning the NNP MPA as a destination where tourism contributes to both biodiversity protection and local community benefits.

7.2 EDUCATION AND AWARENESS

Environmental education is crucial for raising awareness and educating people of all ages about the importance of conserving the environment and cultural heritage, promoting a sustainable environment and responsible

resource use for future generations. Increasing public understanding of the ecological importance of marine ecosystems, the role of MPAs, and the specific features of the NNP MPA helps to build stewardship, reduce user conflicts, and promote compliance with regulations. At present, public awareness of the NNP MPA remains limited among local communities and even some stakeholders. However, this presents an opportunity to develop targeted education and outreach programmes that can improve knowledge, foster connection with the marine environment, and support behavioural change. Existing SANParks education programmes run through the Socio-economic Transformation division within the broader NNP provide a strong foundation for expanding into marine topics. Public events such as Marine Week, beach clean-ups, and exhibitions can serve as platforms to promote the MPA and its benefits for biodiversity and sustainable development.

7.3 ECOSYSTEM SERVICES AND SOCIO-ECONOMIC CONSIDERATIONS

The socio-economic management of the NNP MPA is based on inclusive and participatory governance processes that aim to address historical exclusions and ensure stakeholder involvement in decision-making (Sink et al. 2012, SANParks 2023). The MPA sustains ecosystem services while contributing to local socio-economic development through opportunities for nature-based tourism, research, recreation, and environmental education, alongside regulated commercial and subsistence fisheries (Griffiths et al. 2010, Van Niekerk et al. 2020, SANParks 2023).

The NNP MPA lies within a sparsely populated region marked by rural isolation, high unemployment, reliance on government support, small-scale livestock farming and fishing, and extreme climatic conditions (SANParks 2023). With diamond mining in decline (a previously large employer in the region), the NNP has become a primary economic driver (SANParks 2023, Kamiesberg Local Municipality). Tourism, centred on the park, is recognised as a key regional attraction but is strongly seasonal (SANParks 2023)

Commercial fishing contributes significantly to the local economy; however, overexploitation has resulted in the decline of several key species. Reductions in stocks of WCRL and snoek have negatively affected the livelihoods of communities dependent on these resources. This highlights the critical role of the MPA in safeguarding breeding stocks and providing essential nursery grounds for larvae and juveniles to settle, thereby supporting population replenishment and spillover into adjacent fishing areas (SANParks 2023).

The current NNP MPA Management Plan includes a Biodiversity and Ecosystem Benefits Programme (BEBP), which seeks to maintain the ecological integrity and healthy functioning of marine and coastal ecosystems within the MPA, while responding to local socio-economic needs (SANParks 2023). While BEBP objectives are well-structured, there remains a notable gap in baseline scientific knowledge on the socio-economic aspects of the NNP MPA. It is recommended that a comprehensive socio-economic assessment be undertaken to inform future management and ensure that conservation goals are aligned with community well-being.

Recognising that lasting conservation depends on strong partnerships with neighbouring communities, SANParks has invested in initiatives that create sustainable livelihood opportunities while supporting the responsible use of natural resources. The Hondeklipbaai Small-Scale Fishers Support Programme, led by the SANParks Socio-Economic Transformation (SET) Division, is a community-based initiative that strengthens sustainable livelihoods while promoting the responsible use of marine resources. By supporting 20 young men and women from the local community with fishing permits, equipment, personal protective gear, training and mentorship, the programme creates legal livelihood opportunities, facilitates the transfer of traditional fishing knowledge, and helps reduce illegal fishing. Through partnerships, skills development and environmental awareness, the programme demonstrates how conservation and community development can work together to improve food security, generate local income and support the long-term sustainable use of marine resources.

8. **MANAGEMENT**

8.1 MPA DESIGN AND EFFECTIVENESS

MPAs are globally and nationally recognised as essential tools for conserving marine biodiversity and supporting sustainable fisheries management (Ballantine 2014). While the primary purpose of MPAs is the protection of ecosystems, this goal can be compatible with resource use activities such as fishing, tourism, and cultural purposes, provided they are ecologically sustainable and effectively managed (Day et al. 2019, Mann-Lang et al. 2021). Global syntheses have demonstrated that well-designed and enforced MPAs can enhance biomass, biodiversity, and fisheries spillover benefits, particularly when no-take zones are respected (Edgar et al. 2014). The effectiveness of an MPA, therefore, depends not only on its ecological features but also on the governance systems and management capacity in place.

In South Africa, the expansion of the MPA network, including the NNP MPA, was undertaken through Operation Phakisa, a national initiative aimed at unlocking the ocean economy while strengthening environmental protection. The declaration of the NNP MPA was informed by a rigorous process of systematic conservation planning and extensive stakeholder engagement. This process identified priority areas for protection based on ecological criteria, including habitat representation, ecosystem threat status, and the need to meet national biodiversity targets, while also considering socio-economic factors and existing ocean uses. As a result, the MPA was designed to protect a representative suite of West Coast ecosystems, including several that are classified as threatened. The NNP MPA encompasses approximately 500 km² of ocean and includes both controlled and restricted zones, reflecting an approach that seeks to balance biodiversity conservation objectives with regulated resource use.

While numerous studies have demonstrated positive ecological outcomes from MPAs in South Africa, including increases in abundance and mean body size of several fishery-targeted species, continued monitoring is required to assess the effectiveness of the NNP MPA in achieving its specific conservation objectives (Buxton & Smale 1989, Bennett 1991, Bennett & Attwood 1993, Cowley et al. 2002, Brouwer et al. 2003, King 2005, Götz et al. 2008, Kerwath et al. 2013, Maggs et al. 2013, 2016). Furthermore, effective enforcement, monitoring, and collaboration are central to the MPA's success. Challenges remain, including overfishing and illegal exploitation, constrained capacity for monitoring and enforcement, limited resource to monitor environmental changes and establish robust baselines, and climate change. Similar issues occur in other South African MPAs, where enforcement, funding, and local support are critical (Sowman et al. 2011).

A dedicated Management Plan has been developed for 2024 to 2033. Its effectiveness will be tracked using tools such as the Monitoring Effectiveness Tracking Tool (METT), which has already been applied across other South African MPAs (SANParks 2006, Sink et al. 2012, DEA 2016). Management will follow a Strategic Adaptive Management (SAM) approach, as used by SANParks to address the complexity of social-ecological systems. SAM is strategic (planning with foresight), adaptive (learning while doing), and participatory (involving stakeholders in decisions) (SANParks 2006).

9. RESEARCH AND MONITORING

9.1 LONG-TERM ECOLOGICAL MONITORING

Effective conservation relies on integrating sound management actions and robust scientific research. Research and monitoring are critical for the implementation and good governance of MPAs. SANParks monitoring and research are guided by an overarching Research Strategy (Freitag et al. 2020), national and internal policies and priorities and the gazetted objectives of protected areas and management plans. Long-term ecological monitoring is essential to inform our understanding of the factors driving changes in biodiversity and the impacts of pressures on ecosystem function.

As previously stated, there is a general lack of baseline ecological monitoring data in the region. However, the Namaqua rocky shore long-term ecological monitoring programme is a collaborative initiative between SANParks and DFFE that has been conducted annually since 2015 to track changes in intertidal rocky shore ecosystems in and around NNP MPA. Monitoring is carried out at ten fixed sites spanning sheltered and exposed shores, inside and outside the MPA, as well as in areas influenced by mining activity. Using standardized methods, the programme uses fixed shore-perpendicular transects, photo-quadrats, and in situ quadrat surveys to quantify community structure, species percentage cover, and the densities and size frequencies of key intertidal species. These data support long-term assessments of biodiversity trends, resource use, climate change effects, alien species, and MPA effectiveness, providing an essential baseline for adaptive management and conservation planning in the Namaqua coastal region

Research led by DFFE to improve the understanding of underwater noise impacts has resulted in the installation of an acoustic hydrophone in the MPA. This provides an important opportunity to characterise the local soundscape and assess potential ecological implications, and continued collaboration and data sharing will strengthen its value for management. DFFE has also conducted regular Cape fur seal counts along the coastline, providing useful population-monitoring data and trends. Research cruises conducted by DFFE and SANBI have also generated additional ecological information. Improving access to, and integration of, these datasets will enhance SANParks' ability to incorporate them into ongoing monitoring, adaptive management, and evidence-based decision-making.

9.2 RESEARCH PRIORITIES

There are several key research gaps that have been identified for the NNP MPA, which need to be addressed to support effective management, policy development, and adaptive conservation strategies.

Long-term in situ water temperature records, together with broader oceanographic data, would substantially strengthen understanding of environmental variability and change in the area. These datasets would complement existing biodiversity and monitoring information by providing essential context on drivers such as upwelling dynamics, thermal anomalies, and seasonal productivity patterns. Improved access to such data would enhance the interpretation of ecological trends, support climate-change vulnerability assessments, and inform adaptive management within the MPA.

Another important gap is the need for a better understanding of invasive alien species within the MPA. Marine invasive species can outcompete native fauna and flora, alter habitat structure, and disrupt food webs (Sesay et al. 2024). Currently, there is limited information on the presence, extent and ecological impact of non-native species in the NNP MPA, making it difficult to assess the urgency and appropriate management responses. Targeted research and ongoing monitoring are therefore needed to establish baseline conditions, detect emerging incursions early, and guide proportionate and evidence-based responses. Related to this is the need for improved species management, including the development of strategies to control and, where feasible, eradicate invasive or non-native species through measures such as prevention, early detection, containment and targeted removal. While the MPA is home to several iconic and threatened species, including the Cape cormorant *Phalacrocorax capensis*, bank cormorant *Phalacrocorax neglectus,* Heaviside's dolphin *Cephalorhynchus heavisidii,* and various reef fish, the effectiveness of current protection measures for these species has not been fully assessed (SANParks 2023). Research is needed to support the development of targeted conservation interventions, especially for species vulnerable to fishing pressure, habitat degradation or changing ocean conditions.

Understanding the impacts of the MPA on fisheries, both positive and negative, is another critical area. While MPAs can enhance fish stocks through spillover and habitat protection, they can also restrict access for local fishers. There is a lack of quantitative evidence on how the NNP MPA has affected fish populations and fishing livelihoods since its establishment. Addressing this will require fisheries catch data, effort mapping and interviews with stakeholders both within and adjacent to the MPA. Furthermore, the socio-economic dimensions of the MPA remain poorly understood. While some work has been conducted, a comprehensive socio-economic assessment of the NNP MPA is still needed to inform sustainable management and stakeholder engagement strategies.

Further research is needed to understand the impacts of climate change on the coastal section of the NNP, enabling the development of predictive mitigation strategies. The role of the MPA in enhancing ecosystem resilience to these impacts should also be evaluated, particularly in the context of the no-take status, which limits extractive pressures across most of the area. While the MPA cannot directly buffer large-scale climate drivers, it may improve the capacity of ecosystems to withstand and recover from change by maintaining ecological integrity. In addition, the condition of several vulnerable ecosystems protected within the MPA, including the Namaqua Kelp Forest, Namaqua Exposed Rocky Shore, Namaqua Mixed Shore, Namaqua Sheltered Rocky Shore, Namaqua Very Exposed Rocky Shore, and particularly the Southern Benguela Reflective Sandy Shore, requires thorough assessment.

Finally, there is a need to establish a baseline for human activities within and adjacent to the MPA, including permitted resource use such as line fishing, bait collection and rock lobster harvesting within controlled zones, as well as broader commercial activities occurring outside the MPA (e.g. commercial fishing, diamond mining and vessel traffic), and to assess the ecological carrying capacity of these activities within the context of the MPA's conservation objectives. Without baseline data, it is difficult to evaluate cumulative impacts or determine what levels of use are ecologically sustainable.

9.3 RESEARCH PERMITS

MPA regulations stipulate that a permit is required to conduct research inside an MPA. External researchers must submit research proposals outlining their research aims and requirements in gain support from SANParks. Each research 'node' oversees the research and monitoring conducted in its complement of parks, working closely with the park managers to guide management strategies and actions: for the NNP MPA, this node is the Cape Research Centre. Research proposals are submitted online via the SANParks portal.

Each research proposal is evaluated by an internal research committee in terms of its logistics and possible risks to the environment or to the quality of visitor experiences in national parks. SANParks scientists provide feedback on each proposal, often offering insider knowledge to enhance the project's usefulness for managing protected areas, where applicable. If the proposal involves the handling of animals, it will be referred to the SANParks Animal Use and Care Committee.

Projects may be rejected if they are incompatible with the environment, visitor experiences, or ethical treatment of animals, if they are deemed unfeasible, or if SANParks does not have the capacity to meet the requirements of the project. If the proposal is accepted, researchers provide SANParks with reports on the outcomes of the project and copies of data and publications. Results and subsequent recommendations are communicated directly to MPA scientists and managers. Researchers are encouraged to share their results and, where possible, their data via the SANParks Data Repository.

10. CONCLUSIONS AND LOOKING AHEAD

The Namaqua National Park MPA protects one of South Africa's last largely intact and least-developed marine wilderness areas, encompassing a diverse mosaic of rocky shores, sandy beaches, kelp forests, offshore reefs, pelagic habitats and nationally important estuaries.

The MPA makes a nationally significant contribution to biodiversity conservation, protecting representative ecosystems, threatened habitats and species, while strengthening the representation of the Namaqua marine bioregion within South Africa's MPA network.

The Groenrivier and Spoegrivier estuaries are integral components of this connected landscape, linking terrestrial, estuarine and marine environments while supporting biodiversity, fisheries and essential ecological processes.

Although the MPA remains relatively intact, it faces growing pressures, including climate change, offshore mineral and energy development, marine pollution, invasive species expansion and resource harvesting, all of which have the potential to erode ecosystem resilience if not proactively managed.

The MPA remains both a conservation stronghold and a frontier for discovery.

The MPA continues to provide unique opportunities to improve our understanding of connectivity, resilience and change within one of the world's most productive coastal upwelling ecosystems.

EMERGING PRIORITIES

As understanding of the MPA continues to develop, several priorities emerge to support effective long-term management:

- Address critical knowledge gaps by expanding baseline biodiversity surveys across under-sampled coastal, offshore and benthic habitats.
- Investigate ecosystem functioning, particularly how Benguela upwelling processes drive biodiversity, ecological connectivity and ecosystem resilience.
- Integrate socio-economic research to better understand resource use, cultural values and the ecosystem services provided by the MPA.
- Strengthen interdisciplinary collaboration to support adaptive management and marine spatial planning.
- Maintain ecological connectivity across terrestrial, estuarine, coastal and offshore environments.
- Build on this State of Knowledge Report as a foundation for future research and management, recognising the NNP MPA as both a nationally important conservation asset and a living laboratory where continued investigation will improve understanding of this remarkable marine system.

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APPENDIX 1

SPECIES LISTS

Compiled species list for the NNP MPA. Species lists were compiled from multiple sources, including published literature, regional field guides, biodiversity databases and expert knowledge. In some cases, species were included based on their documented regional distribution, and their presence within the study area has not yet been verified through targeted field surveys. These lists should therefore be considered preliminary and subject to refinement as additional information becomes available.

Appendix A Marine Mammals

Family	Scientific Name	Common Name	Source
Balaenidae	*Eubalaena australis*	Southern right whale	Mate et al. 2011, Barendse et al. 2011, Findlay et al. 2017
Balaenopteridae	*Megaptera novaeangliae*	Humpback whale	Mate et al. 2011, Barendse et al. 2011, Findlay et al. 2017
Balaenopteridae	*Balaenoptera edeni*	Bryde's whale	SANParks 2023
Delphinidae	*Cephalorhynchus heavisidii*	Heaviside's dolphin	iNat
Delphinidae	*Lagenorhynchus obscurus*	Dusky dolphin	Elwen et al. 2010
Delphinidae	*Delphinus delphis*	Short-beaked common dolphin	Elwen et al. 2010
Otariidae	*Arctocephalus pusillus pusillus*	Cape fur seal	iNat

Appendix B Birds and Shorebirds

Family	Scientific Name	Common Name	Source
Anatidae	*Alopochen aegyptiaca*	Egyptian Goose	SABAP2
Anatidae	*Anas capensis*	Cape Teal	SABAP2
Anatidae	*Anas erythrorhyncha*	Red-billed Teal	SABAP2
Anatidae	*Plectropterus gambensis*	Spur-winged Goose	SABAP2
Anatidae	*Spatula smithii*	Cape Shoveler	SABAP2
Anatidae	*Tadorna cana*	South African Shelduck	SABAP2
Ardeidae	*Ardea cinerea*	Grey Heron	SABAP2
Ardeidae	*Ardea melanocephala*	Black-headed Heron	SABAP2
Ardeidae	*Ardea purpurea*	Purple Heron	SABAP2
Ardeidae	*Egretta garzetta*	Little Egret	SABAP2
Burhinidae	*Burhinus capensis*	Spotted Thick-knee	SABAP2
Charadriidae	*Charadrius hiaticula*	Common Ringed Plover	SABAP2
Charadriidae	*Charadrius marginatus*	White-fronted Plover	SABAP2
Charadriidae	*Charadrius pallidus*	Chestnut-banded Plover	SABAP2
Charadriidae	*Charadrius pecuarius*	Kittlitz's Plover	SABAP2
Charadriidae	*Charadrius tricollaris*	Three-banded Plover	SABAP2
Charadriidae	*Pluvialis squatarola*	Grey Plover	SABAP2

Family	Scientific Name	Common Name	Source
Charadriidae	*Vanellus armatus*	Blacksmith Lapwing	SABAP2
Charadriidae	*Vanellus coronatus*	Crowned Lapwing	SABAP2
Diomedeidae	*Thalassarche chlororhynchos*	Atlantic Yellow-nosed Albatross	SABAP2
Diomedeidae	*Thalassarche melanophris*	Black-browed Albatross	SABAP2
Haematopodidae	*Haematopus moquini*	African Oystercatcher	SABAP2
Laridae	*Chroicocephalus cirrocephalus*	Grey-headed Gull	SABAP2
Laridae	*Chroicocephalus hartlaubii*	Hartlaub's Gull	SABAP2, iNat
Laridae	*Hydroprogne caspia*	Caspian Tern	SABAP2
Laridae	*Larus dominicanus*	Kelp Gull	SABAP2
Laridae	*Sterna dougallii*	Roseate tern	SABAP2
Laridae	*Sterna hirundo*	Common Tern	SABAP2
Laridae	*Sterna vittata*	Antarctic Tern	SABAP2
Laridae	*Sternula balaenarum*	Damara Tern	SABAP2
Laridae	*Thalasseus bergii*	Greater Crested Tern	SABAP2
Laridae	*Thalasseus sandvicensis*	Sandwhich Tern	SABAP2
Pelecanidae	*Pelecanus onocrotalus*	Great White Pelican	SABAP2
Phalacrocoracidae	*Microcarbo coronatus*	Crowned Cormorant	SABAP2
Phalacrocoracidae	*Phalacrocorax capensis*	Cape Cormorant	SABAP2, iNat
Phalacrocoracidae	*Phalacrocorax carbo*	Great Cormorant	iNat
Phalacrocoracidae	*Phalacrocorax neglectus*	Bank Cormorant	SABAP2
Phoenicopteridae	*Phoeniconaias minor*	Lesser Flamingo	SABAP2
Phoenicopteridae	*Phoenicopterus roseus*	Greater Flamingo	SABAP2
Phoenicopteridae	*Phoenicopterus ruber*	American Flamingo	SABAP2
Podicipedidae	*Podiceps nigricollis*	Black-Necked Grebe	SABAP2
Podicipedidae	*Tachybaptus ruficollis*	Little Grebe	SABAP2
Procellariidae	*Procellaria aequinoctialis*	White-chinned petrel	SABAP2, AntTrack_SCAR
Rallidae	*Fulica cristata*	Red-knobbed Coot	SABAP2
Recurvirostridae	*Himantopus himantopus*	Black-winged Stilt	SABAP2
Recurvirostridae	*Recurvirostra avosetta*	Pied Avocet	SABAP2
Scolopacidae	*Actitis hypoleucos*	Common Sandpiper	SABAP2
Scolopacidae	*Arenaria interpres*	Ruddy Turnstone	SABAP2
Scolopacidae	*Calidris alba*	Sanderling	SABAP2
Scolopacidae	*Calidris canutus*	Red Knot	SABAP2
Scolopacidae	*Calidris ferruginea*	Curlew Sandpiper	SABAP2
Scolopacidae	*Calidris minuta*	Little Stint	SABAP2
Scolopacidae	*Calidris pugnax*	Ruff	SABAP2
Scolopacidae	*Numenius phaeopus*	Eurasian Whimbrel	SABAP2
Scolopacidae	*Tringa glareola*	Wood Sandpiper	SABAP2
Scolopacidae	*Tringa nebularia*	Common Greenshank	SABAP2
Spheniscidae	*Spheniscus demersus*	African Penguin	SABAP2
Sulidae	*Morus capensis*	Cape Gannet	SABAP2

Appendix C Chondrichthyans

Family	Scientific Name	Common Name	Source
Callorhinchidae	*Callorhinchus capensis*	St Joseph Shark	Branch et al. 2010a
Dasyatidae	*Dasyatis chrysonota*	Blue Stingray	Branch et al. 2010a
Hexanchidae	*Notorynchus cepedianus*	Broadnose Sevengill Shark	Branch et al. 2010a
Lamnidae	*Isurus oxyrinchus*	Mako Shark	Branch et al. 2010a
Rajidae	*Raja straeleni*	Biscuit Skate	Branch et al. 2010a
Rajidae	*Rostroraja alba*	Bottlenose Skate	Branch et al. 2010a
Rhinobatidae	*Acroteriobatus annulatus*	Lesser Sandshark	Branch et al. 2010a
Scyliorhinidae	*Haploblepharus pictus*	Dark Shyshark	Branch et al. 2010a
Triakidae	*Galeorhinus galeus*	Soupfin Shark	Branch et al. 2010a

Appendix D Teleosts

Family	Scientific Name	Common Name	Source
Carangidae	*Trachurus trachurus*	Atlantic Horse Mackerel	FBIP_SAEON
Clinidae	*Clinus acuminatus*	Sad Klipvis	IZIKOmarine_bnyFish
Clinidae	*Clinus agilis*	Agile Klipvis	IZIKOmarine_bnyFish
Clinidae	*Clinus heterodon*	West Coast Klipvis	IZIKOmarine_bnyFish
Clupeidae	*Sardinops sagax*	South African Sardine	FBIP_SAEON
Engraulidae	*Engraulis* spp.	Anchovies	Hutchings et al. 2002, Griffiths et al. 2010, Majiedt et al. 2013, Blamey et al. 2015
Gempylidae	*Thyrsites atun*	Snoek	FBIP_SAEON
Latridae	*Chirodactylus brachydactylus*	Two-tone Fingerfin	Branch et al. 2010a, Branch & Branch 2018
Merlucciidae	*Merluccius capensis*	Cape Hake	Branch et al. 2010a, Branch & Branch 2018
Ophidiidae	*Genypterus capensis*	Kingklip	FBIP_SAEON
Scombridae	*Scomber japonicus*	Chub Mackerel	FBIP_SAEON
Soleidae	*Austroglossus microlepis*	West Coast Sole	FBIP_SAEON
Sparidae	*Argyrozona argyrozona*	Carpenter Seabream	FBIP_SAEON
Sparidae	*Pterogymnus laniarius*	Panga Seabream	FBIP_SAEON
Sparidae	*Pachymetopon blochii*	Cape bream	Branch et al. 2010a, Branch & Branch 2018
Triglidae	*Chelidonichthys* spp.	Smallscaled Gurnards	FBIP_SAEON
Zeidae	*Zeus capensis*	Cape John Dory	FBIP_SAEON

Appendix E Marine Invertebrates

Phylum	Scientific Name	Common Name	Source
Annelida	*Gunnarea gaimardi*	Cape Reef-worm	Biccard et al. 2025
Arthropoda	*Octomeris angulosa*	Eight-shell Barnacle	Biccard et al. 2025
Arthropoda	*Deto echinata*	Horned Isopod	Biccard et al. 2025
Arthropoda	*Jasus lalandii*	West Coast Rock Lobster	Biccard et al. 2025
Arthropoda	*Pterygosquilla*	Mantis Shrimps	SAEON_DIM
Arthropoda	*Tetraclita serrata*	Grey Volcano Barnacle	Biccard et al. 2025
Arthropoda	*Tylos granulatus*	Giant Pill Bug	Biccard et al. 2025
Cnidaria	*Bunodactis reynaudi*	Sandy Anemone	Biccard et al. 2025
Cnidaria	*Aequorea* spp.	Many-ribbed Jellyfish	SAEON_DIM
Cnidaria	*Pelagia noctiluca*	Mauve Stinger	SAEON_DIM
Cnidaria	*Physalia physalis*	Portuguese Man-o-war	FBIP_Sea, iNat
Cnidaria	*Anthothoe chilensis*	Striped Anemone	Biccard et al. 2025
Echinodermata	*Parvulastra exigua*	Dwarf Cushion Star	Biccard et al. 2025
Echinodermata	*Astropecten irregularis pontoporeus*	Sand Sea Star	SAEON_DIM
Echinodermata	*Roweia webbi*	Sea Urchin	FBIP_Invert, IZIKO_MarInv
Echinodermata	*Holothuria* spp.	Sea Cucumbers	Biccard et al. 2025
Echinodermata	*Ophiura* spp.	Serpent Stars	Biccard et al. 2025
Echinodermata	*Parechinus angulosus*	Cape Urchin	Biccard et al. 2025
Mollusca	*Afrolittorina* sp.	Periwinkles	Biccard et al. 2025
Mollusca	*Aulacomya atra*	Ribbed Mussel	Biccard et al. 2025
Mollusca	*Mytilus galloprovincialis*	Mediterranean Mussel	Biccard et al. 2025
Mollusca	*Octopus vulgaris*	Common Octopus	Biccard et al. 2025
Mollusca	*Scutellastra granularis*	Granular Limpet	iNat
Mollusca	*Helcion pectunctulus*	Prickly Limpet	Biccard et al. 2025
Mollusca	*Scutellastra cochlear*	Pear Limpet	Biccard et al. 2025
Mollusca	*Scutellastra argenvillei*	Argenville's Limpet	Biccard et al. 2025
Mollusca	*Cymbula granatina*	Granite Limpet	Biccard et al. 2025
Mollusca	*Comitas saldanhae*	Benguela Comitas	SAEON_DIM
Mollusca	*Siphonaria capensis*	Cape False-limpet	Biccard et al. 2025
Mollusca	*Oxystele tigrina*	Tiger Topshell	Biccard et al. 2025
Mollusca	*Athleta lutosa*	Pink-foot Volute	SAEON_DIM

Appendix F Algae

Family	Scientific Name	Common Name	Source
Lessoniaceae	*Ecklonia maxima*	Sea Bamboo (Brown Algae)	Biccard et al. 2025 / Branch G, Griffiths CL, Branch M, Beckley L, 2010a
Laminariaceae	*Laminaria pallida*	Split-fan Kelp (Brown Algae)	Biccard et al. 2025 / Branch G, Griffiths CL, Branch M, Beckley L, 2010a

Family	Scientific Name	Common Name	Source
Rhodomelaceae	*Carradoriella virgata*	Kelp Fan (Red Algae)	Biccard et al. 2025 / Branch G, Griffiths CL, Branch M, Beckley L, 2010a
Gelidiaceae	*Gelidium vittatum*	Red Ribbons (Red Algae)	Biccard et al. 2025 / Branch G, Griffiths CL, Branch M, Beckley L, 2010a
Ceramiaceae	*Carpoblepharis flaccida*	Flaccid Kelp-weed (Red Algae)	Biccard et al. 2025 / Branch G, Griffiths CL, Branch M, Beckley L, 2010a
Delesseriaceeae	*Botryocarpa prolifera*	Black Spot (Red Algae)	Biccard et al. 2025 / Branch G, Griffiths CL, Branch M, Beckley L, 2010a
Delesseriaceae	*Neuroglossum binderianum*	Veined Tongues (Red Algae)	Biccard et al. 2025 / Branch G, Griffiths CL, Branch M, Beckley L, 2010a
Delesseriaceae	*Botryoglossum platycarpum*	Red Algae (Red Algae)	Biccard et al. 2025 / Branch G, Griffiths CL, Branch M, Beckley L, 2010a
Delesseriaceae	*Hymenena venosa*	Veined Oil-weed (Red Algae)	Biccard et al. 2025 / Branch G, Griffiths CL, Branch M, Beckley L, 2010a
Rhodymeniaceae	*Rhodymenia obtusa*	Broad Wine-weed (Red Algae)	Biccard et al. 2025 / Branch G, Griffiths CL, Branch M, Beckley L, 2010a
Gigartinaceae	*Gigartina* spp.	Tongue-weeds (Red Algae)	Biccard et al. 2025 / Branch G, Griffiths CL, Branch M, Beckley L, 2010a
Champiaceae	*Champia lumbricalis*	Jointed Weed (Red Algae)	Biccard et al. 2025 / Branch G, Griffiths CL, Branch M, Beckley L, 2010a
Sarcodiaceae	*Trematocarpus fragilis*	Red Algae	Biccard et al. 2025 / Branch G, Griffiths CL, Branch M, Beckley L, 2010a
Ralfsiaceae	*Pseudoralfsia verrucosa*	Brown Limpet Paint (Brown Algae)	Biccard et al. 2025 / Branch G, Griffiths CL, Branch M, Beckley L, 2010a
Bangiaceae	*Porphyra capensis*	Purple Laver (Red Algae)	Biccard et al. 2025 / Branch G, Griffiths CL, Branch M, Beckley L, 2010a
Ulvaceae	*Ulva* spp.	Green Algae	Biccard et al. 2025 / Branch G, Griffiths CL, Branch M, Beckley L, 2010a
Hildenbrandiaceae	*Hildenbrandia* spp.	Encrusting Red Algae	Biccard et al. 2025 / Branch G, Griffiths CL, Branch M, Beckley L, 2010a

Appendix G Plankton

Family	Scientific Name	Common Name	Source
Anaulaceae	*Anaulus australis*	Surf Diatom	Lamberth et al. 2022

South African
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