SECTION 5.6: ADJACENT SEA USE

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AMENDMENT RECORD			
Rev	**Draft**	**Date**	**Description**
0		02/06/2013	New section, replacing old KSSR Rev 1. Original submission to the NNR
1		01/12/2021	Revised by SRK, accepted by Eskom
1A		5/09/2022	Revised to address NNR comments

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EXECUTIVE SUMMARY

This section of the Duynefontyn Site Safety Report (DSSR) presents the characterisation of the current and expected future adjacent sea use in the Duynefontyn site (the site) region.

The information contained within this section provides input into the evaluation of the potential radiological impacts of normal radioactive discharges and accidental releases to the public to inform ***Chapter 7*** (Potential Radiological Impact on the Public and the Environment, PRIPE) and for the purposes of emergency planning in ***Chapter 8*** (Emergency Planning, EP).

The results of the characterisation investigations can be summarised as follows:

- The regional shoreline to the north of the site is characterised by exposed rocky shores, mixed shores and sandy shores. Land use along this coastline is predominantly conservation and rural, with the exception of the coastal towns of Langebaan (73 km north-northwest), Yzerfontein (41 km north-northwest) and Grotto Bay (22 km north-northwest). The Langebaan lagoon Marine Protected Area (MPA), a Convention on Wetlands of International Importance Especially as Waterfowl Habitat (RAMSAR) site, is located 76 km north-northwest and northwest. Other MPAs include Malgas Island (including the Jutten and Marcus Islands MPAs) (70 km north-northwest) and Sixteen Mile Beach (46 km northwest).

- The regional shoreline to the south of the site is characterised by exposed rocky shores, mixed shores, sandy shores and Cape Island (Robben Island), as well as isolated estuarine areas. Land use along this coastline is dominated by the urban uses of the Cape Metropolitan Area and, to a lesser extent, Rooi Els (77 km south-southeast). The remainder of the coastline is utilised for conservation purposes, including the Table Mountain MPA (25 km south of the site, Robben Island MPA (16 km south-southwest) and Helderberg MPA (55 km southeast).

- The site falls within the Special Sea Area declared in terms of International Convention for the Prevention of Marine Pollution from Ships of 1973, as modified by the Protocol of 1978 (MARPOL), which is focused on protection of the marine environment and resources from oil pollution. Control of the use of the sea and the seashore within the site region falls within the ambit of the Maritime Zones Act, 1995, the Sea Shore Act, 1935 and the Marine Living Resources Act, 1998.

- The main activities associated with the maritime and coastal environment are linked to the characteristics of the coastline and include fishing, collection of food, recreational and tourist activities and the processing of fish products.

- Fishing activities presented in this section of this DSSR include commercial

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fishing, small-scale fishing and recreational fishing. Fish stocks are calculated by the Department of Forestry, Fisheries and the Environment (DFFE) on an annual basis and fishing allocations are made on a yearly basis. The commercial fishing yield is highly dependent on this official process and is dynamic in nature. A prediction over the lifetime of the nuclear installation(s) is not possible. The key findings are as follow:

- Commercial fisheries present in the site region include offshore fisheries (hake deep-sea trawl, hake inshore trawl, small pelagics, horse mackerel, large pelagics and Patagonian toothfish), inshore fisheries (demersal shark, tuna, hake longline and West Coast rock lobster) and nearshore/small-scale fisheries (seaweed, hake handline, West Coast rock lobster, West Coast mussels, abalone, traditional line fishing and traditional net-fishing). Many of the targeted species are highly migratory and nomadic and their abundance is dependent on the available food. Any adverse impact on a particular species or within a confined geographic area could affect other fisheries along the entire South African coastline.

- The stocks of many commercially fished species are either declining or depleted and it is not possible to provide estimations of abundance and yield for the lifetime of the nuclear installation(s). In addition, due to ecological changes, there has been a southward and eastward shift in fishing activity, with the site region increasingly supporting a changing number of species. It is therefore important that data related to commercial fisheries be updated on a regular basis throughout the nuclear installation lifetime in order to understand any important trends that may occur in this industry.

- Currently, there are no mariculture facilities within the site region.

- Currently, no guano collection occurs within the site region.

- Small-scale (previously called subsistence) fishing is difficult to quantify for the site region. The sector was recently legally created to recognise those fishers who depend on marine living resources for direct food security. Informal small-scale fishing occurs either with or without a recreational fishing licence. Informal or unregulated small-scale fishing cannot be quantified.

- Recreational fishing is popular for line fishermen along the coastline within the site region, due to the occurrence of rocky outcrops and ledges. Offshore recreational fishing in the site region targets mostly tuna species. Recreational fishing is not permitted within the Langebaan MPA, the Sixteen Mile Beach MPA, the Helderberg MPA and within certain restricted areas in the Table Mountain MPA. Recreational fishermen that target line fish in particular are not permitted to sell the catch commercially, and retain most of it for own consumption.

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- The coastal region surrounding the site is a popular tourist destination and includes Cape Town and several resort towns such as Langebaan, Yzerfontein, Grotto Bay and Rooi Els. Recreational and tourism activities that occur along the coast include swimming, surfing, kite surfing, boating, sand yachting and recreational fishing.

- Popular swimming beaches include Melkbosstrand Beach, Big Bay, Bloubergstrand, Milnerton Beach, Clifton, Camps Bay, Hout Bay, Boulders Beach, Fish Hoek, St. James, Muizenberg, Mnandi Beach, Macassar Beach, Strand, Gordon's Bay, Koeël Bay and Rooi Els. Current land use trends indicate an increased emphasis on conservation and eco-tourism related activities outside of the existing urban settlements, and intensification of land uses within the urban areas.

- Recreational activities within the site vicinity (within 16 km of the nuclear installation(s)) are concentrated at Melkbosstrand, Big Bay, Bloubergstrand and, to a lesser degree, at Silwerstroomstrand. Recreational activities in the site vicinity include swimming, surfing, kite surfing, fishing, boating and sand yachting.

- There are 78 registered facilities that process fish products in the site region, within the industrial areas of Cape Town Metropolitan Area and within or close to the more significant harbours, namely the Port of Cape Town and Hout Bay. There are also significant fish processing facilities in St. Helena Bay and the Port of Saldanha, located outside of the site region. These facilities represent the main processing and distribution points for sea products in the site region. The fish processing industry will continue to concentrate in harbours along the coast and nearby industrial areas. It is, however, dynamic in nature and monitoring of this fishery sector component must be updated regularly in order to maintain an accurate understanding of the sector and its development.

- Since fish caught in the site region is also processed outside of the site region, it is recommended that all fishing rights holders that potentially operate in the site region should be considered in the EP.

- The data presented provide adequate input for the purposes of determining the potential radiological impact on the population and the environment, set out in detail in ***Chapter 7***. The description of adjacent sea use sets out the type, location and distribution of the activities and was provided to inform the determination of direct and indirect pathways that may lead to the potential radiological exposure of the population within the site region.

- The data presented provide adequate input for the purposes of the emergency planning set out in detail in ***Chapter 8***:

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- No commercial activity associated with adjacent sea use occurs within the 0 to 5 km EP zone, as required by the regulations on siting. There is also an existing 2 km exclusion zone that extends offshore from the high water mark around the KNPS which prohibits any recreational activities ((Refer to ***Chapter 9*** (Physical Protection and Security)).

- Fish processing and distribution facilities are distributed throughout the site region.

- The potential non-radiological sources of impacts on the population and environment were determined as follows:

  - desalination – The proposed mixing of the brine of the proposed desalination plant with the cooling water will result in significant dilution, and the brine will be undetectable at the outfall. Refer to ***Section 5.12*** (Water Supply) for details on the proposed desalination plants.

  - exclusion zone - Since there is an existing exclusion zone around the KNPS, the proposed nuclear installation(s) will not have a significant additional restriction on sea usage use in this section of the coast.

- The main activities and characteristics relevant to nuclear installation safety were determined. Hazards associated with external events of a natural origin and with the coastline and the sea are considered in ***Section 5.9*** (Oceanography and Coastal Engineering). The only hazard of a natural maritime origin related to the topics covered in this section concerns the loss of cooling water supply as a result of entrainment of marine organisms and settlement of sessile organisms, resulting in the blockage of intake pipes. The planned off-shore intake structures are expected to reduce the risk of blockage through in-growth significantly. The inclusion of a velocity cap reduces the potential for entrainment of fish significantly. The use of chlorine will also keep the cooling system free of marine growth. Potential impacts by marine organisms on the cooling water supply can be dealt with through appropriate nuclear installation design and management measures. Those aspects are planned to be developed by Eskom in the Safety Analysis Report for new nuclear installation(s) in the next licensing stage.

- The section concludes that on-going monitoring of adjacent sea usage is not required for the purposes of this section of this DSSR. The existing radio-nuclide monitoring programme will remain in place for the lifetime of the nuclear installation(s). However, it is recommended that regular review or update of this section of this DSSR take place and that the section be updated at least every five years in order to ensure that the data remain current and to ensure that sufficient information is available to ensure the viability of the site over its lifecycle, with specific reference to PRIPE and EP.

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FIGURES

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DRAWINGS

APPENDICES

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5.6 ADJACENT SEA USE

5.6.1 Introduction

This section of the DSSR presents the characterisation of the current and expected future adjacent sea use in the Duynefontyn site (the site) region.

This section complements the description of the site characteristics in ***Section 5.3*** (Ecology), ***Section 5.4*** (Demography), ***Section 5.5*** (Land and Water Use) and ***Section 5.12*** (Water Supply).

This report is an update of the DSSR Section 5.6, Revision 0 (Eskom, 2015).

5.6.2 Purpose and Scope

The purpose of this section is to provide an update on adjacent sea use in the site region. The purpose of providing the adjacent sea use characteristics and activities in the site region is to:

- provide a description of the current and expected future adjacent sea use characteristics, with particular emphasis on commercial, subsistence and recreational fishery activities, together with the associated uncertainties;
- provide input to determine the potential impact of the nuclear installation(s) on the marine environment during normal nuclear installation operation (e.g. thermal plume, desalination-related brine plume), with specific reference to the evaluation in ***Section 5.3***;
- provide input into the evaluation of the potential radiological impacts of normal radioactive discharges and accidental releases to the public (see ***Chapter 7*** and ***Chapter 8***);
- identify aspects that require future monitoring during the lifetime of the nuclear installation(s) in order to provide the assurance that the viability of the site will not be compromised by possible changes in adjacent sea use during the lifetime of the nuclear installation(s);
- provide input to the evaluation of the feasibility of emergency planning for the nuclear installation(s) on the site, undertaken in ***Chapter 8***.

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Notes:

This section of this DSSR does not deal with activities and sea usage related to harbours and shipping lanes and associated human-induced hazards. Harbours are only referred to in order to characterise a particular activity related to adjacent sea use, i.e. commercial fishing activities. Harbours, shipping lanes and associated human-induced hazards are specifically addressed in detail in ***Section 5.7*** (Nearby Transportation, Industrial and Military Facilities).

5.6.3 Regulatory Framework

The legal and regulatory basis that guides the compilation of this DSSR is outlined in ***Chapter 2*** (Legal and Regulatory Basis). The current national normative acts and associated regulations specifically relevant to aspects of adjacent sea use are set out below, followed by a discussion of relevant international standards and guidelines.

5.6.3.1 Legal Requirements

The national regulations relevant to this section are The Regulations on Licensing of Sites for New Nuclear Installations, R927 (Department of Energy, 2011), which require *inter alia*:

"5. A Site Safety Report referred to in Regulation 3(2)(a) must contain the following -

(3) The characteristics of the site relevant to the design assessment, risk and dose calculations, including inter alia:

(a) external events;

(e) regional development;

(f) projections of the above data commensurate with the design life of the nuclear installation(s)."

5.6.3.2 Regulations, Documents and Guidelines

In addition to the abovementioned national regulation, national and international safety standards and recommendations were also considered to ensure that this section is developed in accordance with international best-practice and included the following:

- National Nuclear Regulator, Regulatory Guide: Interim Guide for the

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Siting of Nuclear Facilities, RG-0011 (National Nuclear Regulator, 2016), which requires *inter alia* the following:

- Section 6.1.1(b) "*Characteristics of the site and its environment which could influence the transfer of released radioactive materials to persons*";
- Section 6.1.4 "*Characteristics of the natural environment in the region that may be affected by potential radiological impacts in operational and accident conditions should be investigated*";
- Section 8.2.3(d) "*Bodies of water used for commercial, individual and recreational fishing, including details of the aquatic species fished, their abundance and yield*";
- Section 8.2.3(e) "*Bodies of water used for … recreational purposes such as bathing and sailing*";
- Section 8.2.3(h) "*Products imported or exported from the region that may form part of the food chain";*
- Section 8.2.3(i) "*Free foods … such as seaweed*";
- Section 8.4.3.1(h) "Spawning periods and feeding cycles of major fish species".

- International Atomic Energy Agency Safety Standards No. SSR-1, Site Evaluation for Nuclear Installations (International Atomic Energy Agency, 2019). This establishes the requirements for:
  - Paragraph 1.4(a), "*Defining the information to be used in the site evaluation process*";

  and requires evaluation of as far as it relates to adjacent sea use:
  - Paragraph 4.6(b), "*The characteristics of the site and its environment that could influence the transfer of radioactive material released from the nuclear installation to people and to the environment*";
  - Paragraph 4.27, "*The potential for …, chemical releases and/or thermal releases that might affect the safety of the nuclear installation … shall be considered in the site evaluation process*";
  - Paragraph 6.11, "*The characterization of the uses of land and water shall include investigations of the land and surface water and groundwater resources that might be used by the*

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population or that serve as a habitat for organisms in the food chain"

- International Atomic Energy Agency Safety Guide No. NS-G-3-2, Dispersion of Radioactive Material in Air and Water and Consideration of Population Distribution in Site Evaluations for Nuclear Power Plants (International Atomic Energy Agency, 2002), which requires consideration of, *inter alia*:
    - Section 3.3: Information necessary and relevant, *inter alia*, to relevant food chains leading to humans, to relevant habits of the population and to recreational pursuits such as water sports and fishing;
    - Section 4.2: The identification of bodies of water used for commercial, individual and recreational fishing; bodies of water used for commercial purposes including navigation and recreational purposes such as bathing and sailing; products exported from the site region that may form part of the food chain; and free foods such as seaweed;
    - Section 4.3: The description of the location, nature and extent of the use of water bodies in the site region, as well as a description of changes of uses of water in the site region, such as for fishing and recreational activities;
    - Section 4.4: Future water uses projected over the lifetime of the nuclear installation(s) to the extent possible;
    - Section 4.6: Data on different water bodies, including data on water used for fishing, the aquatic species fished, their abundance and yields; water used for commercial, individual and recreational fishing; water used for recreational purposes; number of persons engaging in swimming, boating and other recreational uses, and time spent on these activities;
    - Section 4.7: If the site is located on an ocean coast, the users of the sea out to a few tens of kilometres in all directions must be identified and characterised.

In addition, international conventions that are directed at managing maritime resources that have informed this section of this DSSR include:

- MARPOL (International Maritime Organisation, 1973 & 1978) - This is one of the most important international marine environmental

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conventions directed at minimizing pollution of the seas, including dumping, oil and exhaust pollution. Its objective is to preserve the marine environment through the complete elimination of pollution by oil and other harmful substances and the minimisation of accidental discharge of such substances. South Africa is a party to the MARPOL.

- The International Commission for the Conservation of Atlantic Tunas (ICCAT) (2019c) – This was established with the objective of maintaining the population of tuna and tuna-like fish in the Atlantic Ocean at levels that will permit maximum sustainable yields. It also aims at implementation of research programmes, analyses of fishing statistics and formulation of stock conservation recommendations. South Africa is a founding member of ICCAT and has been a contracting party to the convention since 1967.

- The Convention for the Conservation of the Southern Bluefin Tuna (CCSBT) (2020c) – This was established with the objective is to ensure, through appropriate management, the conservation and optimal utilisation of southern bluefin tuna. South Africa has been a contracting party to the convention since 2016.

5.6.3.3 Other Applicable Legislation to Adjacent Sea Use

The following national acts and international convention were also considered:

- Integrated Coastal Management Act, Act 24 of 2008, as it governs the establishment of a system of integrated coastal and estuarine management and defines the rights and duties in relation to coastal areas;

- Marine Living Resources Act, Act 18 of 1998, as it controls and manages the use of marine resources within South African waters;

- Maritime Zones Act, Act 15 of 1994, as it defines baselines and maritime zones within South African waters (i.e. internal waters, the territorial waters, the contiguous zones, the exclusive economic zones and the continental shelf);

- Prevention of Pollution from Ships, Act 2 of 1986, as it governs the discharges of oil, except for clean or segregated ballast, from all ships;

- United Nations Convention on the Law of the Sea, 1982, as it relates

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to the permitted exploration and exploitation of natural resources.

5.6.4 Approach to the Characterisation

The evaluation of adjacent sea use was performed in a way that:

- determines the current and future characteristics and activities associated with the coastal and maritime environment;
- determines the current and future adjacent sea use distribution;
- identifies the important adjacent sea use characteristics that are required for the evaluation of the potential consequences to the population and the environment during normal and accidental nuclear installation conditions conducted for the purpose of ***Chapter 7*** and ***Chapter 8***;
- provides input into the identification of critical groups and the identification of direct and indirect pathways for public exposure to radiological exposure and potential radioactive contamination of the food chain;
- describes the potential hazards of a natural origin that must be taken into consideration in the design of the nuclear installation(s) (with reference to ***Section 5.3*** and ***Section 5.9***);
- provides input for the evaluation of the feasibility of the emergency plan presented in ***Chapter 8***;
- presents the site reference adjacent sea use data in the surrounding site region (National Nuclear Regulator, 2002);
- identifies areas of uncertainties and management of uncertainties;
- identifies critical / important features and characteristics, as well as required future actions (e.g. additional monitoring and confirmatory studies).

5.6.4.1 Area of Investigation

The selected area of investigation is large enough to cover the overall emergency planning zone (EPZ) radii, which are described in ***Subsection 5.6.7***.

The area covered in the characterisation includes the area situated

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between Saldanha Bay in the north-northwest and Rooi Els in the south-southeast, as illustrated in ***Drawing 5.6.1***. This drawing illustrates the site region (defined by the 80 km radius around the site) and the site vicinity (defined by the 16 km radius around the site). The site characteristics are discussed in terms of the site region and site vicinity.

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VREDENBURG
JACOBSBAAI
SALDANHA
LANGEBAAN
HOPEFIELD
HOPEFIELD
PIKETBERG
KORINGBERG
PORTERVILLE
MOORREESBURG
SARON
TULBAGH
GOUDA
TULBAGHWEG
RIEBEEK WEST
RIEBEEK KASTEEL
CERES
WOLSELEY
YZERFONTEIN
DARLING
Dassen Island
MALMESBURY
ABBOTSDALE
GROTTO BAY
MAMRE
CHATSWORTH
PELLA-KATZENBERG
ATLANTIS
KALBASKRAAL
DUYNEFONTYN SITE
5km
16km
35km
80km
MELKBOS STRAND
BLAAUWBERGSTRAND
PARKLANDS
Robben Island
DURBANVILLE
MILNERTON
FISANTEKRAAL
KLAPMUTS
VAL DE VIE
PAARL
WELLINGTON
RAWSONVILLE
To Johannesburg
BELLVILLE
GOODWOOD
FRANSCHHOEK
GREEN POINT
CAMPS BAY
BLACKHEATH
BLUE DOWNS
VILLIERSDORP
CONSTANTIA
BERGVLIET
KHAYELITSHA
MACASSAR
SOMERSET WEST
NOORDHOEK
KOMMETJIE
FISH HOEK
SIMON'S TOWN
SCARBOROUGH
CASTLE ROCK
THE STRAND
SIR LOWRY'S PASS
GORDONS BAY
GRABOUW
BOT RIVER
To George
ROOI-ELS
PRINGLE BAY
BETTY'S BAY
KLEINMOND
FISHERHAVEN
HAWSTON
HERMANUS
SANDBAAI (CALEDON)
To Saldanha
To Vredendal
N7
N1
N2
R45
R307
R44
R27
R304
R315
R44
R43
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NE
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Legend

- Eskom Properties
- Magisterial Districts (MD)
- Local Municipalities (LM)
- Allotment Townships
- Roads
- Railways
- Rivers
- Dams

N
W E
S

0 3.75 7.5 15 22.5 30
Kilometers

COORDINATE SYSTEM		
Map projection: Gauss Conformal Datum: Hartebeeshoek 94 Spheroid: WGS84 Scale factor: 1 Central meridian: LO19 Units: International meter		
PLANNING PARTNERS		
COMP	NJ	06/04/2021
REV		
SCALE	1:500 000	

Eskom

SITE SAFETY REPORT FOR DUYNEFONTYN

AREA OF INVESTIGATION - SITE VICINITY (16 KM) AND SITE REGION (80 KM)

SOURCE OF INFORMATION: ESKOM & Planning Partners

REV BY		
AUTH BY		
	DWG NO	REVISION
RELEASED BY ESKOM	5.6.1	0

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5.6.4.2 Topics

The following main topics are presented in this section of this DSSR:

- the coastal area and maritime zones within the national context;
- the generalised bathymetry as an indicator of the regional topography of the ocean, with reference to ***Section 5.9***;
- existing and planned marine protected areas, special areas and closed areas or other declared marine conservation areas, where the harvesting of marine organisms is controlled or restricted;
- current and future coastal and maritime activities, such as fishing and harvesting of marine organisms for commercial, subsistence and recreational purposes that occur in the site region in terms of species, abundance, location and volumes caught;
- spawning periods and feeding cycles of major fish species, insofar as they are important to the commercial fisheries sectors;
- present and future recreational activities, such as tourism and eco-tourism and use of the coastal and maritime environment for recreational purposes such as sailing and bathing;
- current and future mariculture activities in the site region;
- potential effect of the nuclear installation(s) on the marine environment (thermal plume and desalination-brine plume) with reference to ***Section 5.9*** and ***Section 5.12***, sea usage and activities, e.g. distribution of fish processing establishments, as well as recreational use of the coastline;
- potential impacts of the adjacent sea activities on the nuclear installation(s) throughout its lifetime;
- characteristics and activities that need to be taken into account in emergency planning;
- potential radiological impacts on the public and the environment (informed by ***Chapter 7***) and hazards of a natural origin (informed by ***Section 5.3***) that need to be considered in the design of the nuclear installation(s).

The scope of the evaluation is summarised in ***Table 5.6.1*** below.

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Table 5.6.1
Structure of this Site Safety Report

Topic	Site Region (80 km)	EPZ: Site Vicinity (16 km)
Coastal zone (Coastline, Islands)	***Subsection 5.6.5.1***	***Subsection 5.6.5.1***
Maritime zones	***Subsection 5.6.5.2***	
Marine Protected Areas	***Subsection 5.6.5.3***	***Subsection 5.6.7.1***
Commercial fisheries	***Subsection 5.6.6.1***	***Subsection 5.6.7.1***
Fish processing establishments	***Subsection 5.6.6.2***	***Subsection 5.6.7.1***
Commercial fishery products exported from the site region	***Subsection 5.6.6.3***	
Collection of free foods	***Subsection 5.6.6.4***	
Impact of climate change	***Subsection 5.6.6.5***	
Recreation and tourism-related activities	***Subsection 5.6.6.6***	***Subsection 5.6.7.1***
Gas, oil and phosphate mining	***Subsection 5.6.6.7***	

5.6.4.3 Data Sources

The information presented in this section of this DSSR was obtained from official sources, national databases and regional and local studies. In cases where lack of data or limited data was identified, primary research and/or surveys were conducted. Information was obtained from the following sources:

- aerial photography and South African 1:50 000 scale topo-cadastral sheets;
- South African naval charts, e.g. SAN MZ1 and SAN 57;
- regional coastal sensitivity maps;

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- DFFE: Databases and reports relating to fishing stocks and rights allocations[1];
- DFFE: Fish Processing Establishments Rights Register;
- national or regional sectoral studies and reference books;
- publications and reports of scientific working groups;
- Eskom's nuclear sites investigation reports;
- primary data collection: surveys and field checks; municipal and institutional records, telephonic surveys; interviews with regional and local groups and institutions;
- evaluations being carried out in parallel or as part of this DSSR (coastal engineering, demography, land and water use, ecology and nearby transportation, industrial and military facilities).

Unless otherwise indicated in this section, the data which form the basis for defining the fishery sectors' characteristics are derived from the information provided by the DFFE, which controls and manages the use of marine resources in line with the Marine Living Resources Act, 1998 (Republic of South Africa, 1998).

The data sourcing cut-off date is 31 December 2018. However, where certain data sourced prior to the cut-off date were deemed too outdated, more up-to-date data were sourced after this date when it became available.

5.6.4.4 Presentation of Data

All data and information collected and assessed for the purpose of this section were:

- recorded and presented in tabular format (where appropriate) in terms of distance (km), while the direction is indicated by a compass sector (northeast, south-southeast, etc.) – Measurements were taken from a predefined co-ordinate defined in ***Section 5.1*** (Geography and Site Location) on the site that sets a constant from which all distances relative to the site are presented in this DSSR. Direction was recorded clockwise starting with north and distance was

[1] DFFE was previously called the Department of Agriculture, Forestry and Fisheries (DAFF) and the Department of Environment, Forestry and Fisheries (DEFF).

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recorded in ascending order.

- spatially presented in drawings that correspond with the respective areas of investigation.

Tabular data provided input to a Geographic Information System database for the site description.

All distances in the drawings, figures, and tables presented in this section are measured in a straight line from the site co-ordinates below, which is located at a central position on the site:

- X: -52727.4000
- Y: -3727966.6500.

The description of adjacent sea use is provided in terms of segments, sectors and annuli. ***Figure 5.6.1*** below illustrates these terms for ease of reading the document. The description is presented in terms of the site region (80 m) and site vicinity (16 km).

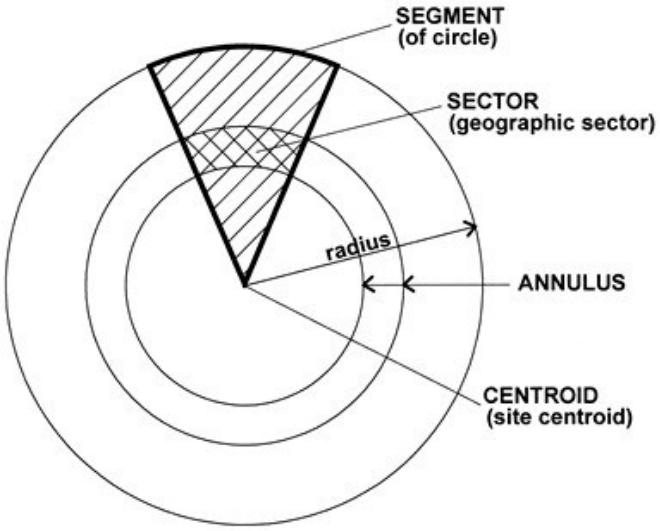

Figure 5.6.1
Illustration of Terms: Segment, Sector and Annulus

In order to align the analysis and presentation of data of this section with ***Section 5.4*** and ***Section 5.5***, and its use in ***Chapter 7*** and ***Chapter 8***, data presented in this section of this DSSR are presented in terms of the following radial grids:

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- 5 km radial interval and 22.5° grid for the site region;
- 5 km, 10 km and 16 km radii and/or a 22.5° grid for the site vicinity.

The radial grid includes the representation of the existing EPZs that apply to the site, namely the Precautionary Action Zone (PAZ, 5 km)[2], the Urgent Protective Action Planning Zone (UPZ, 16 km)[3] and the Long Term Protective Action Planning Zone (LPZ, 80 km)[4]. The EPZs were superimposed on these grids and are presented in blue on the respective drawings and form the basis of the discussion presented in ***Subsection 5.6.7***.

5.6.5 Description of the Coastal Zone and Maritime Area in the Site Region

The description of adjacent sea use is presented for the site region and site vicinity. Each topic discussed is set out in terms of these two main areas of investigation with a greater level of detail presented for the site vicinity.

5.6.5.1 The Coastal Zone

The coastal zone, illustrated in ***Drawing 5.6.2*** and compiled from the Coastal Sensitivity Atlas of South Africa (1984), is described in terms of the characteristics of the coastline and the location of coastal towns and estuaries.

In terms of the South African National Biodiversity Institute National Biodiversity Assessment (2018), the coast was for the first time mapped and described as a cross-realm zone, spanning the terrestrial and coastal marine realms, including all estuaries. This most current mapping for the coast is illustrated in ***Drawing 5.6.3*** and ***Drawing 5.6.4***. Together, these two drawings form the basis for characterising the coastal zone. A comparative evaluation of the two maps was conducted and the

[2] Precautionary Action Zone: Where the risk of deterministic effects is sufficiently high to warrant the establishment of plans for the implementation of pre-emptive protective actions based on plant conditions before a release or shortly thereafter (Eskom, 2021).

[3] Urgent Protective Action Planning Zone: where the risk of stochastic effects is sufficiently high to warrant the establishment of plans to implement protective actions based on environmental monitoring or on plant conditions (Eskom, 2021).

[4] Long Term Protective Action Planning Zone: where preparations for effective implementation of protective actions to reduce the risk of deterministic and stochastic health effects from long term exposure to deposition and ingestion must be developed in advance (Eskom, 2021).

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outcomes of the comparison are provided (Planning Partners, 2020).

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COORDINATE SYSTEM Map projection: Gauss Conformal Datum: Hartebeeshoek 94 Spheroid: WGS84 Scale factor: 1 Central meridian: LO19 Units: International meter	Eskom	SITE SAFETY REPORT FOR DUYNEFONTYN			
PLANNING PARTNERS	EXTRACT OF COASTAL SENSITIVITY ATLAS OF SOUTH AFRICA: 1984 (80 KM) SOURCE OF INFORMATION: Planning Partners		REV BY		
			AUTH BY		
COMP NJ 06/04/2021			DWG NO		REVISION
REV	RELEASED BY ESKOM	NOTE: For proper clarity this drawing must be printed at scale, A3 paper size.	5.6.2		0
SCALE NTS					

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-110000 -80000 -50000 -20000

-3700000 -3750000 -3800000

80km

16km

5km

DUYNEFONTYN SITE

ROBBEN ISLAND

FALSE BAY

Legend

- Boulder Shore
- Cape Island
- Exposed Rocky Shore
- Mixed Shore
- Sandy Shore
- Sheltered Rocky Shore
- Estuarine

N W E S

0 5 10 20

Kilometers

COORDINATE SYSTEM			Eskom	SITE SAFETY REPORT FOR DUYNEFONTYN		
Map projection: Gauss Conformal Datum: Hartebeeshoek 94 Spheroid: WGS84 Scale factor: 1 Central meridian: LO19 Units: International meter			EXTRACT OF SOUTH AFRICA'S ECOLOGICALLY DETERMINED COASTAL ZONE (2018)		REV BY	
PLANNING PARTNERS					AUTH BY	
COMP	NJ	06/04/2021	SOURCE OF INFORMATION: Planning Partners		DWG NO	REVISION
REV				NOTE: For proper clarity this drawing must be printed at A3 scale.	5.6.3	0
SCALE	1:450 000					

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-110000 -80000 -50000 -20000

-3700000 -3750000 -3800000

Ecosystem Type

- Agulhas Boulder Shore
- Agulhas Dissipative Intermediate Sandy Shore
- Agulhas Dissipative Sandy Shore
- Agulhas Exposed Rocky Shore
- Agulhas Intermediate Sandy Shore
- Agulhas Island
- Agulhas Kelp Forest
- Agulhas Mixed Shore
- Agulhas Reflective Sandy Shore
- Agulhas Sheltered Rocky Shore
- Agulhas Very Exposed Rocky Shore
- Cape Bay
- Cape Boulder Shore
- Cape Exposed Rocky Shore
- Cape Flats Dune Strandveld
- Cape Island
- Cape Kelp Forest
- Cape Mixed Shore
- Cape Rocky Inner Shelf
- Cape Sandy Inner Shelf
- Cape Seashore Vegetation
- Cape Sheltered Rocky Shore
- Cape Very Exposed Rocky Shore
- Cool Temperate Estuarine Lagoon
- Cool Temperate Estuarine Lake
- Cool Temperate Large Temporarily Closed
- Cool Temperate Micro-estuary
- Cool Temperate Small Fluvially Dominated
- Cool Temperate Small Temporarily Closed
- False and Walker Bay
- Hangklip Sand Fynbos
- Langebaan Dune Strandveld
- Overberg Dune Strandveld
- Peninsula Granite Fynbos
- Peninsula Shale Renosterveld
- Saldanha Flats Strandveld
- Saldanha Granite Strandveld
- Saldanha Limestone Strandveld
- Southern Benguela Dissipative Intermediate Sandy Shore
- Southern Benguela Dissipative Sandy Shore
- Southern Benguela Intermediate Sandy Shore
- Southern Benguela Reflective Sandy Shore

DUYNEFONTYN SITE

5km

16km

ROBBEN ISLAND

FALSE BAY

DUYNEFONTYN

N

W E

S

0 5 10 20

Kilometers

COORDINATE SYSTEM	Eskom	SITE SAFETY REPORT FOR DUYNEFONTYN
Map projection: Gauss Conformal Datum: Hartebeeshoek 94 Spheroid: WGS84 Scale factor: 1 Central meridian: LO19 Units: International meter	EXTRACT OF SOUTH AFRICA'S COASTAL ECOSYSTEM TYPES: 2018 (80 KM) SOURCE OF INFORMATION: Planning Partners	REV BY: / AUTH BY: / DWG NO: / REVISION
PLANNING PARTNERS		
COMP: NJ 06/04/2021		
REV:	RELEASED BY ESKOM	NOTE: For proper clarity this drawing must be printed at scale, A3 paper size.
SCALE: 1:450 000		5.6.4 / 0

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a) The Coastline in the Site Region

The coastline in the site region stretches from Saldanha Bay in the north-northwest to Rooi Els in the south-southeast. The coastline includes the Langebaan Lagoon to the north-northwest, Table Bay to the south-southwest, the Cape Peninsula to the south and False Bay to the south-southeast of the site. The shoreline, as described in terms of the Coastal Sensitivity Atlas of South Africa (1984), consists of exposed rocky headlands, wavecut rocky platforms and fine grain sandy beaches, as well as an isolated pebble beach 74 km to the south-southeast between Koeëlbaai and Rooi Els.

The Langebaan Lagoon, considered to be one of the biodiversity 'hot spots' in South Africa and declared a Convention on Wetlands of International Importance Especially as Waterfowl Habitat (RAMSAR) site in 1988 that encompasses 6 000 ha, is located 61 km to the north-northwest of the site.

Several rivers discharge into the sea along this coastline as illustrated in ***Drawing 5.6.1***. These are the Sout River (4 km south-southeast), Diep River (24 km south-southeast), Mud River (25 km north-northwest), Liesbeek River (26 km south), Disa River (42 km south), Kuils and Eerste Rivers (54 km southeast), Lourens River (68 km southeast), Steenbras River (68 km south-southeast) and Rooi Els River (80 km south-southeast).

Estuarine environments in the site region are the Wildevoël Vlei, which overflows into shallow backshore tidal lagoons along Noordhoek Beach (47 km south), Schusters River at Scarborough (68 km south), Silvermine at Fish Hoek (47 km south), Seekoevlei and Sandvlei, which discharge into False Bay to the south (47 km south) and the Black River via the Salt River Canal, which discharges into Table Bay to the immediate north of Cape Town Harbour (26 km south).

The Cape Town Metropolitan Area dominates the coastline to the south of the site, with much of the coastline being taken up by urban development, including low density and high density residential uses, industrial uses, the Port of Cape Town and conservation uses. To the north of the site, the coastline is characterised by coastal towns interspersed by undeveloped coastline and conservation areas.

The smaller coastal towns in the site region include Langebaan (73 km north-northwest), Yzerfontein (41 km north-northwest), Grotto Bay (22 km north-northwest) and Rooi Els (77 km south-southeast).

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Residential resort developments in the site region and situated on the coast include Tygerfontein (39 km north-northwest), Jakkalsfontein (34 km north-northwest), Ganzekraal (20 km north-northwest) and Silwerstroomstrand (12 km north-northwest). These predominantly resort towns or settlements offer a range of outdoor recreational activities, including water sports, hiking, whale-watching and fishing (Planning Partners, 2020).

The following islands are located in the site region (Planning Partners, 2020):

- Marcus (82 km north-northwest) and Jutten islands (79 km northwest) within Saldanha Bay;
- Schaapen Island (75 km north-northwest);
- Vondeling Island to the south of Saldanha Bay (72 km northwest);
- Meeu Rock (46 km northwest) off Yzerfontein;
- Dassen Island (43 km northwest) off Yzerfontein;
- Robbesteen north of Ou Skip (4 km northwest);
- Robben Island in Table Bay (16 km south-southwest);
- Duikerklip near Hout Bay (43 km south-southwest);
- Seal Island in False Bay (53.1 km south-southeast).

The coastline in the site region contains a number of harbours, as illustrated in ***Drawing 5.6.9***. All harbours are located to the south of the site. The Port of Cape Town (26 km south) is the only commercial harbour located in the site region. The Hout Bay Harbour (42 km south), Kalk Bay Harbour (50 km south) and Gordon's Bay Harbour (67 km southeast) are declared fishing harbours. Other harbours in the site region include (Planning Partners, 2020):

- Murrays Bay (14 km south-southwest);
- Granger Bay (25 km south);
- Victoria & Alfred Basins (25 km south);
- Simon's Town (57 km south);

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- Harbour Island (66 km southeast).

Saldanha Bay Harbour (84 north-northwest) falls outside of the site region.

The Coastal Sensitivity Map (2018), prepared under the auspices of South African National Biodiversity Institute, maps and delineates the ecologically determined coast of South Africa. On the landward side, vegetation types are included in the ecologically determined coast if they are described as purely coastal or having coastal affinity and if 70 per cent of the extent is within 10 km of the shore. On the seaward side, all ecosystem types that are influenced by the land have been classified as coastal. These include marine ecosystem types up to the back of the inner shelf, the full extent of bays and all river influenced ecosystem types, as illustrated in ***Drawing 5.6.4***

Drawing 5.6.3 represents an extract of South Africa's ecologically determined coastal zone and its key sub-components.

The coastal zone is represented in terms of five main categories, i.e. semi-coastal vegetation; coastal vegetation; shore; estuarine and the coastal marine realm. Non-coastal terrestrial and the non-coastal marine environments have been excluded. The shore has been mapped in terms of boulder shores; exposed rocky shores; mixed shores; sandy shores; sheltered rocky shores; island shores and estuarine shores and associated estuaries.

In the site region, areas previously mapped in 1984 as exposed rocky headlands and wavecut rocky platforms have now been mapped as exposed rocky shore and mixed shores in terms of the 2018 classification system. Although there is a reasonable alignment in terms of the distribution of these two classification systems, the detail in terms of specific designation of a specific portion of the coast has been refined.

Two further classifications have been introduced that overlap with areas previously mapped as exposed rocky headlands, i.e. boulder shores and sheltered rocky shores. The main sheltered rocky shore occurs on the southwestern shore of Saldanha Bay. The area was previously mapped as fine grain sandy beach and exposed rocky headland. Boulder shores occur on the western coastline between Camps Bay and Llandudno and south of Kommetjie.

The coastline classified as fine grain sandy beaches in 1984 are now classified as sandy shores. The estuarine coastline has now been

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included in the mapping (only open estuaries were mapped, in 1984).

b) The Coast Line in the Site Vicinity

In the site vicinity, the coastline is mapped as predominantly sandy, with mixed and exposed rocky shores occurring beyond the 5 km radius.

The coastline in the site vicinity, as described in the South African Coastal Sensitivity Atlas, is characterised by long, sandy beaches, which are broken intermittently by rocky outcrops and ledges. Sandy beaches occur from 8 km north-northwest towards the site, as well as at Duynefontein, Melkbosstrand and Bloubergstrand to the south, as illustrated in ***Drawing 5.6.2***. The beaches at Silwerstroomstrand, Melkbosstrand and Bloubergstrand are the most accessible. The site vicinity also includes a significant headland at Bokpunt, located 15 km northwest.

The Sout River (4 km south-southeast) is the only river that discharges into the sea in the site vicinity.

There is a 2 km seaward exclusion zone on the coastline bordering the existing Koeberg “A” Nuclear Power Station Units 1 and 2 (KNPS) (see ***Figure 5.6.2***). No general activity (swimming, operating of a vessel, etc.) is permitted within the 2 km sea exclusion zone located for 3 km along the seashore adjacent to the KNPS.

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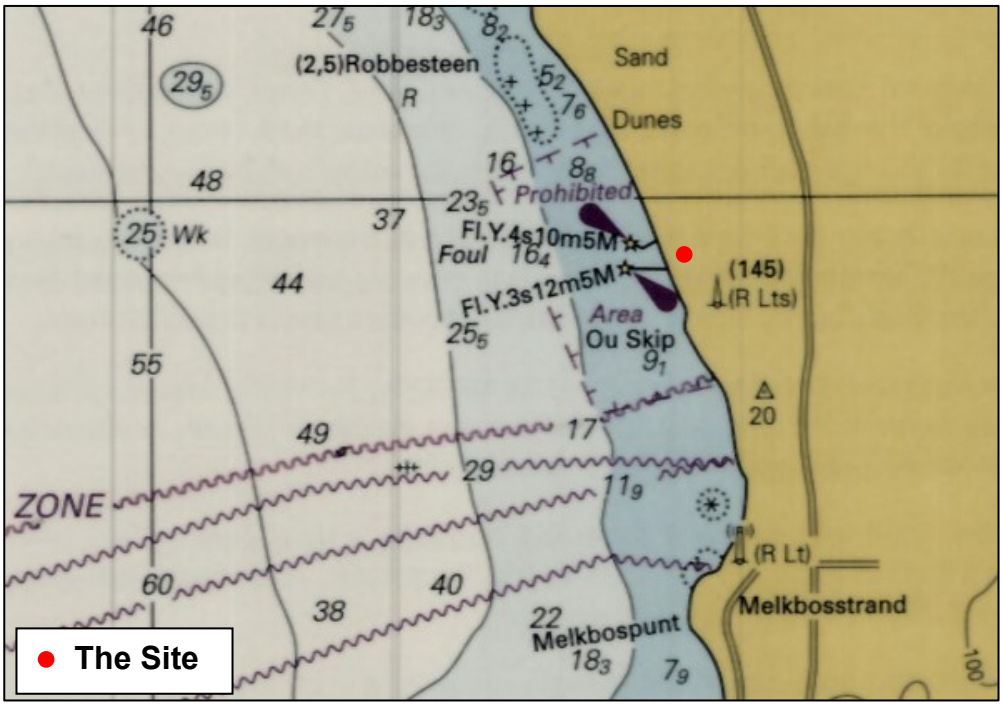

Figure 5.6.2
KNPS: Existing Prohibited Area

Robben Island, approximately 16 km to the south-southwest, is partially included in the site vicinity. Its coastline is predominantly characterised by exposed rocky headlands and limited sandy beaches, as illustrated in ***Drawings 5.6.2*** and ***5.6.3*** (Planning Partners, 2020).

The residential suburbs of Duynefontein, Melkbosstrand and Bloubergstrand, fronting onto the coast, are situated in the site vicinity. The residential suburb of Duynefontein represents the only urban use within the 5 km radius.

The KNPS water intake system is located within this area and has two large breakwaters for the intake and two smaller breakwaters for the outlet.

A site-specific description of the coastline, prepared as part of the marine ecology assessment conducted for the Nuclear 1 project, indicates that the sandy shores to the north of the KNPS are wave exposed and consist of coarse-grained quartz sand and weathered shell. The smaller beaches to the south are more sheltered and consist of finer sediment (Planning Partners, 2020).

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c) Estuaries in the Site Region

The South African National Biodiversity Assessment (SA:NBA): Estuarine Realm (2018) identified 15 estuaries and 18 micro-estuaries in the site region.

The SA:NBA (2018) introduced a revision of Whitfield's 1992 estuarine classification system, which consisted of five classes of estuaries. The revised SA:NBA classification introduced several new classes within the classification system, now consisting of nine classes, as well as three micro-classes, as included in ***Table 5.6.2*** and illustrated in ***Figure 5.6.3***.

Table 5.6.2
Whitfield 1992 versus SA:NBA 2018 Estuary Classification

1992 Classification	2018 Classification
Estuarine lake	Estuarine lake
Estuarine bay	Estuarine bay
-	Estuarine lagoon
Permanently open	Predominantly open
Temporarily open/closed	Large temporarily closed
	Small temporarily closed
River mouth	Large fluvially dominated
	Small fluvially dominated
-	Arid predominantly closed

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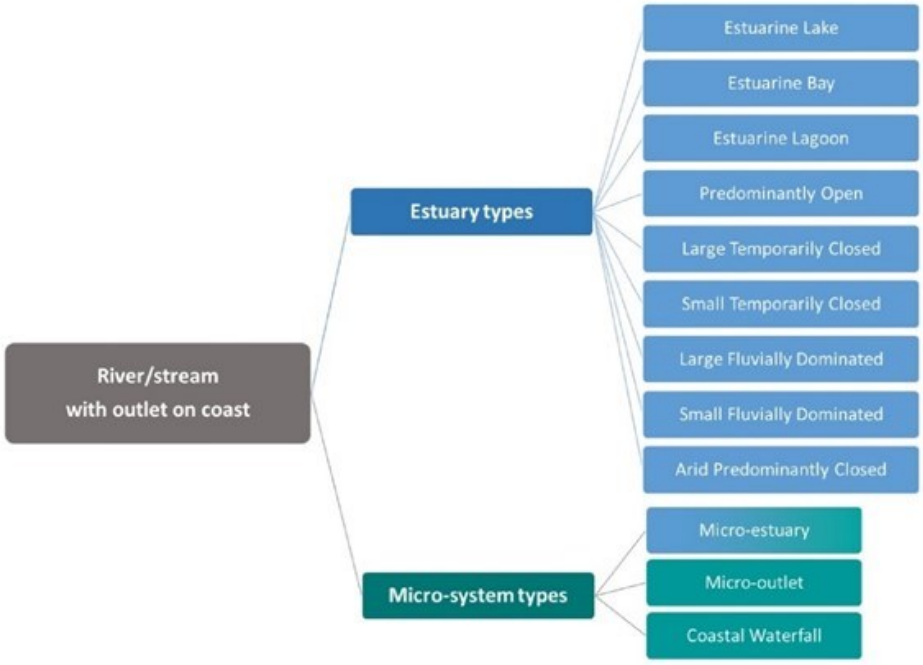

Figure 5.6.3
SA:NBA 2018 Estuary Classification

A total of 15 estuaries and 18 micro-estuaries are located in the site region (Planning Partners, 2020). Name, location, distance and direction from the site are provided for each of these, as well as key fishing effort where available (illustrated in ***Figure 5.6.4***):

- Langebaan Estuary (estuarine lagoon), 33°5'50.36"S 18°1'18.97"E (75 km north-northwest): Estuarine lagoons are the rarest ecosystem type and the Langebaan Estuary is the only estuary of its kind in South Africa. Bait collection and fishing occur. The DFFE recorded fishing effort within the estuary as high in 2011 and very high in 2018. Total catch recorded by DFFE in 2018 amounted to 206 t.

- Dwars Noord (micro-system: micro-outlet), 33°24'15.98"S 18°13'39.38"E (36 km north-northwest);

- Dwars Suid (micro-system: micro-outlet), 33°26'12.16"S 18°15'46.92"E (31 km north-northwest);

- Modder (micro-system: micro-estuary), 33°29'5.12"S 18°18'24.45"E (24 km north-northwest);

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- Cool Temperate 3 (micro-system: micro-outlet), 33°30’59.67”S 18°19’29.19”E (20 km north-northwest);
- Jacobsbaai (micro-system: micro-outlet), 33°31’12.44”S 18°19’27.45”E (20 km north-northwest);
- Lêerbaai (micro-system: micro-outlet), 33°32’14.11”S 18°19’4.72”E (19 km northwest);
- Bok Suid (micro-system: micro-outlet), 33°34’8.79”S 18°20’2.33”E (15 km northwest);
- Cool Temperate 4 (micro-system: micro-outlet), 33°34’39.97”S 18°21’8.74”E (13 km northwest);
- Silwerstroom (micro-system: micro-outlet): 33°34’53.79”S 18°21’21.74”E (13 km northwest);
- Springfontein (micro-system: micro-outlet): 33°36’27.56”S 18°22’26.03”E (9 km northwest);
- Sout Suid (micro-system: micro-outlet), 33°42’49.07S” 18°26’36.59”E (4 km south-southeast);
- Diep/Rietvlei Estuary (large temporarily closed), 33°53’23.654”S 18°28’55.7148”E (24 km south-southeast): Both fishing and bait collection occur within the estuary – DFFE recorded fishing effort within the estuary as low in both 2011 and 2018. Total catch recorded by DFFE in both 2011 and 2018 amounted to 8 t.
- Sout Wes Estuary (large temporarily closed, but is transformed and currently predominantly open), 33°54’28.925”S 18°28’17.7095”E (26 km south): Both fishing and bait collection occur within the estuary – DFFE recorded fishing effort within the estuary as low in both 2011 and 2018. No catch data were recorded by DFFE in either 2011 or 2018.
- Disa Estuary (large temporarily closed), 34°2’47.0075”S 18°21’16.2000”E (42 km south): Bait collection occurs within the estuary, but was not reported in the SA:NBA 2018 – DFFE recorded fishing effort within the estuary as low in both 2011 and 2018. No catch data were recorded by DFFE in either 2011 or 2018.
- Goeiehoop (micro-system: micro-outlet), 34°5’47.91”S

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18°21’10.15”E (41 km south);

- Wildevoëlvlei Estuary (large temporarily closed), 34°7’38.6796”S 18°20’35.8332”E (51 km south): Bait collection occurs, but was not reported in the SA:NBA 2018 – DFFE recorded fishing effort within the estuary as low in 2011 and 2018. Catch data recorded by DFFE in 2011 amounted to 1 t. In 2018, no data were recorded.

- Bokramspruit (micro-system: micro-estuary), 34°8’3.65999”S 18°19’57.6335”E (52 km south);

- Schuster Estuary (small temporarily closed), 34°12’7.3619”S 18°22’15.2651”E (59 km south) – DFFE recorded fishing effort within the estuary as low in 2011 and 2018. No catch data were recorded by DFFE in either 2011 or 2018.

- Krom Estuary (small temporarily closed), 34°13’51.391”S 18°22’42.2436”E (62 km south) – DFFE recorded fishing effort within the estuary as low in both 2011 and 2018. No catch data were recorded by DFFE in either 2011 or 2018.

- Olifantsbos (micro-system: micro-outlet), 34°15’26.47”S 18°22’58.31”E (65 km south);

- Booiskraal (micro-system: micro-outlet), 34°17’14.50”S 18°23’46.66”E (68 km south);

- Buffels Wes (micro-system: micro-outlet), 34°19’5.6532”S 18°27’42.4151”E (71 km south);

- Elsies (micro-system: micro-estuary), 34°9’37.5083”S 18°25’53.3495”E (54 km south);

- Silwermyn Estuary (large temporarily closed and currently transformed to small temporarily closed), 34°7’57.9467”S 18°26’20.1227”E (51 km south): Both fishing and bait collection occur – DFFE recorded fishing effort within the estuary as low in 2011 and 2018. No catch data were recorded by DFFE in either 2011 or 2018.

- Zand Estuary (large temporarily closed), 34°6’22.9823”S 18°28’35.4000”E (43 km south): Marina da Gama is a residential marina situated within the estuary – Both fishing and bait collection occur. DFFE recorded fishing effort within the estuary as medium in both 2011 and 2018. Total catch recorded by DFFE in both 2011 and

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2018 amounted to 20 t.

- Zeekoei Estuary (estuarine lake, now predominantly open), 34°5'54.3083"S 18°30'17.7623"E (47 km south) – The Zeekoei lake system was naturally closed for long periods until the 1940s when the connection between the lakes and main estuary channel was severed by weirs and levees that were constructed to prevent flooding of surrounding urbanised areas, whilst maintaining high water levels in the main water bodies. A concrete canal currently connects the lake system to the sea. Although there is no tidal exchange, the system is essentially permanently open, but no longer functions as an estuarine lake. Both fishing and bait collection occur. DFFE recorded fishing effort within the estuary as low in both 2011 and 2018. No catch data were recorded by DFFE in either 2011 or 2018.

- Eerste Estuary (large temporarily closed), 34°4'43.7771"S 18°45'13.4028"E (54 km southeast): Both fishing and bait collection occur – DFFE recorded fishing effort within the estuary as low in both 2011 and 2018. No catch data were recorded by DFFE in either 2011 or 2018.

- Lourens Estuary (small temporarily closed), 34°6'0.18719"S 18°48'39.0347"E (59 km southeast): Both fishing and bait collection occur – DFFE recorded fishing effort within the estuary as low in both 2011 and 2018. No catch data were recorded by DFFE in either 2011 or 2018.

- Cool Temperate 5 (micro-system: micro-estuary), 34°7'39.74"S 18°50'8.69"E (63 km southeast);

- Sir Lowry's Pass Estuary (small temporarily closed), 34°9'20.0160"S 18°51'53.6220"E (67 km southeast): Both fishing and bait collection occur – DFFE recorded fishing effort within the estuary as low in both 2011 and 2018. No catch data were recorded by DFFE in either 2011 or 2018.

- Steenbras Estuary (small fluvially dominated), 34°11'41.348"S 18°49'9.88319"E (68 km south-southeast): Both fishing and bait collection occur – DFFE recorded fishing effort within the estuary as low in both 2011 and 2018. Catch data recorded by DFFE in 2011 were 1 t. No data were recorded for 2018.

- Rooi Els Estuary (small temporarily closed), 34°17'44.786"S

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18°49'15.7620"E (78 km south-southeast): Both fishing and bait collection occur – DFFE recorded fishing effort within the estuary as low in both 2011 and 2018. No catch data were recorded by DFFE in either 2011 or 2018.

It is estimated that in 2011, approximately 1 035 t of fish were caught in the Cool Temperate region, with Langebaan Lagoon being the estuary where the highest volume was recorded within the site region. From 2011 to 2018, estuarine fishing effort remained stable for most of the site region, with the exception of the Langebaan Lagoon where fishing effort increased from high to very high (Planning Partners, 2020). In addition to their overall biodiversity value, estuaries in the Western Cape play an important role as fish nurseries, contributing significantly to biodiversity, estuarine fisheries and nearshore marine fisheries. The SA:NBA 2018 has ranked the importance of estuaries within this region as follows: Langebaan Lagoon (high importance), Diep/Riet (high importance), Sout (Wes) (low importance), Disa (low importance), Wildevoëlvlei (low importance), Schuster (low importance), Krom (low importance), Silwermyn (low importance), Zand (high importance), Zeekoei (low importance), Eerste (medium low importance), Lourens (low importance), Sir Lowry's Pass (low importance), Steenbras (low importance) and Rooi Els (low importance) (Planning Partners, 2020).

Estuaries accommodate a range of recreational activities. These are discussed ***Section 5.6.6.6***.

d) Estuaries in the Site Vicinity

Only estuaries classified as micro-systems (micro outlets) occur within the site vicinity and include Bok Suid (15 km northwest), Cool Temperate 4 (13 km northwest), Silwerstroom (13 km northwest), Springfontein (9 km northwest), and Sout Suid (4 km south-southeast).

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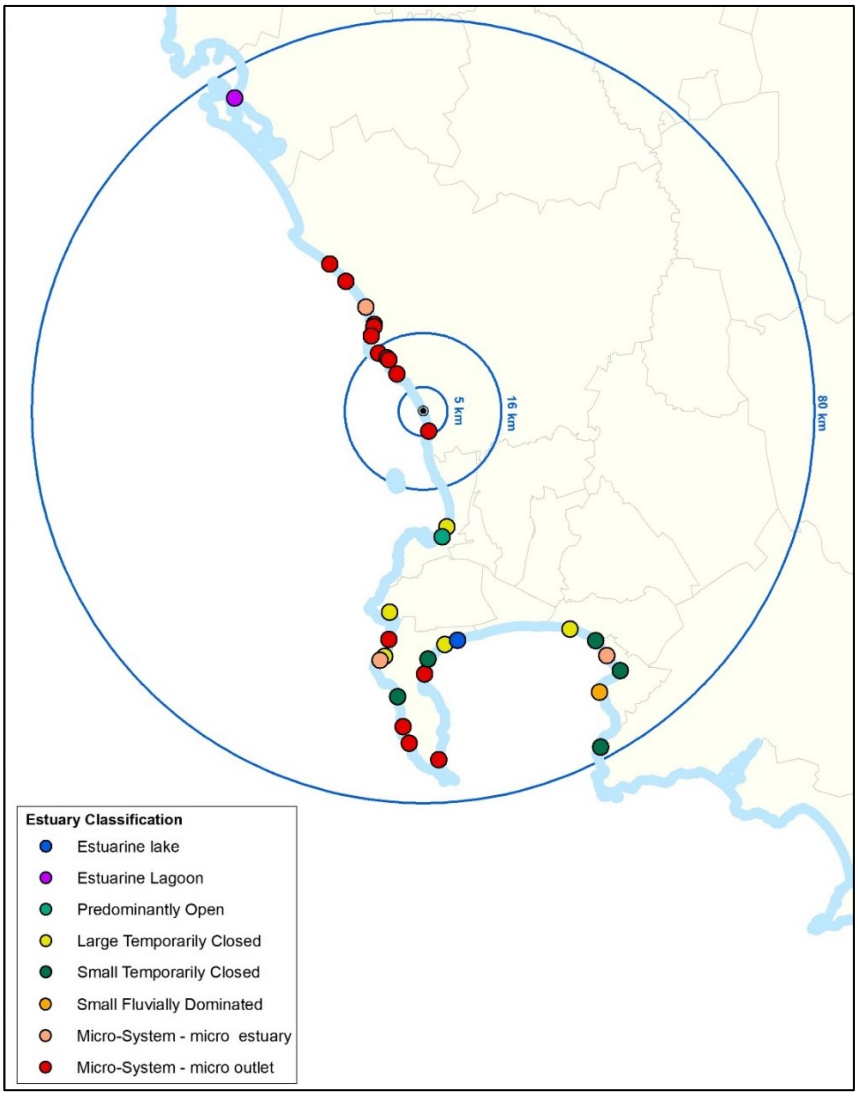

Figure 5.6.4
Distribution of Estuaries and Micro-estuaries in the Site Region

5.6.5.2 Maritime Zones

The site region falls within the maritime zones defined in terms of the Maritime Zones Act, 1994. The Act defines baselines and the maritime zones to include the internal waters, the territorial waters, the contiguous zones, the exclusive economic zones and the continental shelf, as described below and illustrated in ***Figure 5.6.5***.

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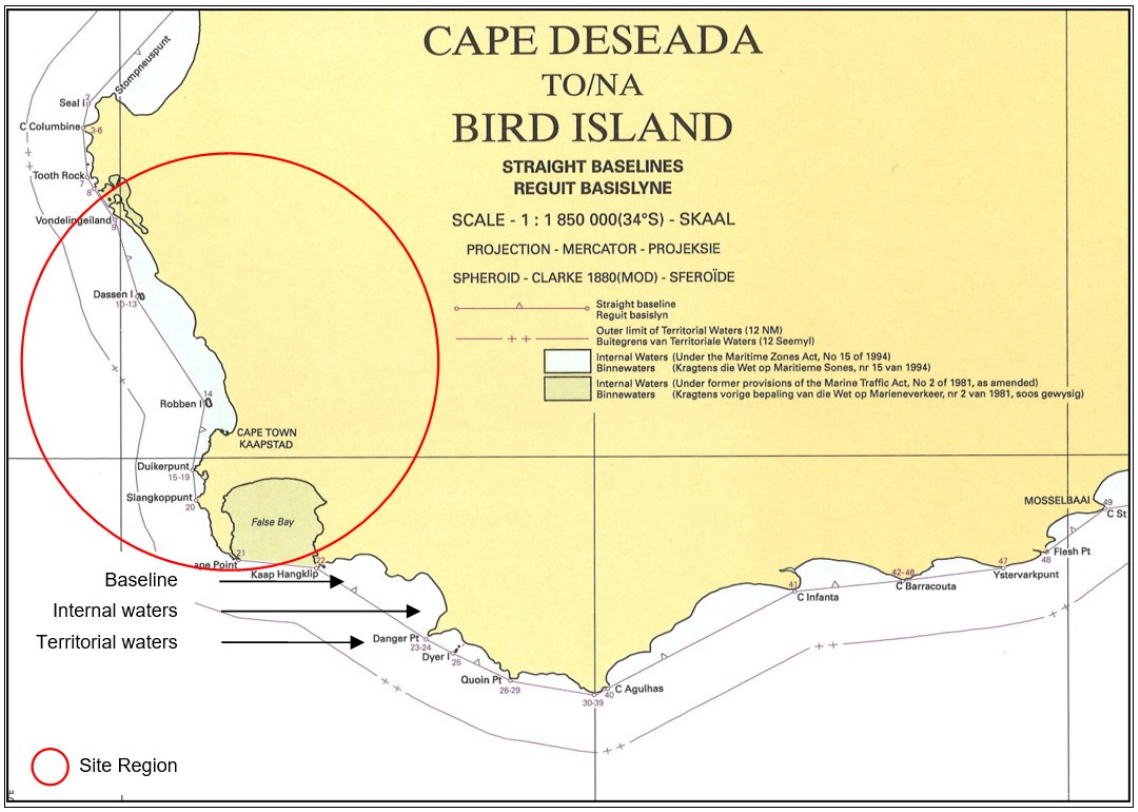

Figure 5.6.5
Baselines, Internal Waters and Territorial Waters

In principle, baselines are defined by the low water mark, unless they are defined in terms of straight lines that join the grouped co-ordinates mentioned in Schedule 2 of the Act, which are then the baselines of that relevant part of the coast and the outer limits shall be the outermost harbour works, which form an integral part of the harbour system.

The internal waters consist of the water landward of the baselines and within the outer limits of harbours. Any law in force in the Republic of South Africa, including the common law, shall also apply in its internal waters and the airspace above its internal waters. The right of innocent passage shall not exist in the internal waters, except if the internal waters concerned were territorial waters before the commencement of this Act on 11 November 1994. The 'right of innocent passage' means the right of innocent passage as defined in Section 2 of the Marine Traffic Act, 1981, Act 2 of 1981).

The territorial waters encompass the sea within a distance of 12 nmi

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(22 km) from the baselines. Any law in force in the Republic of South Africa, including the common law, shall also apply in its territorial waters and the airspace above its territorial waters. The right of innocent passage exists in the territorial waters.

The contiguous zone is the sea beyond the territorial waters within a distance of 24 nmi (44 km) from the baselines. Within the contiguous zone and the airspace above it the RSA shall have the right to (i) exercise all the powers it considers necessary to prevent contravention of any fiscal law or any customs, emigration, immigration or sanitary law and (ii) make such contravention punishable.

The exclusive economic zone encompasses the sea beyond the territorial waters within a distance of 200 nmi from the baselines. The Republic of South Africa has the same rights and powers in respect of all natural resources as it has with respect to its territorial waters.

The continental shelf is defined in Article 76 of the United Nations Convention on the Law of the Sea, 1982, adopted at Montego Bay on 10 December 1982. The continental shelf consists of a series of straight lines joining the coordinates mentioned in Schedule 3 of the Act. South Africa has the rights to the exploration and exploitation of natural resources, as defined in paragraph 4 of Article 77 of the Convention. The continental shelf is also deemed to be unalienated State land (refer to ***Figure 5.6.6***).

The existing extent of South Africa's exclusive economic zone is about 1 553 000 km². South Africa has submitted requests for additional entitlements under international law to lengthen its seabed rights to specific parts of the continental shelf.

On 5 May 2009, South Africa submitted information on the limits of the Continental Shelf beyond 200 nmi from the baselines in respect of the mainland of the territory of the Country, to the Commission on the limits of the Continental Shelf, in accordance with Article 76, paragraph 8 of the Convention. On conclusion of the consideration of the submission, the commission will make recommendations in accordance with Article 76 of the Convention. It is predicted that the success of these claims will extend the continental shelf to 137 000 km² of seabed privileges to South Africa's inland exclusive economic zone and 1 108 000 km² to the exclusive economic zone nearby the Prince Edward Islands (as illustrated in ***Figure 5.6.6***) (Planning Partners, 2020).

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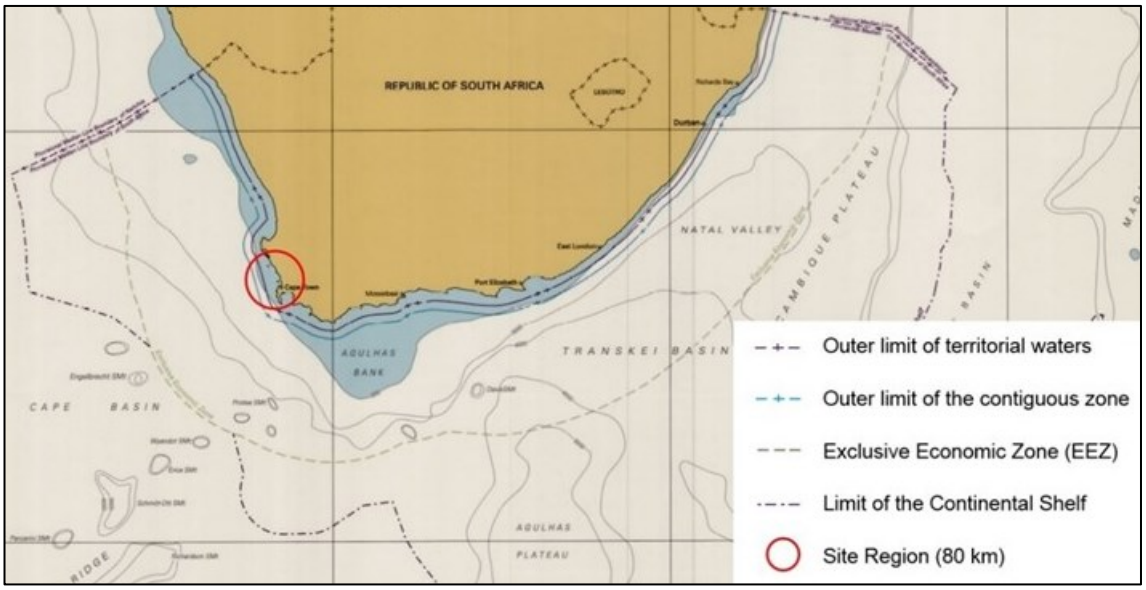

Figure 5.6.6
Contiguous Zone, Exclusive Economic Zone and Limit of the Continental Shelf

a) Rights Reserved

The Republic of South Africa may in any area of the sea or the airspace above the sea take such measures as are necessary against any vessel or aircraft in order to protect the coastline of the country or related interests, including fishing, pollution or any threat of pollution (i) resulting from a maritime casualty or an act or omission relating to such a casualty and (ii) which may reasonably be expected to result in major harmful consequences. These consequences also include the potential consequences that may affect the safety of the nuclear installation(s) (Planning Partners, 2020).

b) Generalised Bathymetry

The general description of the bathymetry of the sea in the site region presented in this section is based on the mapping done by the South African Navy Hydrographic Office. ***Drawing 5.6.5*** illustrates the generalised bathymetry in the site region and the site vicinity. Detailed information on the inshore bathymetry is presented in ***Section 5.9***. ***Drawing 5.6.5*** indicates that the ocean depth in the site region reaches 278 m below mean sea level to the west of the site. A large proportion of this area falls within the 100 m and 200 m isobaths. The depth of the sea in the site vicinity reaches approximately 80 m. The sea within 5 km is

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generally shallower than 30 m.

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All charted Traffic Separation Schemes are listed in South African Annual Notice to Mariners No 5, which indicates which schemes are IMO-adopted and includes other relevant information.

VESSEL TRAFFIC SERVICES

For procedures and working details of VTS see South African List of Lights and Radio Signals *(SAN HO-1)*.

DUYNEFONTYN SITE

80km

16km

5km

Vessel Traffic Services (see Note)

Submarine Cable (see Note)

Vessel Traffic Services (see Note)

AMMUNITION DUMPING GROUND (Disused)

Explosives (1987)

Current Meters

Current Meters

Current Meters

Sand Patch

Foul

North Head Fl(3)23M

South Head Fl(4)24M

Saldanha Bay

Langebaan Lagn

Vredenburg

(R Lt)

Langebaanweg

Hopefield

Langebaan

Mooreesburg

Yzerfonteinpunt (48) (R Lts) RW

Darling

Kapokberg 459

Contreberg 476

Dassenberg 567

Malmesbury

Wellington

Dassen I Fl(2)26M

St.Sh

Bokpunt

Sh

Melkbospunt

Koeberg 375

Robben Oc.WR.24/12M

Robben Island

Milnerton Fl(3)25M

Radio Masts Aero.Fl.R.18M

Green Pt Fl.25M

CAPE TOWN/KAAPSTAD

Stellenbosch

Houtbaai

Duikerpunt 652

RADIO MAST (R Lts)

Vulcan Rk

Somerset West

Strand

HOTTENTOTSHOLLANDBERG

Slangkoppunt Fl(4)30M

RADIO MAST(85) (R Lts)

Simonstown

VALSBAAI

Koeëlberg 1267

Fl(5)Y.20s

Albatross Rks

Cape of Good Hope

Cape Point Fl(2+1)32M

Bellows Rk

Rocky Bank

Kaap Hangklip Fl.25M

M.S

M.S.Sh

PA

COORDINATE SYSTEM	Eskom	SITE SAFETY REPORT FOR DUYNEFONTYN
Map projection: Gauss Conformal Datum: Hartebeeshoek 94 Spheroid: WGS84 Scale factor: 1 Central meridian: LO19 Units: International meter	GENERAL BATHYMETRY (80 KM)	REV BY:
PLANNING PARTNERS		AUTH BY:
COMP NJ 06/04/2021	SOURCE OF INFORMATION: Planning Partners	DWG NO: 5.6.5
REV	NOTE: For proper clarity this drawing must be printed at A3 scale.	REVISION: 0
SCALE NTS		

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5.6.5.3 Protected Maritime Areas

Protect maritime areas located within the site region include Marine Protected Areas, Special Areas and Closed Areas, declared in terms of South African legislation.

a) Marine Protected Areas within the Site Region

South Africa's MPAs contribute towards achieving the United Nations Sustainable Development Goals, specifically Sustainable Development Goal 14: Conserve and Sustainably Use the Oceans, Seas and Marine Resources. They contribute to poverty alleviation, increase economic growth, support food and job security, maintain ecosystem resilience and are vital for coping with climate change (Planning Partners, 2020).

Until 2014, most MPAs in South Africa were established by way of Section 43 of the Marine Living Resources Act, Act 18 of 1998. Prior to this Act, MPAs were declared in terms of the Sea Fisheries Act (1973 and 1988) and its various amendments. The declaration and management of MPAs are now provided for in terms of National Environment Management Act: Protected Areas Amendment Act, Act 21 of 2014, which came into effect on 2 June 2014. All MPAs that were declared under Act 18 of 1998 must be regarded as MPAs declared under Act 21 of 2014.

Section 13(1) of the Act sets out the general restrictions that apply within an MPA as follows:

"no person may in a marine protected area—

(a) fish or attempt to fish;

(b) take or destroy any fauna or flora;

(c) undertake any dredging or extraction of sand, rock, gravel or minerals unrelated to any activities referred to in section 48(1);

(d) discharge or deposit waste or any other polluting matter;

(e) in any manner which results in an adverse effect on the marine environment, disturb, alter or destroy the natural environment or disturb or alter the water quality or abstract sea water;

(f) carry on any activity which may have an adverse effect on the ecosystem of the area;

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(g) construct or erect any building or other structure on or over any land or water within such a marine protected area;

(h) carry on marine aquaculture activities;

(i) engage in bio-prospecting activities;

(j) sink or scuttle any platform, vessel or other structure; or

(k) undertake mineral exploration, and production of petroleum and other fossil fuels."

Section 13(2) makes provision for the Minister to prescribe (i) different zones to regulate different activities within a specific marine protected area and (ii) activities which require a permit.

The MPAs recorded in the site region in 2008 (Department of Agriculture, Forestry and Fisheries, 2020a) are illustrated in ***Drawing 5.6.6***.

The only new MPA declared in 2019 in the site region is the Robben Island MPA (8 km south-southwest). The nearest new MPA declared in 2019 falls outside of the site region and is the Cape Canyon MPA (110 km northwest) near Saldanha Bay (see ***Drawing 5.6.7***) (Planning Partners, 2020).

The MPAs included in the site region are as follow (Planning Partners, 2020):

- Langebaan Lagoon MPA: The MPA was declared in 2000 and is located approximately 60 km to the north-northwest and northwest of the site. The area that the MPA encompass is bounded by the highwater mark and, as a northern boundary, a line running from Leentjiesklip No. 2 (33°03‘.707S 18°2‘.462E) towards Salamander Point (33°04‘.323S 17°59‘.795E), until it meets the seaward boundary of the South African National Defence Force area (demarcated by yellow buoys), and then along this boundary to the yellow buoy east of Meeu Island (33°05‘.166S 18°00.809E), and then along a straight line to Perlemoen Point on the western shore of Langebaan Lagoon ǁ (33°05‘.590S 48°00‘,211E).

  The Langebaan Lagoon MPA is divided into three zones. Recreational fishing is only permitted in the northern-most zone. The areas where fishing is restricted are indicated in ***Drawing 5.6.7***.

  Fishing is only permitted beyond 70 km northwest, north of Beacon

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LB4 in Kraalbaai and LB3 in Oesterwal. No fishing is allowed between 50 km and 70 km northwest of the site. Furthermore, no West Coast rock lobster may be caught between North Head and South Head in Saldanha Bay.

The catching of line fish in terms of a net-fishing permit is permitted to the south of a line joining beacons LB4 in Kraal Bay, on the western shore of the lagoon, and LB3 at Oesterwal, on the eastern shore of the lagoon, and north of a line joining beacons LBI south of Churchhaven, on the western shore of the lagoon, and L82 at Bottelary, on the eastern side of the lagoon. SANParks is the management agency. The commercial net-fishery is discussed in detail in ***Section 5.6.6.1***.

- Malgas Island MPA: The MPA was declared in 2000 and is located approximately 70 km north-northwest. The MPA area is below the highwater mark between latitudes 33°02‘.806S and 33°03‘.506S and longitudes 17°55‘.261E and 17°55‘.862E.

  Jutten and Marcus islands are included within this MPA and no fishing is allowed along the shores of these islands. However, the catching of line fish from a vessel in terms of recreational and commercial fishing permits in the Malgas Island, Jutten Island and Marcus Island MPAs is allowed. SANParks is the management agency.

- Jutten Island MPA: The MPA was declared in 2000 and the area is below the highwater mark between latitudes 33°04‘.706S and 33°05‘.306S and longitudes 17°56‘.961E and 17°57‘.861E.

- Marcus Island MPA: The MPA was declared in 2000 and the area is below the highwater mark between latitudes 33°02‘.507S and 33°02‘.806S and longitudes 17°57‘.861E and 17°58‘.361E.

- Sixteen Mile Beach MPA: The MPA was declared in 2000 and is located approximately 46 km to the northwest of the site. The MPA area is bounded by a line beginning at the highwater mark in Plankiesbaai (33°07‘.106S 17°58‘.377E) and then running southeastwards along the highwater mark to Rooipan se Klippe near Yzerfontein (33°20‘.006S 18° 09‘.595 E), and then due westwards to longitude 18°08‘.095E and then along a northwest line to the intersection of latitude 33°07‘.107S and longitude 17°55‘.96E.

  The MPA restricts fishing from the shore between Plankies and

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Rooipan se Klippe near Yzerfontein.

The catching of line fish from a vessel and the catching of West Coast rock lobster (Jasus lalandii) and abalone (Haliotis Mae), in terms of recreational and commercial fishing permits, is permitted in this MPA. No jetskis may be used anywhere in the MPA. SANParks is the management agency.

- Table Mountain National Park MPA: The MPA was declared in 2004 and is located 25 km south of the site. It includes the following 'no take' zones where fishing is prohibited (see ***Drawing 5.6.7***):
    - St. James Restricted Zone, between the tidal pool at St. James and the tidal pool at Kalk Bay and the boundary co-ordinates 34°07'.123S 18°27'.568E, 34°07'.567S 18°27'.050E and 34°07'.567S 18°27'.568E;
    - Boulders Restricted Zone, the area between the eastern end of Simon's Town harbour and Oatlands and the boundary co-ordinates 34°11'.567S 18°26'.762E, 34°12'.705S 18°27'.781E, 34°10'.581S 18°27'.196E and 34°10'.581S 18°27'.781E;
    - Castle Rock Restricted Zone, between the beacon VB1 at Miller's Point and beacon VB2 at Partridge Point, extending approximately 2 km seawards – The boundary co-ordinates are 34°15'.480S 18°28'.344E, 34°14'.100S 18°28'.508E, 34°14'.100S 18°29'.300E and 34°15'.480S 18°29'.300E;
    - Paulsberg Restricted Zone, between Smitswinkel Point and Venus Pool and extending approximately 1 nmi (1.85 km) seawards – The boundary coordinates are 34°17.744'S 18°28.020'E, 34°16.549'S 18°28.464'E, 34°16.549'S 18°29.000'E, 34°17.744'S 18°29.000'E;
    - Cape of Good Hope Restricted Zone, between 'Hoek van die Bobbejaan' and the fence at Scarborough and extending approximately 1 nmi (1.85 km) seawards with boundary co-ordinates 34°12.271'S 18°22.194'E, 34°18.393'S 18°24.258'E, 34°16.490'S 18°22.194'E, 34°18.393'S 18°23.500'E;
    - Karbonkelberg Restricted Zone, between the Sentinel at Hout Bay and Oudekraal and extending 6 km offshore at the widest

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point. The boundary co-ordinates are 34°03.660'S 18°20.252'E, 33°58.757'S 18°21.847'E, 34°03.660'S 18°17.797'E, 33°58.757'S 18°17.797'E;

- between Melkbos Point (beacon MB1) and Die Josie (near Chapman's Peak, beacon MB2), extending 22 km seawards from the highwater mark where no crayfish may be caught;
- Castle Rock MPA in which the catching of snoek (*Thyrsites atun*) is permitted by a person authorised to undertake commercial fishing from licensed local fishing vessels;
- Table Mountain National Park MPA in which SANParks is the management agency and no jetskis are allowed;

- Helderberg MPA: The MPA was declared in 2000 and includes the area between the highwater mark and a line 500 m seawards of the highwater mark, between, as western boundary, a line due south of the mouth of the Eerste River, and, as eastern boundary, a line due south of the mouth of the Lourens River, in False Bay.

  No fishing is permitted between the mouth of the Eerste River and the mouth of the Lourens River in False Bay, extending 500 m seawards from the highwater mark. Jetskis are allowed in the MPA. A Closed Area is located from the Lourens river Mouth to the eastern breakwater of the harbour at Gordon's Bay stretching 500 m seaward. Only shore angling is permitted within this area.

- The Robben Island MPA: The MPA was declared in 2019 and is a sanctuary for endangered African penguins, bank cormorants and terns. Robben Island itself is one of the few places to continue to support viable abalone (*Haliotis midae*) stocks and protection of this area may promote stock recovery. This MPA also helps protect West Coast rock lobster.

  The MPA consists of the following three Controlled Zones and one Restricted Zone, which are illustrated in ***Figure 5.6.7***:

  - one Restricted Zone, indicated as the Robben Island Restricted Zone;
  - two Offshore Controlled Zones, indicated as the Robben Island Offshore Controlled Zone and the Robben Island Middle Controlled Zone;

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- one Inshore Controlled Zone, indicated as the Robben Island Inner Controlled Zone.

No person may conduct scientific research in the MPA without a permit. No person may fish or attempt to fish in the Restricted Zone. No person may fish in a controlled zone without a valid permit. A person in possession of a fishing permit may only fish from a vessel in the following areas:

- Offshore Controlled Zone for small pelagic species: yellowtail or snoek;
- Middle Controlled Zone, by undertaking line fishing for yellowtail and snoek;
- Inner Controlled Zone, between sunrise and sunset for abalone and by line fishing for snoek, yellowtail or hottentot;
- subject to species restrictions, quantity, fish size limits, allowable effort, closed seasons or bag limits authorised by such fishing permit.

No person may collect broodstock in a Controlled Zone for the purposes of undertaking aquaculture without a permit.

In principle, no person shall engage in SCUBA diving, diving or be in possession of prohibited gear in the Restricted Zone, except with permission under specified circumstances including to conduct research or salvage operations. No person may operate or attempt to operate a SCUBA diving business in a Controlled Zone of the MPA without a permit.

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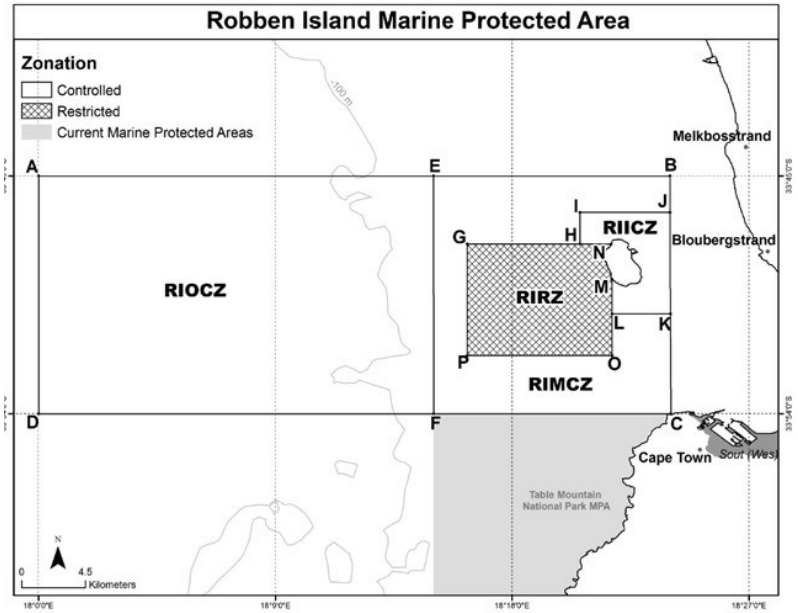

Figure 5.6.7
Robben Island MPA

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-120000 -80000 -40000 0

-3640000 -3680000 -3720000 -3760000 -3800000 -3840000

NW NE W E SW SE S

80km 70km 60km 50km 40km 30km 20km 10km 5km 16km

DUYNEFONTYN SITE

Shell Bay Point SHBW2/SHB3
Stompneus Point SHBW1/SHB2
DWARSKERSBOS
EENDEKUIL
AURORA
ST HELENA BAY
LAAIPLEK
VELDDRIF
PATERNOSTER
VREDENBURG
PIKETBERG
JACOBSBAY
SALDANHA
KORINGBERG
PORTERVILLE
LANGEBAAN
MOORREESBURG
SARON
YZERFONTEIN
DARLING
RIEBEEK WEST
RIEBEEK KASTEEL
CERES
WOLSELEY
MALMESBURY
ABBOTSDALE
GROOTBAY
MAMRE
GREATER CHATSWORTH
CHATSWORTH
PELLA/KATZENBERG
ATLANTIS
KALBASKRAAL
BAIN'S KLOOF PASS
WELLINGTON
MBEKWENI
RAWSONVILLE
PHILADELPHIA
KLIPHEUWEL
PAARL
MELKBOS POINT MB1
FISANTEKRAAL
BLOUBERGSTRAND
ROBBEN ISLAND
MILNERTON
DURBANVILLE
KRAAIFONTEIN
BRACKENFELL
KLAPMUTS
SIMONDIUM
DEVONVALE
GOODWOOD
BELLVILLE
PNIEL
LA MOTTE
FRANSCHHOEK
KYLEMORE
GREEN POINT
GRANJEZICHT
CAMPS BAY
KUILS RIVER
STELLENBOSCH
CAPE TOWN
NYANGA
BLUE DOWNS
VILLIERSDORP
HOUT BAY
CONSTANTIA
KHAYELITSHA
MITCHELL'S PLAIN
THEEWATERSKLOOF
"DIE JOSIE" H1
NOORDHOEK
MACASSAR
SOMERSET WEST
HELDERBERG MPA
THE STRAND
SIR LOWRYS PASS
KOMMETJIE FISH HOEK
GORDONS BAY
GRABOUW
SIMON'S TOWN
SCARBOROUGH
FALSE BAY
BOT RIVER
SMITSWINKELBAAI
CAPE POINT
ROOIELS
PRINGLE BAY
KLEINMOND
CAPE HANGKLIP
BETTY'S BAY MPA
SAND BAY
ZWEIPLLE

Saldanha
North Head NH1/NH2
Salamander Point
Marcus Island
Malgas Island
Leentjiesklip No. 2
Jutten Island
Langebaan
Perlemoen Point
South Head SH1/SH2
Plankies Bay
LB3 Oesterwal
Kraal Bay
LB2
LB4
LB1
Sixteen Mile

Green Point
CAPE TOWN
Sea Point
KARBONKELBERG RESTRICTED ZONE
Oudekraal
TABLE MOUNTAIN NATIONAL PARK MPA
Hout Bay
Muizenberg
Kalk Bay
ST JAMES RESTRICTED ZONE
BOULDERS RESTRICTED ZONE
Schuster's Bay
Simon's Town
Scarborough
CASTLE ROCK RESTRICTED ZONE
Millers Pt
Partridge Pt
Smitswinkel Pt
Hoek van die Bobbejaan
CAPE OF GOOD HOPE RESTRICTED ZONE
PAULSBERG RESTRICTED ZONE
Cape Point

B1 STONEY POINT
B4 JOCK SE BAAI
HR1 KRAAL ROCK
HR2 RIETFONTEIN
HARDER BAY
POINT

Legend

EPZ's

- 5km
- 16km
- 80km
- Marine Protected Area (Controlled Zone)
- Marine Protected Area (Restricted Zone)
- Marine Protected Area (Sanctuary Zone)
- Rock Lobster Closed Area
- Closed Areas

N W E S

0 5 10 20 30
Kilometers

COORDINATE SYSTEM	Eskom	SITE SAFETY REPORT FOR DUYNEFONTYN
Map projection: Gauss Conformal Datum: Hartebeeshoek 94 Spheroid: WGS84 Scale factor: 1 Central meridian: LO19 Units: International meter	MARINE PROTECTED AREAS: 2008 (80 KM)	REV BY / AUTH BY
PLANNING PARTNERS	SOURCE OF INFORMATION: Planning Partners	DWG NO: 5.6.6 / REVISION: 0
COMP: NJ 06/04/2021	NOTE: For proper clarity this drawing must be printed at A3 scale.	
REV		
SCALE: 1:650 000		

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DUYNEFONTYN SITE

N
NE
E
SE
S
SW
W
80km
5km
16km

AURORA
ST HELENA BAY
LAAIPLEK
JACOBSBAAI
SALDANHA
LANGEBAAN
HOPEFIELD
KORINGBERG
PORTERVILLE
MOORREESBURG
SARON
TULBAGH
GOUDA
TULBAGHWEG
RIEBEEK-WEST
RIEBEEK KASTEEL
WOLSELEY
YZERFONTEIN
DARLING
Dassen Island
MALMESBURY
ABBOTSDALE
GROTTO BAY
MAMRE
CHATSWORTH
PELLA-KATZENBERG
ATLANTIS
KALBASKRAAL
WELLINGTON
RAWSONVILLE
PHILADELPHIA
KLIPHEUWEL
PAARL
MELKBOSSTRAND
FISANTEKRAAL
KLAPMUTS
VAL DE VIE
BLAAUWBERGSTRAND
Robben Island
MILNERTON
DURBANVILLE
GOODWOOD
BELLVILLE
FRANSCHHOEK
CAMPS BAY
BLACKHEATH
BLUE DOWNS
CONSTANTIA
VILLIERSDORP
KHAYELITSHA
MACASSAR
BERGVLIET
SOMERSET WEST
NOORDHOEK
SIR LOWRY'S PASS
THE STRAND
KOMMETJIE
FISH HOEK
GORDONS BAY
GRABOUW
SIMON'S TOWN
SCARBOROUGH
CASTLE ROCK
BOT RIVER
ROOI-ELS
KLEINMOND
PRINGLE BAY
BETTY'S BAY
FISHERHAVEN
HAWSTON
HERMANUS
SANDBAAI (CALEDON)

Marine Protected Areas

- Controlled
- Restricted
- Sanctuary
- Rock Lobster Closed Area
- Closed Areas

N W E S

0 5 10 20 30
Kilometers

COORDINATE SYSTEM			Eskom	SITE SAFETY REPORT FOR DUYNEFONTYN		
Map projection: Gauss Conformal Datum: Hartebeeshoek 94 Spheroid: WGS84 Scale factor: 1 Central meridian: LO19 Units: International meter					REV BY	
PLANNING PARTNERS			MARINE PROTECTED AREAS: 2020 (80 KM)		AUTH BY	
COMP	NJ	06/04/2021	SOURCE OF INFORMATION: Planning Partners		DWG NO	REVISION
REV				NOTE: For proper clarity this drawing must be printed at A3 scale.	5.6.7	0
SCALE	1:650 000					

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b) Marine Protected Areas within the Site Vicinity

Portions of the Robben Island MPA fall within the site vicinity and beyond 5 km to the south-southwest. The area within the site vicinity includes a portion of the West Coast rock lobster closed area which extends up to the coastline, the controlled area and a portion of the restricted area, situated to the west of Robben Island.

c) Special Sea Areas

MARPOL is recognised as being the first multilateral instrument to be concluded with the prime objective of protecting the environment by preserving the seas and coastal environment from pollution. South Africa is a signatory to this convention.

MARPOL defines certain sea areas as 'special areas' in which, for technical reasons relating to their oceanographical and ecological condition and due to the particular character of their sea traffic, the adoption of special mandatory methods for the prevention of sea pollution is required.

These special areas are provided with a higher level of protection than other areas of the sea and the adoption of special mandatory methods for the prevention of pollution of the sea from ships by oil.

Under Annexure 1 of MARPOL, a Special Sea Area over the southern South African waters was declared on 1 August 2008. It incorporates the continental shelf from the mouth of the Spoeg River in the west to the immediate east of the Great Fish River in the east extending out to the continental shelf break at the 500 m isobath. It encompasses the whole of the continental shelf region known as the Agulhas Bank as well as the southern and central portion of the Benguela upwelling system.

The Special Sea Area is illustrated on ***Figure 5.6.8*** and encompasses most of the site region and the whole of the site vicinity, the site being indicated by the red dot on the figure.

The South African domestic legislation to implement this Annexure 1 on Marine Pollution (Prevention of Pollution from Ships, Act 2 of 1986) is administered by the South African Maritime Safety Authority. The regulations govern the discharges of oil, except for clean or segregated ballast, from all ships. They require *inter alia* that all ships be fitted with pollution prevention equipment to comply with the stringent discharge regulations (Planning Partners, 2020).

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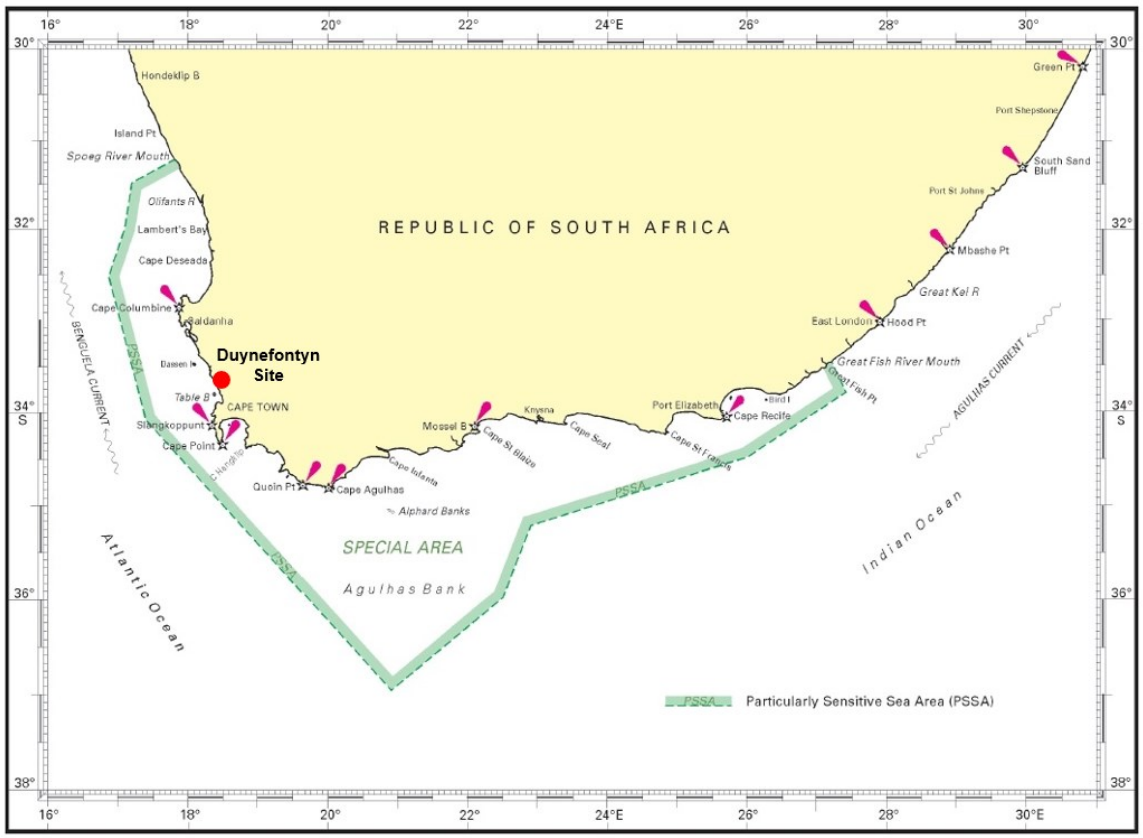

Figure 5.6.8
Special Sea Area: Southern South African Waters

i) Discharge of Oil or Oily Mixtures

Discharge into the sea of oil or oily mixtures, as defined in an appendix to the Convention, is prohibited by the regulations of Annexure 1, except when all the following conditions are satisfied (Planning Partners, 2020):

- From the machinery space bilges of all ships, except from those of tankers where the discharge is mixed with oil cargo residue:
    - The ship is not within a Special Area.
    - The ship is more than 12 miles from the nearest land.
    - The ship is en route.
    - The oil content of the effluent is less than 15 parts per million (ppm).

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- The ship has an operational oil discharge monitoring and control system, oily water separating equipment, oil filtering system or other installation required by this Annexure.

- These restrictions do not apply to discharges of oily mixture which without dilution have an oil content not exceeding 15 ppm.

- From the cargo area of an oil tanker (discharges from cargo tanks, including cargo pump rooms and from machinery space bilges mixed with cargo oil residue):

  - The tanker is not within a Special Area.

  - The tanker is more than 50 miles from the nearest land.

  - The tanker is proceeding en route.

  - The instantaneous rate of discharge of oil content does not exceed 30 ℓ per mile.

  - The total quantity of oil discharged into the sea does not exceed for existing tankers 1/15 000 of the total quantity of the particular cargo of which the residue formed a part, and for new tankers (as defined in the new Annexure) 1/30 000 of the total quantity of the particular cargo of which the residue formed a part.

  - The tanker has in operation, except where provided for in the Annexure, an oil discharge monitoring and control system and a slop tank arrangement.

ii) Shipboard Oil Pollution Emergency Plans (SOPEP)

Regulation 26 of Annexure 1 to MARPOL 73/78 requires every oil tanker of 150 Gt and above and every other vessel of 400 Gt and above, to carry onboard a Shipboard Oil Pollution Emergency Plan approved by the vessel's flag administration. Regulation 26 came into force on 4 April 1995 for all existing vessels. The International Maritime Organization has produced guidelines, as Resolution MEPC 54(32), for the development of Shipboard Oil Pollution Emergency Plans. This regulation also applies to off-shore installations engaged in gas and oil production, sea ports and oil terminals (Planning Partners, 2020).

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d) Closed Areas

Closed Areas in the site region are Saldanha Bay, Table Bay and Strand. These areas are discussed in the MPAs subsection above.

5.6.6 Description of Sea Use Activities in the Site Region

Activities related to sea use in the site region were considered for the purposes of this DSSR. The results from the investigations are presented below in terms of the site region and site vicinity. This section focuses on the use of the marine and coastal environment for commercial, individual and recreational purposes. The main activities described include (see ***Table 5.6.3***):

- the fishery sector and associated activities;
- collection of free foods;
- recreational use and tourism;
- fish processing.

For the purpose of presenting adjacent sea use activities, activities are grouped as are set out in ***Table 5.6.3***.

Table 5.6.3
Activities Related to Sea Use in the Site Region

Activity	Main Item
Fishery sectors and associate activities	Local commercial fishing ((***Subsections 5.6.6.1(b)(i)*** to ***(d)(viii)***) Small-scale fisheries (***Subsection 5.6.6.4***) Mariculture (***Subsection 5.6.6.5***)
Processing and distribution	Fish processing establishments (***Subsection 5.6.6.2***) Commercial species exported from the site region(***Subsection 5.6.6.3***)
Recreational use and tourism	Eco-tourism (***Subsections 5.6.6.7(a)(i)*** and ***5.6.6.7(b)(i)***) Public coastal resorts (***Subsections 5.6.6.7(a)(ii)***) Amenity beaches and tidal pools

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Activity	Main Item
	(***Subsection 5.6.6.7(a)(iii)***) Swimming (***Subsection 5.6.6.7(a)(iv)***) Angling and recreational fishing (***Subsection 5.6.6.7(a)(v)***) River and estuarine-based recreation (***Subsection 5.6.6.7(a)(vi)***) Bait collection (***Subsection 5.6.6.7(a)(vii)***) Sand yachting (***Subsection 5.6.6.7(a)(viii)***) Boat-based whale and dolphin watching (***Subsection 5.6.6.7(b)(ii)***) White shark cage diving (***Subsection 5.6.6.7(b)(iii)***) Small craft harbours and boat-based recreational fishing (***Subsection 5.6.6.7(b)(iv)***) Surfing (***Subsection 5.6.6.7(b)(v)***) Kite surfing (***Subsection 5.6.6.7(b)(vi)***) Jet skiing (***Subsection 5.6.6.7(b)(vii)***)
Gas, oil and phosphate mining	Offshore oil and gas (***Subsection 5.6.6.8(a)***) Coastal Offshore Mineral Sand and Phosphate Mining (***Subsection 5.6.6.8(b)***)

5.6.6.1 The Commercial Fishery Sectors and Associated Activities

a) Legislative Framework

i) Marine Living Resources Act

The South African Commercial Fisheries Sector is regulated in terms of the Marine Living Resources Act 18 of 1998. The purpose of the Act is to provide for the conservation of the marine ecosystem, the long-term sustainable utilisation of marine living resources and the orderly access to exploitation, utilisation and protection of certain marine living resources. The Act provides for the exercise of control over marine living resources in a fair and equitable manner to the benefit of all the citizens of South Africa and to provide for matters connected therewith. In terms of the Act, commercial fishing means fishing for any of the species which have been determined by the Minister in terms of Section 14 of the Act to be subject to the allowable commercial catch or total applied effort, or parts of both (Planning Partners, 2021a).

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The Act defines fish to mean the marine living resources of the sea and the seashore, including any aquatic plant or animal whether piscine or not, and any mollusc, crustacean, coral, sponge, holothurian or other echinoderm, reptile and marine mammal, and includes their eggs, larvae and all juvenile stages, but does not include sea birds and seals.

The Act recognises the following four types of fishing that may take place in the South African exclusive economic zone and the deep-sea (Planning Partners, 2021a):

- local fishing to include recreational and small-scale fishing[5];
- commercial fishing;
- foreign fishing;
- deep-sea fishing.

With the enactment of the Marine Living Resources Act in 1998, an ecosystem-based fisheries management approach was adopted in South Africa. Consequently, ecosystem-based measures were incorporated into the permit conditions of most commercial fishery sectors in terms of which fishing rights allocations are made in terms of total allowable catch (TAC), total applied effort (TAE), upper precautionary catch limit (UPCL) or a combination thereof.

In terms of the Marine Living Resources Act, the Minister may by notice in the Gazette declare a harbour or a defined portion of a harbour or a defined area of the sea and the seashore to be a fishing harbour. There are 12 proclaimed fishing harbours in the Western Cape, of which 3 are included in the site region (See ***Table 5.6.4*** and ***Drawing 5.6.9***).

Table 5.6.4
Proclaimed Fishing Harbours in the Site Region

Regional Cluster	Harbour	Distance (km)	Direction
Cape	Hout Bay Harbour	42.2	S

[5] The amended MRLA (Act 5 of 2014) no longer refers to subsistence fishing, as "subsistence fisher" was deleted by section 1(e) of the amended Act, with the simultaneous insertion of the 'small scale fisheries sector' in section 1(a).

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Regional Cluster	Harbour	Distance (km)	Direction
Metropolitan Area	Kalk Bay Harbour	50.3	S
	Gordons Bay Harbour	67.1	SE

A large section of the commercial Port of Cape Town is utilised as a fishing harbour and, and the Port of Cape Town is the largest harbour (in terms of value of catch landed) that serves the fishing industry in the site region.

Small craft harbours and slipways are described in detail in ***Section 5.7*** of the DSSR. They will be referenced in this report only where relevant to a specific fishery under discussion.

ii) The Commercial Fishery Rights Allocation

Fishery rights are allocated under the Marine Living Resources Act, which constitutes permission to harvest a marine living resource for a specified period. Fishing rights are allocated to a specified person or entity and the transfer thereof may require the specific permission of the Minister.

The South African commercial marine fishery currently consists of 22 fishing sectors, shown in ***Table 5.6.5***. In terms of the General Policy on the Allocation and Management of Fishing Rights (2013), fishing sectors are grouped into four clusters, for the assessment of applications for fishing rights. The purpose of clustering the fisheries together is administrative, procedural and to a lesser extent, substantive. Fish processing establishments and the small-scale fishery sector are dealt with separately in ***Section 5.6.6.2*** and ***Section 5.6.6.4*** (Planning Partners, 2021a).

Table 5.6.5
Commercial Fishery Clusters A, B, C and D

Cluster A	Cluster B	Cluster C	Cluster D
Hake deep-sea trawl	Hake longline	Hake handline	Net fishery (trek- and gillnets, beach-seine)

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Cluster A	Cluster B	Cluster C	Cluster D
Hake inshore trawl	West Coast rock lobster (offshore)	West Coast rock lobster (nearshore)	KwaZulu-Natal beach seine
Horse mackerel	Squid	Traditional line fishery	White Mussels
Small pelagics (anchovy and pilchards)	Seaweed	Abalone	Oysters
Patagonian tooth fish	Tuna pole-line		
South Coast rock lobster	Demersal Shark		
KwaZulu-Natal prawn trawl			
Large pelagics (tunas and swordfish)			

In terms of the General Policy (2013) fishing rights are allocated in all sectors for a period not exceeding 15 years. The policy must be read in conjunction with fishery-specific policies that have been adopted for each fishery sector. At present, only South African citizens and South African controlled and owned entities are authorised to fish commercially in South Africa's exclusive economic zone (Planning Partners, 2021a).

On 20 July 2018, the Deputy Director-General: Fisheries Management (acting) published a notice informing interested and affected parties that the DFFE would be embarking on the Fishing Rights Allocation Process (FRAP) 2020, which would include a review of the General Policy 2013. The 2020 FRAP was deferred as a result of Covid-19. Many fisheries are operating under exemption issued by the Minister in terms of the Marine Living Resources Act.

The commercial fisheries that occur within the marine and coastal environment of the site region (from Saldanha Bay to Rooi Els) can be grouped into the following three categories:

- pelagic fisheries (near-surface) that include pilchards, anchovy,

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sardines, tuna and swordfish;

- demersal fisheries (mid to deep water) that include hake and horse mackerel;
- inshore fisheries that include West Coast rock lobster, abalone, line fish, white mussel, net-fishing and seaweed harvesting.

For the purpose of site characterisation, the fisheries that occur in the site region or off the coast of the site region will be presented as follows:

- offshore and highly capital-intensive fisheries:
  - hake deep-sea trawl;
  - hake inshore trawl;
  - small pelagic (purse-seine: pilchards and anchovies);
  - horse mackerel (mid-water trawl);
  - large pelagic (longline) (tunas, swordfish and sharks);
  - Patagonian toothfish (longline);
- inshore and capital intensive-fisheries:
  - demersal shark (longline);
  - tuna (pole and line);
  - hake longline;
  - West Coast rock lobster (traps);
- nearshore/small-scale commercial:
  - seaweeds (kelps, Ulva, Gracillaria and Porphyra);
  - hake handline;
  - West Coast rock lobster (hoopnets);
  - West Coast mussels;
  - abalone;

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- traditional line fishery;
- traditional net-fishery (trek nets and beach-seines).

b) Offshore Fisheries

i) Hake Deep-sea Trawl

Overview

The South African hake resource consists of two overlapping species, the shallow-water Cape hake (*Merluccius capensis*) and the deep-water hake (*Merluccius paradoxus*). *Merluccius capensis* is found from southern Angola to northern KwaZulu-Natal on the east coast of South Africa. *Merluccius paradoxus* is distributed from northern Namibia to southern Mozambique.

As the common names imply, the two species differ in terms of distribution by depth. Off South Africa, the shallow water species have been recorded at depths of between 30 and 500 m, with most of the population between 100 and 300 m. Deep-water hake are found between 110 and 1 000 m, with most of the population located between 200 and 800 m (Durholtz, 2019).Their distribution is illustrated in ***Figure 5.6.9*** (Department of Environment Forestry and Fisheries, 2020a).

The distribution of both species is virtually continuous around the South African coast and they are currently treated as single stocks of each species within South African waters. Recent genetic analyses have suggested that there is one stock of shallow-water hake in South African waters, another stock in central/northern Namibia, and a third stock that extends from southern Namibia into the northern areas of the South African West Coast (although the extent of the southward extension is currently unknown). These analyses have also suggested that *Merluccius paradoxus* is probably a single stock that extends into Namibia (Durholtz, 2019).

The western Agulhas Bank, the area between the Agulhas Bank and Elands Bay, has been identified as the main spawning ground for Cape hakes and spawning occurs at depths below 100 m. The larvae would be transported to the northern nursery areas. One known nursery area of *Merluccius paradoxus* is located over the shelf off the Orange River mouth, whereas that of *Merluccius capensis* appears to be located just north of St Helena Bay. In the southern Benguela system, Cape hakes spawn all year round with highest spawning activities from August to October. The peak spawning time for *Merluccius paradoxus* is estimated

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to be from mid-September to early October, and the current assumption is that the peak spawning time for *Merluccius capensis* might occur earlier (Grote, et al., 2012).

Merluccius capensis mainly feed on other small fish, but may also eat squid and crustaceans. Their most common prey is small deep-water hake. Early juveniles prey on small crustaceans such as krill and amphipods, but become more piscivorous (fish-eating) with increasing size. They undertake vertical migrations in the water column at night to feed (Grote, et al., 2012).

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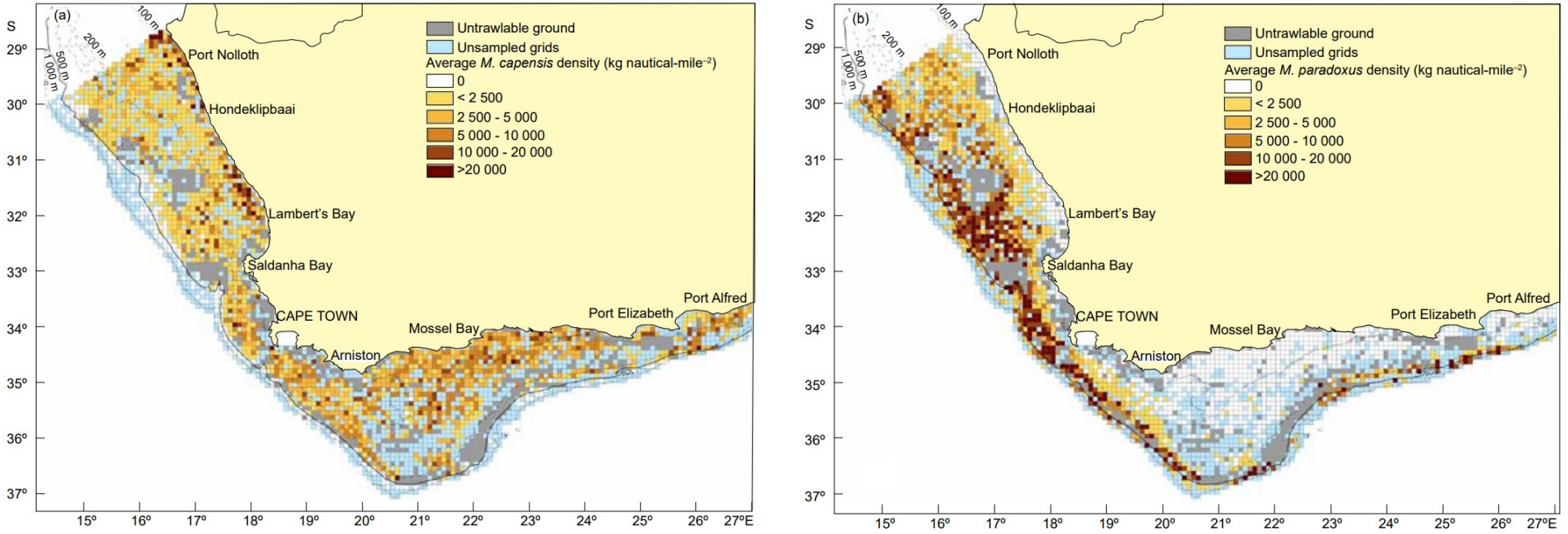

Figure 5.6.9
Distribution of the (a) the Shallow-water Hakes and (b) the Deep-water Hakes as determined by Fishery-independent Demersal Surveys (Densities kg/nmi²) are averages over all Survey Stations within Each Survey Grid Block

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The hake resource is currently targeted by the following four fishing sectors:

- Deep-sea/offshore trawl: operates around the entire South African coast in waters deeper than 110 m and is restricted to the "*trawl footprint*" (See ***Figure 5.6.10***). The offshore trawl footprint is located to a limited extent within the site region to the west and the southwest.
- Inshore trawl: restricted to the South African South Coast east of the 20°E line of longitude – It is currently restricted to the "*trawl footprint*" illustrated in ***Figure 5.6.10***;
- Hake longline: operates around the entire South African coast;
- Hake handline: restricted to the South African South coast east of the 20°E line of longitude, i.e. not in the site region.

Hake is also caught as incidental by-catch in the traditional line fish and horse mackerel-directed mid-water trawl fisheries.

The hake fishery is the most valuable of South Africa's marine fisheries, providing the basis for some 30 000 jobs (Department of Environment Forestry and Fisheries, 2020a).

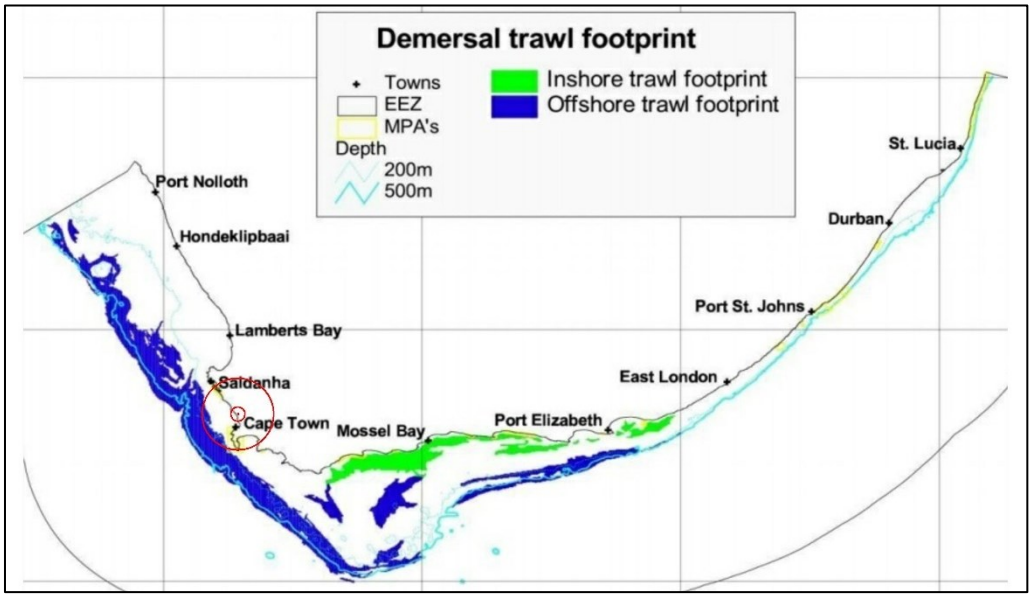

Figure 5.6.10
Demersal Hake Trawl Footprint (with the Approximate Location of the Site Region indicated by the Red Circle)

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History and Historic Trends of the Fishery

The demersal trawl fishery dates back to the late 1890s, with hake being caught as an incidental by-catch of Agulhas sole and West Coast sole (Durholtz, 2019).

Directed fishing for hake only began towards 1917/1918. Historic catch data between 1917 and 2017 are illustrated in ***Figure 5.6.12***. The peak in catch volume in 1972 at over 295 000 t was due to the incursion of foreign fleets in 1962 that led to this dramatic increase in fishing effort (Department of Environment Forestry and Fisheries, 2020a).

Concerns relating to increased catches and decreasing catch rates led to the establishment of the International Commission for the South East Atlantic Fisheries in 1972 to manage what had by then become an international fishery (Department of Environment Forestry and Fisheries, 2020a).

The declaration of the 200 mile Exclusive Fishery Zone by South Africa in 1977 brought the management of the South African hake resource under the direct control of the South African government, with the exclusion of foreign vessels, bar a few vessels operation under bi-lateral agreements (Department of Environment Forestry and Fisheries, 2020a), resulting in a reduction in the total catch of hake to about 50 per cent (c. 147 000 t) of that recorded in 1972 (Durholtz, 2019).

Management of the Fishery

An Operational Management Procedure (OMP) was introduced in 1990 to manage the hake fishery. The hake OMP is a set of rules that specify how the hake TAC is calculated based on stock specific monitoring data. The OMP is revised every four years to account for possible revisions in datasets and understanding of resource and fishery dynamics, with OMP-18 being the current version (Durholtz, 2019).

Assessment of the South African hake resource is complicated by the fact that the two hake species are morphologically similar and cannot easily be identified (Durholtz, 2019).

The development and revision of recent OMPs takes the certification of the South African hake trawl fishery by the Marine Stewardship Council into consideration. The fishery was first certified in 2004 and re-certified on two occasions (2010 and 2015). The fishery is currently being assessed towards a third re-certification under the new Marine Stewardship Council Fishery Standard (Durholtz, 2019).

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Status of the Resource

The results from the Fisheries Branch of the Department of Agriculture, Forestry and Fisheries (DAFF), now DFFE, surveys show that the relative abundance of *Merluccius paradoxus* is much higher than that of *Merluccius capensis* on the West Coast. The abundance of both species of hake is much higher on the West Coast than on the South Coast. Typically the biomass on the West Coast is about twice that of the biomass on the South Coast (Smith & Cochrane, 2016).

The May 2018 hake stock assessment indicated that *Merluccius paradoxus* and *Merluccius capensis* were both above the biomass target reference point. These trends reflect a mostly stable or positive hake stock (Williamson & Japp, 2018b).

Vessels and Gear

Hake Deep-sea Trawl fishery in South Africa is currently undertaken by a fleet of 51 vessels of various sizes. These vessels are either freezer trawlers or wetfish trawlers comprised as follows:

- There are currently 21 freezer trawlers operating in the fishery, of which 11 focus on harvesting and producing (headed and gutted) frozen hake products, while 10 are equipped with on-board processing facilities.

- The wetfish (or fresh fish) trawler fleet currently consists of 30 vessels. These trawlers focus mostly on harvesting hake for further processing onshore.

Freezer vessels may work in an area for up to a month at a time and wetfish vessels remain in an area for about a week before returning to port (Wilkinson & Japp, 2018b).

These vessels collectively employed 2 036 permanent staff, averaging approximately 40 crew per trawler. There were approximately 2 500 permanent onshore employees involved in processing landed fish, as well as approximately 1 500 temporary workers associated with onshore fish processing in the fishery (Fiandeiro, et al., 2019).

Otter trawling is the main trawling method used in the South African hake fishery. The configuration of trawling gear, as illustrated in ***Figure 5.6.11*** is similar for both offshore and inshore vessels (Wilkinson & Japp, 2018b).

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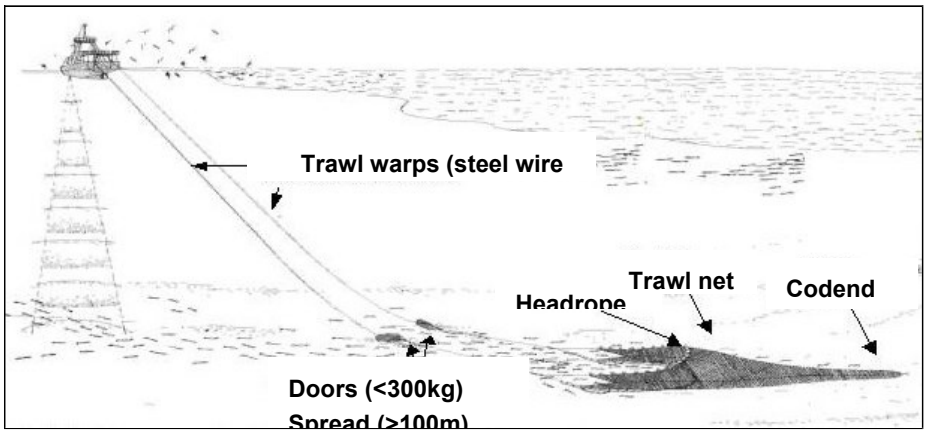

Figure 5.6.11
Typical Gear Configuration used by Offshore Demersal Trawlers targeting Hake

Fishery Allocation and Catch Data

The most recent long-term fishery rights were awarded for a 15-year period from 1 January 2006 to 31 December 2020. Allocations were made to 45 hake deep-sea trawl rights holders. These rights have been extended to 31 December 2021 (Department of Environment, Forestry and Fisheries, 2020c).

Once the TAC for Hake Deep-sea Trawl has been determined, an additional by-catch allowance for the mid-water trawl fishery is deducted (equivalent to 2 per cent of the horse mackerel TAC, of which hake is a `by-catch'). The remainder is allocated among the four hake directed sectors in the following proportions (Durholtz, 2019):

- deep-sea trawl: 0.8393 t (c. 83.9 per cent);
- inshore trawl: 0.0618 t (c. 6.2 per cent);
- hake longline: 0.0655 t (c. 6.6 per cent);
- hake handline: 0.0334 t (c. 3.3 per cent).

The demersal trawl components (inshore and deep-sea) of the fishery are restricted to fishing within the "*trawl footprint*" (Durholtz, 2019). Refer to ***Figure 5.6.10***.

Figure 5.6.12 illustrates the historic catch data with reference to (a) the TAC introduced in 1990 and historic catch split between Cape hake

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(*Merluccius capensis*) and the deep-water hake (*Merluccius paradoxus*) from 1917 to 2018 (in '000 t) and (b) the split between the four hake fisheries for the period 1960 to 2018 (in '000 t) (Durholtz, 2019).

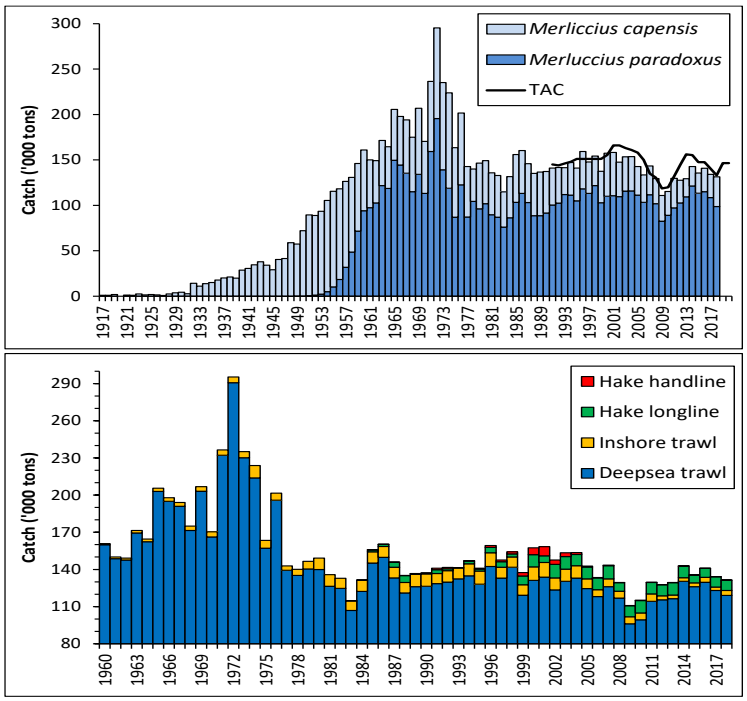

Figure 5.6.12
Historic Catch Data in '000 t (a) split between Cape Hake Merluccius Capensis and the Deep-water Hake Merluccius Paradoxus (1917 to 2018) and (b) split between the Four Hake Fisheries (1960 to 2018) (Department of Environment Forestry and Fisheries, 2020a)

Figure 5.6.13 illustrates the total hake TAC for all four hake fisheries relative to the hake caught on the West Coast for the period 2005 to 2018 in ton (t). It illustrates the relative importance of the hake deep-sea and hake longline fishery on the West Coast, as well as illustrating a relatively stable TAC. A gradual downward trend in catch over the same period is evident. Hake caught in the West Coast accounted for 84.4 per cent of the entire South African hake TAC in 2007, 58.8 per cent in 2013 and 66.6 per cent in 2018.

Figure 5.6.14 illustrates the hake species-disaggregated catches (in '000 t) on the West Coast for the period 2005 to 2018 for the deep-sea

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trawl and longline fishery (Ross-Gillespie & Butterworth, 2019).

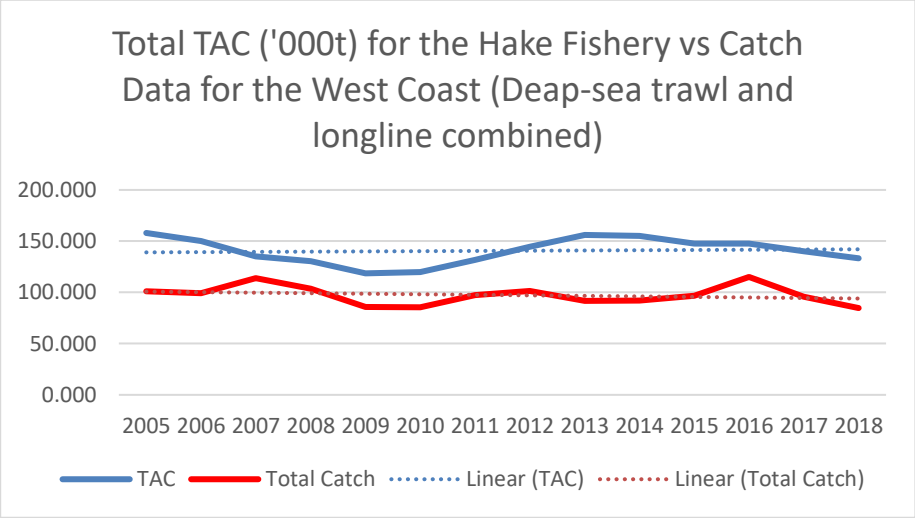

Figure 5.6.13
Hake TAC(t) for all Four Hake Fisheries relative to the Hake caught (‘000 t) on the West Coast (2005 to 2018)

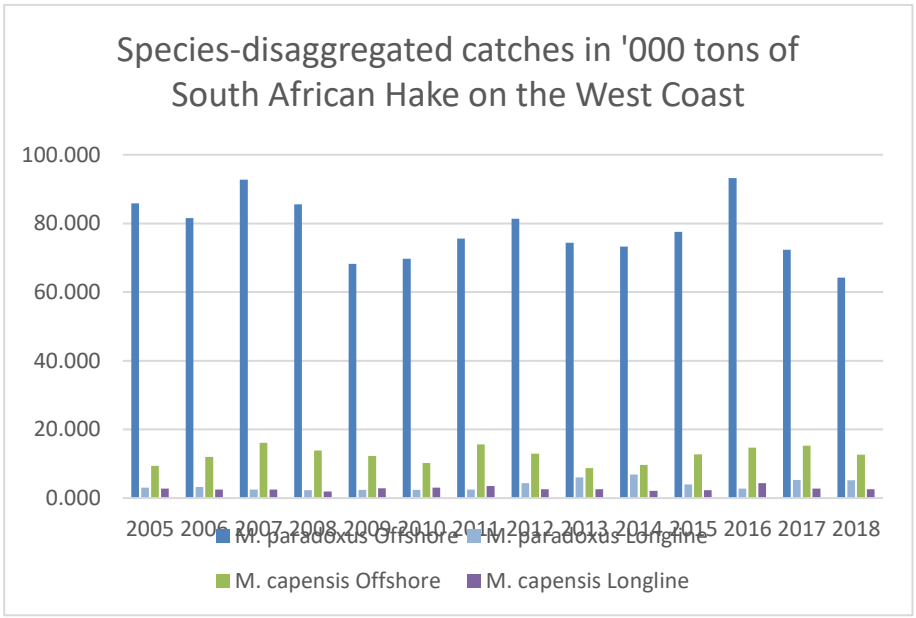

Figure 5.6.14
Species-disaggregated Hake Catch on the West Coast (2005 to 2018)

Table 5.6.6 summarises the TAC from 2005 to 2018 with data referenced

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as follows: TAC 2005 to 2015, TAC 2016, TAC 2017 and TAC 2018 (Department of Environment Forestry and Fisheries, 2020a).

Table 5.6.6
Commercial Fishery Clusters A, B, C and D ('000 t)

		M. paradoxus		*M. capensis*	
	TAC	Offshore	Longline	Offshore	Longline
2005	158,000	85,869	3,091	9,398	2,773
2006	150,000	81,513	3,241	11,984	2,520
2007	135,000	92,724	2,512	16,145	2,522
2008	130,532	85,538	2,255	13,838	1,937
2009	118,587	68,202	2,410	12,296	2,828
2010	119,831	69,709	2,394	10,186	3,086
2011	131,780	75,576	2,522	15,673	3,521
2012	144,671	81,411	4,358	12,928	2,570
2013	156,075	74,341	6,056	8,761	2,606
2014	155,280	73,252	6,879	9,671	2,123
2015	147,500	77,521	4,001	12,727	2,325
2016	147,500	93,173	2,806	14,744	4,360
2017	140,125	72,326	5,288	15,273	2,807
2018	133,119	64,252	5,156	12,689	2,615

Effort distribution for the period 2000 to 2016 is illustrated in ***Figure 5.6.15*** (Sink, et al., 2019).

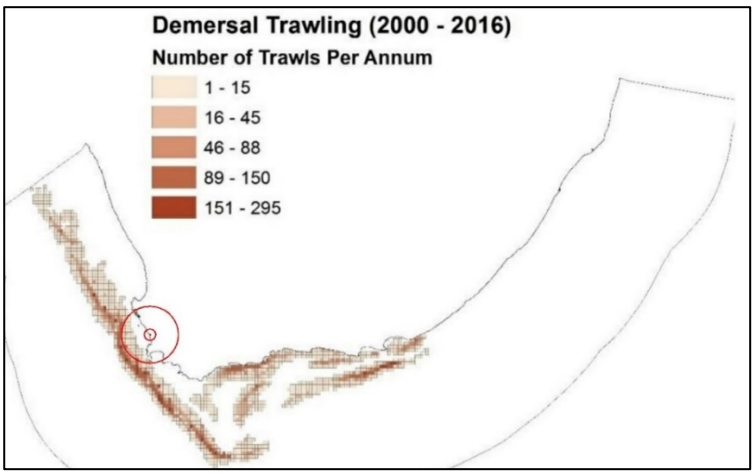

Figure 5.6.15
Demersal Hake Trawl Effort for the Inshore and Offshore Sector presented as 2000 to 2016 Mean Annual Hours of Trawling on a Five Minute Grid

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Closed Areas

The following spatial restrictions apply to the fishery:

- No fishing is permitted within coastal lagoons, rivers or estuaries.
- In the area east of 020°E longitude, no fishing is allowed in water depths of less than 110 m or within 20 nmi of the coast, whichever is the greater distance.
- In the area west of 020°E, no fishing may take place within 5 nmi of the coast.
- No fishing may take place within False Bay, north of a straight line drawn from the lighthouse at Cape Hangklip to the lighthouse at Cape Point.
- Kingklip spawning: During the period 1 September to 30 November, no fishing may take place within the quadrangle described by lines joining the following and illustrated by the red box in ***Figure 5.6.16***:
  - A: 34°48'S 024°00'E;
  - B: 34°38'S 025°00'E;
  - C: 34°44'S 025°00'E;
  - D: 34°57'S 024°00'E (Department of Agriculture, Forestry and Fisheries, 2010).
- No fishing may take place outside of the areas defined as the "*trawl footprint"*, as illustrated in ***Figure 5.6.16***. This ringfencing relates the trawl fishery grounds that have been systematically fished in the past, where the benthos has already been altered (Norman, et al., 2018).

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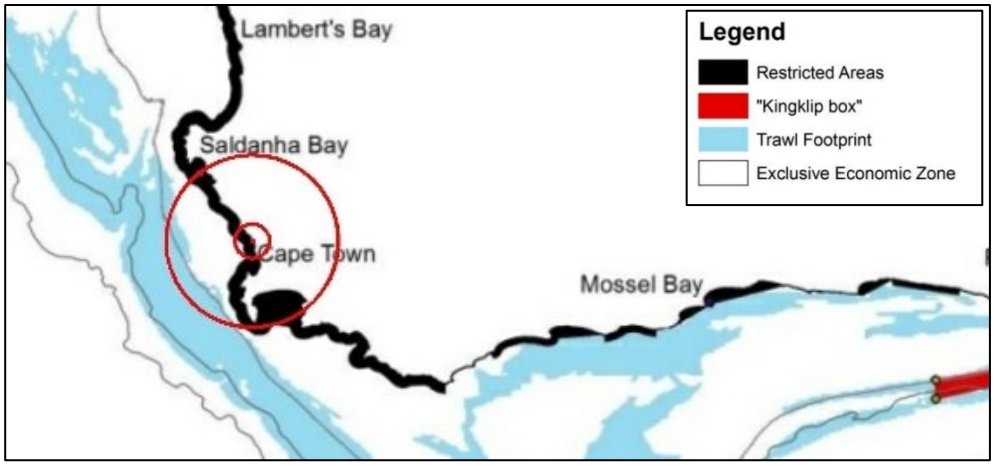

Figure 5.6.16
Spatial Extent of the Hake Trawl Fishery (Light Blue) the Nearshore Protected Areas (Black) and Kingklip Spawning Box (Red)

Market Destinations

Hake in either raw commodity or processed form is sold to both the domestic and export markets to a range of customers, including:

- the food service industry, which includes the sale of hake products to food service distribution channels such as restaurants, catering companies, company canteens, quick-service restaurants, hotels and government contracts.

- large rights holders, which provide the retail market with a range of branded value-added products – Sales take place in large supermarket chains e.g. Shoprite and Pick 'n Pay.

- a mixture of fresh and frozen (mainly) headed and gutted products, which are sold to wholesalers for further distribution into the market – Wholesalers' main customers are hawkers and traders who sell to the informal market.

A total of 67 per cent of Hake Deep-sea Trawl is exported to Europe, America and Australia. The majority of the export volumes are either filleted (56 per cent) or headed and gutted (34 per cent) products.

Domestic sales are dominated by a combination of processed products (50 per cent) sold to the retail market and headed and gutted products (41 per cent) sold mainly to the wholesale and food service industries.

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Currently, the contribution of these sales to the South African economy is significant, totalling R 4.5 billion; 67 per cent of sales value is due to export sales (Fiandeiro, et al., 2019).

Table 5.6.7
Summary of the Hake Deep-sea Trawl Fishery (Entire Fishery)

Duration of Rights	15 years (1 January 2006 to 31 December 2020, extended to 31 December 2021)
Value of Total Hake Fishery (R)	R4.5 billion (R5.2 billion for the entire hake sector)
Fish Landed (Hake Deep-sea Trawl West Coast (2018))	76 941 t (of 131 370 t South Africa-wide)
Number of Jobs Sustained	30 000
Number of Vessels	51
Number of Right Holders (as at 2018)	45
Closed Season (No Fishing)	None

ii) Hake Inshore Trawl

The Hake inshore trawl fishery does not operate within the site region, as it operates between Cape Agulhas on the South Coast and the Great Kei River on the East Coast, as illustrated in ***Figure 5.6.9***.

iii) Small Pelagic Fisheries

Overview

Forage fish occur in the continental shelf waters between Hondeklip Bay on the West Coast and Durban on the East Coast. They generally exhibit strong population responses to environmental variability, which results in large fluctuations in abundance over space and time, even in the complete absence of fishing (Department of Environment Forestry and Fisheries, 2020a).

The South African small pelagic resource consists of predominantly anchovy (*Engraulis encrasicolus*), sardine (*Sardinops sagax*) and round eye herring (*Etrumeus whiteheadi*). These species generally account for

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90 per cent of the total pelagic purse-seine catch off the South African coastline (Department of Environment Forestry and Fisheries, 2020a). This resource is separated from the Namibian and Angolan stocks by a semi-permanent intense upwelling cell off Luderitz (Coetzee, et al., 2019).

Anchovy and sardine have a migratory life history with adults spawning on the Agulhas bank and eggs and larvae transported to the more productive West Coast where recruitment and feeding takes place. Spawners then return to the south coast to complete the cycle (Watermeyer, et al., 2016)

St. Helena Bay, north of the site region, is known as a nursery ground for sardine (*Sardinops sagax)* and anchovy (*Engraulis encrasicolus)* (Grote, et al., 2012)

Hout Bay is the only harbour in the site region from where small pelagic fishing vessels operate. Ports of deployment correspond with the location of fish processing establishments (canning factories and fish meal plants) along the coast (Norman, et al., 2018).

The small pelagic fishery catches are the largest of all fisheries sectors in terms of landed mass and constitutes the second largest catch value, after the hake trawl fishery (Department of Environment Forestry and Fisheries, 2020a).

The fishery is multi-species and can be defined in terms of 'target sectors' *viz*:

- Target Fishery 1: sardine directed with anchovy, redeye and horse mackerel by-catch;
- Target Fishery 2: anchovy with juvenile sardine, redeye and horse mackerel;
- Target Fishery 3: redeye directed (with by-catch of sardine and horse mackerel);
- Target Fishery 4: bait fishery for sardine.

The abovementioned fisheries overlap spatially and seasonally, have limits on by-catch and other measures relating to mesh size and area controls etc.

The distribution of sardine has changed on an almost annual basis from

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being predominantly located on the South Coast in one year to being found mainly on the West Coast in the next year. Catches of sardine on the South Coast have exceeded those taken on the West Coast in only four years (2005 to 2008), with the majority of those sardine caught on the South Coast being transported back to factories on the West Coast; either by large, refrigerated seawater vessels or by truck. Presently, the majority of sardine processing infrastructure is still based on the West Coast. Most of the lease agreements and systems established for the offloading of sardine in Mossel Bay for road transport, by West Coast-based Rights Holders, during years when the sardine TACs and availability of sardine on the South Coast were high, have been discontinued (Coetzee, et al., 2019).

The current low sardine TACs are insufficient for profitable operation of the major canning facilities and the bulk of canned sardine products currently produced in South Africa contain sardine that are sourced from Morocco and elsewhere (Coetzee, et al., 2019).

This fishery sector employed a total of 5 200 workers (Feike, 2021a).

History and Historic Trends of the Fishery

The fishery began in 1935, but it was only in 1943 that commercial operations commenced in the St. Helena Bay area. Purse-seiners operated between Lambert's Bay and Cape Hangklip.

Initially, sardine and horse mackerel (*Trachurus capensis*) dominated the catch. Annual sardine catches increased from 200 000 t in the 1950s to 400 000 t in the early 1960s. Horse mackerel trawl catches peaked at 118 000 t in the mid-1970s and decreased to less than 20 000 t annually by the mid-1990s. Anchovy then dominated the catch and largely sustained the industry for the next 30 years. Catches peaked at 600 000 t in the late 1980s and then decreased to a low of 40 000 t in 1996 (Department of Environment Forestry and Fisheries, 2020a).

A conservative management strategy was introduced, which resulted in rapid population growth. The sardine catch then increased to 374 000 t in the early 2000s, particularly on the South Coast. The anchovy catch also increased rapidly. This resulted in total pelagic landings of 500 000 t between 2001 and 2005. Thereafter, several successive years of low sardine recruitment resulted in a decrease in the sardine catch to as low as 91 000 t in 2008 and 95 000 t in 2015. Anchovy catches however averaged around 200 000 t in the five year period 2010 to 2015; the highest catch recorded in that period was 479 000 t in 2013 (Department of Agriculture Forestry and Fisheries, 2016c).

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In December 2018 Exceptional Circumstances for sardine was declared following a sardine survey biomass estimate which indicated that the sardine biomass was below the range simulated during the development of OMP-18. In 2019 the sardine directed TAC was only 12 250 t and less than 1 000 t of sardine had been landed by the end of October 2019 (Coetzee, et al., 2019). The 2019 sardine catch of only 2 100 t is the lowest recorded in the last 70 years. The 2019 anchovy catch of 165 000 t is the lowest recorded since 2013 (Department of Environment Forestry and Fisheries, 2020a).

Round herring catches have been reported since the mid-1960s, with catch never exceeding 100 000 t. In 2015, a catch of only 34 000 t was recorded (Department of Agriculture Forestry and Fisheries, 2016c).

Status of the Resource

The biomass and distribution of sardine and anchovy, and other schooling pelagic and meso-pelagic fish species such as round herring, juvenile horse mackerel, lantern fish (*Lampanyctodes hectoris*) and light fish (*Maurolicus walvisensis*) are assessed bi-annually using hydro-acoustics (Coetzee, et al., 2019).

The biomass of sardine increased gradually from less than 50 000 t in 1984 to approximately 2.5 million t in 2000. While consecutive years of very good recruitment pushed the total biomass beyond 4 million t in 2002, a period of prolonged poor (or below average) recruitment since 2004 has led to a decline in the adult biomass to below 500 000 t since 2007 to recent lows of 258 000 t in 2016 and a thirty-year low of 90 768 t in 2018 (Coetzee, et al., 2019), (de Moor, et al., 2019b). The 2019 sardine recruitment estimate was approximately 172 500 t, a continuation of particularly low recruitment since 2005 (Japp & Augustyn, 2019), (de Moor, et al., 2019b).

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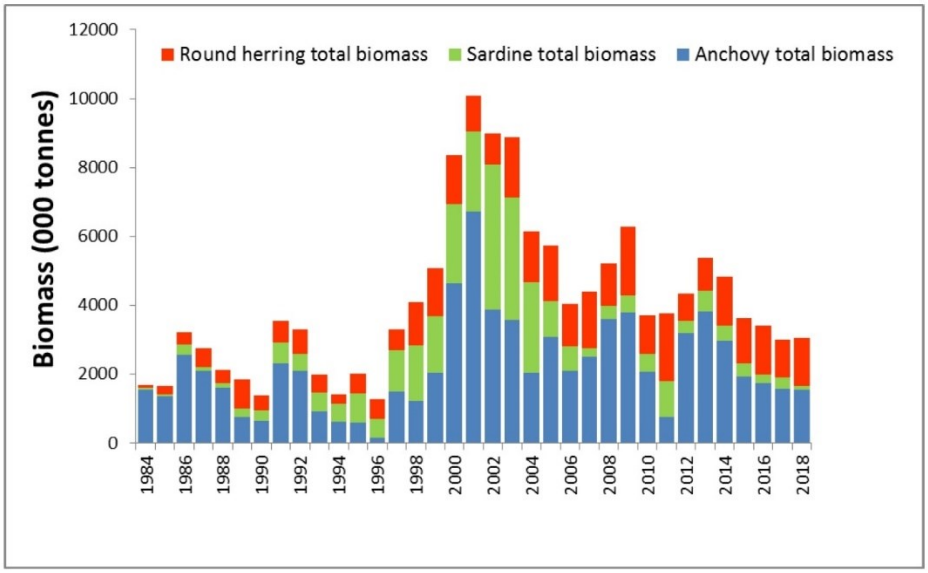

Figure 5.6.17
Historic Biomass Estimates: Combined Anchovy, Sardine and Redeye Round Herring up to Port Alfred (1984 to 2018)

The 2018 biomass survey indicated that the combined estimate of anchovy, sardine and round herring biomass has remained virtually unchanged since 2017 at just over 3 million t, with the decrease in sardine biomass being offset by the increase in round herring biomass (Department of Environment, Forestry and Fisheries, 2018).

The 2018 biomass of sardine west of Cape Agulhas was only 35 000 t, representing 38 per cent of total biomass in South Africa. This has decreased sharply from over 100 000 t in 2017 and is the lowest biomass observed west of Cape Agulhas since 1985 (Department of Environment, Forestry and Fisheries, 2018). The Small Pelagic Working Group has however noted that the 2018 survey length frequency may have under-represented large sardine, which may have led to the inaccurate determination of sardine biomass. A re-evaluation of the data indicates that the sardine biomass may potentially have been underestimated by up to 65 per cent (de Moor, et al., 2019a).

The 2018 biomass of anchovy found to the west of Cape Agulhas has halved since 2017 from just over 50 per cent to just under 25 per cent. The combined biomass of anchovy and sardine in the area to the west of Cape Agulhas is less than 400 000 tonnes, representing a decrease of 60 per cent since 2017 (Department of Environment, Forestry and

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Fisheries, 2018).

Figure 5.6.18 and ***Figure 5.6.19*** illustrate the estimated abundance and recruitment of sardine and anchovy for the period 1984 to 2019 (Planning Partners, 2021a).

Figure 5.6.18
Estimated Abundance and Recruitment of Sardine/Pilchard (1984 to 2019)

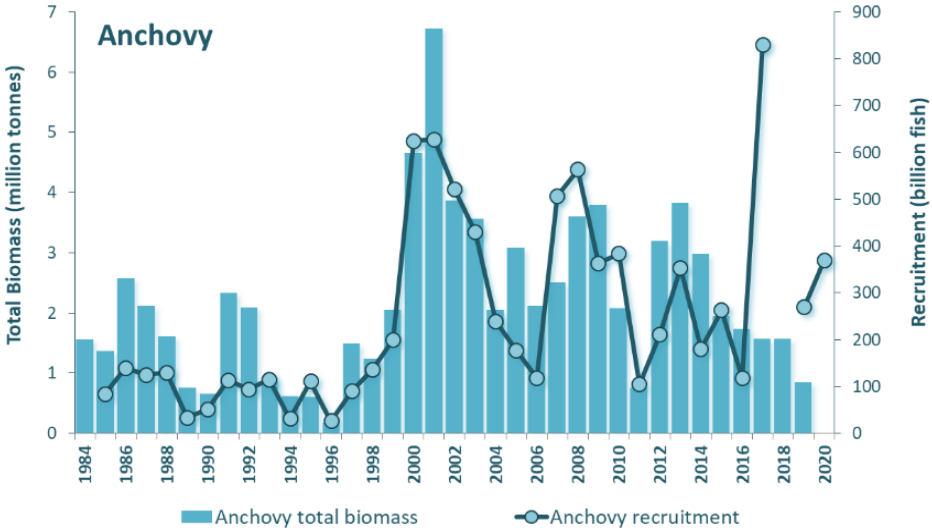

Figure 5.6.19
Estimated Abundance and Recruitment of Anchovy (1984 to 2019)

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Management of the Fishery

In 1971, a combined pelagic TAC was implemented, which was deemed the most effective means of limiting over-exploitation. Species-specific TACs were introduced in 1983 to encourage diversification, protect the sardine resource and prevent over-exploitation of anchovy. Other smaller pelagic species were designated 'non-quota' in 1983 to further encourage diversification of catch (Coetzee, et al., 2019).

The anchovy fishery has been regulated since 1991 by using an OMP approach. In 1994, a joint anchovy-sardine OMP was implemented with the aim of ensuring sustainable utilisation of both resources (Coetzee, et al., 2019).

The objective of the OMP is to maximise average directed sardine and anchovy catch in the medium-term, subject to constraints on the extent to which TACs can vary from year to year in order to enhance industrial stability (Department of Agriculture Forestry and Fisheries, 2016c).

TACs for both species and a Total Allowable By-catch (TAB) for sardine are set at the beginning of the fishing season, based on results from the adult biomass survey of the previous November. Since the anchovy fishery is largely a recruit fishery, the TAC of anchovy and the juvenile sardine by-catch allowance is revised mid-year following completion of the recruitment survey in May/June (Department of Agriculture Forestry and Fisheries, 2016c).

In terms of OMP-18, TAC is related to biomass, which at certain points influences the allowable catch. With reference to sardine, the OMP set rules are the following:

- Where the sardine biomass is ≥ 1.6 million t, the TAC is capped at 200 000 t.
- Where sardine biomass is considered stable, the TAC is set at 65 000 t.
- Where sardine biomass decreases to < 200 000 t, the absolute minimum TAC is set at 10 000 t, which was the case in 2019.
- In addition to the directed sardine and anchovy TACs, several by-catch limits and Precautionary Upper Catch Limits (PUCLs) are set (Coetzee, et al., 2019), (Japp & Augustyn, 2019).

While Exceptional Circumstances have been declared for sardine in

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2018, the socio-economic implications of any management recommendation also needs to be considered. For this reason, the directed sardine fishery was not closed in 2019. In addition, severely constraining the small sardine by-catch with anchovy could hamper the anchovy fishery, which has consistently had high TACs in recent years in response to high anchovy abundances (de Moor, et al., 2019a).

The closure of areas around important seabird breeding colonies (e.g. African penguin and Cape gannet) to fishing has occurred (Coetzee, et al., 2019). Islands in the site region where this closure currently occur are Dassen and Robben Islands. The closed area extends 20 km around these islands, as illustrated in ***Figure 5.6.20***.

These closures are currently still in an experimental stage and not permanent. ***Table 5.6.8*** provides a schedule of closures around breeding colonies for the period 2008 to 2019 for islands located in the site region. During these times, no fishing may occur within these areas.

Table 5.6.8
Schedule of Closures around Breeding Colony Islands

Island	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Dassen Island	X	X					X	X	X			
Robben Island				X	X	X				X	X	X

For the 2020 fishing season, the area around Dassen Island is closed to both the sardine and anchovy fisheries (Department of Environment, Forestry and Fisheries, 2019a) (Department of Agriculture, Forestry and Fisheries, 2019c).

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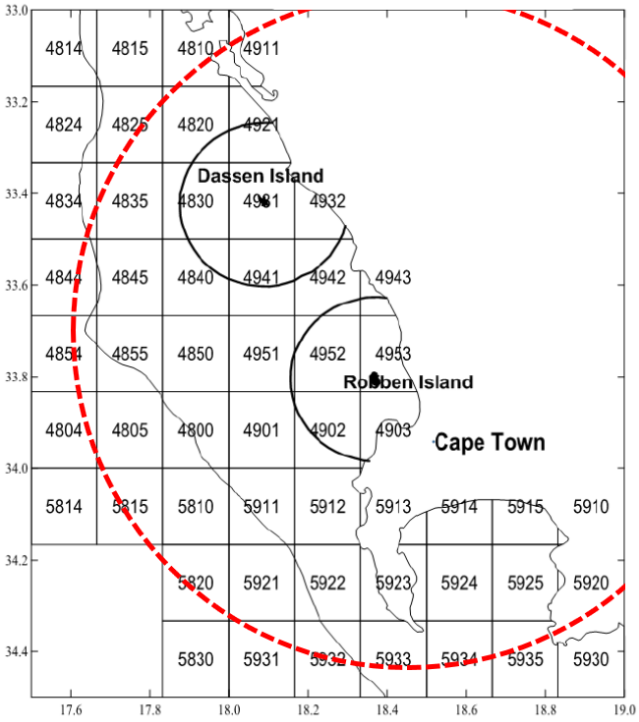

Figure 5.6.20
Marine Area Closed to the Small Pelagic Purse-seine Fisheries

Vessels and Gear

The fishery utilises wooden, glass reinforced plastic and steel-hulled vessels, using a large net that extends to a depth of 60 m to 90 m (***Figure 5.6.21***). Once the shoal has been encircled the net is pursed, hauled in and the fish pumped on board into the hold of the vessel (Wilkinson & Japp, 2018b).

Data obtained from the DFFE for the period 2008 to 2018, showed that between 82 and 72 vessels were active in the fishery, with 72 vessels recorded for 2018 (Department of Environment, Forestry and Fisheries, 2020b).

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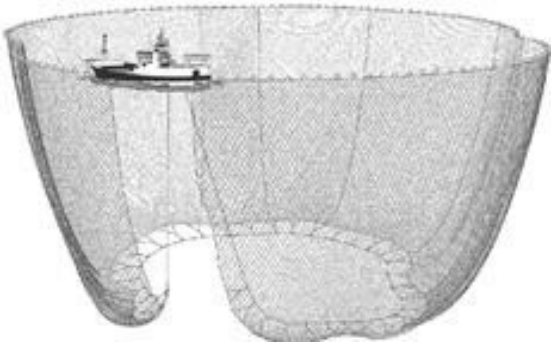

Figure 5.6.21
Small Pelagic Fisheries: Vessel and Gear

The sardine-directed fleet concentrates effort in a broad area extending from Lambert's Bay towards Cape Point and then eastwards along the coast to Mossel Bay and Port Elizabeth. The anchovy-directed fishery takes place predominantly on the southwest coast from Lambert's Bay to Kleinbaai (19.5°E) and is most active in the period from March to September. Round herring (a non-quota species) is targeted when available and specifically in the early part of the year (January to March) and is distributed from Lambert's Bay to the south of Cape Point. This fishery may extend further offshore than the sardine and anchovy-directed fisheries (Norman, et al., 2018).

There is an established seasonal pattern that reflects the migration and inter-annual growth of the small pelagic resources exploited. The fishery operates throughout the year with a break from mid-December to mid-January. The geographical distribution and intensity of the fishery is largely dependent on the seasonal fluctuation and distribution of the targeted species (Norman, et al., 2018).

Fishery Allocation and Catch Data

A total of 109 long-term rights were issued for the period 2006 to 2020. Fishing rights allocations range from 0.05 to 15 per cent of the TAC, per rights holder. 73 per cent of the TAC is held by rights holders from the West Coast. ***Figure 5.6.22*** and ***Figure 5.6.23*** provides an overview of historic catch data for the main species of fish caught in the small pelagic fishery (Department of Environment Forestry and Fisheries, 2020a).

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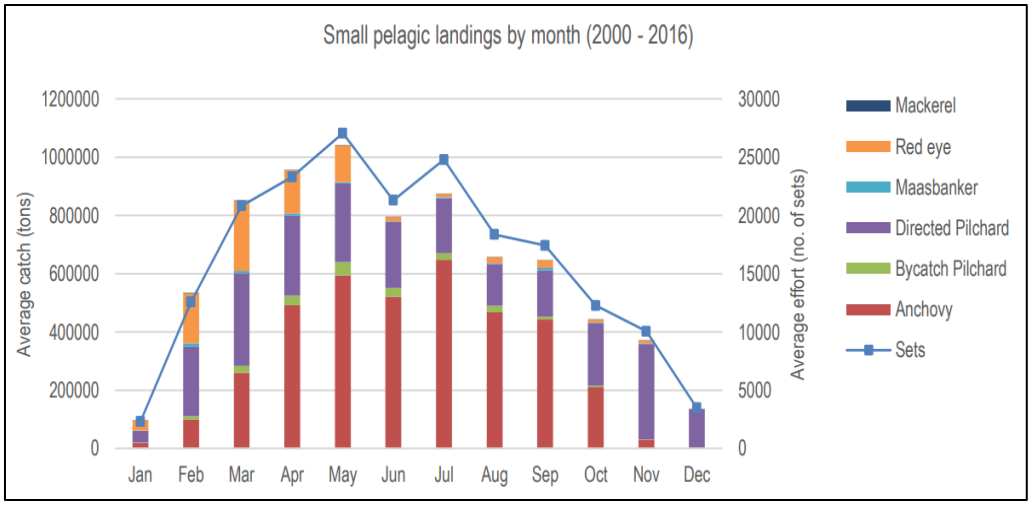

Figure 5.6.22
Average Monthly Catch(t) and Effort (sets) for the Small Pelagic Purse-seine Fleet (2000 to 2016) (South Africa)

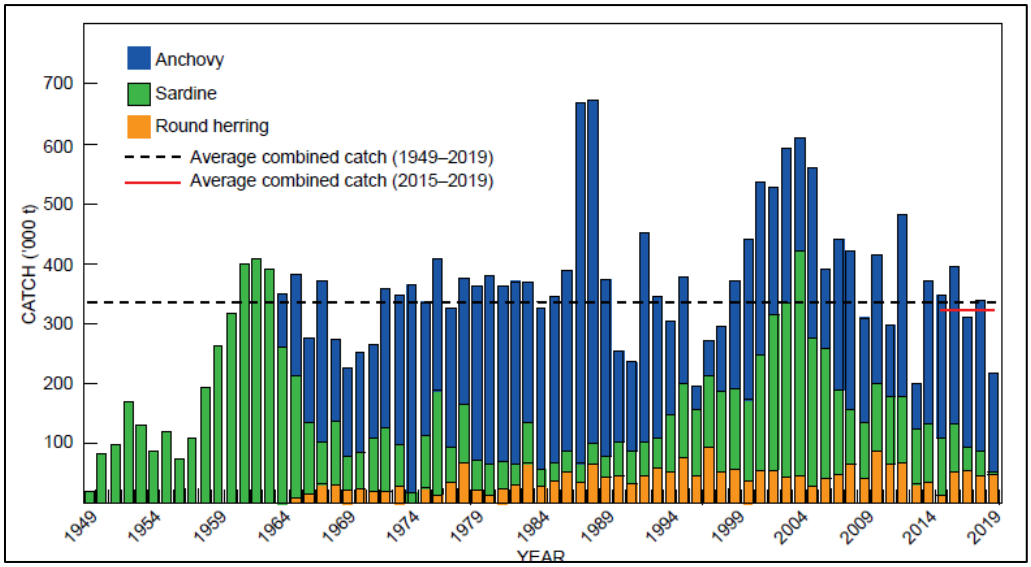

Figure 5.6.23
Small Pelagic Catch Data (1949 to 2019) (South Africa)

Catch data obtained from the DFFE in 2020 provided data for fishery areas described as (i) 20 to 24 degrees east, Cape Columbine to Cape Point (Pool C), (ii) Cape Point to Cape Agulhas, east of 24 degrees east (Pool B) and (iii) North of Cape Columbine (Pool A). The site region (80 km) corresponds with the area defined as Cape Columbine to Cape Point and part of the area described as Cape Point to Cape Agulhas. The

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data were provided for the period 2014 to 2018 and is presented in ***Figure 5.6.24***. During this period, the proportion of the catch in the site region was lowest in 2015 and made up 31 per cent of the national catch in 2016.

Figure 5.6.25 shows the catch composition of pelagic fish caught for the period 2014 to 2018 between Cape Columbine and Cape Point. The data were obtained from DFFE in 2020. The data show that the catch in the site region consists predominantly of redeye (round herring) and pilchard/anchovy. Very little sardine is currently being caught in the site region.

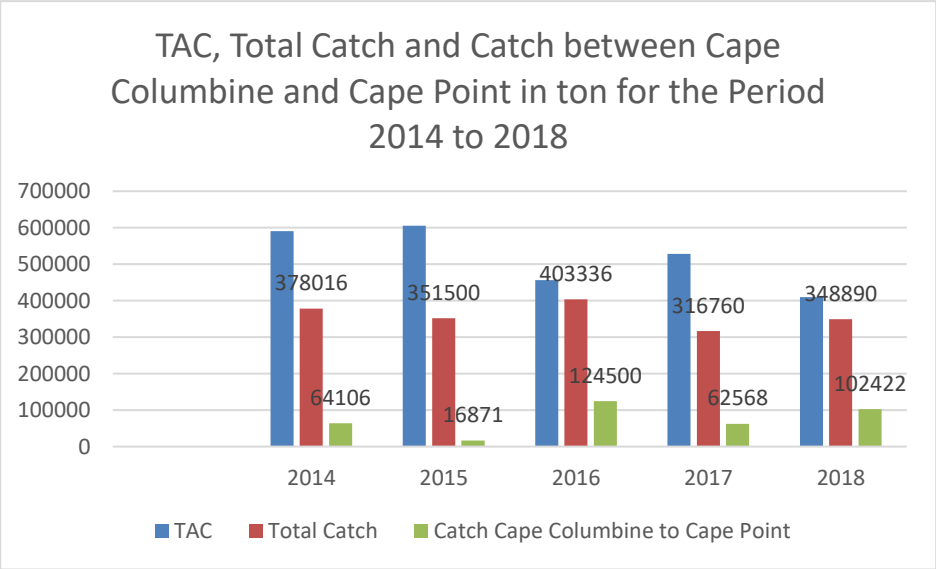

Figure 5.6.24
Proportion of Total Catch of Small Pelagic Fish caught in the Site Region (2014 to 2018) (Department of Environment, Forestry and Fisheries, 2020b)

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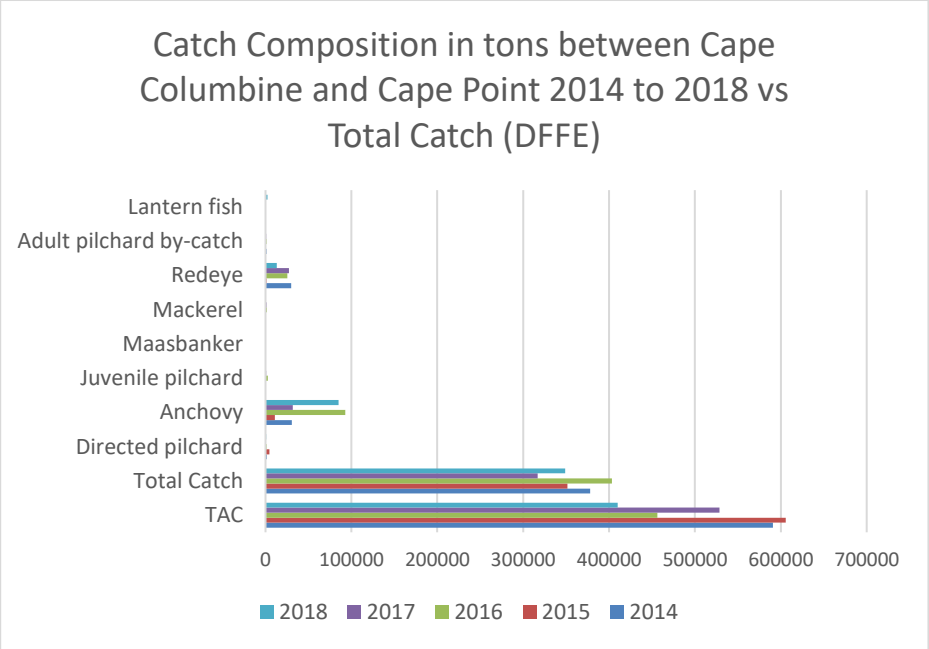

Figure 5.6.25
Small Pelagic Fish caught in the Site Region (2014 to 2018) (Department of Environment, Forestry and Fisheries, 2020b)

Market Destinations

Approximately 85 per cent of the sardine catch is canned, whilst the remainder is frozen and packed in boxes for local and international bait markets. Anchovy and round herring are mostly reduced to fishmeal and oil and used as a protein to supplement agri- and aquafeeds. Round herring are processed for fishmeal and fish oils and sardine are canned or frozen for human consumption and pet food, or frozen for bait (Department of Agriculture Forestry and Fisheries, 2016c).

There are not fishmeal plants located in the site region. Cape Town contains the only pack and freeze operations in the site region.

Anchovy and round herring are processed for fishmeal and fish oils and sardine are canned or frozen for human consumption and pet food or frozen for bait. The 10-year annual average catch is reported to be 350 000 t. 93 per cent of fishmeal and fish oil is exported, A total of 90 per cent of frozen sardine is exported, whilst 88 per cent of canned sardine is destined for the domestic market, with the remaining 12 per cent of canned sardine destined for export within the Southern African

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Development Community region (FishSA, 2019).

Main export market destinations are the following (Planning Partners, 2021b):

- fishmeal: an estimated 55 000 t was exported to the Far East, including China, Japan, South Korea and Japan and Southern and Northern Europe during 2016/2017 (World Grain, 2020);
- frozen sardine: South America, Mauritius and the South Pacific.

Table 5.6.9
Summary of the Small Pelagic Fishery (Entire Fishery)

Duration of Rights	15 years (2006 – 2020)
Value of Fishery (R)	R3.2 billion
Fish Landed (2018)	Approximately 350 000 t
Number of Jobs Sustained	5 200
Number of Vessels	72
Number of Right Holders	109
Closed Season (No Fishing)	Mid-December to mid-January

iv) Horse Mackerel Mid-water Trawl

Overview

Cape horse mackerel (*Trachurus capensis*), also known as maasbanker, are semi-pelagic shoaling fish that occur on the continental shelf off Southern Africa from southern Angola to the Wild Coast.

Currently, the largest concentrations of adult fish are found on the Agulhas Bank near the continental shelf break on the South Coast (Department of Environment Forestry and Fisheries, 2020a).

Juveniles are found inshore, mainly on the West Coast. the exploitation of horse mackerel in South African waters occurs in two main areas, namely (i) the West Coast where juveniles are caught and (ii) the Agulhas Bank area (South-east Coast) where predominantly adults are caught (Japp, et al., 2019).

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Figure 5.6.26 illustrates the distribution of Cape horse mackerel, as derived from fishery-independent demersal research surveys. Data are shown as the average density (kg per nmi²) per grid block over surveys conducted from 1986 to 2017 (Department of Environment Forestry and Fisheries, 2020a).

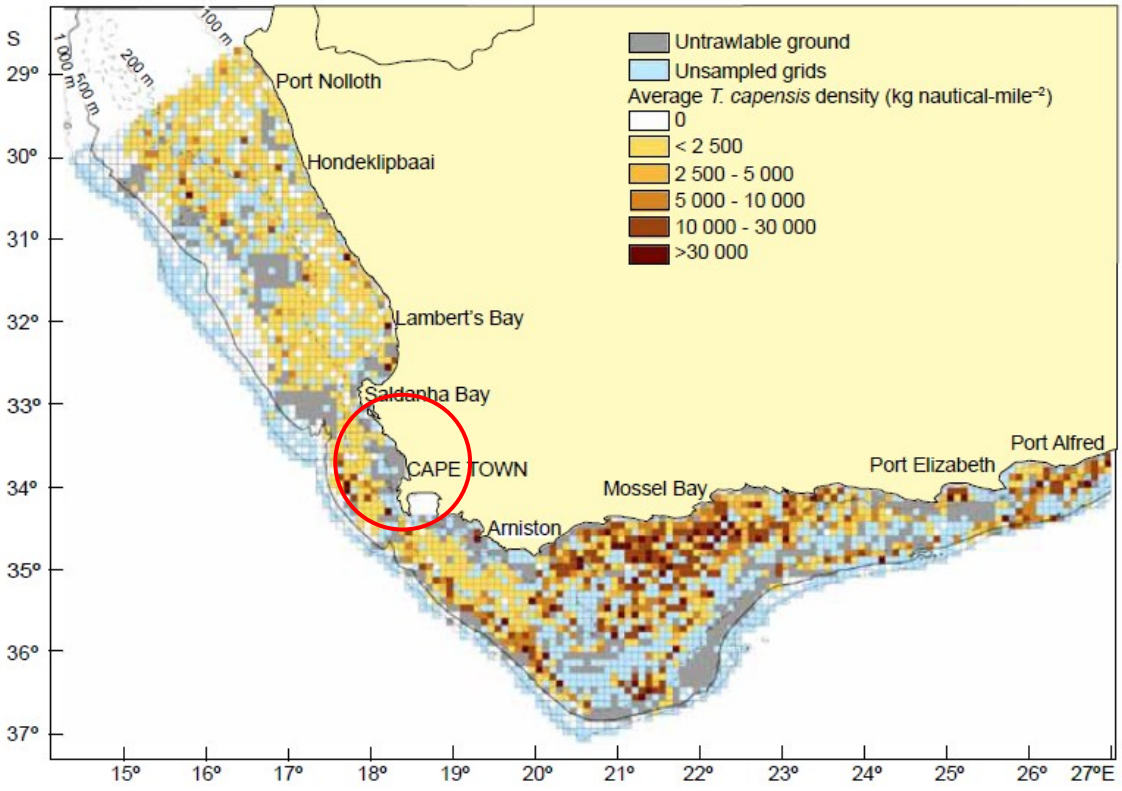

Figure 5.6.26
Distribution of Cape Horse Mackerel in South African Waters relative to the Site Region (2086 to 2017)

Horse mackerel are known to be difficult to catch as they migrate up and down in the water column and occur from the shallowest waters out to the deep waters of the continental shelf. The South African fisheries for Cape horse mackerel are broadly separated into three sectors:

- a targeted fishery using mid-water trawls mainly on the South Coast and the now up to Cape Point;
- a second fishery using bottom trawls (typically for hake) as incidental by-catch mainly on the South Coast;

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- a third fishery targeting juvenile Cape horse mackerel as an accidental by-catch, mainly on the West Coast (Japp, et al., 2019) (Department of Environment Forestry and Fisheries, 2020a).

Figure 5.6.27 illustrates the three horse mackerel fishery sectors relative to the site region. Current data indicate that horse mackerel mid-water trawl does not occur in the site region. The small pelagic purse-seine fishery targets horse mackerel in the site region, while the demersal hake trawl lands horse mackerel as by-catch on the western edge of the site region. Refer to ***Figure 5.6.10***, which illustrates the demersal trawl footprint relative to the site region.

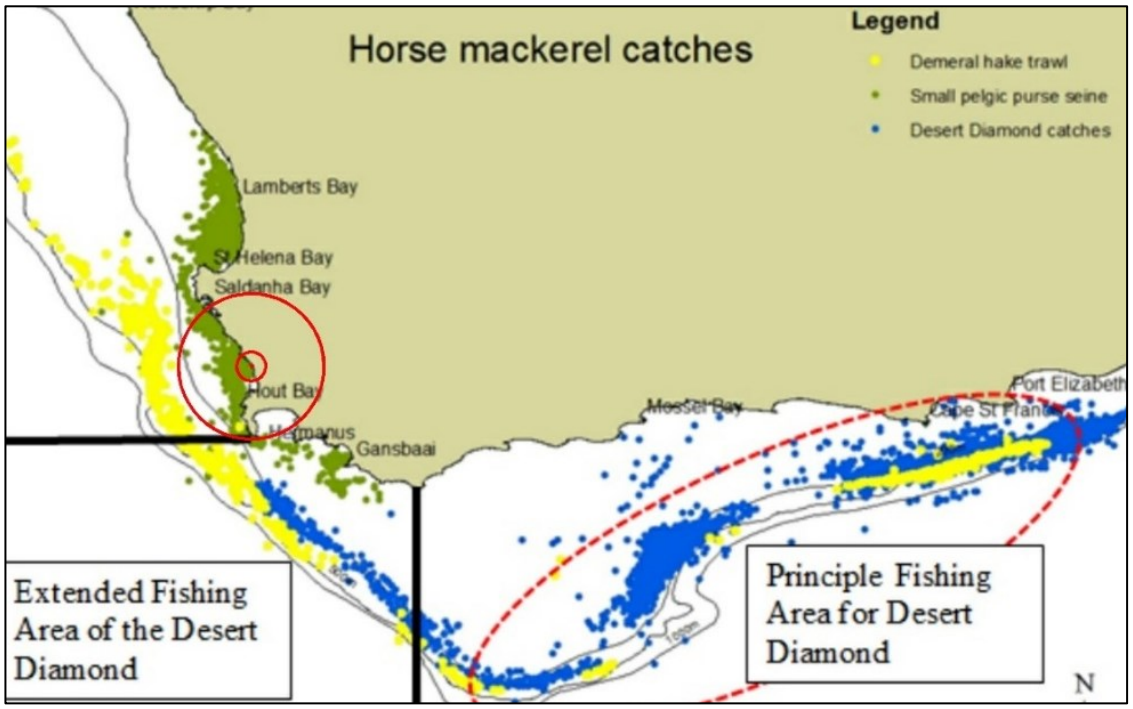

Figure 5.6.27
Distribution of Horse Mackerel Catches taken by the Different Fishery Sectors: Directed Mid-water Trawl Fishery, Demersal Trawl Fishery and Small Pelagic Purse-sein Fishery, with the Site Region (80 km) illustrated by the Outer Red Line

The sector employs a total of 950 workers and were valued at R275 million in 2020 (Feike, 2021b).

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History and Historic Trends of the Fishery

Historically, large surface schools of adult Cape horse mackerel occurred on the West Coast and supported a purse-seine fishery/small pelagic fishery that made substantial catches. These large schools have since disappeared from the South African West Coast, but still occur off Namibia. Catches on the West Coast peaked at 118 000 t in 1950s (Department of Environment Forestry and Fisheries, 2020a) and declined to negligible levels in the late 1960s with a catch of only 1 400 t recorded in 1968 (Department of Agriculture Forestry and Fisheries, 2016c). In the 1990s, purse-seine catches showed an increasing trend with a catch of 26 000 t recorded in 1998. Concerns relating to potential impact on the trawl fishery for adult horse mackerel led to the introduction of a PUCL of 5 000 t in the purse-sein fishery in 2000. Since then, the average annual catch by the purse-seine fleet has been 3 400 t (Department of Agriculture Forestry and Fisheries, 2016c). For the period 2004 to 2018, the average annual catch was approximately 3 000 t (Johnston & Butterworth, 2019b).

In the 1950s and 1960s, trawl catches of Cape horse mackerel were incidental to directed hake and sole fisheries. During this period, catches amounted to less than 1 000 t (Department of Environment Forestry and Fisheries, 2020a). The commercial fishery of Cape horse mackerel was established in the mid-1960s (Sink, et al., 2019). Trawling for horse mackerel increased significantly, notably in the 1970s by foreign trawlers and peaked at 93 000 t in 1977. DAFF recorded a catch of 116 400 t for the same year in the trawl fishery. After South Africa declared the Exclusive Fishery Zone in 1977 and foreign participation in the fishery was controlled, catches stabilised between 27 000 t and 58 000 t per annum (Department of Environment Forestry and Fisheries, 2020a).

From the 1980s onwards, the resource was also targeted by the South African bottom and mid-water trawl vessels. Foreign fleets were phased out in 1992. The annual catch now landed exclusively by the South African fleet declined to below 10 000 t in 1995 and 1996. With the re-establishment of the mid-water trawl fishery in 1997, the annual catch has increased and fluctuated between 8 000 t and 31 000 t since 2000 (Department of Environment Forestry and Fisheries, 2020a).

The current trawl catch (mid-water, bottom and dual operators) approximates 50 000 t a year (caught on the Agulhas Bank mostly), whilst the small pelagic fishery catches no more than 10 000 t on the West Coast. Only one vessel, the *FV Desert Diamond,* fishes exclusively using mid-water trawl gear in addition to a number of smaller hake

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trawlers carrying dual hake and horse mackerel rights that target the resource (the “dual rights vessels”) (Japp, et al., 2019).

Management of the Fishery

Initially, the fishery was managed in terms of an annual TAC limit, which was set for 1990 (35 000 t) and 1991 (45 000 t). This TAC was based on catch per unit effort (CPUE) data. With the phasing out of the foreign fleet in 1992, the foreign CPUE time-series was terminated and a precautionary maximum catch limit (PMCL) was set at 40 000 t.

Thereafter a yield-per-recruit modelling approach was applied until 1999, when an age-structured production-model of the resource was developed. Biomass projections using this model indicate a PMCL of 34 000 t for the trawl fishery and a PUCL of 5 000 t for the purse-seine fishery and imposed for the 2000 fishing season. The trawl PMCL was increased to 44 000 t for 2002. In 2002 the PMCL was split into two components with 12 500 t reserved as by-catch in the hake demersal trawl fishery and 31 000 t allocated to the horse mackerel directed mid-water trawl fishery, which was maintained at that level until 2012 (Department of Environment Forestry and Fisheries, 2020a). The PUCL for the purse-seine fishery was maintained at 5 000 t until 2010 (Department of Agriculture Forestry and Fisheries, 2016c).

In 2012, an OMP approach was introduced for the horse mackerel directed mid-water trawl fishery to improve utilisation of the resource, which maintained the 12 500 t demersal trawl by-catch reserve (Department of Environment Forestry and Fisheries, 2020a).

A portion of the horse mackerel allocation is annually set aside as a by-catch reserve in the hake trawl sectors and some is reserved as by-catch in the small pelagic purse-seine fishery. An adaptive control rule in the form of TAC was introduced in 2013, using a three year “running average” (Department of Agriculture Forestry and Fisheries, 2016c). Effectively, the rule determines that if recent abundance indices are high compared to averages over a fixed past period, the TAC is increased or vice versa (Department of Agriculture, Forestry and Fisheries, 2015b).

Status of the Resource

Uncertainty regarding the reasons for a continued reduction in availability/abundance remains, with the available data being uninformative on this aspect. The analyses consequently used a suite of model variants that incorporated various assumptions regarding the underlying cause of the low CPUE, in recent years. With the inclusion of

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additional CPUE data from the dual rights vessels, the model yielded slightly more optimistic estimates of current biomass. However, the results were broadly similar to those previously reported, with the "catchability" models estimating current resource status at about 62 per cent of pre-exploitation spawning biomass, whereas the "mortality" variant yielded an estimate of about 24 per cent (Williamson & Japp, 2018a). The differences between these two alternate models when projecting into the future will be substantial (Johnston & Butterworth, 2017).

Given the ongoing uncertainty in the state of the stock and the best efforts to assess the fishery, DFFE has recommended that the precautionary catch approach be maintained and, for the near future at least, has maintained the management of horse mackerel based on the agreed OMP (Japp, et al., 2019).

The assessment conducted in 2018 led to the increase of the mid-water trawl effort limit by 18 per cent, with a corresponding increase in TAC set at 27 670 t for the 2019 fishing season (Department of Environment Forestry and Fisheries, 2020a).

In 2019, it was estimated that the Cape horse mackerel resource was currently at 66 per cent pre-exploitation biomass. Projections of future resource status indicated that all future levels of mid-water catch would lead to a reduction in spawning biomass and CPUE in median terms. For mid-water catches up to 30 000 t per annum there was no concern in terms of stock status and the catch and effort limits imposed in 2019 were therefore maintained for 2020 (Department of Environment Forestry and Fisheries, 2020a).

Vessels and Gear

Currently only one vessel, the *FV Desert Diamond*, operates exclusively in South African waters using midwater trawl (Wilkinson & Japp, 2018b).The *FV Desert Diamond* is a freezer trawler and tows trawl warps, net and cod-ends as illustrated in ***Figure 5.6.28*** (Sink, et al., 2019).

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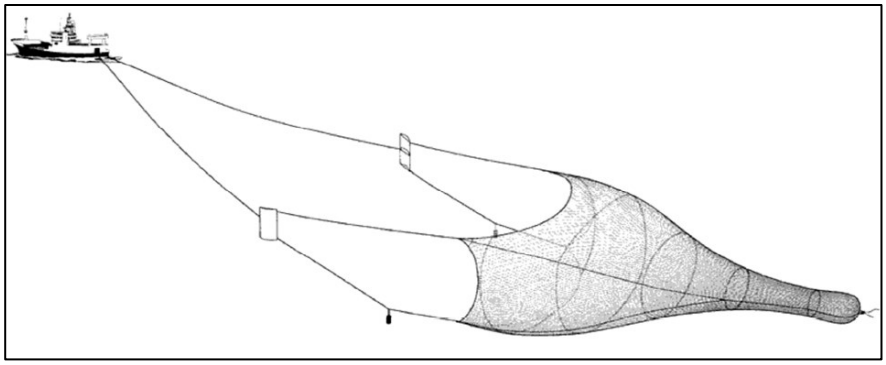

Figure 5.6.28
Schematic Diagram showing the Typical Gear Configuration of a Horse Mackerel Mid-Water Trawler

In addition, there are a number of smaller hake trawlers carrying dual hake and horse mackerel rights (Japp, et al., 2019). See ***Figure 5.6.21*** for the configuration of the purse-seine fisheries vessels and gear.

Fisheries Allocation and Catch Data

The most recent long-term horse mackerel fishery rights allocations were awarded to 8 rights holders for a 15-year period from 1 January 2017 to 31 December 2031 (Department of Agriculture, Forestry and Fisheries, 2018).

The horse mackerel TAC was set at 36 125 t, of which 27 670 t was allocated to directed mid-water trawling and 8 455 t set aside as a by-catch reserved in the demersal/hake trawl sectors. The PUCL applied to juvenile horse mackerel catches in the purse-seine/pelagic fishery was maintained at the 2017 level (spread over three years) at 12 000 t (Japp, et al., 2019).

Figure 5.6.29 illustrates the horse mackerel fishery catch limits for the period 2008 to 2019 (Department of Environment Forestry and Fisheries, 2020a).

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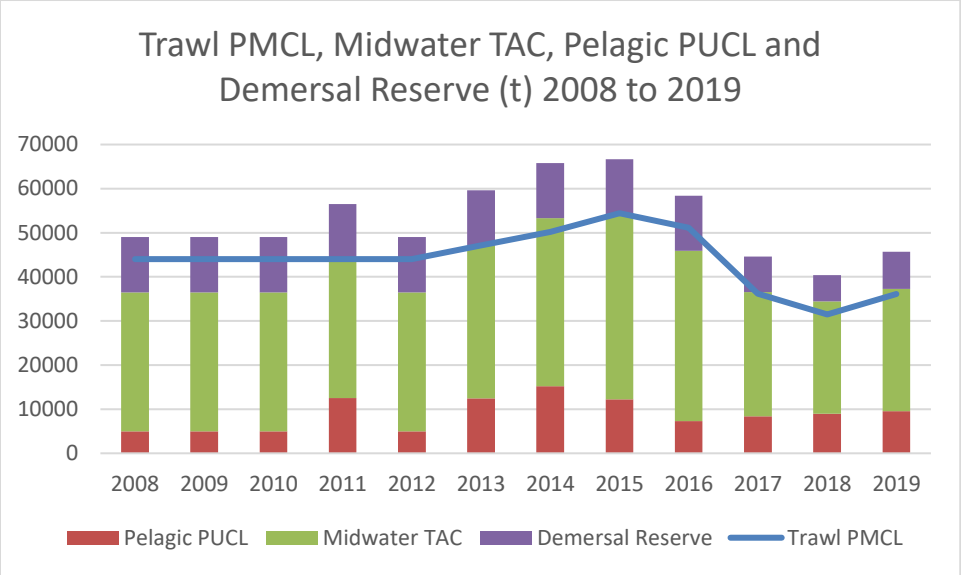

Figure 5.6.29
Cape Horse Mackerel PMCL/TAC/PUCL/Reserve in t (2004 to 2018)

Figure 5.6.30 presents the PMCL (t) in the blue line. This represents the total fishery allocation for the demersal trawl, mid-water trawl and the small pelagic allocation. The hake by-catch reserve allocation is also represented. The PUCL applied to juvenile horse mackerel catches in the purse-seine fishery for small pelagic species is represented in red in ***Figure 5.6.29***.

Figure 5.6.30 illustrates the Cape horse mackerel catch for the three fishery sectors for the period 2008 to 2018. From the graph, it is evident that the horse mackerel catch rates in the mid-water trawl decreased sharply from 2013 to 2016. However, since the *FV Desert Diamond* started fishing in the experimental areas west of 20°E in 2016 to allow fishing further west to a line due west of Cape Point (34° 20' S), there was a steady increase of catch in the mid-water trawl sector. This vessel operates outside of the site region.

The horse mackerel catch in the purse-sein fishery has been consistently below the PUCL fishery allocations, except in 2011, when the purse-seine fishery almost achieved its three-year running total of 12 000 t with a catch of 10 990 t of juvenile Horse mackerel being recorded.

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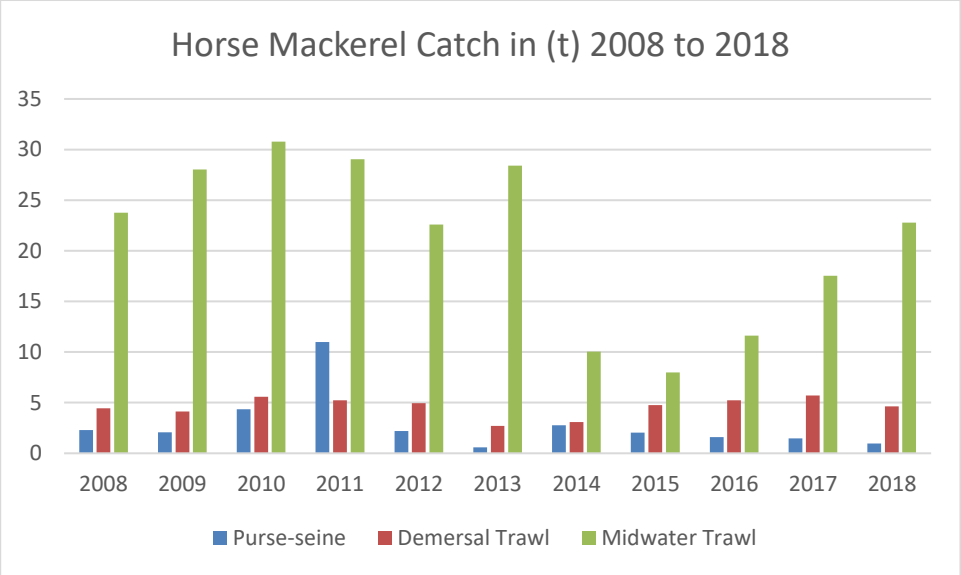

Figure 5.6.30
Cape Horse Mackerel Catch in (t) (2008 to 2018)

Closed Areas

Several fisheries target the horse mackerel and accordingly fishing restrictions in the three fisheries differ. Restrictions and closed areas are summarised as follows:

- Demersal Trawl Fishery: In terms of the 2017 fishing season permit conditions (Planning Partners, 2021a):
    - Fishing is only permitted in South African waters (excluding tidal lagoons, tidal rivers and estuaries, closed areas and marine protected areas).
    - Fishing is not permitted within False Bay, north of a straight line drawn from the lighthouse at Cape Hangklip to the lighthouse at Cape Point (Norman, et al., 2018).
- Mid-water Trawl Fishery: In terms of the 2017/2018 fishing season permit conditions (Planning Partners, 2021a):
    - Fishing is only permitted in South African waters (excluding tidal lagoons, tidal rivers and estuaries), east of 20°E longitudinal.
    - Fishing is not permitted in depths of less than 110 m or within 20 nmi from the coast, whichever is the greater distance.

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In the experimental area, i.e. between 20°E longitudinal and the line drawn due west from Cape Point 34°20'S, DFFE has set conditions that include strict limitations on by-catch. If the limits are reached for any one of these species, mid-water trawling would be suspended and the historical spatial limits reinforced, i.e. 20°E restriction (Norman, et al., 2018).

- Purse-seine Fishery: In terms of the 2017 fishing season permit conditions (Planning Partners, 2021a):
    - Fishing is only permitted in South African waters (excluding tidal lagoons, tidal rivers and estuaries).
    - In the area east of 20°E longitudinal, no fishing is permitted in depths of less than 110 m or within 20 nmi from the coast, whichever is the greater distance.
    - In the area west of 20°E longitudinal, no fishing is permitted within 5 nmi from the coast, which applies to the site region.
    - No fishing may take place outside of the areas defined as the "hake trawl ring fence".

Market Destinations

The average annual horse mackerel catch is generally frozen whole at sea, yielding a low-value product and a cheap source of protein. In 2015, DFFE reported that the majority of the catch was exported to West Africa without being landed or processed in South Africa. Currently, 50 per cent of the catch is exported to African countries, including Cameroon, Nigeria, Democratic Republic of Congo, Angola and Mozambique. The other 50 per cent is exported domestically, predominantly to the northern provinces (Planning Partners, 2021b).

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Table 5.6.10
Summary of the Horse Mackerel Fishery (Entire Fishery)

Duration of Rights	15 years (2017 – 2031)
Value of Fishery (R) (2020)	R275 million
Fish Landed (2018)	Approximately 29 000 t
Number of Jobs Sustained (2020)	950
Number of Vessels	1
Number of Right Holders	8
Closed Season (No Fishing)	None

v) Large Pelagic Longline Fishery

Overview

The tuna pole-line and large pelagic longline fisheries target large pelagic species in the Atlantic and Indian oceans. Additionally, the boat-based commercial line fishery catches tunas opportunistically and the boat-based recreational anglers undertake game fishing for tuna and billfish.

The common commercial tuna species include albacore (*Thunnus alalunga*), bigeye tuna (*Thunnus obesus*), yellowfin tuna (*Thunnus albacares*), southern bluefin (*Thunnus maccoyii*) and billfish such as swordfish (*Xiphias gladius*) are the main species targeted by the longline sector. All species are highly migratory and their distributions span across multiple exclusive economic zones, as well as the high seas of all oceans, except the Southern bluefin tuna that is confined to the southern hemisphere (Department of Environment Forestry and Fisheries, 2020a).

The main species targeted by the large pelagic longline fishery are bluefin tuna, bigeye tuna, yellowfin tuna and swordfish, with albacore tuna (*Thunnus alalunga*), blue sharks (*Prionace glauca*) and shortfin mako sharks (*Isurus oxyrinchus*) are the main by-catch species in the longline sector (Department of Environment Forestry and Fisheries, 2020a). Bluefin tuna is generally not targeted by longline vessels due to the small quota (40 t) for this species (Department of Agriculture Forestry and Fisheries, 2016c). Directed targeting of pelagic sharks is not permitted in the large pelagic longline fishery (Winker, et al., 2019a).

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History and Historic Trends of the Fishery

The domestic commercial longlining for tuna has been documented from the early 1960s, with catches reaching approximately 2 000 t. The fishery rapidly declined and ceased in the mid-1960s due to the low quality bluefin and albacore tuna landed. Foreign vessels however continued to fish for the resource from the 1980s through to the 2000s under bi-lateral agreements (Department of Agriculture Forestry and Fisheries, 2016c).

The fishery was revived when it was demonstrated that tuna and swordfish could be profitably exploited. In 1997, 30 experimental longlining permits were issued for primarily tuna and catches peaked at 2 500 t during this phase (Department of Agriculture Forestry and Fisheries, 2016c), (Department of Environment Forestry and Fisheries, 2020a).

The South African large pelagic longline fishery was formalised into a commercial fishery in 2005. A total of 18 swordfish-directed and 26 tuna-directed fishing rights, valid for 10 years, were issued. The fishery was restricted through TAE control. The large pelagic longline fishery was initially split into swordfish and tuna-directed sub-sectors, but by 2006, only 9 swordfish-directed longline vessels operated in the sector, resulting in the lowest annual catch since 2001 (Department of Agriculture Forestry and Fisheries, 2016c). The policy was amended in 2008 (Winker, et al., 2019a). The decision was taken in 2014 to refer to the fleet as the large pelagic longline fishery.

The 10-year long-term rights issued in 2005 expired in 2015. The fishery operated under exemption rights (Department of Agriculture Forestry and Fisheries, 2016c) until new fishing rights were allocated in 2017 (Winker, et al., 2019a). A total of 60 commercial fishing rights were granted and a total of 34 vessels were authorised to fish. In terms of the fishing rights register as at 2018, 59 fishing rights were issued in this fishery (Department of Agriculture, Forestry and Fisheries, 2018). The total number of active longline vessels within South African waters was 22, 18 of which were fishing in the Atlantic (West of 20°E) during 2017 (Wilkinson & Japp, 2018a).

According to the ICCAT, the number of reported South African longline fishing vessels active in the ICCAT convention area was 18 in 2017, 19 in 2018 and 18 in 2019 (International Commission for the Conservation of Atlantic Tunas, 2020b).

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Management of the Fishery

Large pelagic resources are highly migratory and fished by many nations, and these resources are managed by Regional Fisheries Management Organisations. South Africa is a member of three Regional Fisheries Management Organisations, namely (i) the ICCAT since 1967, with full membership (ii) Indian Ocean Tuna Commission and the (iii) Commission for the CCSBT since 2016 (Department of Agriculture Forestry and Fisheries, 2016c). The respective areas of management are illustrated in ***Figure 5.6.31***. The site region corresponds with the ICCAT and CCSBT area of influence (Terje Løbach, et al., 2020).

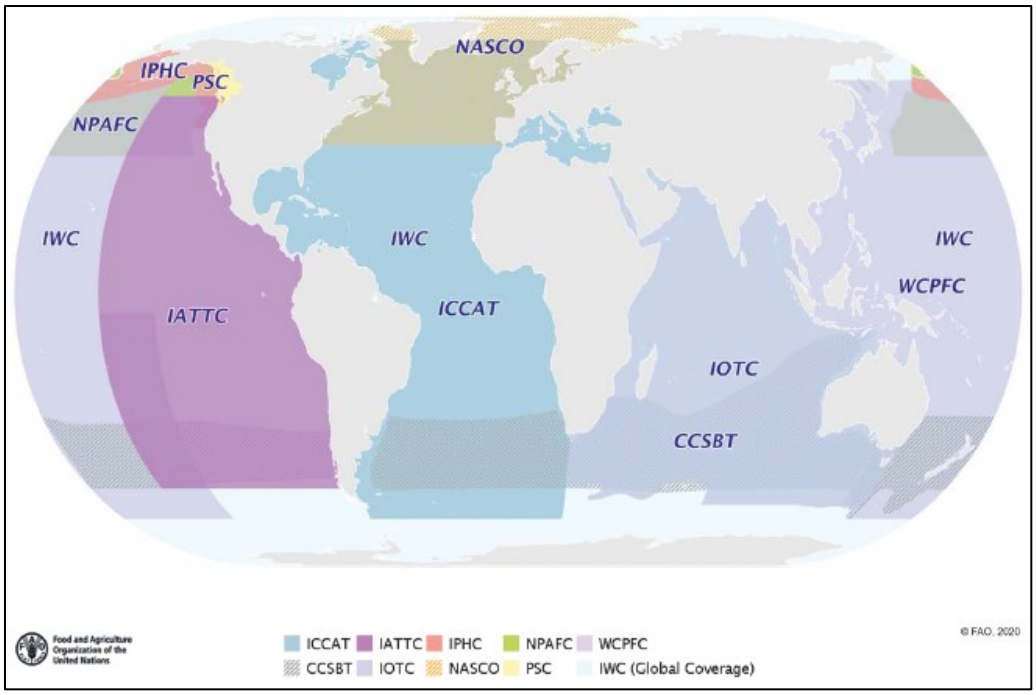

Figure 5.6.31
Regional Large Pelagic Fisheries Management Areas (2020)

Status of the Resource

A single stock for the entire Atlantic Ocean is assumed for yellowfin tuna and bigeye tuna. For albacore and swordfish, two different stocks are recognised in the Atlantic, a North and a South stock, separated at 5°N. There is a management boundary that separates the Indian and Atlantic Oceans at 20°E (Department of Agriculture Forestry and Fisheries, 2016c).

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The 2018 Bigeye tuna stock assessment conducted by ICCAT Standing Committee Research and Statistics (SCRS) confirmed that the bigeye tuna is overfished. The estimated Maximum Sustainable Yield is 76 200 t. Current catches (78 500 t) are above the Maximum Sustainable Yield and a TAC of 65 000 t applies. The TAC for bigeye tuna for 2017 was exceeded by more than 20 per cent and this level of catch is projected to reduce the probability to reach the convention objectives by 2028. The contracting and cooperating non-contracting parties was planning to implement a 15-year rebuilding programme for bigeye tuna, with the goal of achieving the Maximum Sustainable Yield with a probability of more than 50 per cent (International Commission for the Conservation of Atlantic Tunas, 2019a).

The TAC for yellowfin tuna was exceeded in 2016 by 37 per cent and by 26 per cent in 2017. A stock assessment carried out by ICCAT in 2019 suggested that maintaining catch levels at 110 000 t were sustainable. However, the 2018 catch was estimated to be four times higher at 423 815 t (Department of Environment Forestry and Fisheries, 2020a). Based on available evidence and 2017 data, the yellowfin tuna stock is overfished (Department of Environment Forestry and Fisheries, 2020a).

The 2017 stock assessment for the South Atlantic swordfish confirmed that the stock of South Atlantic swordfish is overfished. The SCRS advised that the a TAC of 14 000 t would have a 50 per cent probability of rebuilding the stock and a TAC of 14 000 t was therefore set for 2018 (International Commission for the Conservation of Atlantic Tunas, 2017a); (International Commission for the Conservation of Atlantic Tunas, 2020a); (Department of Environment Forestry and Fisheries, 2020a).

The 2016 SCRS report found that the Southern Atlantic albacore stock is most probably not overfished. The SCRS concluded that projections at a level consistent with the 2016 TAC of 24 000 t showed that probabilities of being in the green quadrant of the Kobe plot across all scenarios would increase to 63 per cent by 2020. The next stock assessment of Southern Atlantic albacore was to be conducted in 2020 (International Commission for the Conservation of Atlantic Tunas, 2017b).

The 2020 Southern Bluefin Stock Assessment indicated that the stock remains below the estimated Maximum Sustainable Yield, at 13 per cent of the initial biomass. The current estimated trends indicate that the stock has been rebuilding by approximately 5 per cent per year since the low point in 2009 (Commission for the Conservation of Southern Bluefin Tuna, 2020a).

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Vessels and Gear

The domestic fleet operates predominantly out of the Cape Town and Hout Bay Harbours. The vessels are typically small fibreglass or wooden hulled and have a maximum range of two weeks. The relatively smaller size (approximately 24 m) and short range of vessels limit the extent of their operations (Norman, et al., 2018).

Gear consists of mono-filament mainlines of between 25 km and 100 km in length which are suspended from surface buoys, as illustrated in ***Figure 5.6.32*** (Wilkinson & Japp, 2018b).

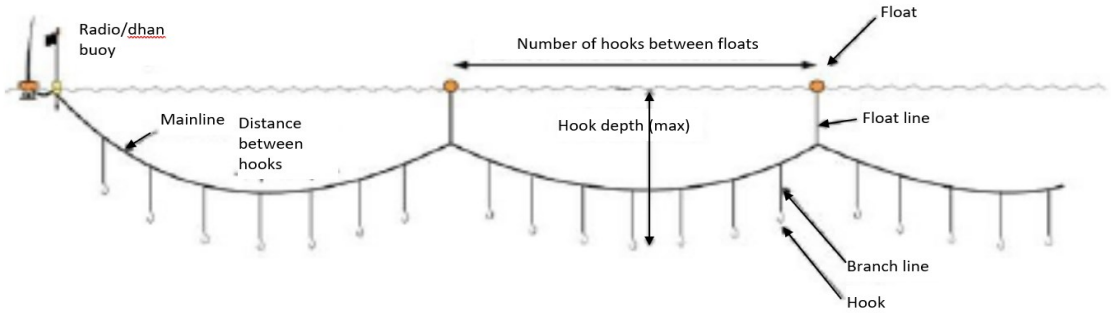

Figure 5.6.32
Large Pelagic Longline Fishery: Vessel and Gear

Fishery Allocation and Catch Data

The current TAC for South Atlantic swordfish is 1 001 t (2018 to 2021) (International Commission for the Conservation of Atlantic Tunas, 2017a) and the TAC for South Atlantic albacore is 4 400 t (2017 to 2020). South Africa's allocation of Southern bluefin tuna, one of the world's most valuable marine fish species, increased from 40 t in 2015 to 150 t in 2016 and 2017 to 450 t for 2018 until 2020 (International Commission for the Conservation of Atlantic Tunas, 2019d).

Figure 5.6.33 illustrates intensity of pelagic longline fishing for the period 2006 to 2016 (Sink, et al., 2019). The 18 active registered longline vessels (2017) did not operate in the site region (Wilkinson & Japp, 2018b).

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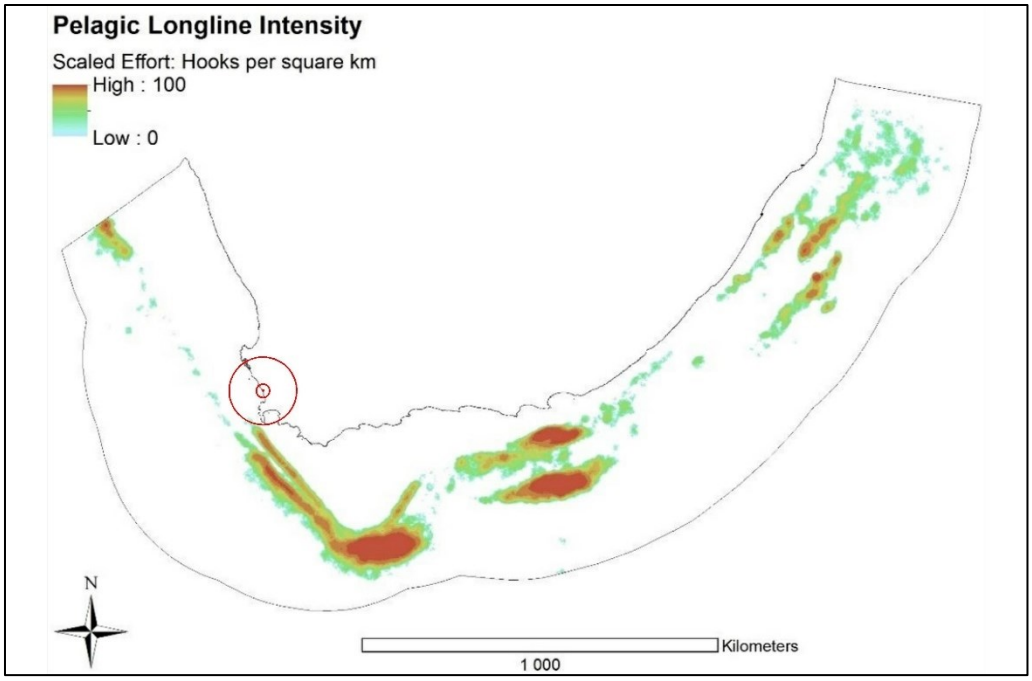

Figure 5.6.33
Scaled Intensity of Large Pelagic Longline Fishing for the Period 2006 to 2016 using the Annual Average of the Number of Hooks per Square Kilometre

The 2017 South African longline catches of swordfish (189 t), yellowfin tuna (152 t), bigeye tuna (235 t) and blue sharks (418 t) were higher than in 2016, while albacore (145 t) and shortfin mako shark (305 t) decreased slightly. Strategies to reduce shark targeting to direct effort towards improved tuna and billfish catch have been included in the Large Pelagic Longline Fishery Policy and have been implemented since January 2017 (International Commission for the Conservation of Atlantic Tunas, 2019d).

Figure 5.6.34 illustrates the total tuna catches for South Africa for the period 2005 to 2016 (Department of Agriculture, Forestry and Fisheries, 2013) (Wilkinson & Japp, 2018b).

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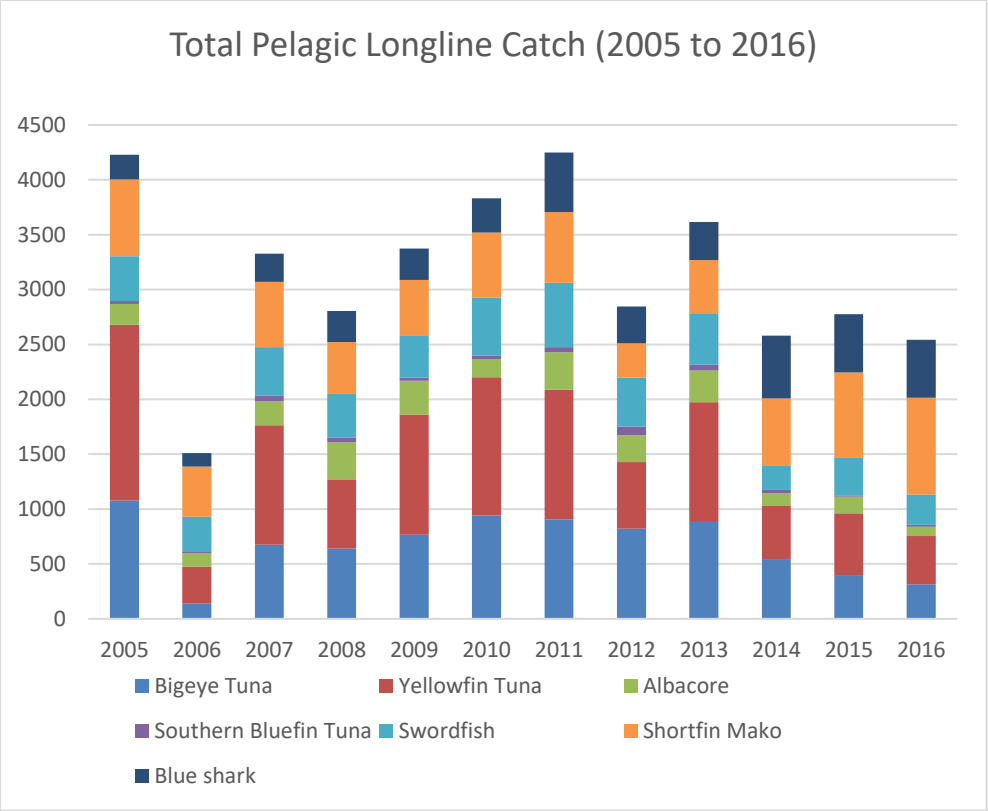

Figure 5.6.34
Total Large Pelagic Longline Catch(t) for South Africa (2005 to 2016)

South Africa has set aside 5 t of its Southern bluefin tuna allocation to account for recreational catch mortality (Commission for the Conservation of Southern Bluefin Tuna, 2020b).

Closed Areas

In terms of the 2018/2019 fishing season permit conditions:

- Longline fishing is permitted in South African waters, excluding tidal lagoons, tidal rivers and estuaries.
- Setting and retrieving of longlines can be conducted in the South African exclusive economic zone, excluding within a 12 nmi area along the entire South African coastline and within 20 nmi of MPAs.
- Fishing is permitted both east and west of 20°E.

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- Fishing in SANParks areas is subject to regulations promulgated under the National Parks Act (Act. No. 57 of 1976) as amended (Norman, et al., 2018).

Market Destinations

The South African Tuna Association, which represents tuna pole, line and longline permit holders, targets albacore, bigeye, yellowfin, southern bluefin tuna and sharks, as well as snoek and collectively lands an average of 3 300 t of fish for the entire tuna fishery annually. The total catch is exported. The main export markets are China, Japan and Europe (FishSA, 2019).

Table 5.6.11
Summary of the Large Pelagic Fishery (Entire Fishery)

Duration of Rights	15 years (2020 – 2034)
Value of Fishery (R)	Not known
Fish Landed (2017)	Approximately 1 444 t
Number of Jobs Sustained	Not known
Number of Vessels	22
Number of Right Holders (as at 2018)	59
Closed Season (No Fishing)	None

vi) Patagonian Tooth Fish

The Patagonian toothfish (*Dissostichus eleginoides*) occurs at depths of between 70 and 1 600 m around the sub-Antarctic Islands and Seamounts, mainly between 40°S and 55°S. A longline fishery for this species operates in the South African exclusive economic zone around the Prince Edward Islands. The fishery does therefore not occur in the site region (Department of Environment Forestry and Fisheries, 2020a).

c) Inshore/Nearshore Fisheries

i) Demersal Shark (Longline)

Overview

South African chondrichthyans (including sharks, skates, rays and

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chimaeras) are harvested in 12 of the 22 commercial fisheries. Of the 204 recorded species, less than 10 are targeted by the shark-directed demersal longline fishery and by parts of the line and net-fisheries (Department of Environment Forestry and Fisheries, 2020a). The species are increasingly being targeted by a growing number of recreational fishers. The demersal shark fishery targets mainly soupfin sharks (*Galeorhinus galeus*), smoothhound sharks (*Mustelus mustelus*), Bronze Whaler (*Carcharhinus brachyurus*), St. Joseph sharks (*Callorhinchus capensis*) and various rays and skates (Da Silva 2015).

The targeting of bull sharks (*Carcharhinus leucas*), hammerhead sharks (*Sphyrna spp.*), oceanic sharks such as blue sharks (*Prionace glauca*), shortfin mako sharks (*Isurus oxyrhinchus*), oceanic whitetip sharks (*Carcharhinus longimanus)* and thresher sharks (*Alopias spp*) is prohibited in this fishery (Department of Agriculture Forestry and Fisheries, 2016c).

There are several fisheries that catch shark as either directed or as non-directed fisheries. This section only deals with the demersal shark longline fishery, which is the only fishery that consistently targets demersal sharks (Department of Environment Forestry and Fisheries, 2020a).

The demersal shark longline fishery operates in coastal waters from the Orange River on the West Coast to the Kei River on the East Coast, but fishing rarely occurs north of Table Bay (Department of Environment Forestry and Fisheries, 2020a).

The fishery operates in the Western Cape and Eastern Cape and generally in waters that are shallower than 100 m (Department of Environment Forestry and Fisheries, 2020a).

History and Historic Trends of the Fishery

Commercial scale exploitation of chondrichthyans was initiated in South Africa in the 1930s, around the traditional fishing villages in the Western Cape. The fishery used handlines and targeted inshore demersal sharks for their livers to produce Vitamin A oil (Department of Environment Forestry and Fisheries, 2020a). Increased demand for natural Vitamin A (from shark liver) after the Second World War saw annual landings exceeding 4 000 t. By the 1940s, catches in soupfin sharks declined with a shift to targeting other species and have yet to return to pre-war levels (Department of Agriculture Forestry and Fisheries, 2016c).

In the 1990s, there was renewed interest in sharks and the shark-directed

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longline fishery was established (Winker, et al., 2019b). The fishery split into the pelagic shark longline fishery targeting blue shark and mako shark and the demersal shark longline fishery targeting soupfin sharks and smoothhound sharks (*Mustelus mustelus*) (da Silva, et al., 2019).

Permits for directed catching of sharks were first issued in 1991, with over 30 permits being issued. In 1998 the number of permits was reduced to 23 due to poor fishery performance and in 2004 further reduced to 11 and from 2008 onwards, 6 permits were issued. As the majority of rights holders own multiple rights in different fisheries, there are seldom more than three vessels operating at the same time (Winker, et al., 2019b); (da Silva, et al., 2019). The pelagic shark longline fishery was absorbed into the large pelagic fishery in March 2011 (Department of Agriculture Forestry and Fisheries, 2016c).

Estimated landings of 408 t, 175 t and 88 t of shark were reported in the fishery in 2010, 2011 and 2012. The apparent drop in landed catches at the time may be attributed to a combination of effort displacement to more lucrative fisheries, target availability or a general decline in abundance (da Silva, et al., 2015).

Rights in the demersal shark longline fishery were reallocated during FRAP 2013. Annual landings have fluctuated widely due to variation in demand and price (Winker, et al., 2019b).

Landings of smoothhound shark across all fisheries reveal large annual fluctuations around an initially increasing trend from 16 t in 1990 to 252 t in 2010. A sharp decline to 56 t in 2014 was the result of the most productive demersal shark longline vessel not fishing in that year. Catches again increased to 124 t in 2016 (da Silva, et al., 2019).

Landings of soupfin shark across all fisheries declined from 692 t in 1952 to 329 t in 2016 (Winker, et al., 2019b).

Management of the Fishery

The demersal shark longline fishery which targets soupfin sharks and smoothhound sharks is managed on a TAE basis with 6 vessels currently targeting shark. There are seldom more than 3 vessels operating at the same time (Winker, et al., 2019b); (da Silva, et al., 2019).

The South African National Plan of Action for Sharks was finalised in 2013. This plan recommended, *inter alia*, a slot limit on the catch of inshore demersal sharks of between 70 and 130 cm total length (da Silva, et al., 2018).

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Status of the Resource

Historically there was little co-ordinated research relating to the stock assessment of commercially viable sharks. As sharks form a minor part of landed catch of many South African fisheries, there was little cohesion between DFFE's fishery-specific Scientific Working Groups regarding the management of chondrichthyans (sharks, skates, rays and chimaeras).

Historical analysis of catch and effort data, although limited, conducted by da Silva (2007) showed that smoothhound shark was marginally over-exploited and by McCord (2005) showed that soupfin shark was fully exploited (da Silva, et al., 2015).

Two recent assessments of both the smoothhound and the soupfin shark have been conducted and published in 2019 by da Silva et al (da Silva, et al., 2019) and Winker et al (Winker, et al., 2019b). The assessment of smoothhound sharks found that the stock was not overfished but subject to overfishing. Projections indicate that current catch levels of 125 t per annum will result in the smoothhound shark stock being overfished in future (da Silva, et al., 2019).

The assessment recommends that in order to ensure that smoothhound shark biomass increases by 2024 with a probability of 80 per cent, a decrease in catch to below 75 t is required. Even at these catch rates the projected recovery of the stock, which is estimated to have declined by 30 per cent since 1990, will be slow (da Silva, et al., 2019).

Soupfin shark stocks in South Africa are currently overfished and still subject to overfishing. A steady decline in soupfin shark biomass is evident from 1952 to 2016. At current catch levels of 329 t per annum, further depletion of the stock will occur, with possible commercial extinction before 2055 (Winker, et al., 2019b).

To ensure that soupfin shark biomass, which is estimated to have declined by 50 per cent, increasing by 2024 with an 80 per cent probability, a decrease in catch to below 100 t per annum is required, with recovery anticipated to be very slow (Winker, et al., 2019b).

Vessels and Gear

Fishing vessels are smaller than 30 m in length, with a set of weighted longlines that are baited with on average 1 000 hooks (up to 2 000) (da Silva, et al., 2015). Within the site region, designated landing sites are the Port of Cape Town and Hout Bay Harbour (Department of Environment, Forestry and Fisheries, 2019b).

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Fishery Allocation and Catch Data

There are currently 6 rights holders in the fishery with fishery rights allocated in terms of FRAP 2013 with a validity up to 31 December 2020 (Department of Agriculture, Forestry and Fisheries, 2018).

For the period 2011 to 2014 DAFF reported that the annual average dressed weight of sharks caught by the demersal shark longline fishery were 25.72 t of soupfin shark and 49.69 t of smoothhound (Department of Agriculture Forestry and Fisheries, 2016c).

Figure 5.6.35 and ***Figure 5.6.36*** illustrate the estimated catch (t) for smoothhound for the period 1990 to 2016 and soupfin shark for the period 1952 to 2016 for all fisheries (Department of Environment Forestry and Fisheries, 2020a).

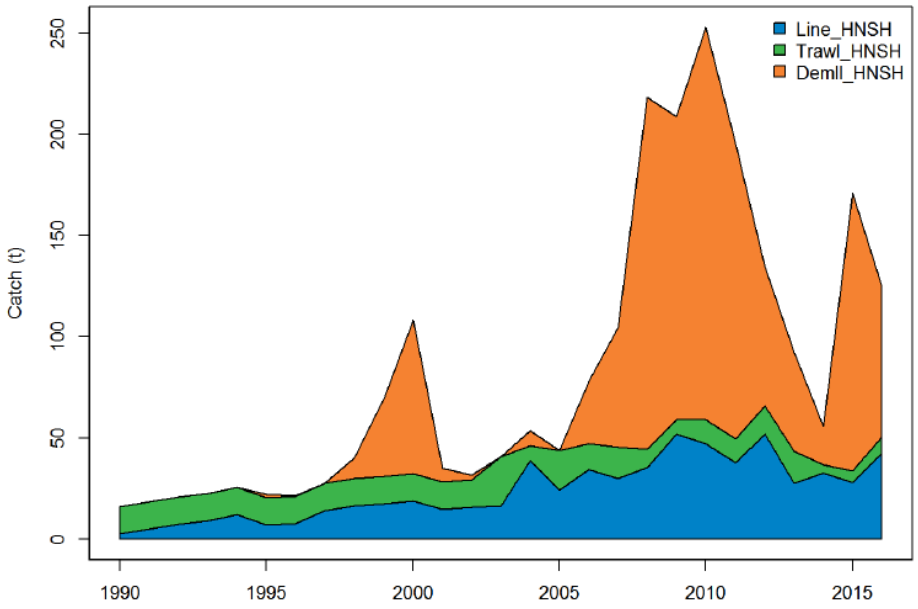

Figure 5.6.35
Estimated Catch (t) for Smoothhound Shark South Africa for all Fisheries (1990 to 2016)

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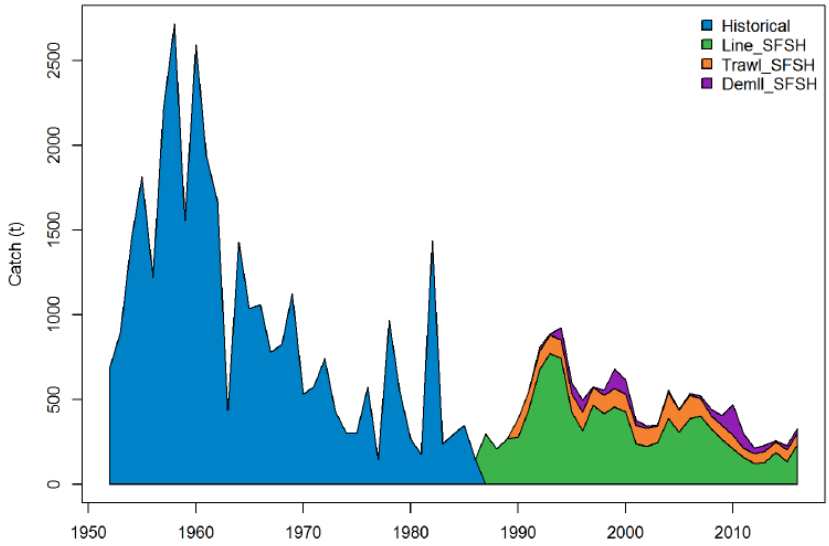

Figure 5.6.36
Estimated Catch (t) for Soupfin Shark South Africa for all Fisheries (1952 to 2016)

Table 5.6.12 presents the number of smoothound and soupfin sharks caught for the period 2016 to 2019, as reported on by the Minister of Environment, Forestry and Fisheries (Department of Environment, Forestry and Fisheries, 2019d).

Table 5.6.12
Number of Smoothhound and Soupfin Shark landed 2016 to 2019

Year	Smoothhound Sharks	Soupfin Shark
2016	17 558	6 384
2017	18 298	4 741
2018	30 112	8 061
2019	11 796	830

The demersal shark is one of three fisheries responsible for catching the majority of soupfin and smoothhound sharks in South Africa. This sector accounts for 13 per cent of the total catch of soupfin shark and 70 per cent of the total catch of smoothhound sharks in South Africa

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(Department of Environment, Forestry and Fisheries, 2020d).

Closed Areas and Restricted Areas

In terms of the 2019 fishing season permit conditions:

- Permits are valid only in South African waters (excluding tidal lagoons, tidal rivers and estuaries), closed areas and marine protected areas as stipulated in Chapter 3 of the Marine Living Resources Act Regulations.
- No fishing shall take place within False Bay, north of a straight line drawn from the lighthouse at Cape Hangklip to the lighthouse at Cape Point (Department of Environment, Forestry and Fisheries, 2019b).
- No fishing shall take place east of a line drawn due south of East London Harbour (27°55'E) (outside of the site region).
- Fishing and/or the removal or disturbance of any marine life in the National Parks is prohibited. Fishing in other marine and estuarine areas controlled by the SANParks is subject to regulations promulgated under the National Parks Act, 1976 (Act No. 57 of 1976) as amended.
- During the period 1 September to 30 November, no fishing shall take place within the quadrilateral described by lines joining the following four points (outside of the site region):
    - A: 34°48'S 024°00'E;
    - B: 34°38'S 025°00'E;
    - C: 34°44'S 025°00'E;
    - D: 34°57'S 024°00'E (Department of Agriculture, Forestry and Fisheries, 2016a).

Market Destinations

The bulk of soupfin and smoothhound shark trunks and fins are exported to Australia for use in the fillet trade. Shark meat and shark fins are primarily exported to Australia and Asia, respectively (Sink, et al., 2019).

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Table 5.6.13
Summary of the Demersal Fishery (Entire Fishery)

Duration of Rights	15 years (2020 – 2034)
Value of Fishery (R)	Not known
Fish Landed (2019)	12 626 sharks
Number of Jobs Sustained	Not known
Number of Vessels	6
Number of Right Holders (as at 2018)	6
Closed Season (No Fishing)	None

ii) Tuna Pole (Pole and Line)

Overview

Tuna species, including temperate albacore (*Thunnus alalunga*) and Southern bluefin (*Tunnus maccoyii*), tropical yellowfin (*Tunnus albacares*) and bigeye (*Tunnus obesus*) and billfishes such as swordfish (*Xiphias gladius*) are highly migratory species. They are distributed throughout the Atlantic and Indian Oceans, except for Southern bluefin tuna, which are confined to the Southern Hemisphere (Department of Environment Forestry and Fisheries, 2020a).

The tuna pole (pole and line) fishery is one of two commercial fisheries that target tuna and tuna-like species. The South African tuna pole-line (baitboat) fleet operates in waters up to 1 000 km of the South and West Coasts of South Africa from October to May (Department of Agriculture Forestry and Fisheries, 2016c; Winker, et al., 2019a). In addition, the boat-based commercial line fishery catches tuna opportunistically and the boat-based recreational anglers undertake game fishing for tunas and sailfishes (Department of Environment Forestry and Fisheries, 2020a).

Juvenile and sub-adult albacore (caught predominantly on pole) and, when available in the inshore regions, yellowfin tuna (caught predominantly with rod and reel), are the main targets in the tuna pole-line fishery (Department of Agriculture Forestry and Fisheries, 2016c; Winker, et al., 2019a), (Department of Environment Forestry and Fisheries, 2020a).

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The bulk of the fleet operates out of the Port of Cape Town and Hout Bay Harbour and fish within a 100 nmi radius of these locations (Sink, et al., 2019) from October to May (Department of Environment Forestry and Fisheries, 2020a).

History and Historic Trends of the Fishery

Fishing for tuna dates back to the 1970s in South Africa when tuna were caught in minimal quantities as by-catch in other fisheries, making this the oldest commercial fishery for tuna in South Africa. Records show that in 1979 yellowfin tuna (*Thunnus albacares*) became available close inshore off Cape Point and catches of over 4 500 t were recorded. By 1980 the yellowfin tuna was no longer available close inshore, an occurrence that has repeated itself from 2005 to 2007 and from 2011 to 2014 (Department of Agriculture Forestry and Fisheries, 2016c). This has resulted in the targeting of albacore (*Thunnus alalunga*) instead on the southwest and west coasts of South Africa. Albacore catches peaked at 6 000 t in 1989, although these catches were believed to be under-reported and were probably closer to 10 000 t (Winker, et al., 2019a).

In addition to the uniform target species, and due to the seasonality of the tuna pole and line fishery, vessels will augment catches opportunistically with snoek (*Thyrsites atun*) and yellowtail (*Seriola lalandi*) (Winker, et al., 2019a) (Department of Environment Forestry and Fisheries, 2020a).

In April 2016, Southern bluefin tuna quotas were for the first time allocated to the tuna pole and line sector, which contributed just over 3.7 t (approximately 5.5 per cent) to the total catch by 7 vessels in the period May to July. No catch was taken by the tuna pole and line fleet in 2017. During 2018/2019, tuna pole and line vessels caught 2.5 t Southern bluefin tuna (Winker, et al., 2019a).

Management of the Fishery

The tuna pole sector is effort-controlled and the number of vessels and crew are limited. Prior to 2006, the pole and line fishery was managed as part of the commercial line fishery. During the 2006 fishery allocation process, the commercial line fishery was divided into three separate sectors consisting of the traditional line fishery (455 vessels and 3 450 crew), the hake handline sector (130 vessels and 785 crew) and the tuna pole and line fishery (200 vessels and 3 600 crew). Of the 200 vessels and 3 600 crew allocation available for the 8 year period, only 198 vessels and 2 961 crew were allocated fishing rights in 2006.

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On average, there were 130 vessels active over the period 2005 to 2013 (Winker, et al., 2019a).

Status of the Resource

The 2016 ICCAT stock assessment of Atlantic albacore stock indicated that the stock is neither overfished nor subject to overfishing. Projections at 2016 TAC levels (24 000 t) indicated that the stock will be optimally exploited by 2020 at 63 per cent of the TAC. However, a high degree of uncertainty exists as to the total catch that the stock can sustain. A new assessment was scheduled for 2020 (DFFE, 2020). The data were not available at the time this report was compiled.

The 2019 ICCAT stock assessment for yellowfin tuna indicated that the spawning stock biomass in the Atlantic Ocean was just above that which would produce Maximum Sustainable Yield, and estimates suggest that maintaining catch levels at the current TAC of 110 000 t were sustainable. However the 2018 catch was estimated to be four times higher at 423 815 t, and at which catch rate the resource will become overfished. A stock assessment in Indian Ocean Tuna Commission area in 2018 estimated the spawning biomass stock at 30 per cent of unfished levels. Although further assessment is required, the current status of the yellowfin tuna stock is considered to be overfished and subject to overfishing (DFFE, 2020).

Vessels and Gear

Vessels are on average 16 m in length and utilise rod and reel gear to target yellowfin tuna, while pole gear is used to target albacore. Pole fishing gear consists of a hooked line (usually a barbless hook with a feathered jig) attached to a rigid pole (Sink, et al., 2019).

Fishery Allocation and Catch Data

The South African tuna pole fishery largely operates off the West Coast of South Africa within the 200 nmi fishing zone, particularly between 29° and 32°S, targeting Southern Atlantic tuna stocks. Less than 1 per cent of the tuna pole catch is caught eastwards of the 20°E longitude line. Tuna fishermen focus their effort along the continental shelf edge with the highest reported effort between Lamberts Bay and the southern tip of the Agulhas Bank (Sink, et al., 2019).

The 2017 total baitboat effort of 3 062 catch days represents a substantial decrease of 38 per cent effort compared to 2016. This resulted in a decrease of albacore and yellowfin tuna catches to 1 640 t

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(approximately 18 per cent) and 235 t (approximately 61 per cent), respectively (International Commission for the Conservation of Atlantic Tunas, 2019d). In 2017, 60 fishing rights were allocated for a period of 15 years (DAFF, 2018).

The fishery is seasonal with vessels active predominantly between November and May, with peak catches recorded from November to January (Planning Partners, 2021a).

Figure 5.6.37 illustrates the annual total catch (t) of the main species caught by tuna pole vessels in the ICCAT region (West of 20ºE), 2006 to 2017 (Wilkinson & Japp, 2018a) (Jones, et al., 2018).

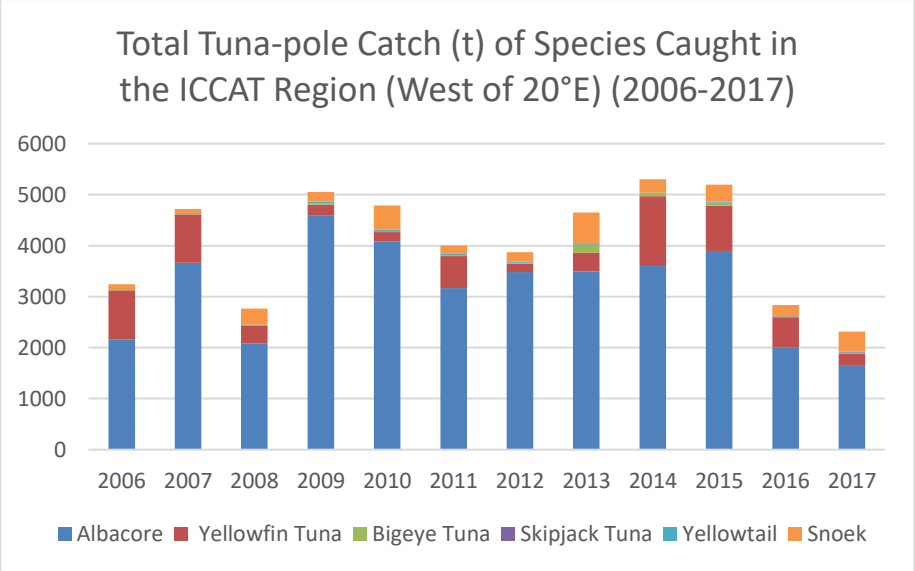

Figure 5.6.37
Total Tuna Pole Catch (t) in the ICCAT Region (West of 20°E) (2006 to 2017)

Figures 5.6.38 and ***5.6.39*** illustrate the mean annual albacore and albacore catch and tuna pole effort for a period measured from 2003 to 2018 and 2016 respectively (Parker, et al., 2020b), (Parker, et al., 2017).

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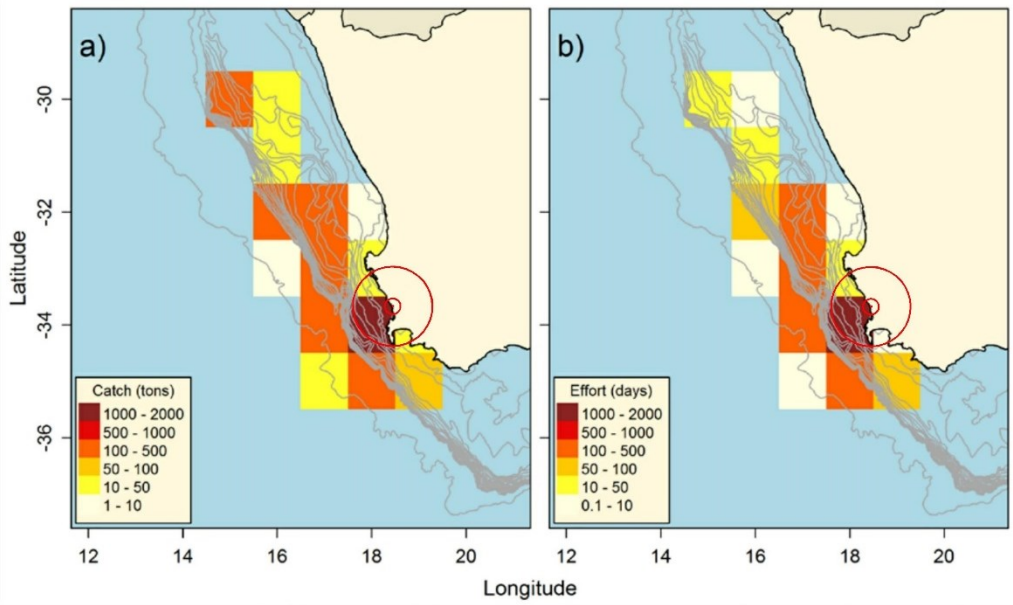

Figure 5.6.38
Mean Annual a) Albacore Catch (t) and b) Tuna Pole Effort (Boat Days) at the 1×1 Degree Reporting Resolution (2003 to 2018) (Parker, et al., 2020b)

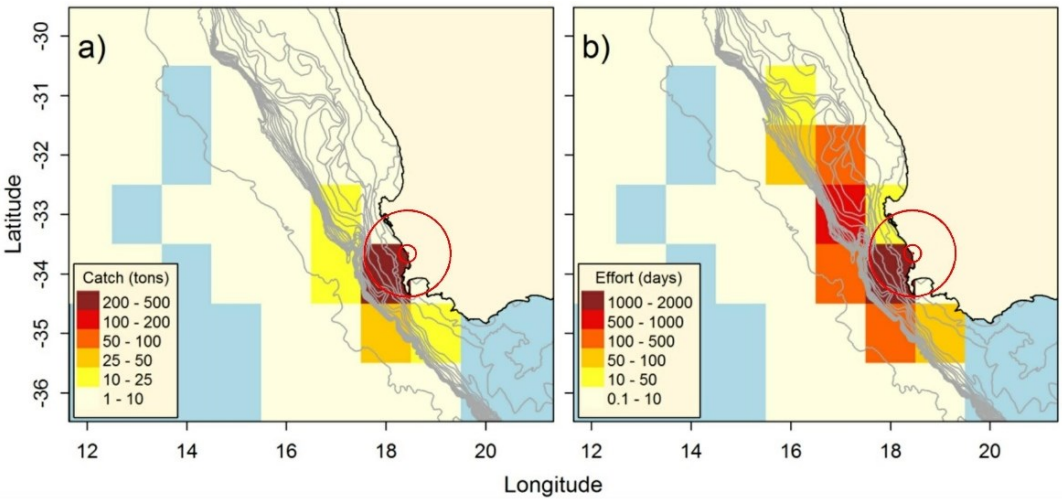

Figure 5.6.39
Mean Annual a) Yellowfin Tuna Catch (t) and b) Tuna Pole Effort (Boat Days) at the 1×1 Degree Reporting Resolution (2003 to 2016) (Parker, et al., 2017)

The tuna pole fishery is a highly targeted fishery with virtually no

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unintentional by-catch (Department of Environment Forestry and Fisheries, 2020a).

Market Destinations

Juvenile albacore in the southeast Atlantic is primarily for export to canning markets. Some yellowfin and bigeye tuna are sold on the sashimi markets in Europe, United Kingdom, United States of America and Japan (Feike, 2021e).

Table 5.6.14
Summary of the Tuna Pole Fishery (Entire Fishery)

Duration of Rights	15 years (2017 – 2033)
Value of Fishery (R) (2017)	R117.6 million
Fish Landed (2017)	Approximately 1 875 t
Number of Jobs Sustained	Not known
Number of Vessels	92
Number of Right Holders (as at 2018)	60
Closed Season (No Fishing)	June to September

iii) Hake Longline

Overview

Hake longline fishing takes place throughout the year along the west and southeast coasts. Most of the fishing vessels are based in Cape Town. Vessels operate in offshore and inshore waters defined by the 110 m depth contour or a distance of 20 nmi from the shore (Nyengera & Angel, 2019). This fishery sector employed a total of 1 495 workers in 2020 (Feike, 2021c).

History and historic Trends of the Fishery

Hake-directed demersal longlining is a relatively new fishery, having started in the early 1990s. The fishery went through a trial experimental period between 1994 to 1996. It was formalised through medium-term rights allocated in 1998. Full rights were allocated in 2004 that were synchronised with the other hake sectors (Norman, et al., 2018).

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As the fishery developed, the grounds fished using longlines expanded to a point where currently there is near complete overlap of the two hake fisheries (Norman, et al., 2018).

Management of the Fishery

In the earlier years of the management of the fishery, area-based separation of hake longline was applied, i.e. splitting of the TAC between East Coast and West Coast and also inshore-offshore separation similar to the inshore and deep-sea trawls. Separate rights are still (2018) allocated for the West Coast and South Coast (Norman, et al., 2018).

Vessels and Gear

The vessels are small and range from 15 to 30 m in length. The fleet targets the two hake species of deep-water hake (*Merluccius paradoxus*) and shallow-water hake (*Merluccius capensis*) (Nyengera & Angel, 2019). The fishery is restricted to 20 000 hooks per set and only utilise bottom set longlines (Department of Environment, Forestry and Fisheries, 2019e).

Fishery Allocation and Catch Data

In 2018, there were 134 rights holders and 40 registered vessels, of which 25 were active. Data on the TAC and hake longline catch for the period 2005 to 2018 are provided under the hake deep-sea trawl section of the report.

The 2006 priority fishing areas in the site region were based on 2000 to 2017 data obtained from DAFF and are as follows (Norman, et al., 2018):

- Area 1: due west of Hondeklip Bay – This is an area known as the Karbonkel.
- Area 2: due west of Saldanha Bay – This is an area known as the Dassen Hole and is part of a feature known as the Cape Canyon.
- Area 3 : an extensive area extending from due west of Cape Town to due south of Danger Point, also referred to as “Browns Bank”.

The hake longline apportionment is less than 10 per cent of the TAC and longline allocation is increasingly being converted to trawl. The fishery nevertheless remains a key part of the hake fishery, mostly because it has many rights holders with relatively small allocations (Norman, et al., 2018).

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Restricted Areas

Restricted areas are present on the west and south coasts. On the West Coast and in the site region in terms of the 2020 fishing season permit conditions:

- Fishing is not permitted in tidal lagoons, tidal rivers and estuaries.
- No fishing is allowed within 5 nmi of the coastline west of 20º E longitude.
- No fishing shall take place within False Bay north of a straight line drawn from the lighthouse at Cape Hangklip to the lighthouse at Cape Point.
- No fishing may take place in an MPA (Department of Environment, Forestry and Fisheries, 2019e).

Market Destinations

The primary target market for the hake longline fishery is for export to the wetfish market (Nyengera & Angel, 2019), with prime quality hake destined for Europe. Hake that is not suitable for the export market, such as smaller frozen and non-prime quality fresh hake, is sold into the domestic wholesale or food service markets. Most fish are sold headed and gutted (Fiandeiro, et al., 2019).

Table 5.6.15
Summary of the Hake Longline Fishery (Entire Fishery)

Duration of Rights	15 years (2006 – 2020)
Value of Fishery (R) (2019)	R2.0 billion (includes hake deep-sea trawl)
Fish Landed (2018)	Approximately 120 000 t (including hake deep-sea trawl)
Number of Jobs Sustained (2020)	1 495
Number of Vessels	40
Number of Right Holders (as at 2018)	134
Closed Season (No Fishing)	None

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iv) West Coast Rock Lobster (Offshore)

Overview

West Coast rock lobster (*Jasus lalandii*, WCRL) occur inshore (shallower than 200 m depth) from just north of Walvis Bay in Namibia (approximately 23º S) to East London (approximately 28º S). Commercial exploitation occurs from about 25º S in Namibia to Danger Point (approximately 35º S). However, recreational fishing extends further eastwards to Mossel Bay (Johnston & Butterworth, 2018).

WCRL are slow growing long-lived animals and inhabit rocky areas and exhibits a seasonal inshore-offshore migration (Johnston & Butterworth, 2018).

The fishery is considered South Africa's most important rock lobster fishery, with 20 per cent of the resource harvested by hoop nets from "bakkies" vessels (5 m to 7 m long and are propelled by single outboard engines of about 10 hp to 15 hp, though oars are still used in places like Elands Bay) in the nearshore area up to 1 nmi offshore and 80 per cent by offshore trap vessels operating in water depths of up to 100 m. The resource in the nearshore region is also harvested by recreational fishers and small-scale fishers operating exclusively in the nearshore region in the summer months (Department of Environment Forestry and Fisheries, 2020a).

The WCRL fishery is South Africa's most valuable crustacean fishery. This is due to the high market value of the resource (more than R 500 million per year) and job provision for more than 4 200 people (Department of Environment Forestry and Fisheries, 2020a).

History and Historic Trends of the Fishery

The fishery dates back to at least 1875 when the first commercial processing plant was established. Two major fishing sectors harvest this resource, the offshore trap vessels operating in waters up to 100 m depth and the inshore sector that utilises hoop nets to harvest WCRL in shallow water up to 1 nmi from the shore (Sink, et al., 2019).

The commercial industry expanded rapidly in the early part of the twentieth century, although catch statistics prior to 1940 are sparse, catches appeared to have peaked in the period 1950 to 1965 when between 13 000 and 16 000 t were landed annually. More efficient lobster traps were introduced in the 1960s (Johnston & Butterworth, 2018).

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From 1946 onwards, annual TACs were set. Until the mid-1960s, catches were directly controlled by these limits. In the 1967 season, catch rates began to decline and catch limits could not be filled. Decreases in the TAC (to between 4 000 and 6 000 t) restored some balance over the period 1970 to 1989, with catch ranging between 3 500 t and 4 000 t (Johnston & Butterworth, 2018), (Department of Environment Forestry and Fisheries, 2020a).

The tail-mass production limit was replaced by a whole lobster (landed mass) limit, and area/zone allocations were introduced in the early 1980s (a TAC for each zone/area). Initially, 10 traditional West Coast fishing areas were delimited in zones A to D. In 1987, a new fishing ground was opened in False Bay (Zone E) and Zone F was opened in 1999 following the eastward migration of lobster to the area east of Cape Hangklip (Department of Environment Forestry and Fisheries, 2020a), as illustrated in ***Figure 5.6.40***.

Other management measures enforced from the early stages of the fishery were size limits, a closed winter season and the prohibition of catches of berried or soft-shelled lobsters, and a daily bag limit for recreational fishers (Johnston & Butterworth, 2018) (Department of Environment Forestry and Fisheries, 2020a). Along with mass stranding/walkouts in the 1990s and 2000s caused by low oxygen events along the West Coast, the targeted resource declined. By 1996, catches had decreased to their lowest levels at 1 500 t, with no marked signs of recovery since (Department of Environment Forestry and Fisheries, 2020a).

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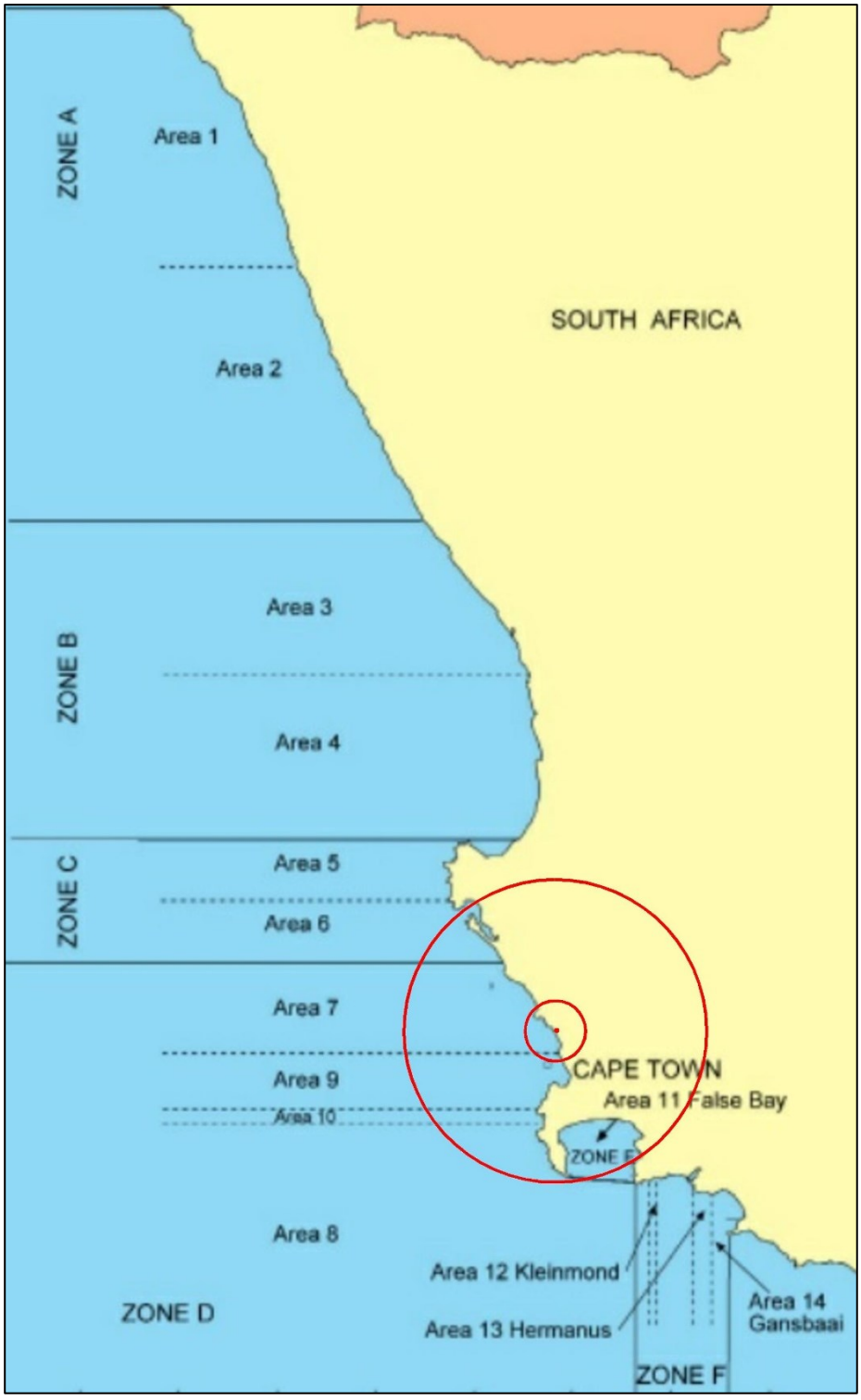

Figure 5.6.40
West Coast Rock Lobster Fishing Zones and Areas

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Management of the Fishery

Since the 1997 season, the TAC has been set annually through the application of an OMP, which provides recommendations for a global TAC and a TAC for each zone (Johnston & Butterworth, 2018).

Since 1997 OMP has been revised four times, in 2000, 2003, 2007 and 2011. In 2013/2014, Exceptional Circumstances arose in Super Area 7 following on a large decline in abundance in that area. This necessitated the development of an interim approach to provide a TAC recommendation for the 2013/2014 fishing season that was consistent with the intent of rebuilding plan inherent in OMP-2011 (35 per cent recovery in male biomass above 75 mm carapace length by 2021). A new OMP (OMP-2015) was developed and adopted to provide the scientific recommendations for TACs for the WCRL resource for 2015/2016 and following three seasons (Department of Environment Forestry and Fisheries, 2020a).

The commercial TAC was 3 206 t for the 2003 season and has been followed by a broadly steady downward trend to 1 924 t for the 2016 and 2017 seasons. The updated assessment in 2016, coupled to a re-evaluation of the magnitude of poaching which indicated a doubling over the three preceding years, saw the resource declining to levels outside the range of the scenarios for which this OMP had been tested. Consequently, under the Exceptional Circumstances provisions of the OMP, TAC recommendations were based instead on “best estimate” projections (Johnston & Butterworth, 2018).

The global TAC for both the 2018 and 2019 seasons was set at 1 084 t (Department of Environment, Forestry and Fisheries, 2019c) (Oceana, 2019).

Status of the Resource

When compared to the assessed biomass of WCRL in the early 19th century, the resource is evidently heavily depleted, both in terms of the harvestable component of the population (smaller than 75 mm carapace length) and spawning biomass (females smaller than 65 mm carapace length). The current harvestable biomass is estimated at 2 to 3 per cent of the pre-exploitation levels. This decline is largely a result of two effects: large unsustainable catches taken particularly during the middle decades of the 20th century and a substantial reduction in the somatic growth rate over the last thirty years.

Uncontrolled and increasing poaching has recently become an important

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factor in the decrease of the resource (Johnston & Butterworth, 2018). Determined trends set out in ***Table 5.6.16*** were determined for use in updated assessments and projections (Brandão, et al., 2018).

Table 5.6.16
Current Illegal Fishing Estimates of WCRL in t applied in the OMP

Year	Base Case	Sensitivity 1	Sensitivity 2
1950	0	0	0
1985	348	516	271
1990	402	601	312
2000	556	785	432
2008	568	826	527
2012	900	900	700
2014	1350	1050	1050
2015	1546	1115	1202
2017+	1521	1107	1183

The WCRL stock is currently considered collapsed and in crisis with escalated levels of poaching. Declines in WCRL can be attributed to a combination of factors including changes in fishing methods, spatial shifts in distribution, changes in management measures, reduced growth rates and over exploitation (Sink, et al., 2019).

Results from an updated assessment conducted in 2018 indicate that similar to 2016, the Exceptional Circumstances provisions of the OMP-2015 still apply as the super-area 8+, in particular, remains at a much lower level than anticipated at the time that the OMP was adopted (Department of Environment Forestry and Fisheries, 2020a).

Vessels and Gear

Right holders in the WCRL (offshore) fishery use larger, more sophisticated vessels with larger crews. Traps can be shaped as tubes or boxes that are set out and left to soak for a period of time (Sink, et al., 2019).

Fishery Allocation and Catch Data

Exploitation of WCRL is divided between the WCRL (Offshore) fishery

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and a separate fishery for the nearshore area (the WCRL (Nearshore) fishery). Based on the prevalence and location of the resource, 80 per cent of the TAC is allocated to the WCRL (offshore) fishery and 20 per cent to the WCRL (nearshore) fishery. *Figure 5.6.41* illustrates the Global TAC versus the TAC allocation to the WCRL (offshore) fishery for the period 2004 to 2019 (Planning Partners, 2021a).

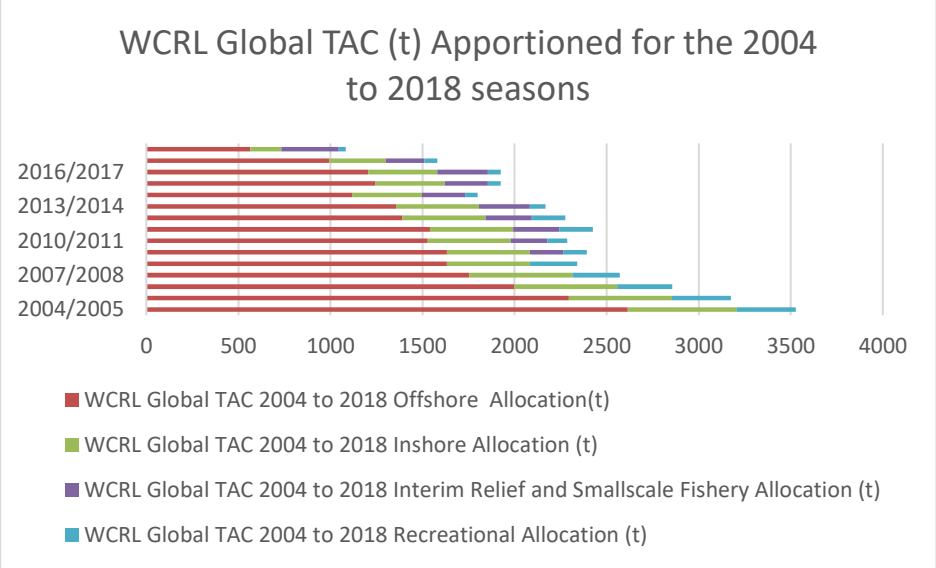

Figure 5.6.41
WCRL Global TAC and Allocation to the Offshore WCRL Fishery in relation to other WCRL Fisheries

In 2019, the DFFE determined a global TAC of 1 084 t to the WCRL fishery of which 536.91 t was allocated to commercial WCRL (offshore) fishery and 180.83 t to the small-scale WCRL (offshore) fishery for the 2019/2020 fishery season (Department of Environment, Forestry and Fisheries, 2019c).

An assessment of the annual average effort conducted for the purpose of the 2018 National Biodiversity Assessment is illustrated in ***Figure 5.6.42*** (Sink, et al., 2019).

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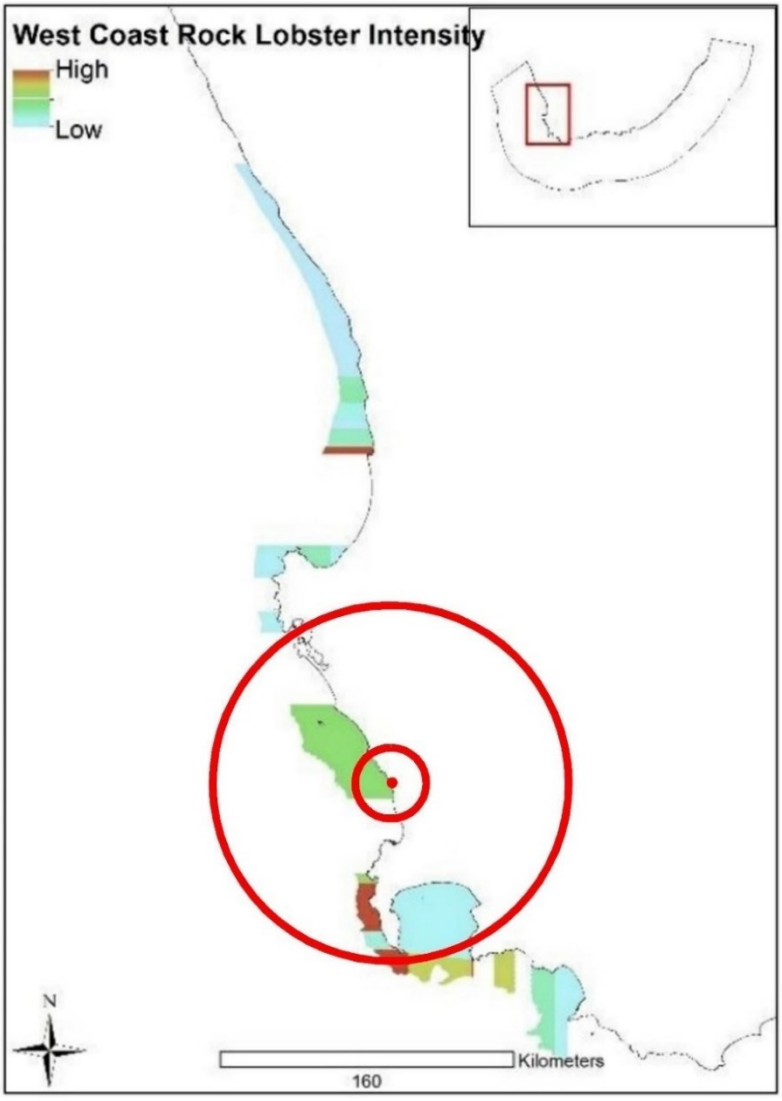

Figure 5.6.42
National Biodiversity Assessment 2018: WCRL Average Annual Effort after Sink et al (2019)

Fishing rights were granted for the maximum period of 15 years from 2017 to 2033 to 210 rights holders (Department of Agriculture, Forestry and Fisheries, 2018).

The commercial and small-scale fishing sectors are authorised to undertake fishing for four months in each super area/zone. The start and end dates for the fishing season per sector and super area/zone in the site region are as follows:

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- Super Area 5 and 6: no offshore fishery for WCRL;
- Super Area 7: December to March;
- Areas 8 and 11: January to May;
- Area 8 (Deep-sea): June and July (Department of Environment, Forestry and Fisheries, 2019c).

Restricted Areas

The fishery is not permitted to operate in an MPA and a permit holder may only fish in the area and for the period noted on the permit (Department of Environment, Forestry and Fisheries, 2019c).

Market Destinations

Some 95 per cent of WCRL catch is exported, of these 90 per cent is exported live to markets in China and Japan and 5 per cent is exported frozen to China, Japan and the United States (FishSA, 2019). It is assumed the remainder is destined for the domestic market. These figures do not include illegal, unregulated and unreported fishing (Planning Partners, 2021b).

Table 5.6.17
Summary of the WCRL Fishery (Entire Fishery)

Duration of Rights	15 years (2017 – 2033)
Value of Fishery (R) (2017)	R500 million (WCRL fishery as a whole)
Fish Landed (2018)	871 t
Number of Jobs Sustained	4 200 (WCRL fishery as a whole)
Number of Vessels	60
Number of Right Holders (as at 2018)	210
Closed Season (No Fishing)	Super Area 7: April to November: Super Areas 8 and 11: June to December; Super Area 8: August to May.

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d) Nearshore Fisheries
i) Seaweed

Overview

The South African seaweed industry is based on the commercial collection of kelps and red seaweed (*Gelidium*) and small quantities of other seaweed species. Commercial exploited seaweeds occur between the Orange and Mtamvuna rivers. On the West Coast, the industry is based on the collection of beach-cast kelps and the harvesting of fresh kelps (Department of Environment Forestry and Fisheries, 2020a).

The sector is small compared to other fishery sectors, and is estimated to be worth at least R40 million annually (Department of Environment Forestry and Fisheries, 2020a).

In 2015, the seaweed sector employed over 1 700 people (of whom approximately 313 are permanent whilst approximately 1 450 are employed seasonally) (Department of Agriculture, Forestry and Fisheries, 2015a).

History and Historic Trends of the Fishery

Since at least 1953, beach-cast kelp of both *Ecklonia maxima* and *Laminaria pallida* have been harvested at quantities that have been determined by market demand. By 1977, a maximum harvest of approximately 5 000 t (dry weight) was reached. Since then, an annual average of 1 312 t dry weight have been collected. South African yields were lower between 1993 and 1995 as a consequence of strong international competition from Chinese alginate producers (Department of Agriculture, Forestry and Fisheries, 2015a).

The recent growth of the abalone farming industry has increased the demand for freshly harvested kelp. Some 5 000 t of fresh kelp fronds, with a market value of R 6 million, is supplied annually to abalone farmers located in two main nodes at Cape Columbine just north of the site region and at Hermanus and Danger Point (Department of Agriculture, Forestry and Fisheries, 2015a) (Department of Environment Forestry and Fisheries, 2020a).

Management of the Fishery

The coastline between the Orange and Mtambuva rivers is divided into 23 seaweed rights areas (see ***Figure 5.6.43)***. Rights allocations within an area are allocated per seaweed group and only one per seaweed

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group is allocated in any one area (Department of Environment Forestry and Fisheries, 2020a).

Management of most seaweeds is based on TAE, while harvesting of fresh kelp is managed annual Maximum Sustainable Yield, set in annual permit conditions. The commercial season for permits and reporting of seaweed harvests is from 1 April of year 1 to 31 March of year 2 (Department of Environment Forestry and Fisheries, 2020a).

Status of the Resource

Exploitation levels are controlled by limiting effort to only one commercial operator per concession area and through the monitoring of yields. Amounts of beach-cast kelp are not monitored for practical reasons due to the length of the coastline (Department of Agriculture Forestry and Fisheries, 2016c), (Department of Environment Forestry and Fisheries, 2020a).

There are currently no stock status concerns for kelps or other seaweeds as these resources are considered to be under-exploited (non-kelps) or optimal (kelps) and the fishery pressure being light to optimal (Department of Agriculture Forestry and Fisheries, 2016c).

Fishery Allocation

In 2018 kelp rights were held in 13 seaweed areas. The fishing rights register dated July 2018, there are 15 kelp fishery rights, most of which are valid from 1 February 2017 to 29 February 2032, within the fishery as a whole.

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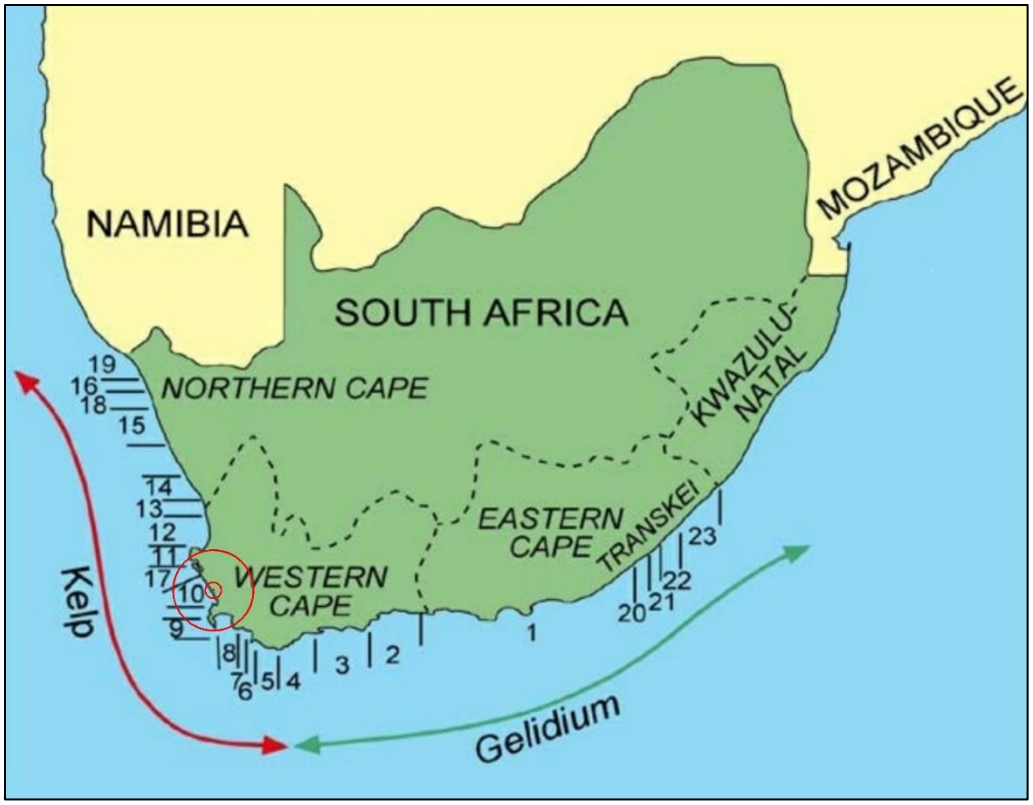

Figure 5.6.43
Seaweed Concession Areas on the South African Coastline

Allocations to concession areas within or close to the site region stipulated in the Seaweed Fishery Policy: 2015 (Department of Agriculture, Forestry and Fisheries, 2015a) are the following and illustrated on ***Figure 5.6.43***:

- Area 8 (Kelp Right):
    - boundaries of concession area: western bank of the Bot River estuary mouth (34º22'00"S 19º06'00"E) to Swartklip (34º04'29"S 18º41'12"E);
    - exclusion zones located outside of the site region - No kelp harvesting is permitted in the Betty's Bay Marine Reserve, i.e. from Stony Point (34º22'28"S 18º53'45"E) to Beacon B4 on the eastern side of Jock Se Baai (Dawidskraal) (34º21'24"S 18º56'17"E).

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- functional group/genus/species: kelp (*Ecklonia maxima* and *Laminaria pallida*);
- harvesting/collecting method:
  - beach-cast kelp - All or any parts *of* beach-cast plants may be collected by hand.
  - harvesting of live (fresh) kelp: by hand, using a knife or sickle, using a diver or from a boat or the shore – No kelp plants with a stipe less than 50 cm long may be cut or damaged.
- maximum yield:
  - beach-cast kelp: no limit;
  - kelp fronds: as specified in annual permit;
- the 2014/2015 TAC allocated a maximum of:
  - 1 024 t fresh weight of kelp fronds; or
  - a maximum of 2 048 t of whole kelp (fronds plus stipes);

- Area 8 (Ulva/Porphyra Right):
  - boundaries of concession area: western bank of the bank of the Bot River estuary mouth (34º22'00"S 19º06'00"E) to Swartklip (34º04'29"S 18º41'12"E);
  - exclusion zones located outside of the site region - No kelp harvesting is permitted in the Betty's Bay Marine Reserve, i.e. from Stony Point (34º22'28"S 18º53'45"E) to Beacon B4 on the eastern side of Jock se Baai (Dawidskraal) (34º21'24"S 18º56'17"E).
  - functional group/species: Ulva species, Porphyra species;
  - harvesting/collecting method - Picking by hand, with a likely harvest of 1 to 2 t per annum of each genus are possible.
- Area 9 (Kelp Right):
  - boundaries of concession area: from Simonstown municipal

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border at Rocklands (34º13'00"S 18º28'00"E) to Klein Koeëlbaai near Bakoven (33º57'38"S 18º22'20"E);

- permitted harvesting zone - Kelp harvesting is permitted in the Soetwater/Kommetjie area.
- functional group/genus/species: kelp (*Ecklonia maxima* and *Laminaria pallida*);
- harvesting/collecting method:
  - beach-cast kelp - All or any parts of beach-cast plants may be collected by hand.
  - harvesting of live (fresh) kelp: by hand, using a knife or sickle, using a diver or from a boat or the shore – No kelp plants with a stipe less than 50 cm long may be cut or damaged;
- maximum yield from Soetwater area:
  - beach-cast kelp: no limit;
  - kelp fronds: as specified in annual permit;
- the 2014/2015 TAC allocated a maximum of:
  - 1 030 t fresh weight of kelp fronds;
  - 060 t of whole kelp(fronds plus stipes);

- Area 9 (Ulva/Porphyra Right):
  - boundaries of concession area: from Simonstown municipal border at Rocklands (34º13'00"S 18º28'00"E) to Klein Koeëlbaai near Bakoven (33º57'38"S 18º22'20"E), excluding MPAs;
  - functional group/species: Ulva species and Porphyra species;
  - harvesting/collecting method: picking by hand;
  - maximum yield as specified in annual permit, with likely harvests of 1 to 2 t per annum of each genus are possible – The bulk of this area is located within MPAs.

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- Area 10 (Kelp Right):
    - boundaries of concession Area: CCC boundary south of Blouberg (33º48'48"S 18º28'00"E) to South Head, Saldanha (33º06'18"S 17º57'18"E);
    - harvesting exclusion zone - No kelp harvesting is permitted in the following areas: South Head (33º06'18"S 17º57'18"E) to Black Rock (33º09'44"S 18º01'20"E), off Dassen Island and off Robben Island.
    - functional group/genus/species: kelp (*Ecklonia maxima* and *Laminaria pallida*);
    - harvesting/collecting method:
        - beach-cast kelp - All or any parts of beach-cast plants may be collected by hand.
        - harvesting of live (fresh) kelp: by hand, using a knife or sickle, using a diver or from a boat or the shore - No kelp plants with a stipe less than 50 cm long may be cut or harmed.
    - maximum yield:
        - beach-cast kelp: no limit;
        - kelp fronds: as specified in annual permit;
    - the 2014/2015 TAC allocated a maximum of:
        - 94 t fresh weight of kelp fronds;
        - 188 t of whole kelp (fronds plus stipes);
- Area 10 (Ulva/Porphyra Right):
    - boundaries of concession area: CCC boundary south of Blouberg (33º48'48"S 18º28'00"E) to South Head, Saldanha (33º06'18"S 17º57'18"E);
    - harvesting exclusion zone: no harvesting is permitted in the following areas: South Head (33º06'18"S 17º57'18"E) to Black Rock (33º09'44"S 18º01'20"E), off Dassen Island and Robben

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Island;

- functional group/species: Ulva species and Porphyra species;
- harvesting/collecting method: picking by hand;
- maximum yield as specified in annual permit, with likely harvests of 1 to 2 t per annum of each genus possible.

Figure 5.6.44 illustrates the annual yields of commercial seaweed for the period 2008 to 2018 (Department of Environment Forestry and Fisheries, 2020a).

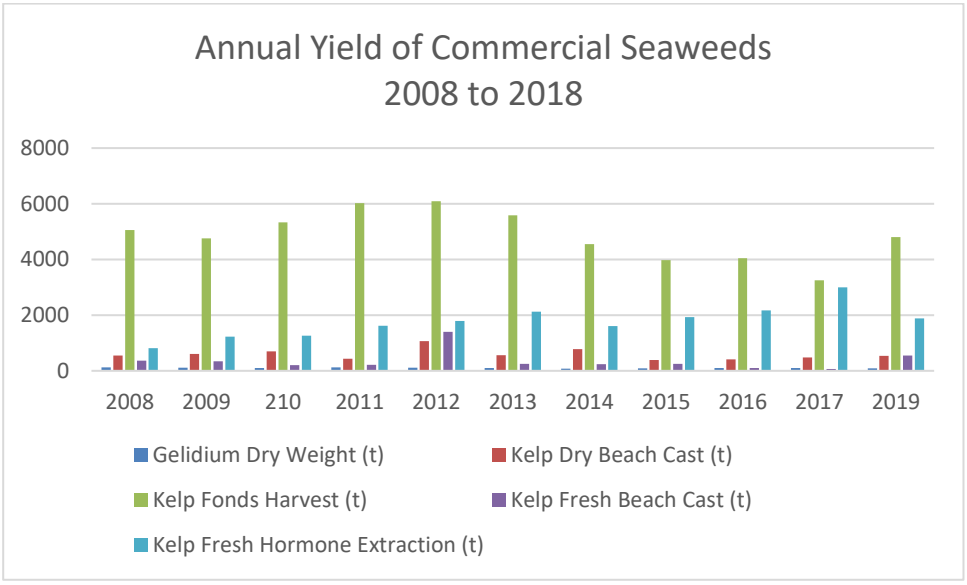

Figure 5.6.44
Annual Commercial Seaweed Yield in t (2008 to 2018)

Figure 5.6.45 illustrates the relative kelp harvesting for *Ecklonia maxima* displayed in kg per km² for the period 2000 to 2017 relative to the site region. Fresh kelp frond harvests have ranged between 3 to 6 t per year, with 0.4 to 1.8 t of dry kelp being harvested (Sink, et al., 2019).

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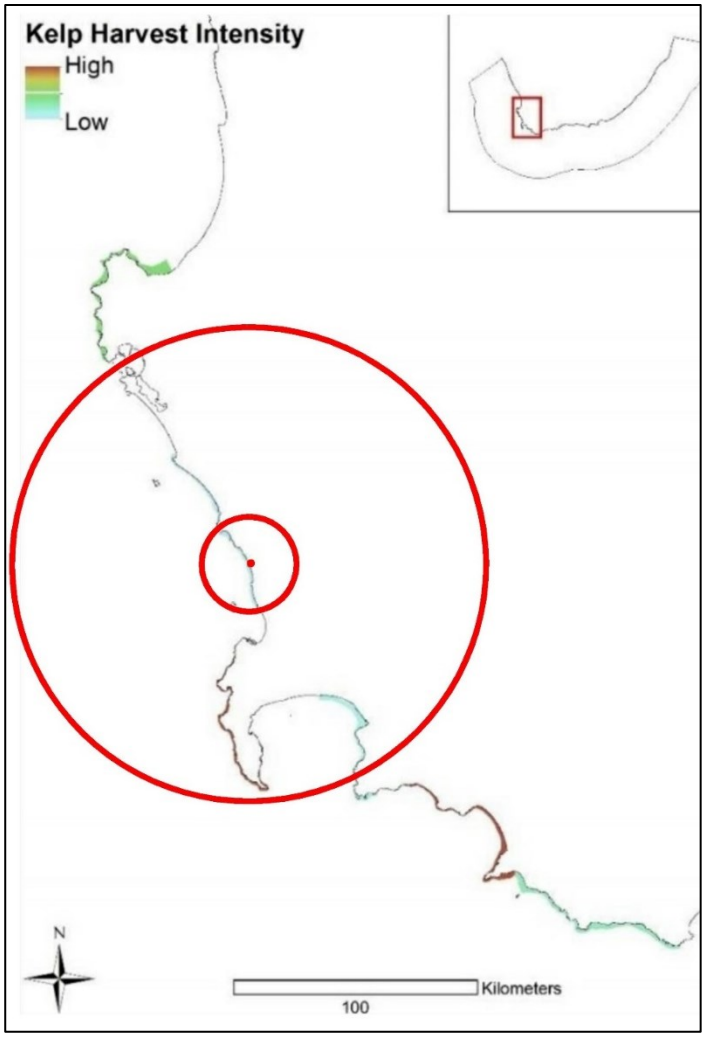

Figure 5.6.45
Kelp Harvesting of Ecklonia maxima displayed as the Kilograms per Square Kilometre for the Period 2000 to 2017

Market Destinations

Beach-cast kelp is sundried, milled and exported mainly for the extraction of alginate. No commercial extraction occurs in South Africa due to strong international competition. Recently, powdered kelp has been exported to Japan for use in formulated fish-feed. Fresh kelp is also harvested in relatively small quantities for the production of a liquid plant-growth stimulant (Kelpak) from *Ecklonia maxima*. A similar local product has also been marketed (Liquikelp) (Department of Agriculture, Forestry and Fisheries, 2015a). In 2020 DFFE reported that in Area 6 and 9, the

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production of plant-growth stimulant by Kelpak and Afrikelp use a combined 1 887 t of fresh kelp in 2018 (Department of Environment Forestry and Fisheries, 2020a).

The growth in abalone farming has led to an increase in demand for fresh kelp as feed. In 2014, a total of 4 800 t of fresh kelp fronds was supplied to farmers. In 2016, the demand for kelp as feed was centred around two abalone farming nodes, i.e. Cape Columbine and between Hermanus and Danger Point, both of which are located outside of the site region (Department of Agriculture Forestry and Fisheries, 2016c). Since the reassignment of concession Areas 5, 8 15 and 16 to the small-scale fisheries sector in 2016, no kelp harvesting has been undertaken in these areas. This has impacted on the nearby abalone farms, which have had to rely on artificial feed for their abalone (Department of Environment Forestry and Fisheries, 2020a).

Table 5.6.18
Summary of the Seaweed Fishery

Duration of Rights	15 years (2017 – 2032)
Value of Fishery (R) (2017)	R40 million
Volumes harvested (2018)	3.4 to 7.8 t
Number of Jobs Sustained	1 700
Number of Vessels	N/A
Number of Right Holders (as at 2018)	15
Closed Season (No Fishing)	None

ii) Hake Handline

The hake handline fishery is restricted to east of the 20°E line of longitude (Durholtz, 2019) and therefore does not occur in the site region.

iii) West Coast Rock Lobster (Nearshore)

Both the commercial and small-scale fishery sectors are active in the WCRL nearshore fishery (Department of Environment, Forestry and Fisheries, 2019c).

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History and Historic Trends of the Fishery

Commercial harvesting of WCRL started in the late 1800s, with yields peaking in the early 1950s at 18 000 t. At the time, the resource was predominantly caught with hoopnets, until 1965 when motorised deck boats and more efficient traps were introduced (Department of Agriculture Forestry and Fisheries, 2016c).

Thereafter, the nearshore resource was exploited by subsistence and recreational fishers. In 2001, a nearshore commercial sector (or limited commercial fishery) was established. By the end of 2003, the then DAFF had allocated commercial rock lobster fishing rights to more than 785 former subsistence fishers. The commercialisation of these fisheries has permitted fishers to sell and market their products (Department of Agriculture, Forestry and Fisheries, 2015c).

Vessels and Gear

Currently, the inshore commercial sector may only use hoopnets and may not move between management areas (Johnston & Butterworth, 2018), which are illustrated in ***Figure 5.6.40*** above.

Fishery Allocation and Catch Data

Based on the prevalence and location of the resource, 20 per cent of the annual TAC is allocated to the WCRL (nearshore) fishery (Department of Agriculture, Forestry and Fisheries, 2015c).

Under the TAC management system, annual catch limits were allocated to ten traditional West Coast fishing areas (Zones A to D). In 1987, a new fishing ground was introduced in False Bay (Zone E). In 1999, following on the eastward migration of the WCRL to the area east of Cape Hangklip, Zone F was opened and there are now 14 WCRL areas (Department of Agriculture Forestry and Fisheries, 2016c).

Zones C, D and E are located in the site region. Within these zones, management areas 6 to 11 are located in the site region (Department of Agriculture Forestry and Fisheries, 2016c).

During the 2005/2006 Long-Term Fishing Rights Allocation and Management Process (LTRAMP), the DFFE allocated 1 062 commercial WCRL fishing rights. Of these, 825 were granted in the WCRL(nearshore) fishery (Department of Agriculture, Forestry and Fisheries, 2015c).

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Following on FRAP 2015, the DFFE allocated 409 long-term fishery rights valid for a period of 15 years, from 1 October 2017 to 30 September 2033 (Department of Agriculture, Forestry and Fisheries, 2018).

The TAC allocation for 2019/20 to the commercial WCRL nearshore fishery was 170.25 t and a combined 170.25 t for the small-scale WCRL nearshore and subsistence fisheries (interim relief measure) (Department of Environment, Forestry and Fisheries, 2019c).

Figure 5.6.46 provides a summary of the annual WCRL nearshore TAC allocation relative to the TAC allocations in the WCRL fisheries from the 2004/2005 season to 2018/2019 season (Department of Agriculture Forestry and Fisheries, 2016c) (Johnston & Butterworth, 2019a) (Johnston & Butterworth, 2018).

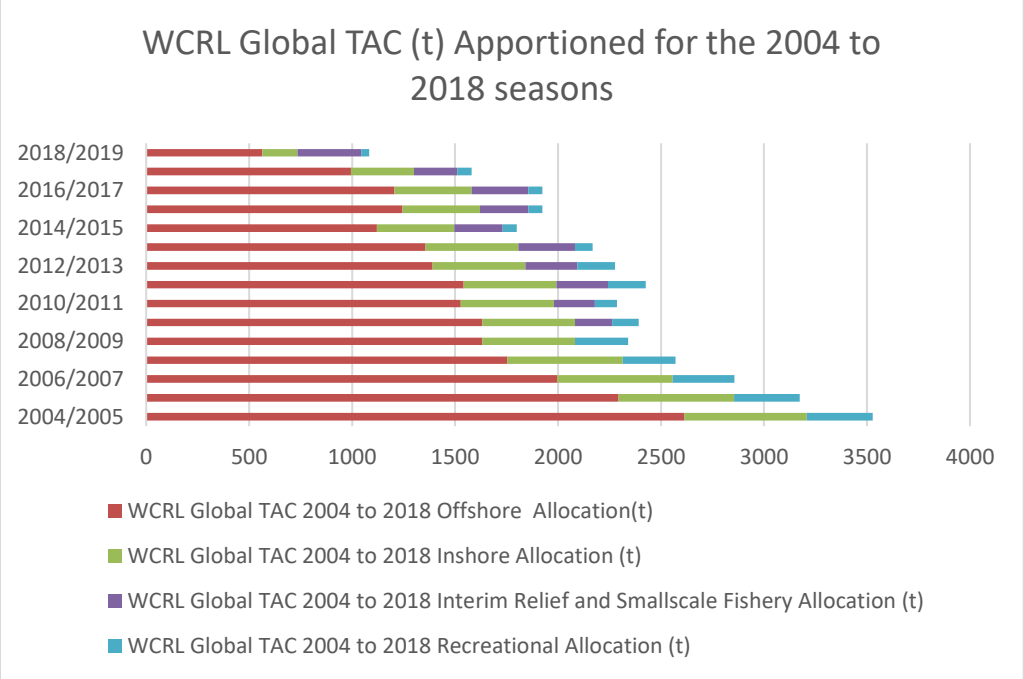

Figure 5.6.46
WCRL Nearshore TAC relative to the TAC Allocations in the WCRL Fishery

Data obtained from DFFE in 2020 for the total WCRL nearshore landings and recorded landings in the site region are illustrated in ***Figure 5.6.47***. The data show that on average the proportion of the catch in the site region amounts to c. 50 per cent or less of the total catch and that total catches within the WCRL nearshore fishery has consistently been below

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the annual TAC allocation for the period 2008 to 2018 (Department of Environment, Forestry and Fisheries, 2020e).

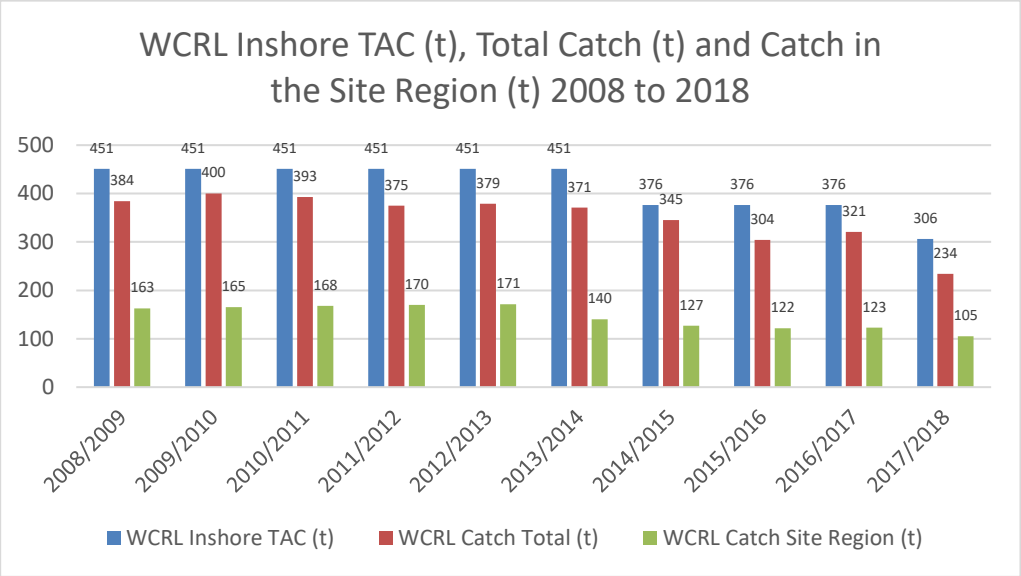

Figure 5.6.47
WCRL Nearshore TAC (t), Total Catch (t) and Catch in the Site Region (t) 2008 to 2018

The commercial nearshore and Interim Relief/Small-scale: Nearshore are authorised to undertake fishing for four months in each Super-area/Zone in the site region, as follows (Department of Environment, Forestry and Fisheries, 2019c):

- Super Area 5 and 6: 15 November to 15 March;
- Areas 8 and 11: 15 November to 15 March.

As such, although the WCRL nearshore fishery is active in the site region, the fishery is not permitted to operate in the site vicinity.

Market Destinations

Target markets are discussed under the WCRL (offshore) subsection.

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Table 5.6.19
Summary of the WCRL (Offshore) Fishery (Entire Fishery)

Duration of Rights	15 years (2017 – 2033)
Value of Fishery (R) (2018)	R500 million (WCRL fishery as a whole)
Fish Landed (2018)	234 t
Number of Jobs Sustained	4 200 (WCRL fishery as a whole)
Number of Vessels	Unknown
Number of Right Holders (as at 2018)	825
Closed Season (No Fishing)	Super Areas 5, 6, 8 and 11: 16 March to 14 November

iv) West Coast White Mussel

Overview

White mussels (*Donax serra*) occur between Namibia and the Eastern Cape. They inhabit the intertidal zone of sandy beaches and their abundance is highest along the West Coast on account of the higher plankton production associated with upwelling of the Benguela Current, when compared with the rest of the South African coast (Department of Environment Forestry and Fisheries, 2020a) (Department of Agriculture, Forestry and Fisheries, 2013).

The zonal distribution of the white mussel changes with the tidal cycle. On the West Coast, juveniles are found high up on the beach and adults are distributed around and below the mean spring low tide mark (Department of Agriculture, Forestry and Fisheries, 2013).

History and Historic Trends of the Fishery

The fishery for white mussels started in the late 1960s as part of a generalised commercial bait fishery. In 1966, the white mussel resources was heavily impacted on by red tide that caused a significant rate of mortality of white mussels. The recovery of the resource took more than 10 years. The total number of white mussels harvested per year has declined since the 1980s, largely as a result of the sector's lack of economic viability (Department of Agriculture, Forestry and Fisheries,

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2013). The fishery was suspended in 1988 when bait rights were revoked (Department of Agriculture Forestry and Fisheries, 2016c).

Following stock assessments conducted during 1988/1989, the fishery was re-introduced as a commercial bait fishery and limited to seven white mussel harvesting areas along the West Coast (Department of Environment Forestry and Fisheries, 2020a) as illustrated in ***Figure 5.6.48***.

Area 1 from the northern border of the KPNS to Bok Point and Area 2 at Yzerfontein, from north of Rietduin to the southern border of the Sixteen Mile MPA, are located in the site region. The remaining areas are located further north along the West Coast.

Management of the Fishery

Since 2007, the commercial white mussel sector has been managed through a TAE. Long-term fishery rights were allocated and limited to one rights holder per area (seven areas) with a maximum if seven pickers each. From 2005 to 2013, 7 rights holders and 49 pickers operated in the fishery (Department of Agriculture, Forestry and Fisheries, 2013). Following on FRAP 2013 and the conclusion of an appeal process 26 commercial rights were confirmed with a validity period from 2015 to 2020 (Department of Environment Forestry and Fisheries, 2020a).

Further, in terms of the interim relief sector launched in 2007, 1 995 interim relief permits were issued for the Western Cape and Northern Cape in the 2013/2014 season. These permits limit the harvest to 50 mussels per person per day, the same limit that applies in the recreational sector (Department of Environment Forestry and Fisheries, 2020a).

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Figure 5.6.48
Areas allocated for the Commercial Harvesting of White Mussel along the West Coast

Status of the Resource

Surveys conducted in the 1990s showed that commercial catches

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amounted to 1 per cent of standing biomass in the relevant areas and the resource was therefore under-exploited (Department of Environment Forestry and Fisheries, 2020a).

A comprehensive assessment of the stock had not been conducted. In 2016, DFFE acknowledged that comprehensive fishery independent surveys would be required in each of the areas to obtain sufficient data for a meaningful assessment. DFFE estimated that 3 to 5 years would be required to complete these surveys (Department of Agriculture Forestry and Fisheries, 2016c). The assessment status has remained unchanged, as reported by DFFE in 2020 (Department of Environment Forestry and Fisheries, 2020a).

At the time of the most recent National Biodiversity Assessment in 2018, the status of the resource was still recorded as uncertain on this basis (Planning Partners, 2021a).

Vessels and Gear

White mussel are collected by hand. The fishery is a marginal, small-scale fishery that does not require any harvesting gear (Department of Agriculture, Forestry and Fisheries, 2015d).

TAE and Catch Data

In terms of FRAP 2013, white mussel fishery rights were valid until 31 December 2020. The 2018 fishery rights register records 25 rights holders in the fishery (Department of Agriculture, Forestry and Fisheries, 2018), while the Ministers Appeal decision recorded 26 rights holders.

The following rights have been allocated to Zones 1 and 2 in the site region:

- Zone 1 at Bokpunt: A total of six rights. Each right holder in this zone will be required to harvest his/her own mussels and will not be permitted to employ pickers;
- Zone 2 at Yzerfontein: A total of one right who will be permitted to employ a maximum of six pickers to assist in the harvesting of mussels (Department of Agriculture, Forestry and Fisheries, 2015d).

Figure 5.6.49 illustrates the historic catch data from 1966 to 2018. It is evident that catch data decreased steadily to the 1990s and remained low under the fishery management through TAC. With the lifting of the commercial upper catch limit and the introduction of a TAE fisheries management approach in 2007, there has been a significant increase in

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the number of white mussels harvested annually, from approximately 200 000 in 2006 to almost 1 400 000 in 2009, and with a reduction to between 800 000 and 900 000 in 2013 and 2014 (Department of Agriculture Forestry and Fisheries, 2016c), whereafter numbers collected have increased to more than 1 000 000 per year.

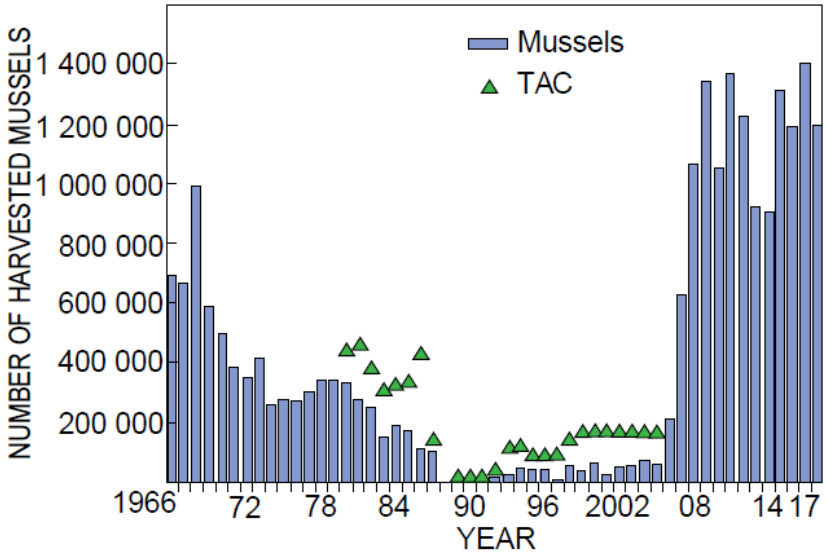

Figure 5.6.49
White Mussel TAC and Yield in Numbers 1966 to 2018

Increases after 2006 are attributed to the lifting of the commercial upper catch limit. CPUE is calculated from 2006 onwards. Data for 2006 and 2007 were still not that accurate and person-hours were probably still under-reported. From 2008 onwards, the CPUE has remained relatively stable at between 300 and 500 mussels per hour harvested as illustrated in ***Figure 5.6.50*** (Department of Environment Forestry and Fisheries, 2020a).

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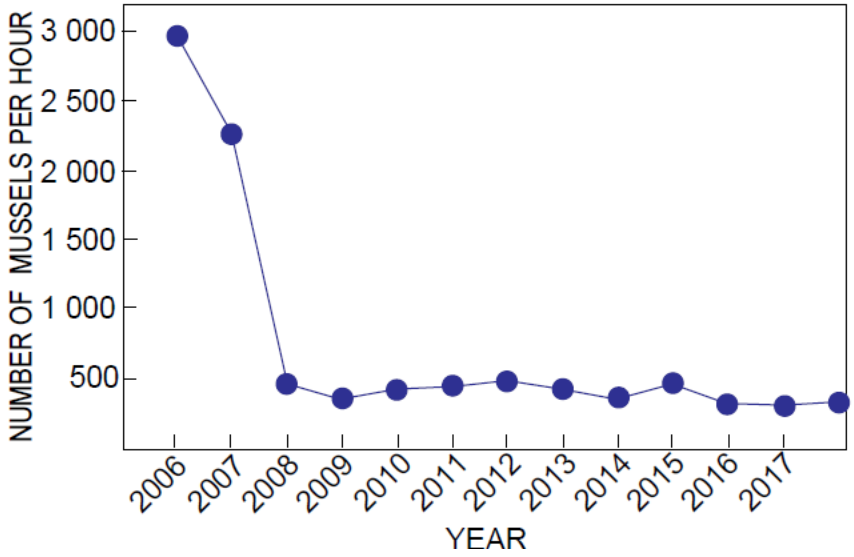

Figure 5.6.50
White Mussel CPUE data calculated from commercial mussel catch data 2006 to 2018

Market Destinations

The white mussel is usually used for bait, but is also a food source.

Future of the Fishery

Currently, DFFE plans to reclassify the white mussel, oyster and hake handline fishing sectors as small-scale fishing sector species. DFFE indicated in 2020 that no commercial fishing rights will therefore be allocated to these three fishing sectors, which includes the white mussel fishery during the FRAP proposed for 2020.

The current rights holders who hold rights in the white mussel fishery were allowed to continue harvesting their allocations until expiry of their rights on 31 December 2020. They can also choose to operate in the small-scale fisheries sector as members of small-scale fishing cooperatives. The proposed classification of the white mussel, oyster and hake handline fishing sectors as small-scale fishing species was proposed to come into effect on 1 January 2021 unless affected stakeholders are informed otherwise (Department of Agriculture, Forestry and Fisheries, 2019d). To date, that has not happened.

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Table 5.6.20
Summary of the West Coast White Mussel Fishery (Entire Fishery)

Duration of Rights	5 years (2015 – 2020)
Value of Fishery (R) (2018)	Not known
Fish Landed (2018)	1 000 000 white mussel
Number of Jobs Sustained	49 pickers
Number of Vessels	N/A
Number of Right Holders (as at 2018)	26
Closed Season (No Fishing)	None

v) Abalone

Overview

Abalone (*Haliotis midae*), locally known as "perlemoen" is widely distributed around the South African coastline from St. Helena Bay on the West Coast to Port St. Johns on the East Coast. It occurs in shallow waters of less than 20 m in depth, but are most abundant in waters of less than 5 m in depth. Abalone reaches sexual maturity at around 7 years of age and is believed to live to an age of 30 years or more (Department of Environment Forestry and Fisheries, 2020a).

The fishery is a high-value fishery and under significant pressure from over-allocation of TAC, as well as illegal fishing and trade. The abalone resource has also been heavily affected by an ecosystem shift through the migration of the WCRL, that has migrated eastward and into two of the main and most productive abalone fishery areas, i.e. Commercial Zones C and D (Department of Agriculture Forestry and Fisheries, 2016c) (Department of Environment Forestry and Fisheries, 2020a).

The legal abalone fishery is highly regulated. The current legal catch size is 114 mm shell width (Department of Agriculture, Forestry and Fisheries, 2019a).

Notwithstanding, there is a significant illegal fishery that developed into a highly complex and sophisticated criminal network of individuals, gangs and syndicates since the mid-1990s, directed at delivering South African

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abalone to key market destinations, in particular to East Asia (De Greef, 2014). In 2018 it was estimated that there had been a 47 per cent increase in illegal catch levels compared to 2017 (Department of Environment Forestry and Fisheries, 2020a).

History, Historic Trends and Management of the Fishery

Historically, the resource was most abundant in the region between Cape Columbine and Quoin Point and supported the fishery for about 65 years. In the past, the resource was also targeted by the recreational fishery. It is currently characterised by unsustainable illegal harvesting (Department of Agriculture Forestry and Fisheries, 2016c).

The commercial (diver) fishery for abalone commenced in the late 1940s. In the early phase, the fishery was unregulated and catch peaked at 3 000 t in 1965. By 1970, a marked decline in catch was evident. The fishery remained stable until the mid-1990s, with a recorded annual catch of between 600 and 700 t. The fishery was dominated by 5 abalone rights holders with 52 divers (Department of Agriculture Forestry and Fisheries, 2016c) (Department of Environment Forestry and Fisheries, 2020a).

A significant increase in the recreational abalone fishery, coupled with high levels of illegal fishing in the 1990s and early 2000s, led to a rapid decline in the resource and the permanent closure of the recreational fishery in 2003/2004.

Transformation of the abalone fishery began in 1998 when 236 traditional abalone fishers were allocated fishing rights. The inclusion of subsistence fishers into the commercial fishery proved difficult to manage and in 2001 the system was replaced by a system of limited commercial rights (De Greef, 2014). In 2003/2004, 10-year long-term rights were allocated to some 300 rights holders. At the same time, Territorial Use Rights in Fisheries were introduced. ***Figure 5.6.51*** illustrates these use rights areas relative to the site region (Department of Environment Forestry and Fisheries, 2020a). Zones D3, E, F (located around Robben Island) and G are located in the site region.

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Figure 5.6.51
Abalone Territorial Use Rights Zones in the Site Region

Illegal fishing however remained high, with large numbers of undersized specimens being harvested. The commercial fishery was consequently closed in 2008 (Department of Environment Forestry and Fisheries, 2020a) and reopened in July 2010 with a TAC allocation of 150 t for the 2009/2010 and 2010/2011 seasons.

The long-term rights that were allocated in 2003/2004 expired in July 2014 and exemptions from Section 18 of the Marine Living Resources Act were granted to abalone right-holders until February 2016. The TAC was reduced to 96 t in the 2013/2014 season and has been maintained at that level up to the 2018/2019 season.

A reduced TAC of 50.5 t was first published for the 2018/2019 season (Department of Agriculture Forestry and Fisheries, 2016c) (Department of Environment Forestry and Fisheries, 2020a). Following appeals from rights holders, the initial TAC was reviewed and ultimately set at 96 t (Department of Agriculture, Forestry and Fisheries, 2019b).

The abalone fishing season is from 1 November to 31 July. In each fishing season, the right holders will be given a certain TAC. The abalone

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fishery is primarily a day fishery and only permitted on weekdays (vessel launching and landing occur between 08h00 and 15h00 and in summer launching can be done an hour earlier).

Launching occurs from designated launching sites of which the Cape Town (Oceana Power Boat Club) slipway, Hout Bay Harbour, Kommetjie slipway and Miller's Point are located within the site region (Department of Agriculture, Forestry and Fisheries, 2015e).

Status of the Resource

The fishery reopened in 2010, conditional on a 15 per cent per annum reduction in poaching and based on a management objective for the sustainable utilisation and recovery of the abalone resource. This measure was to prevent the abalone spawning biomass in each zone from dropping below 20 per cent of its estimated pre-fished biomass and to see it recover to 40 per cent of that level within 15 years of the re-opening of the commercial fishery in 2009/2010, i.e. by the 2024/2025 season (Department of Environment Forestry and Fisheries, 2020a).

The required reduction in illegal harvesting was not achieved and estimates in 2016 indicated that poaching was roughly five times higher.

As reported by StatsSA, abalone closing stock declined from 5 063 t in 2006 to 3 369 t in 2015, a decrease of 33.5 per cent. Catches of abalone fell from 169 t in 2006 to 54 t in 2015, a decrease of 680 per cent. The only growth in stock was recorded in 2009 (1.6 per cent) and 2010 (2.8 per cent) (STATS SA, 2017).

Vessels and Gear

Limitations in terms of gear and equipment exist and fishers shall only utilise a "hookah system" (surface air supply) of which only two may be attached to a permitted vessel (Department of Agriculture, Forestry and Fisheries, 2019a).

Fishery Allocations and Catch Data

Figure 5.6.52 illustrates the historic formal fisheries catch data for the period 1953 to 2018/2019 (Department of Environment Forestry and Fisheries, 2020a).

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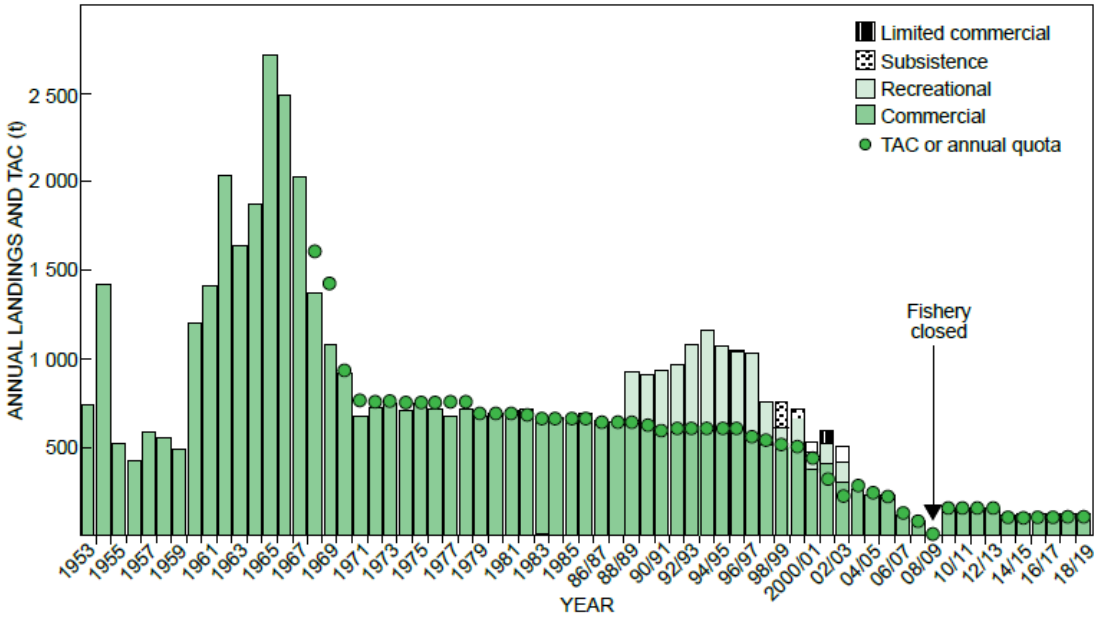

Figure 5.6.52
Abalone Catch Data: 1953 to 2018/2019

Figure 5.6.53 illustrates TAC for the period 1999/2000 to 2014/2015 and the corresponding split between the commercial and recreational fishery and illustrates the suspension of the recreational fishery in 2004 and closure of the commercial fishery in 2008 (Planning Partners, 2021a).

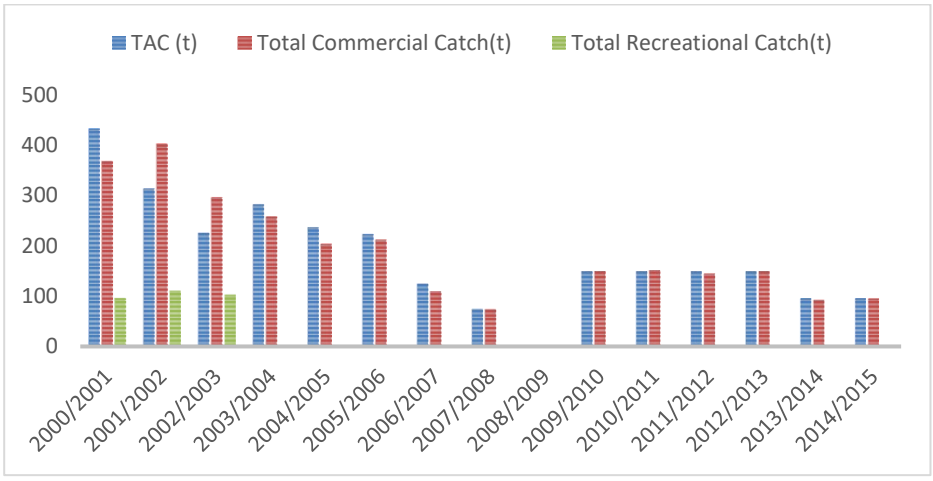

Figure 5.6.53
Abalone TAC versus Commercial and Recreational Catch Data: 2000 to 2015 (update with data from DFFE 2020)

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The TAC that was allocated to the Territorial Use Rights in Fisheries for the period 2009/2010 to 2018/2019 is presented in ***Table 5.6.21***.

Table 5.6.21
Abalone TAC(t) Allocation: 2009/2010 to 2018/2019 per Zone

Zone	2009/ 2010	2010/ 2011	2011/ 2012	2012/ 2013	2013/ 2014	2014/ 2015	2015/ 2016	2016/ 2017	2017/ 2018	2018/ 2019
Zone A	50	50	50	50	25	25	25	25	25	25
Zone B	50	50	50	50	25	25	25	25	25	25
Zone C	0	0	0	0	0	0	0	0	0	0
Zone D	0	0	0	0	0	0	0	0	0	0
Zone E	12	12	12	12	12	12	12	12	12	12
Zone F	20	20	20	20	16	16	16	16	16	16
Zone G	18	18	18	18	18	18	18	18	18	18
Total:	**150**	**150**	**150**	**150**	**96**	**96**	**96**	**96**	**96**	**96**

Due to the depletion of the resource, in particular in Zones C and D, no allocations have been made to these zones over the reported period (Department of Agriculture Forestry and Fisheries, 2016c) (Department of Environment, Forestry and Fisheries, 2020f). Less than 50 per cent of the current TAC allocation of 96 t is assigned to zones that fall partially or wholly in the site region.

The above represents the wild abalone fishery; the legal abalone production from aquaculture and legal wild capture increased from 726 t in 2000 to 1 841 t in 2016 as aquaculture plays an increasingly important role (Okes, N; Bürgener, M; Moneron, S; Rademeyer, J, 2018).

In the 2017/2018 season, 123 vessels were employed in the abalone sector. In the 2018/2019 season, 258 divers / individuals and 40 legal entities were abalone fishery rights holders (Department of Agriculture Forestry and Fisheries, 2016c).

The National Biodiversity Assessment 2018 concluded that the abalone resource remains in crisis and is considered to be collapsed. Declines in the abalone and catch are predominantly a result of illegal harvesting (Sink, et al., 2019).

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Figure 5.6.54 illustrates the combined abalone fishery catch (TAC) and production data for the period 2000 to 2016 (Sink, et al., 2019).

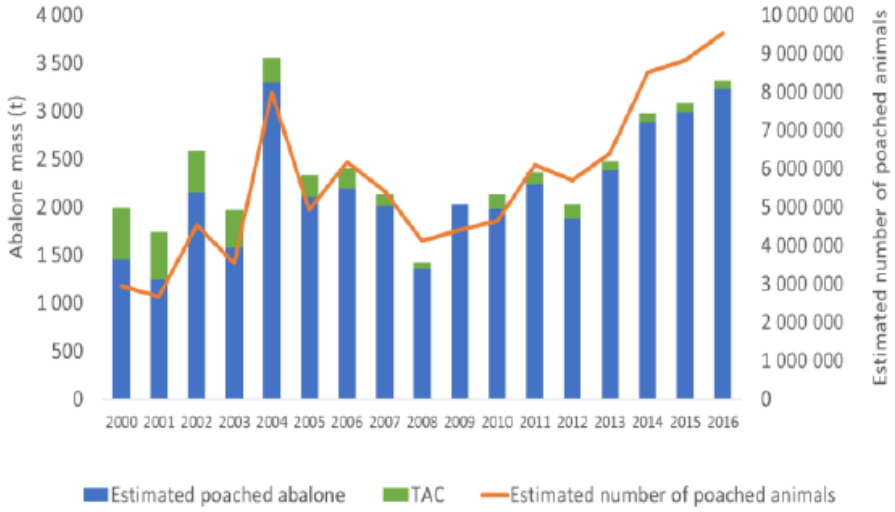

Figure 5.6.54
Abalone Catch and Production: 2000 to 2016 (Wild Capture, Cultured and Illegal Harvest)

From the above, it is evident that the legal wild capture abalone fishery makes a minute contribution to the overall annual harvesting, and that illegal harvesting vastly outstrips the legal fishery (Planning Partners, 2021a).

Closed Areas

No abalone harvesting is permitted in the False Bay Area (Department of Agriculture, Forestry and Fisheries, 2015e).

Market Destinations

The local abalone market is small and it is estimated that 95 per cent of the abalone harvest is exported, mostly to Asian countries. The abalone catch is processed and exported as frozen, canned, dried, live or shell products and/or parts thereof (Department of Agriculture, Forestry and Fisheries, 2015e).

Between 2000 and 2016, the main importers of all abalone products were Hong Kong Special Administrative Region (90 per cent), Japan (3 per cent), Singapore (2 per cent), Taiwan (2 per cent) and Macau Special Administrative Region (1 per cent) (Okes, N; Bürgener, M; Moneron, S;

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Rademeyer, J, 2018).

Table 5.6.22
Summary of the Abalone Fishery (Entire Fishery)

Duration of Rights	10 years (2016 – 2025)
Value of Fishery (R) (2018)	R 596.3 million legal trade and estimated R 625 million illegal trade (Global Aquaculture Alliance, 2018)
Fish Landed (2018)	<96 t (legal)
Number of Jobs Sustained	Unknown
Number of Vessels	123
Number of Right Holders (as at 2018)	298
Closed Season (No Fishing)	1 August to 31 October

vi) Traditional Line Fishery

Overview

The commercial line fishery has the largest fleet but makes up only 6 per cent of the total value of all marine fisheries (Harris, et al., 2019). Line fishing in South Africa is defined as the capture of fish with hook and line, but excludes the use of longlines. Together, the three sectors of the line fishery (commercial, recreational and small-scale/subsistence) target between 95 and 200 of South Africa's 2 200 marine fish species. Target species include temperate, reef-associated seabreams (e.g. roman, hottentot seabream, santer and slinger), coastal migrants (e.g. geelbek and dusky kob) and nomads (e.g. snoek and yellowtail). More than 90 per cent of the current line fish catch is derived from the aforementioned eight species (Parker, et al., 2018) (Parker, et al., 2020a).

The commercial line fishing sector is exclusively boat-based. The total number of registered vessels operating in this sector was estimated at 700 in the late 1990s, which accounted for 37 per cent of all commercial fishing boats operating in marine fisheries in South Africa. From 2006, a maximum allocation of 455 boats has been maintained, however the number of boats allocated per zone has varied. Line fishing is a low-earning, labour-intensive industry, important from a human livelihood point of view, employing an estimated 27 per cent of all fishers (Department of Environment Forestry and Fisheries, 2020a).

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After the introduction of the towable ski-boat (open-decked, fiberglass-hulled ski-boat, 10 m to 15 m long and are propelled by two motors ranging from about 70 hp to 90 hp) in the late 1940s, the recreational boat-based sector expanded rapidly, with an estimated minimum number of 4 000 vessels. Landings from this open-access recreational fishery are not reported throughout and the total catch from this sector could be equivalent to that reported by the commercial sector. The recreational line fishery has by far the largest number of participants (more than 450000) of all fishery sectors in South Africa and consequently has great economic value (Department of Environment Forestry and Fisheries, 2020a).

Recently, the small-scale/subsistence sector was legally created to recognise those fishers who depend on marine living resources for direct food security. There are an estimated 30 000 small-scale fishers active along the South African coastline and 85 per cent harvest line fish (Department of Environment Forestry and Fisheries, 2020a).

This sector employed a total of 2 550 workers (Feike, 2021d).

History, Historic Trends and Management of the Fishery

The first comprehensive management framework for the line fishery was introduced in 1985 when this fishery was formally recognised. However, successive research surveys indicated continuing declines in line fish resources. In December 2000, the line fish resources was declared to be in a state of emergency, due to the critical status of many line fish stocks. Effort was reduced and fixed at 450 vessels and the hake and tuna components were developed into separate sectors. To rebuild collapsed stocks and to achieve a sustainable level of utilisation, a Line Fish Management Protocol was developed in 1999 in order to base regulations in the line fishery on quantifiable reference points. This remains the basis of line fish management to date (Parker, et al., 2018).

Commercial line fishery is currently managed through a TAE allocation, based on boat and crew numbers.

The recreational fishery is managed by a number of output restrictions, such as size and bag limits, closed areas and seasons.

The small-scale fishery will also be managed through a combination of size and bag limits, closed areas and seasons (Parker, et al., 2018).

Over 300 communities in the four coastal provinces have been identified as small-scale fishing communities. The intention is that community

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co-operatives will be given 15-year small-scale fishing rights to access a basket of species, based on need and location. The traditional, commercial line-fish sector rights expire in 2020 and the small-scale fishing sector will be given priority in the subsequent line fish rights allocation process (Department of Environment Forestry and Fisheries, 2020a).

Status of the Resource

Stock assessments in 2017 indicated that the drastic reduction of fishing effort since the declaration of the 'linefish emergency' in 2000 (i.e. a subsequent reduction of approximately 70 per cent in effort by 2003) resulted in the partial recovery of some line fish species, such as the slinger (*Chrysoblephus puniceus*), santer (*Cheimerius nufar*), hottentot seabream (*Pachymetopon blochii*) and carpenter (*Argyrozona argyrozona*). However, other important stocks such as silver kob (*Argyrosomus inodorus*) and geelbek (*Atractoscion aequidens*) remain collapsed (Parker, et al., 2020a).

Stocks of rare line fish species, such as red steenbras and dageraad are of serious conservation concern and have been included on the International Union for Conservation of Nature threatened species list as endangered (Parker, et al., 2018).

Line fish resources are also at risk of over-exploitation as they are directly or indirectly exploited by numerous other sectors, including the inshore and offshore trawl fisheries, tuna pole-line fishery, inshore net-fishery, and demersal shark longline fishery (Parker, et al., 2020a).

The yellowtail assessment suggests the stock is optimally exploited, while snoek remains under-exploited. The annual catch of the nomadic yellowtail and snoek depends on their availability to the nearshore line fishers and is, therefore, highly variable. Moreover, the inconsistent quality of yellowtail and snoek landed by the line fishery detracts from the optimal use of these important stocks (Parker, et al., 2018).

Furthermore, some important line fish species, such as geelbek *(Atractoscion aequidens*), snoek (*Thyrsites atun*), yellowtail (*Seriola lalandi*) and silver *kob (Argyrosomus inodorus*) rely to varying degrees on small pelagic species as forage. The knock-on effects of a depleted food source on these line fish stocks was not understood (Parker, et al., 2020a).

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Vessels and Gear

The traditional line fishery is defined by the use of a simple hook-and-line fishing system (excluding the use of longlines and drumlines), with a limit of 10 hooks per line (DAFF 2017).

Commercial fishing vessels range from surf-launching ski-boats of 6 to 8 m in length, to harbour-based freezer vessels (generally longer than 20 m) that can remain at sea for more than 2 weeks at a time (Harris, et al., 2019).

TAE and Catch Data

TAE is managed geographically with the spatial effort of the fishery divided into three zones. Most of the catch (up to 95 per cent) is landed by the Cape commercial fishery, which operates on the continental shelf from the Namibian border on the West Coast to the Kei River in the Eastern Cape. The site region coincides with line fish management Zone A. Zone A extends from the Namibian border to Cape Infanta. The imaginary border line at Cape Infanta has a 5 nmi buffer area on each side. In this buffer area, permit holders from the adjacent Zone A and Zone B may harvest traditional line fish.

Fishing vessels generally range up to a maximum offshore distance of about 70 km (Wilkinson & Japp, 2018a). Annual catch for important species in the fishery for the period 2007 to 2017 is set out in ***Table 5.6.23*** (Parker, et al., 2018).

Table 5.6.23
Reported Annual Catch (t) of the Eight Most Important Traditional Line Fish Species for the Period 2007 to 2017

Year	Snoek	Yellowtail	Kob	Carpenter	Slinger	Hottentot seabream	Geelbek	Santer
2007	2 765	478	841	265	157	128	448	84
2008	5 223	313	715	226	194	120	403	82
2009	6 322	330	884	282	186	184	495	66
2010	6 360	171	838	263	180	144	408	69
2011	6 205	204	625	363	214	216	286	62
2012	6 809	382	441	300	240	160	337	82
2013	6 690	712	313	481	200	173	263	84

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Year	Snoek	Yellowtail	Kob	Carpenter	Slinger	Hottentot seabream	Geelbek	Santer
2014	3 863	987	289	522	201	192	212	74
2015	2 104	609	246	522	186	143	244	69
2016	1 681	475	277	713	211	211	250	66
2017	1 888	361	199	820	215	188	148	72

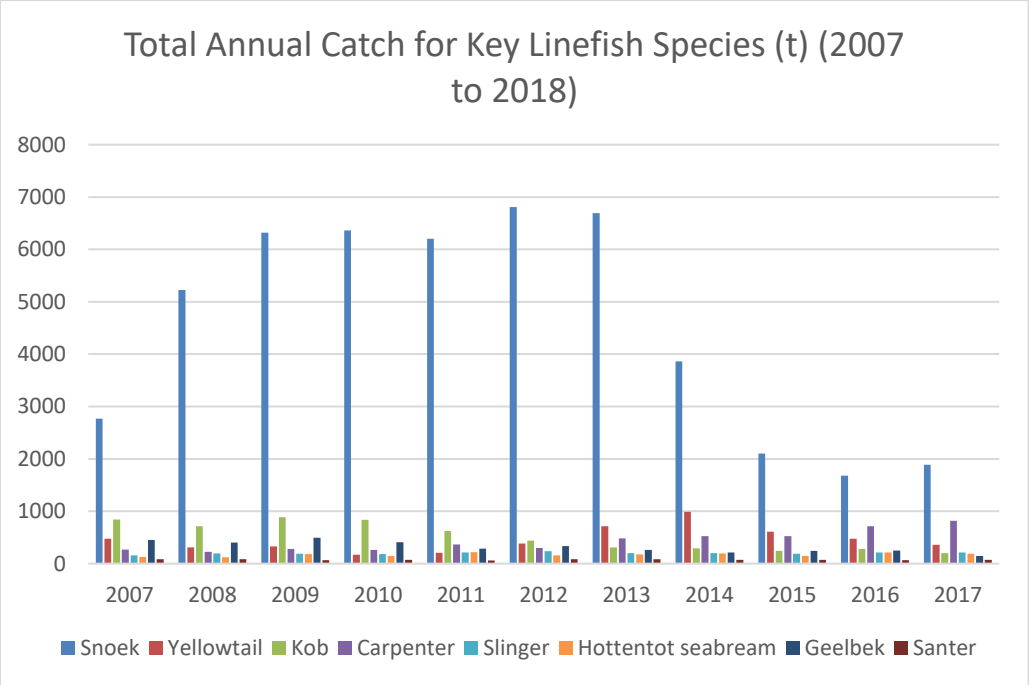

Figure 5.6.55
Average Annual Traditional Line Fish Catch (2007 to 2017)

In terms of the fishing rights register (2018), there were a total of 422 traditional line fish permit holders with permits validity ranging from 1 January 2013 to 12 December 2020 (Department of Agriculture, Forestry and Fisheries, 2018).

Following on the 2013 appeals process in the fishery, a further 171 fishing rights were allocated with a total of 316 rights having been granted in Zone A. In addition, as currently intended, 24 fishing rights were allocated to small-scale fishing community co-operatives in Zone A (Department of Agriculture, Forestry and Fisheries, 2016b).

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Based on the data analyses by Parker et al and published in 2020, the average annual catch distribution for geelbek, silver cob, snoek and yellowtail are reproduced in ***Figure 5.6.56*** (Parker, et al., 2020a).

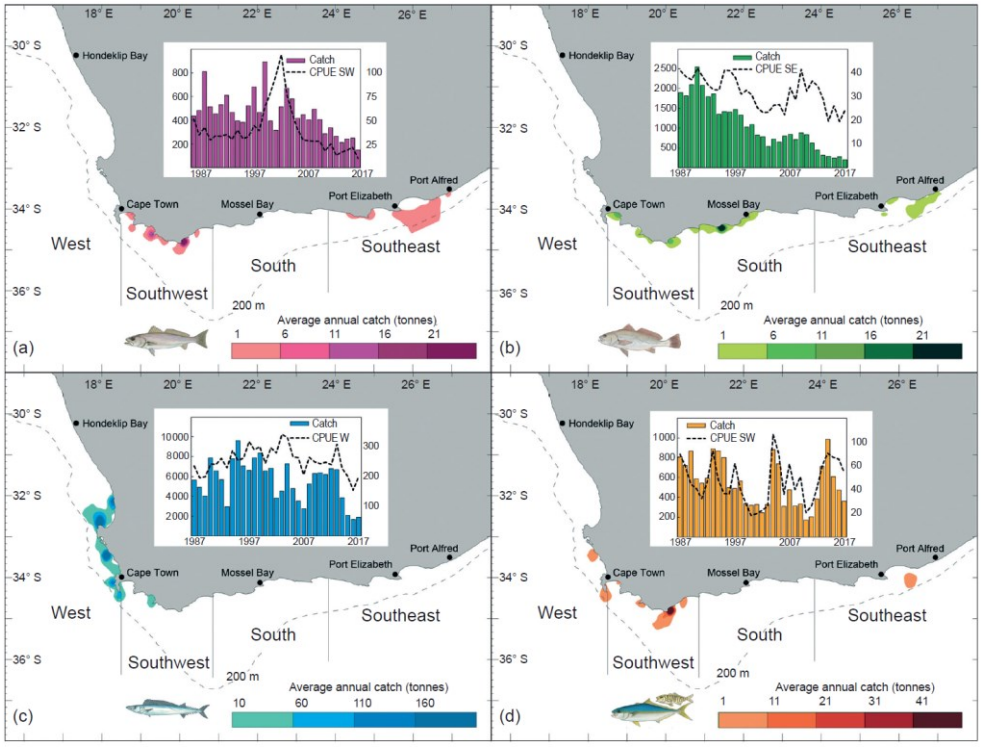

Figure 5.6.56
Average Annual Catch (1987 to 2017) (a) Geelbek, (b) Silver Cob, (c) Snoek and (d) Yellowtail

It is evident from ***Figure 5.6.56*** that snoek is an important line fish species in the site region, both in terms of catch volume and catch distribution. Snoek is the most important species targeted by the commercial line fishery in terms of catch weight and contributes more than 80 per cent to the catch in the line fish Management Zone A (Orange River to Cape Infanta) (Kerwath, et al., 2017b). Other important species include hottentot, cape bream and yellowtail, which are an important component of the line fishery, in particular on the West Coast (Kerwath, et al., 2017a).

Closed Areas

Restrictions include that no permitted fisher shall attach more than ten hooks to a fishing line, deploy a net in the water, fish in an estuary, engage in fishing on the authority of another fishing permit or right,

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tranship fish at sea, or exceed the maximum number of crew on the line fishing vessel, as specified on the permit. Vessels are not permitted to stop or fish in an MPA or any other similar protected marine or conservation area (Republic of South Africa, 2016a).

Market Destinations

The target markets within the South African traditional line fishery include fish processing establishments, distributers, retailers, restaurants and directly to the public. Snoek is the most important line fishery in the site region and there is a substantial informal market for the resource in Cape Town (Isaacs, 2013).

Table 5.6.24
Summary of the Traditional Line Fishery (Entire Fishery)

Duration of Rights	8 years (2013 – 2020)
Value of Fishery (R) (2018)	R 82.5 million
Fish Landed (2018)	3 891 t
Number of Jobs Sustained	2 550
Number of Vessels	450
Number of Right Holders (as at 2018)	617
Closed Season (No Fishing)	None

vii) Net-fishery

Overview

The South African net-fishery consists of two sectors, the beach-seine fishery and the gillnet fishery. The main target species in both fisheries is harder or mullet (*Liza richardsonii*), with 28 beach-seine and 162 gillnet rights holders operating from False Bay to Port Nolloth on the West Coast (Department of Agriculture Forestry and Fisheries, 2016c).

The fishery is managed on a TAE basis with a fixed number of operators in each of 15 defined areas. Permits are issued for the capture of harders, St. Joseph shark (*Callorhynchus capensis*) and species that appear on the “bait list”. In False Bay however, rights holders are permitted to target line fish species that were traditionally exploited by the fishery (Department of Agriculture Forestry and Fisheries, 2016c).

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History and Historic Trends of the Fishery

Beach-seine nets were introduced into the Cape in the mid-1600s and gillnets in the late 1800s. Until 2001, about 450 licenced permit holders used about 1 350 nets, with an estimated addition 100 users deploying a further 400 nets illegally. Catch data during this time indicate that beach-seine and gillnet fishers landed approximately 6 000 t of fish per annum.

The gillnet fishery accounted for, on average 3 250 t of harders, 650 t of St. Joseph shark and 130 t of bycatch consisting of at least 27 species of fish. Illegal gillnetting landed approximately 100 t of hound shark (*Mustelus mustelus*) and 50 t of line fish, mostly galjoen (*Dichistius capensis*).

The beach-seine permit holders landed approximately 1 950 t of harders and more than 200 t of bycatch, predominantly line fish.

From 2001, rights were allocated to fishers reliant on the fishery and part-time fishers removed from the fishery. The legal number of beach-seine operations was reduced to 200 and the gillnet operations to 162, which also resulted in a 40 per cent reduction in fishing effort.

In 2010, 3 Interim Relief gillnet exemptions were issued to 15 fishers in the Langebaan Lagoon, and 2 beach-seine exemptions were issued for Struisbaai and Simon's Town. In the Langebaan Lagoon, this resulted in a 50 per cent increase in effort, over and above the TAE, and a decline in the average size of harder landed in the Langebaan Lagoon by 20 per cent and in Saldanha Bay by 10 per cent (Department of Agriculture Forestry and Fisheries, 2016c) and the collapse of that stock (Department of Environment Forestry and Fisheries, 2020a).

FRAP 2015 and the small-scale fishery implementation were intended to result in these fishers being formally incorporated into the beach-seine TAE and thus attempt to arrest the decline in growth rate. As reported by DFFE in 2020, this management intervention had yet to materialise (Department of Environment Forestry and Fisheries, 2020a).

Management of the Fishery

Historically, very few limits were placed on the beach-seine fishery. In 1983, night fishing was banned and limits were introduced on fishing gear, fishing season and the species that the beach-seine fishery could target (Sink, et al., 2019).

The fishery was also characterised by line fish by-catch. Estuarine

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gillnetting was phased out in all estuaries, with the exception of the Oliphants Estuary (outside of the site region) (Department of Agriculture Forestry and Fisheries, 2016c).

The gillnet fishery operations are restricted to between Port Nolloth to Yzerfontein and the treknet fishery operates between Port Nolloth and Gordon's Bay (Department of Agriculture, Forestry and Fisheries, 2015f).

As part of the management strategy, the fishery is subdivided into 15 areas with discrete effort and species restrictions. The following areas are fished in the site region:

- Area F, Saldanha Bay: north of Salamander Point to Leentjiesklip No. 4 (excluding the harbour area under the jurisdiction of the Ports Authority);
- Area G, Langebaan: Langebaan Lagoon in the areas stipulated by the authority of SANParks;
- Area H, Yzerfontein: the area between the beacon marked YF, approximately 11 km north of Yzerfontein, and the northern border fence of the KNPS, but excluding a 500 m exclusion zone around Dassen Island bounded by the latitudes 33º24.420'S and 33º26.289'S and longitudes 18º04.161'E and 18º06.317'E;
- Area I, Milnerton to Bokpunt: between the Milnerton Lighthouse and Bokpunt;
- Area J, Hout Bay Beach;
- Area K, Longbeach-Kommetjie-Scarborough;
- Area L, Smitwinkel Bay-Simonstown-Fishhoek;
- Area M, Muizenberg-Strandfontein: Neptunes Corner to Strandfontein Pavillion;
- Area N, Strandfontein: Strandfontein to Pavillion-Swartklip (zero TAE area);
- Area O, Macassar: Monwabisi tidal pool to the western boundary fence of the AECI security area.

In 2015, there were 120 rights holders in the net-fishery sector from Port Nolloth to the west of Cape Hangklip. The area between Draaihoek to

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Cape Colombine, including Paternoster, has the most operators in this sector: 80 gillnet and 4 beach-seine (treknet) operators (Department of Agriculture, Forestry and Fisheries, 2015f).

In 2015, DAFF recommended that the number of netfish operators in the Western Cape be limited to 28 beach-seine/treknet operators and 117 gill/drift net operators. The recommended TAE within the site region at the time was 16 beach-seine rights holders, 17 (limited to areas F, G and H), and 4 interim relief allocations (Department of Agriculture, Forestry and Fisheries, 2015f).

During the fishing year of 2017/2018, 27 beach-seine and 162 gillnet permits were allocated within these 15 areas (Horton, 2018).

Status of the Resource

The harder is considered to be over-exploited and under heavy fishing pressure. The stock is also under pressure from illegal harvesting and adverse environmental conditions (Department of Agriculture Forestry and Fisheries, 2016c).

In 2018, an assessment of harder in the Saldanha and Langebaan lagoon net-fishery was conducted. The study established the following: (a) the standardised CPUE of harder for the period 2008 to 2016 has declined, indicating a reduction in relative abundance of harder of approximately 30 per cent over the period; (b) between 1998 and 2017 there was a 20 per cent drop in the average size of harder caught; (c) a spawner biomass-pre-recruit model revealed that the stock is heavily depleted, with the stock currently collapsed at only 24 per cent of the estimated pristine biomass and recruitment is likely to be seriously impaired (Harris, et al., 2019).

These negative results are likely due to the combined effects of the TAE being exceeded by 50 per cent, gillnetting occurring in the Restricted Area of the Langebaan MPA and fishers reducing mesh size to maintain catch (Harris, et al., 2019), (Department of Environment Forestry and Fisheries, 2020a).

The fishery is also subject to illegal fishing, underreporting or non-reporting of catch (Horton, 2018) (Pfaff, 2019).

Vessels and Gear

Beach-seine fishing deploys nets from a row boat to encircle a shoal of fish which is then dragged onto shore. Gillnetting involves the deployment

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of nets that are left to stand vertically in the water column so that fish are caught by becoming entangled in the nets. Refer to ***Figure 5.6.57*** below, which illustrates these two techniques.

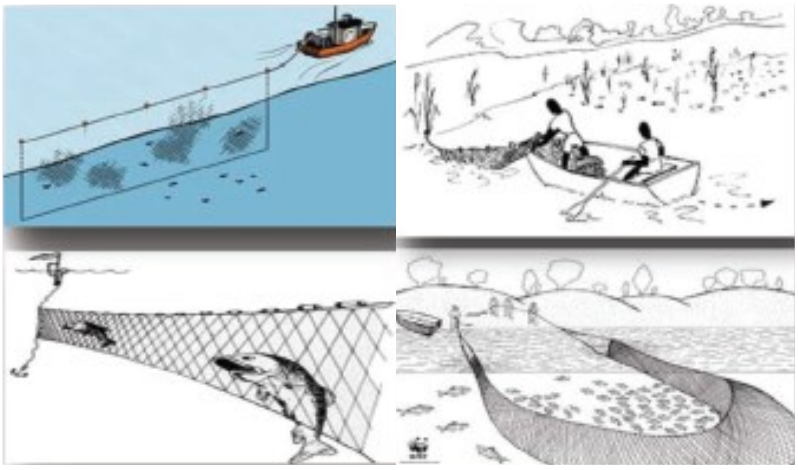

Figure 5.6.57
Gillnet and Beach-seine (Treknet) Net-fisheries

Fisheries Allocation and Catch Data

From 2007 to 2013 there were 190 rights holders, with 189 rights holders recorded for 2014. These data exclude the 5 exemption rights holders. In 2007. By 2014 only 30 per cent remained active. While the number of active rights holders halved, the individual landed tonnage doubled over the same period. According to DAFF, this suggests fewer fishers shared the same pool of fish. ***Figure 5.6.58*** illustrates the volume of fish caught in the net-fishery for the period 2007 to 2014 as reported by DAFF (Department of Agriculture Forestry and Fisheries, 2016c).

Figure 5.6.59 illustrates the relative intensity of fishing effort of the gillnet and beach-seine fisheries in the site region as mapped in the course of the South African National Biodiversity Assessment (Sink, et al., 2019). High levels of gillnet fishery effort are evident in the Langebaan Lagoon (Area G). The beach-seine fishery demonstrates high levels of effort between Muizenberg and Strandfontein (Area M) and medium levels of effort in the site vicinity.

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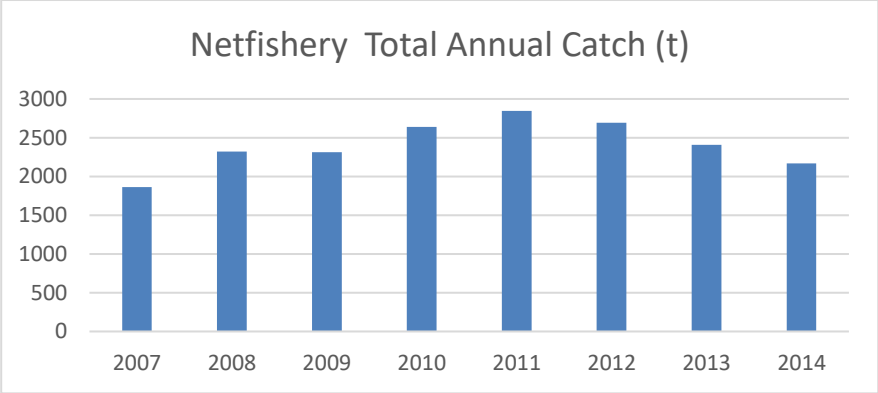

Figure 5.6.58
Total Annual Net-fishery Catch 2007 to 2014

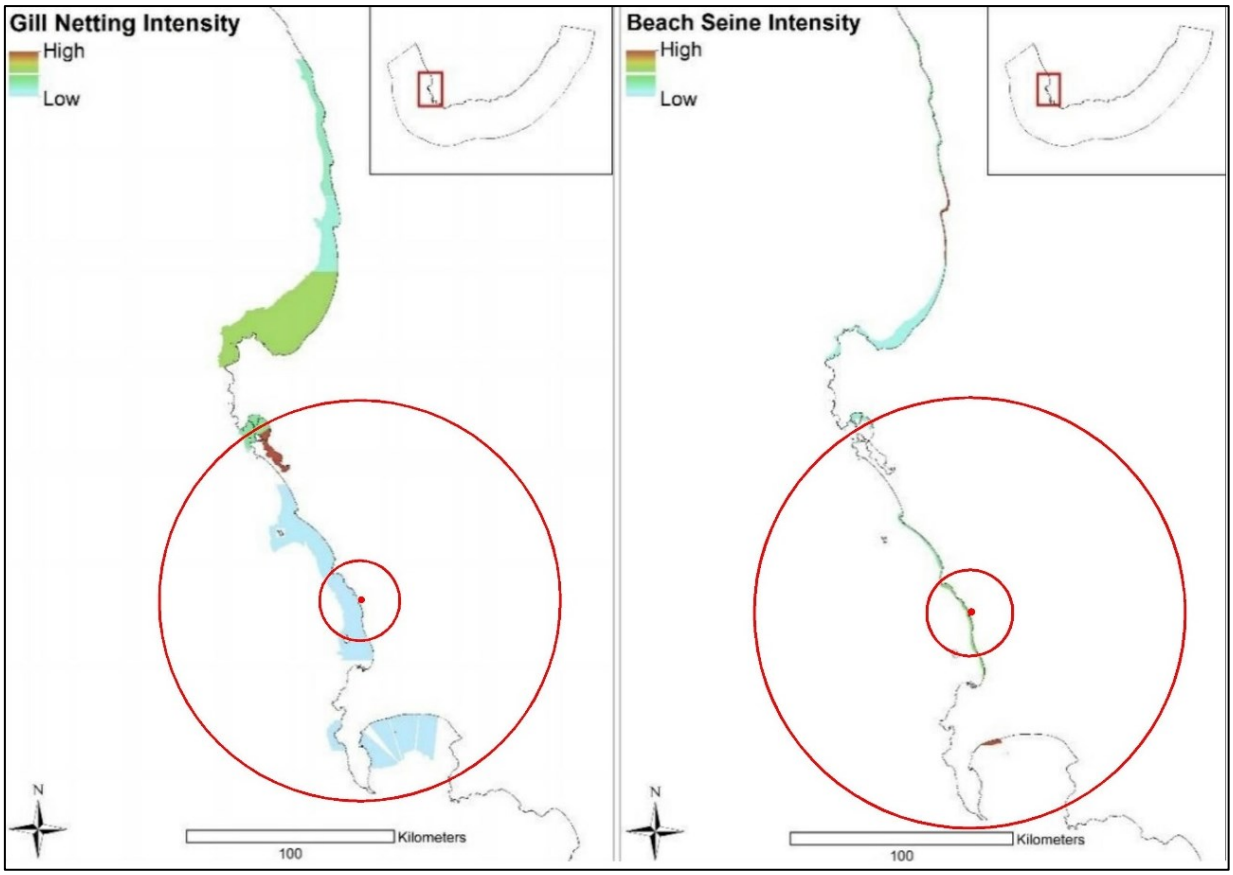

Figure 5.6.59
Map of Gillnet (left) and Beach-seine (Right) Net-fishing Effort illustrated using the Average Number of Permits per Square Kilometre

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The fishery rights register of 2018 recorded that 113 long-term fishery rights allocations were made and are valid from 15 August 2016 to 14 August 2031 (Department of Agriculture, Forestry and Fisheries, 2018).

The annual harder catch decreased by approximately 40 per cent from 127.4 t in 2008 to 77.5 t in 2016. Within the same period, total effort reduced. In 2008, 1 481 days were fished and in 2016 1 228 days were fished (Horton, 2018), as illustrated in ***Figure 5.6.60***.

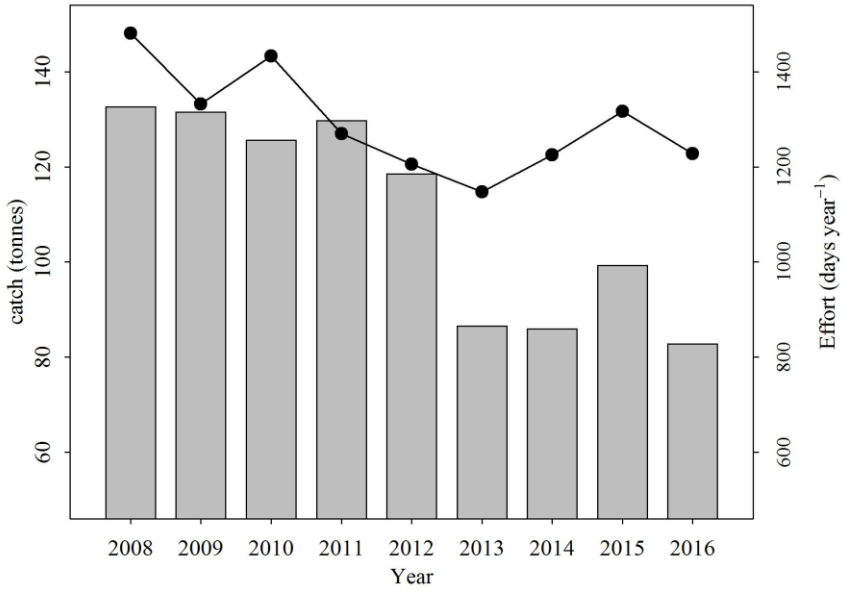

Figure 5.6.60
Harder Catch (t) in Saldanha Bay and Langebaan (2008 to 2016)

Pfaff et al determined the beach-seine catch for the period 1983 to 2017 as illustrated in ***Figure 5.6.61*** below. Currently, the beach-seine fishery in False Bay lands on average 300 t of fish per year. The catch compositions consist of 70 per cent harder, 20 per cent yellowtail and the remainder consisting of a combination of elf, silver cob and other line fish species (Pfaff, 2019).

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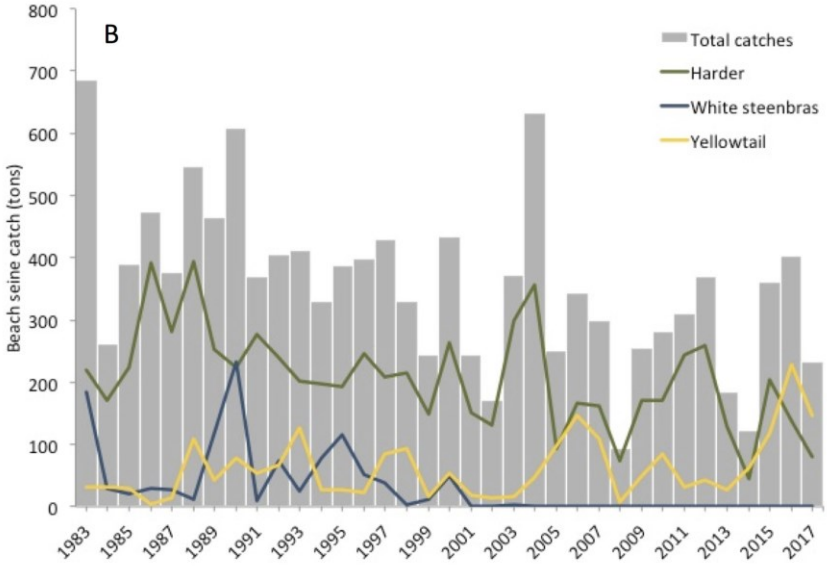

Figure 5.6.61
Commercial Beach-seine Catch (t) in False Bay (1983 to 2017) Total Catch depicted as Columns and Catch of the Most Important Species shown as Lines

Closed Areas

Net-fishery is not permitted in tidal lagoons, tidal rivers and estuaries or MPAs, in accordance with permit conditions for areas A to K.

No person may use beach-seine net, staked net, set-net or cast net for fishing from sunset to sunrise.

The following are closed areas within the site region. No person shall without a permit:

- use any net or netting in the area within Saldanha Bay inside a straight line drawn through beacons marked N.H.1 and N.H.2, respectively, and situated on the point known as "North Head", and a beacon marked S.H.1 and situated on the point known as "South Head", unless authorised by the relevant authority;

- use any staked, set or driftnet within False Bay, in the area north of a straight line drawn from the lighthouse at Cape Hangklip to the lighthouse at Cape Point;

- shall use a driftnet within any trek netting area within a distance of

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2 nmi seaward of the high water mark the area known as Hout Bay Beach.

- shall use any drift, set or staked-net for fishing within the area around Dassen Island bounded by the latitudes 33’24.420'S and 33’26.289'S and longitudes 18º’04.161'E and 18’06.317'E.

- shall use any drift, set or staked-net for fishing within the area around Robben Island bounded by the latitudes 33’47.107'S and 33’49.423'S and longitudes 18’21.289'E and 18’23.190'E (Republic of South Africa, 2016a).

Market Destinations

Fish landed in the net-fishery is sold to the fresh fish market, packed and frozen as bait, while smaller harder are dried and sold as bokkoms. Fish is also retained for own consumption and sold informally within coastal communities as an important food source.

Table 5.6.25
Summary of the Net-fishery (Entire Fishery)

Duration of Rights	15 years (2016 – 2031)
Value of Fishery (R) (2018)	Not known
Fish Landed (2018)	Approximately 298 t
Number of Jobs Sustained	Not known
Number of Vessels	Not known
Number of Right Holders (as at 2018)	113
Closed Season (No Fishing)	None

viii) Octopus Fishery

Overview, History, Historic Trends of Fishery, Vessels and Gear

The common octopus (*Octopus vulgaris*) occurs along the entire South African coastline from intertidal rock pools down to depths of over 200 m and inhabits various substrata. Traditionally, octopus have been harvested primarily for subsistence purposes and bait. Although a sought-after resource internationally, there is currently no commercial octopus fishery in South Africa and the local market for octopus is small

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(Department of Environment Forestry and Fisheries, 2020a).

Following a pilot study to investigate the potential of a commercial fishery, a 5-year experimental octopus pot-fishery operated between 2004 and 2009 (Department of Environment Forestry and Fisheries, 2020a). The outcomes of the experimental fishery were inconclusive, and a further 5-year exploratory fishery was initiated in 2012.

Sixteen fishing areas were designated. In 2016, DAFF reported that only 5 of the 10 successful applicants had activated their fishery rights, and only two permit holders fished on a regular basis. Only one of the designated areas was being fished, (Department of Agriculture Forestry and Fisheries, 2016c) in the western side of False Bay (Pfaff, 2019).

At the end of the second 5-year exploratory period, a proper scientific evaluation of the fishery could still not be made as insufficient data had been received, and the exploratory fishery was extended for another 3 years, which commenced in 2019 (Department of Environment Forestry and Fisheries, 2020a).

On 28 June 2019, following concerns over entanglements and mortalities of whales in octopus fishing gear, the fishery was suspended. However, following consultation with interested parties, the fishery was re-instated and the temporary ban was lifted on 15 November 2019, subject to the implementation of the certain mitigation measures.

Gear used consists of lines, buoys and sinking ropes.

Catch Data

Figure 5.6.62 illustrates catch and effort data for the period 2014 to 2019 (Department of Environment Forestry and Fisheries, 2020a)

Catch significantly increased from about 2 t in 2013 (Department of Agriculture Forestry and Fisheries, 2016c) to 13.1 t in 2014 and 51.85 t by 2018, whereafter it decreased to 38.43 t in 2019. The drop in annual catch in 2017 is attributed to a lower number of pots hauled in that year compared to 2016. The increase in 2018 and 2019 is attributed to increased trend in fishing gear (Department of Environment Forestry and Fisheries, 2020a).

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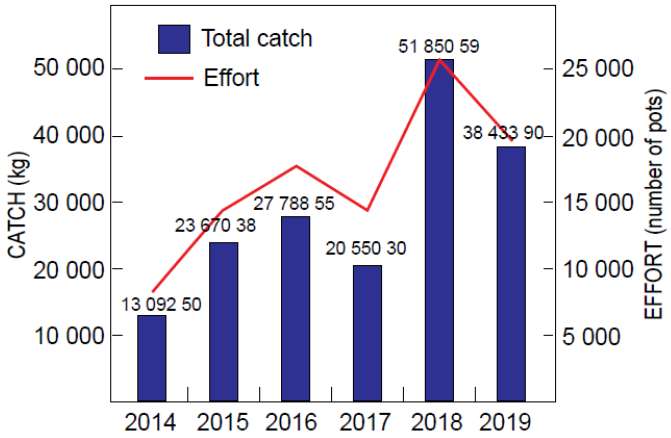

Figure 5.6.62
Total Annual Octopus Catch (Whole Weight) and Effort (Number of Pots Retrieved)

Market Destinations

The target markets are mainly the local retail and restaurant trade. The fishery is now focusing on exporting the product to Spain, the Far East and the USA (Fishing Industry News, 2020).

Table 5.6.26
Summary of the Octopus Fishery (Entire Fishery)

Duration of Rights	3 years (2019 – 2021)
Value of Fishery (R)	Not known
Fish Landed (2019)	38.43 t
Number of Jobs Sustained	Not known
Number of Vessels	Not known
Number of Right Holders (as at 2018)	10
Closed Season (No Fishing)	None

5.6.6.2 Fish Processing Establishments in the Site Region

The site region accommodates an important commercial fishing industry. For this reason, the location and distribution of fish processing establishments in the site region have been determined for the purposes

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of the DSSR (Planning Partners, 2021b).

In terms of Section 18 of the Marine Living Resources Act, no person shall operate a processing facility unless a right to do so has been granted by the Minister. Accordingly, every person that processes fish (e.g. cleans, boxes, stores or adds value to fish) must obtain a permit from DFFE, the Department tasked with administering the Marine Living Resources Act, who also maintains the register of fish processing establishments.

In 2015, DFFE reported that there were 892 (521 land-based and 371 vessel-based) fish processing establishments right/exemption holders operating from Port Nolloth to west of Cape Hangklip. 271 fish processing establishments permits were issued by the Minister in 2015, valid for 15years from 2017 to 2032, a notable reduction in the number of fish processing establishments permits issued in 2008 .

Of the 316 permit holders in South Africa in 2020, 143 are located in the site region, of which only 78 are active land-based establishments.

The proximity of fish processing establishments to areas where marine catch is landed is important for the processing of fish, and the location of these establishments tends to reflect both the location of harbours and the state of the fish stocks in the area. Since fishing is a significant economic sector in the Cape Metropolitan Area and the West Coast, there are large numbers of fish processing establishments located in the site region. There are significant clusters within or close to the more significant harbours, namely the Port of Cape Town and Hout Bay Harbour, as well as certain industrial areas. St. Helena Bay and the Port of Saldanha, which also have clusters of fish processing establishments, fall outside of the site region and are therefore not included in this report.

Table 5.6.27 and ***Drawing 5.6.8*** illustrate the major collection, processing and distribution points for marine products caught, i.e. fish processing establishments, in the site region. The total of 78 establishments that were recorded in the site region in 2020 is significantly lower than the 146 facilities recorded in 2008. This is in keeping with the overall reduction of fish processing establishments permits allocated by the Minister following the FRAP 2015.

Of these 78 facilities, 4 are located in the site vicinity and none within the 5 km radius. The fish processing establishment located nearest the site is situated in the Atlantis industrial area, 8 km to the north-northeast.

©the majority of the fish processing establishments are located between

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20 km and 30 km to the south-southeast and south in the Port of Cape Town and the Paarden Eiland industrial area adjacent to the port (Refer to ***Drawing 5.6.8***). Other significant clusters are located in Airport Industria (30 to 40 km south-southeast) and Hout Bay (40 to 50 km south).

No fish processing establishments are located between the 70 and 80 km radius of the site.

Table 5.6.27
Number of Fish Processing Establishments by Sector (2020)

Distance (km)	Sector											
	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW
0 –10	-	-	-	2	-	-	-	-	-	-	-	-
11 – 20	-	-	-	2	-	-	-	-	-	3	-	-
20 – 30	-	-	-	-	-	-	-	-	-	7	36	-
30 – 40	-	-	-	-	1	-	-	-	1	9	-	-
40 – 50	-	-	-	-	-	-	-	-	2	1	8	-
50 – 60	-	-	-	-	-	-	-	-	-	-	2	-
60 – 70	-	-	-	-	-	-	-	-	-	4	-	-
70 – 80	-	-	-	-	-	-	-	-	-	-	-	-
Total in Sector	**0**	**0**	**0**	**4**	**1**	**0**	**0**	**0**	**3**	**24**	**46**	**0**

A tabulated detailed list of fish processing establishments, with the company name, location, distance and direction from the site, is presented in ***Appendix A***.

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DUYNEFONTYN SITE

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16km

80km

Robben Island

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FPE78

Legend

- Fish Processing Establishment (FPE)
- Magisterial Districts (MD)
- Local Municipalities (LM)
- Allotment Townships

0 4.25 8.5 17 25.5
Kilometers

COORDINATE SYSTEM	Eskom	SITE SAFETY REPORT FOR DUYNEFONTYN
Map projection: Gauss Conformal Datum: Hartebeeshoek 94 Spheroid: WGS84 Scale factor: 1 Central meridian: LO19 Units: International meter	FISH PROCESSING ESTABLISHMENTS (80 KM)	REV BY / AUTH BY
PLANNING PARTNERS	SOURCE OF INFORMATION: Planning Partners Surveys	DWG NO: 5.6.8 / REVISION: 0
COMP NJ 24/03/2021	RELEASED BY ESKOM	NOTE: For proper clarity this drawing must be printed at scale, A3 paper size.
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5.6.6.3 Commercial Fishery Products Exported from the Site Region

The DFFE did not provide data on commercial species (fresh or processed) destined for export markets as this data were considered commercially sensitive and due to capacity constraints within DFFE.

The types of fish exported from the site region is discussed under the individual commercial fishery sectors under ***Subsections 5.6.6.1(b)(i)*** to ***5.6.6.1(d)(viii)***. The location of fish processing establishments where a portion of fish products are exported from is discussed under ***Subsection 5.6.6.2***.

a) Expected Trend during the Nuclear Installation Lifetime

The fish processing industry in the site region is directly related to the abundance, fishing rights allocation and possible migration of the marine resources on which it depends.

At present, the location and extent of the distribution of facilities over the lifetime of the nuclear installation(s) cannot be predicted with any level of confidence. Therefore, the information related to fish processing establishments and exports to external markets to be presented in the DSSR needs to be periodically reviewed, at a minimum, every five to ten years.

5.6.6.4 Small-scale Fisheries in the Site Region

South Africa's small-scale fisheries are extremely diverse in terms of the people, practices and species involved. Small-scale fisheries are practiced by people in rural and urban coastal communities, who have low levels of capital and technology, and high levels of culturally-embedded knowledge and skill to target small volumes of locally-occurring species for subsistence or sale (Schultz, 2016).

In 2000, it was estimated that approximately 30 000 fishers in approximately 28 000 households were dependent on subsistence fisheries, but this was likely to be an under-estimate. In 2010 the number of people directly involved in small-scale fishing activities was estimated closer to 100 000 (Paterson, et al., 2014).

a) Legislative Framework for the Small-scale Fishery Sector

The Policy for the Small-Scale Fishing Sector in South Africa gazetted in 2012 legally recognised small-scale fishing communities' rights to access marine resources. The Marine Living Resources Act was amended in

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2014 to make provision for re-distributing fishing rights in accordance with the policy (Schultz, 2016), with the Small-scale Fishing Regulations gazetted in March 2016 (Republic of South Africa, 2016b). DFFE thereafter commenced with a process of implementing fishery allocations as provided for in the regulations. Following multiple complaints from community members on the verification process in the western Cape, an audit of the process was conducted. In 2021, the Minister of DFFE has approached the High Court to review and set aside the process of awarding small-scale fishing rights in the Western Cape. The intention is that the current form of community and individual access to fish remains in place until the new verification process is completed (Republic of South Africa, 2021).

b) Fishing Communities

Close to thirty geographically distinct fishing communities exist, varying in size from small villages to larger towns. In addition, many more fisher groups operate from within urbanised areas such as the Cape Town Metropolitan Area. ***Figure 5.6.63*** shows the distribution of fishing communities within the site region (Paterson, et al., 2014).

Small-scale fishing is conducted close to shore with boats launched in local waters, and the duration of trips is restricted to one day. The fishing activities are labour-intensive. Men usually (but not always) do the harvesting, while women are responsible for pre- and post-harvest activities. many fishers move between the large and small-scale sectors, making it difficult to characterise certain small-scale fishers. Their participation in these different forms of fishing depends on the time of year, weather conditions, availability of employment opportunities on commercial vessels or space on ski-boats, abundance of locally-targeted species and allocation of fishing rights (Paterson, et al., 2014).

Small-scale fishing along the west and southwest coasts has a distinctly commercial aspect, and to varying degrees, those who are engaged in fishing have an ongoing association with the commercial industry (Paterson, et al., 2014).

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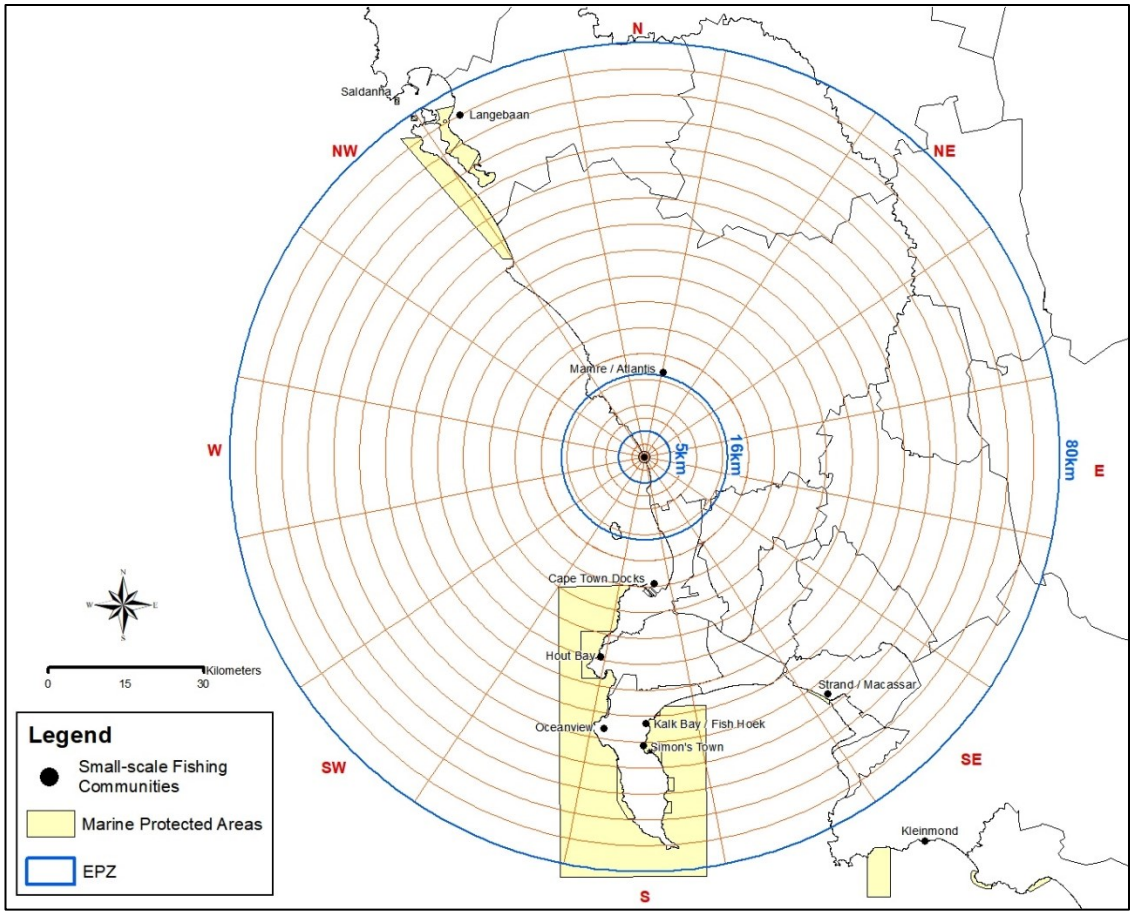

Figure 5.6.63
Fishing Communities in the Site Region (80 km)

c) Vessels, Gear and Species Targeted

In the Western Cape, fisheries activities are mainly boat-based. The traditional wooden bakkie is the commonly-used vessel, which has been used for several centuries. Bakkies target various line fish such as snoek (*Thyrsites atun*), yellow tail (*Seriola lalandi*) and cape bream (*Pachymetopon blochii*) using hand-held fishing lines. These vessels also harvest WCRL with steel-hooped nets deployed by hand. The open-decked, fiberglass-hulled ski-boat is another vessel used in small-scale fishing activities, and it is mainly used in the line fishery. Ski-boats are 10 m to 15 m long, and are propelled by two powerful inboard motors ranging from about 70 hp to 90 hp. Apart from boat-based fishing, residents of coastal communities in the Western Cape also practice shore-based activities such as intertidal shellfish harvesting. Intertidal species are usually harvested for subsistence purposes

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(although there is also limited commercial sale), with small amounts of black mussel (*Mytilus galloprovincialis*) and limpet (*Patella spp*.) collected by hand using improvised metal implements (Schultz, 2016).

Other small-scale fisheries that use low-intensity gear and target multiple species that support local economies and food security also exist. Limited data exist for these fisheries. Recently, an attempt was made to identify all small-scale fisheries that are encompassed in the draft small-scale fisheries policy and ***Table 5.6.28*** sets out the data on target species, fishery sector, region or habitat and gear and/or vessel employed (Paterson, et al., 2014).

Table 5.6.28
Species Targeted, Sector, Region and Gear/Vessel by the Small-scale Fishery

Target Species or Species Group	Fishery Name/ Sector	Region/ Habitat	Gear/ Vessel
Abalone	Commercial Sector	Cape Peninsula to Overstrand	Boat-based hookah diving, poachers are also known to enter from the shore and utilise scuba gear
Bait	Recreational/ Informal	All	Hand pumps/ digging
Harders/ mullet	Small nets	West Coast	Estuarine gillnetting/ drift net/ beach seine net
Kelp (Eklonia maxima)	Commercial kelp	West Coast to Overstrand	Harvested and collected
Linefish (hottentot, steentjie, panga, carpenter, small bottom species)	Recreational/ interim relief permit	Small coastal communities	Non-power or low hp boat, hand line, rod and reel
Linefish (hottentot, steentjie, panga, carpenter, small bottom species)	Traditional Line Fishery	West Coast to Overstrand	Ski-boat, chukkie, hand line, rod and reel
Line fish (multi species)	Recreational/ informal	Shore based, estuaries	Hand line, cast net, rod and reel
Line fish (nomadic pelagic species: snoek, yellow tail, small tunas)	Traditional Line Fishery	West Coast to Gordons Bay	Ski-boat, hand line
Line fish (stumpnose, kob, white steenbras,	Recreational/ informal	Estuaries	Gillnets / set nets

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Target Species or Species Group	Fishery Name/ Sector	Region/ Habitat	Gear/ Vessel
grunter)			
Line fish (white stumpnose, kob)	Small nets	West Coast	Beach-seine net
Line fish (yellowtail)	Traditional Line Fishery/ treknet	False Bay	Beach-seine net
Mediterranean (blue) mussels (*Mystilus galloprovincialus*)	Recreational / informal	West Coast	Hand picked
Rocky shore invertebrates	Informal	Rural	Hand-picked, shore based, panga, knife, screw-driver
Sandy-shore invertebrates	Informal	Rural	Hand-picked with tools
WCRL	Inshore WCRL rights holders / interim relief permit	West Coast	Small boat (ski or rowing) with hoop net
WCRL	Recreational / informal	Cape Peninsula to Overstrand	Snorkelling, paddle skis and hoop nets, poles from the shore
White mussel (as bait)	Informal	West Coast	Spades / hand

d) Rights Holders

Interim relief/small-scale fishery allocations for WCRL and line fish were made to 1 022 fishers in the site region, as set out in ***Table 5.6.29*** (Department of Agriculture, Forestry and Fisheries, 2020b).

Table 5.6.29
Small-scale Fishery Rights Holders in the Site Region

Area	Line Fish	WCRL		Total Fishers per Area	Community
		Area (Nearshore)	Area (Offshore)		
West Coast	Zone A	5 and 6		39	Atlantis, Blouberg
				58	Mamre/ Yzerfontein
				23	Darling
				27	Hopefield
Cape Metro	Zone A	8	8+	13	Kraaifontein/ Belhar/ Delft
				46	Grassy Park
				25	Lavender Hill/ Retreat
				194	Hangberg/ Hout

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Area	Line Fish	WCRL		Total Fishers per Area	Community
		Area (Nearshore)	Area (Offshore)		
					Bay
				70	Imizamo Yethu
				108	Kalk Bay/ Steenberg
				44	Khayelitsha
				32	Langa
				7	Gugulethu/ Crossroads/ Nyanga
				13	Masiphumelele
				64	Mitchellls Plain/ Strandfontein/ Hanover Park
				128	Ocean View
				19	Philippi
		11		112	Helderberg/ Strand/ Gordon's Bay/ Sir Lowrey's Pass/ Macassar

e) Market Destinations

Until recently, knowledge of small-scale fisheries value chains was mostly drawn from literature detailing the socio-economic conditions, livelihoods, harvesting, and post-harvest processes associated with small-scale fisheries. However, recently more detailed research is being conducted into the small-scale fisheries value chains (Schultz, 2016).

In the Western Cape, small-scale fisheries value chains are more complex and extensive than those along South Africa's eastern and north-eastern coastline, where small-scale fisheries are largely non-commercialised and subsistence-oriented. Two of the most economically important value chains in the Western Cape are based on the small-scale snoek and the WCRL fisheries (which includes traditional, commercial and interim relief subsectors).

Snoek has played an important role in the food systems for poorer coastal communities in the Western Cape for centuries, providing a cheap, accessible source of food, rich in protein and essential omega oils. When snoek is landed, it is usually rinsed, de-headed and gutted by fish cleaners, or the catch is loaded directly from the vessels onto vehicles owned by informal buyers or hawkers known as langanas. They purchase snoek wholesale at the landing site and transport it to socio-economically disadvantaged communities in the surrounding area, where they sell it on roadsides or to local fish shops and factories where value is added by

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freezing, smoking and other processes (Schultz, 2016).

WCRL has become a high-value species. Although not researched in as much detail as snoek, existing data indicate that the small-scale WCRL fishery value chain is limited to the harvesting phase, mainly because small-scale fishers are only allocated a few WCRL permits and because they lack the infrastructure and assets required to engage in post-harvest storage and processing. Therefore, most of the WCRL caught by small-scale fishers is directed (formally and informally) into the large-scale or offshore WCRL fishery value chain, where it is processed and exported by established fishing companies. The harvesting phase of the small-scale WCRL value chain is done by fishers (vessel owners and crew) using nearshore commercial quotas and interim relief permits. Significant numbers of fishers also participate in unregulated WCRL fishing activities, harvesting WCRL without quotas or permits. In some cases, fishers sell all of their fresh catch (none is kept for own consumption) directly to the local restaurant and hospitality enterprises (Schultz, 2016).

5.6.6.5 Mariculture in the Site Region

A desktop study was conducted to obtain current data on the distribution of fish processing establishments (including mariculture facilities) in the site region.

Data on the location of mariculture facilities, species and volumes cultured were obtained from the DFFE, Branch: Fisheries Management. The department provided a hard copy of the latest available fish processing register, dated 2020 (Department of Environment, Forestry and Fisheries, 2020g).

Currently, no mariculture occurs within the site region.

5.6.6.6 Impact of Climate Change on Marine Fisheries

This section considers the most important West Coast fisheries in terms of value, employment and/or food security, namely commercial fisheries for demersal fish, small pelagic fish and WCRL and the small-scale line and net-fisheries for a wide range of species (FAO, 2018).

The effects of climate change interact with other stressors such as fishing and pollution and affect the capacity of a species to respond to these other pressures. The effects of climate change are already evident in marine ecosystems and include increases in ocean temperatures and changes in wind speed and direction, ocean chemistry and direction and

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strength of currents (Ortega-Cisneros, et al., 2018).

a) Climate Change Effects on the Marine Environment

i) The Agulhas Current

There is mounting evidence that the Agulhas Current is undergoing changes which could have profound effects on local climate and marine and coastal ecosystems off South Africa. Since the 1980s, sea surface temperatures in the Agulhas Current system (including on the East Coast shelf) have increased by (0.55ºC per decade between 1985 and 2009 (Department of Environmental Affairs, 2013). This has caused an increase in the leakage of warm, high-salinity water into the Atlantic Ocean. An increase in the transfer of energy from the ocean to the atmosphere through increased evaporation has also occurred (Augustyn, et al., 2018).

ii) The Benguela Upwelling

The Benguela upwelling system located on the West Coast of Southern Africa is one of the largest eastern boundary upwelling systems in the world, making it a region of particularly high primary and secondary fish production. The Benguela is divided into northern (Namibian) and southern (South Africa) subsystems by the perennial upwelling cell located at Luderitz (Augustyn, et al., 2018).

Apart from seasonal synoptic effects, variations in El Niño Southern Oscillations and in the Southern Annular Mode are the most important source of large-scale climate variability in the tropics and middle and high latitudes in the Southern Hemisphere (Augustyn, et al., 2018).

During the austral summer, El Niño events causes warmer-than-average sea surface temperatures in the southern Benguela. While there has been no obvious trend in the frequency or intensity of El Niño events in recent decades, there have been changes in the Southern Annular Mode, which may have resulted in a southward shift in synoptic wind systems to the south of the continent. This causes a general reduction in sea surface temperatures in the Cape Peninsula upwelling region in late summer over the past few decades (Augustyn, et al., 2018).

iii) Ocean Acidification

Global biogeochemical climate models and data analysis predict that the Benguela will experience corrosive and irreversible consequences of ocean acidification within the 21st century and that, through changes in

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the Agulhas Current and local upwelling, the East Coast will not escape these effects. There are signs that the Benguela may already be under strain from effects related to ocean acidification, which appear to be most severe in the inshore region of the West Coast (Augustyn, et al., 2018).

iv) Rainfall

Reductions in rainfall, an increase in water abstraction and other agricultural practices have caused river mouth closures and a reduction in the deposition of sediment in the near-shore zone, affecting species which utilise estuaries as breeding and nursery areas or rely on nutrients from sediments for growth. These processes will continue to be affected by changes in rainfall over South Africa (Augustyn, et al., 2018).

The physical and chemical changes outlined in the above could change the hydrobiological environment in the seas around South Africa.

b) Climate Change Effects on the Marine Production

Changes in the frequency, intensity or location of upwelling can have major effects on primary, and thereby secondary, production, directly affecting the base of the marine food chain with profound effects on the ecosystem. According to Verheye et al, there is currently no strong evidence that large scale changes in primary production have in fact occurred off the West Coast in recent decades, or that the major changes in secondary production, which have occurred in the Benguela are due primarily to changes in primary production (Augustyn, et al., 2018).

The following effects of climate change are however, predicted: (a) the upwelling off the West Coast (and in coastal upwelling systems in general) is expected to intensify and (b) changes in water temperature and the wind field (including its effects on upwelling) are likely to effect the oxygen content of sea water, of which the depth, extent and persistence of oxygen-deficient water masses has serious consequences for marine life.

There is currently, no clear evidence of an increase in the extent of low-oxygen water in the St. Helena Bay region on the West Coast. An increase in WCRL ‘walkouts’ in the late 1980s and early 1990s in the St. Helena Bay region provided evidence of an increase in anoxic events in the nearshore zone attributed to harmful algal blooms and their increased occurrence. More recently, the presence of unprecedented red tides off the South Coast of extraordinary spatial extent appear also to be symptomatic of changing environmental conditions (Augustyn, et al., 2018).

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i) **Effects of Climate Change on Key Marine Resources**

The following section sets out the current understanding of the impact of climate change on key marine fisheries that are located on the West Coast.

Hake

Relatively little is known about the effects of environmental factors and behavioural responses on the size of the hake resource, but their longevity, wide geographical range, extensive diurnal vertical migrations, very diverse diet and ability to tolerate relatively low oxygen levels, all suggest that they should be resistant to all but extreme, prolonged environmental perturbations. There is, however, no evidence that major perturbations such as this have in fact been occurring over the hake fishing grounds in South Africa, or that there have been significant changes in abundance or distribution of the species in recent years (FAO, 2018).

In 2015, the demersal trawl fishery as a whole was rated as one of the least vulnerable to climate change at present, despite its high value and relatively large labour force, because of the apparent tolerance of hake to changes in the environment, and the fact that the major part of the fishery is heavily industrialised, with the financial and technical resources to adapt to changes in resource abundance and distribution (FAO, 2018). However, Ortega-Cisneros et al. (2018) who used an ecosystem model and climate projections to evaluate the effects of fishing, warming, and horizontal and vertical mixing on the Southern Benguela (West and South coasts of South Africa) ecosystem, found that warming had the greatest effect, almost always negative, on the biomass of almost all species including Cape hakes that showed biomass reductions of the order of 10 per cent to 20 per cent by 2050 compared to control simulations (Ortega-Cisneros, et al., 2018).

Small Pelagic Fisheries

Small pelagic fish species are planktivorous, short-lived and highly productive. These characteristics make them highly responsive to environmental changes. Hence, they are likely to show a relatively rapid response to climate change impacts, compared to longer lived fish. After Alheit et al (2012), changes in small pelagic fish abundance levels and distributions elsewhere in the world have been convincingly linked to environmental variability, and small pelagic species have been characterised as "*excellent indicators of regime shifts*" (Augustyn, et al., 2018).

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Changing wind fields, increasing water temperatures and stratification in marine ecosystems resulting from climate change have the potential to impact the productivity and species composition of plankton, on which small pelagic fish feed (Augustyn, et al., 2018).

Increased/decreased productivity should be beneficial/detrimental for small pelagics in a general sense, but changes in plankton community or size composition will likely impact species differently, as anchovy and round herring feed predominantly on larger zooplankton, whereas sardine feed primarily on smaller zooplankton (Augustyn, et al., 2018).

Although, previous changes in abundance and distribution of small pelagic species off South Africa have been observed, future changes as a result of climate change appear likely. However, based on current knowledge and data, predictions about climate change effects on South African small pelagic fish and the fisheries they support can only be speculative at this stage. Nonetheless, of the three small pelagic species, a positive response to climate change is considered most likely to be shown by anchovy, if upwelling increases result in an enhanced feeding environment (larger zooplankton) for anchovy off the West Coast and as long as the increased wind (causing increased upwelling) occurs at the ideal time in the anchovy life-cycle. The change in anchovy distribution suggests that there may also be scope for an anchovy-directed fishery off the South Coast (Augustyn, et al., 2018). However, modelling by Ortega-Cisneros et al, indicates that anchovy showed the strongest response to predicted warming of the southern Benguela, with a reduction in biomass of around 50 percent and are more marked impact off the West Coast than the South Coast of South Africa. (Ortega-Cisneros, et al., 2018). The FAO predicts substantial changes in distribution and a reduction of 40-50 per cent south of 48°N for anchovy off Southern Africa (FAO, 2018).

Sardine are expected most likely to show a negative response to climate change due to (i) a change in the trophic environment (including increased dinoflagellate blooms), which may reduce sardine productivity, and (ii) the possible cessation of the sardine run due to warming and other unfavourable oceanographic conditions off KwaZulu-Natal (Augustyn, et al., 2018).

At present there is insufficient knowledge about round herring to make predictions for this species, although its trophic similarity to anchovy suggests that the two species might react in similar fashion (Augustyn, et al., 2018).

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In 2015, the fishery for small pelagic fish on the West Coast and Western Agulhas Bank was rated as the second-most vulnerable to climate change because of the sensitivity of the resource to environmental perturbations, its commercial value and the large number of people employed in the fishery (FAO, 2018).

Line and Net Fisheries

The main physical impacts that directly affect South African line and net fishers include changes in precipitation and associated river run-off and changes in wind strength and direction and associated storm surges, flooding and erosion patterns. Changes in sea surface temperature and other physical properties (e.g., pH) will have a more indirect effect, as these do not necessarily influence the mechanics of the fishing operation but change the ecology and in turn the availability of the exploitable resources within comparatively small fishing habitats (Augustyn, et al., 2018).

The small-scale fishery for line and net-fish, much of which operates off the West Coast, was rated as the most vulnerable to climate change in 2015. This fishery is sensitivity to large-scale and small-scale changes in the environment. With the exception of the recreational sector, many individuals and communities involved in this fishery are poor, relatively unskilled and socially disadvantaged and have a very limited capacity to adapt to adverse changes (FAO, 2018).

West Coast Rock Lobster

WCRL are well-adapted to the highly dynamic nature of an upwelling system and are therefore resilient to many aspects of predicted climate change scenarios. Limited understanding of WCRL larval biology, ecology and behaviour makes it difficult to speculate on the possible impacts of predicted climate change scenarios on that phase of the WCRL life-cycle. Notwithstanding the resilience of this species, the possible increase in lobster walkout events resulting in major losses of mainly undersize female WCRL, coupled with a decrease in lobster settlement and reduced juvenile and adult growth rates, may result in further reduced TACs for this fishery in future (Augustyn, et al., 2018).

5.6.6.7 Recreation and Tourism-related Activities

The coastal area between Cape Town and Saldanha Bay is a popular coastal recreational and tourist destination, with activities concentrated in and around the Langebaan Lagoon, Yzerfontein and Grotto Bay to the north of the site and in the Cape Metropolitan Area, Koeël Bay and Rooi

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EIs to the south of the site. Cape Town is the tourism gateway to the Western Cape and contains numerous tourism-related facilities and activities. To the north, the coastal area between the site and Langebaan is less developed than around Cape Town. A large portion of the site region's northern coastline accommodates the West Coast National Park, where limited access to the beach is permitted. The Table Mountain National Park and Cape Point are located to the south of the site. Further to the south and east of the Cape Metropolitan Area, the area is less developed and much of it forms part of the Kogelberg Biosphere Reserve (see ***Drawing 5.6.9***) (Planning Partners, 2021c).

The following sections report on recreational and tourism activities associated with the coastline's coastal and marine activities that occur in the adjacent sea, with specific focus on the site vicinity, where a greater level of detail reported. ***Section 5.4*** reports on the number of local and visiting people involved in recreational activities.

Land-based recreational and tourism activities and facilities along the coastline that are described include:

- land based eco-tourism;
- public coastal resort facilities;
- popular beach destinations;
- swimming;
- angling;
- bait collecting;
- sand yachting.

Marine activities and facilities that are described include:

- water-based marine eco-tourism;
- small craft harbours and boat-based recreational fishing;
- surfing and kite surfing;
- yachting/sailing;
- jet-skiing.

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As many activities are informal with limited available data, this section focuses on the main activities.

a) Coastal Recreational Activities and Facilities in the Site Region (80 km)

A total of 422 km of coastline is located in the site region and falls within four municipal areas (Planning Partners, 2021c):

- Saldanha Bay Municipality: 104 km of coastline to the north of the site;
- Swartland Municipality: 44 km of coastline to the north of the site;
- City of Cape Town: 16 km of coastline to the north and 247 km coastline to the south of the site;
- Overstrand Municipality: 11 km of coastline to the south-east of the site.

i) Coastal Eco-tourism

Eco-tourism is associated with locations where the public has access to the beach within protected nature areas. In the Cape Metropolitan area these include the Table Mountain National Park, False Bay Ecological Park, Wolfgat Nature Reserve, Macassar Dunes Conservation Area and parts of the Kogelberg Biosphere Reserve. Eco tourism sites outside of the Cape Metropolitan Area include the West Coast National Park, Sixteen Mile Beach and the portion of the Kogelberg Nature Reserve located within the Overstrand municipal area.

Coastal recreational and tourism activities in the large coastal reserves in the site region include *inter alia* (Planning Partners, 2021c):

- West Coast National Park to the north: hiking, 4x4 drives, game viewing, sailing, canoeing, mountain biking, bird watching, self-guided constructed trails and walks, picnicking, adventure activities, recreational angling, ski boats, kite surfing and overnight facilities;
- Table Mountain National Park to the south: fishing, picnicking, sight-seeing, kite surfing, surfing, snorkelling, spearfishing, hiking and overnight facilities, as well as popular tourist destinations that include Cape Point and Boulders Beach to see Penguins;
- Kogelberg Biosphere Reserve to the southeast: fishing, birding, swimming, surfing, hiking, sight-seeing, diving, and whale watching.

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ii) Public Coastal Resort Facilities

Public coastal resort facilities are located at Silwerstroomstrand (12 km northwest), Muizenberg Pavilion (47 km south), Strandfontein (47 km south-southeast), Mnandi (48 km south southeast), Monwabisi (48 km south-southeast), Macassar Pavilion (54 km south-southeast), Harmony Park (62 km southeast) and Klippies Bay (73 km south-southeast), as illustrated in ***Drawing 5.6.9*** (Planning Partners, 2021c).

iii) Amenity/Swimming Beaches and Tidal Pools

Popular amenity/swimming beaches and tidal pools in the site region are provided in ***Appendix B*** (Planning Partners, 2021c).

iv) Swimming

Popular swimming beaches in the site region, to the south of the site, include Melkbosstrand Beach (5 km south-southeast), Big Bay (11 km south), Bloubergstrand (18 km south-southeast), Milnerton Beach (24 km south-southeast), Clifton (30 km south), Camps Bay (31 km south), Hout Bay (42 km south), Boulders Beach (58 km south), Fish Hoek (51 km south), St. James (49 km south), Muizenberg (48 km south), Mnandi Beach (48 km south-southeast), Macassar Beach (53 km southeast), Strand (60 km southeast), Gordon's Bay (67 southeast), Koeël Bay (73 south-southeast) and Rooi Els (78 km south-southeast).

To the north of the site, popular swimming beaches include Silwerstroomstrand (13 km northwest), Ganzekraal (20 km north-northwest), Yzerfontein (45 km northwest), Kraal Baai (70 km north-northwest) and Langebaan (75 km north-northwest). These swimming beaches are illustrated in ***Drawing 5.6.9***. Refer to ***Section 5.4*** for details on the number of beach goers on main beaches.

v) Angling and Recreational Fishing

Shore angling along the South African coastline is a popular recreational activity. The total number of recreational fishermen in the site region is not known. The total estimated catch for the South African marine recreational fishery was 8 355 t, which is larger than the 3 891 t in the commercial line fishery.

The Western Cape State of the Coast Report (2018) reports that 136 940 recreational fishing permits were issued in the 2016/2017 financial year.

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Research conducted by Potts et al in 2015/2016 estimated that there were approximately 72 400 shore-based anglers in the Western Cape. The West Coast was identified as a popular area for recreational fishers.

Factors that may influence the spatial distribution of anglers include:

- the type of shoreline, with angling effort highest on mixed shores, followed by estuaries, sandy beaches and rocky shores, while boulder shores being less preferred;
- catch rate, i.e. at locations where anticipated catch rates were expected to be higher;
- ease of access to the shoreline;
- time of the year or the week, with higher numbers recorded during school holidays and over weekends.

The description of recreational fishing in the site region is focused on the characteristics of the shoreline and the access to recreational fishing opportunities. The main species targeted by recreational fishermen are indicated below and highlights locations of recreational fishing.

The coastline between 80 km and 50 km north-northwest and northwest is dominated by the Langebaan Lagoon. Shore fishing at the western seaboard at Langebaan is mostly limited to the exposed shoreline of the South Head that is not easily accessible, where kob, steenbras and garrick are targeted. Fishing also occurs in the lagoon along the beaches, rocks and from small boats where kob, shad and gurnard are targeted.

The coastline between 50 km northwest (Sixteen Mile Beach, north of Yzerfontein) to 16 km northwest is characterised by sandy beaches, as well as short sections of deep gullies and rocky outcrops. The coastline is reasonably accessible to recreational anglers. Popular spots include Stark's Bank, Grasbank, Draaibank, Dokter se Klip and Ou Skaapeiland, situated on the headland. Main species targeted include galjoen and hottentot.

The coastline between 16 km south southeast to 25 km south-southeast consists of long sandy beaches with intermittent rocky outcrops and ledges. Galjoen and hottentot are targeted.

The coastline between 25 km south-southeast and Hout Bay (42 km south) is not popular with anglers. The Port of Cape Town also lies within this area where access is restricted and fishing is not permitted. The

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coastline at Hout Bay (42 km south) has long stretches of very rugged rocks that alternate with long beaches and hottentot and galjoen are mainly targeted. Popular fishing spots include Witsands, Slangkop, Kommetjie, Ratelklip, Chapman's Point, Rondeheuwel and Koeëlbaai, as well as the Hout Bay harbour wall. Other less accessible spots include Duikereiland, Duikerpunt, Leeugat and Oude Skip.

The eastern coast of the Cape Point peninsula (between 45 km south to 75 km south) consists mainly of steep cliffs and only a few angling spots are accessible, including Bordjiesdrif, Black Rocks and Venus Pools. The Cape of Good Hope Nature Reserve includes numerous fishing spots from small beaches and rocks, including Rooikrans, Penguin Rock and Buffels Bay. Fish targeted include deepwater roman, hottentot, yellowtail, white stumpnose and galjoen.

Fish Hoek and Simon's Town are not popular spots for local recreational fishermen, but holiday makers frequent this stretch of coastline. Rock fishing along the peninsula occurs at Smitswinkel Bay, Boulders, Miller's Point and Castle Rock where roman, hottentot, red stumpnose, white stumpnose, geelbek, yellowtail, steenbras and shad are targeted.

The coastline from Fish Hoek to Strandfontein is rocky with intermittent sandy beaches. The beaches of Strandfontein are steeper than those to the east, offering deeper waters to anglers. The coastline becomes rocky again at Macassar. Fish targeted are white stumpnose, kob, steenbras, galjoen and mackerel.

The coastline from Macassar to Gordon's Bay is dominated by long, sandy beaches that offer good fishing spots, including Swartklip and Macassar beach. To the east of Gordon's Bay, the coastal road has a few parking areas that provide access to fishing spots along this rocky stretch of coastline. Galjoen, shad, kob, white steenbras, mackerel, maasbanker and baardman are targeted.

Popular fishing spots within the site region are indicated in ***Drawing 5.6.9***.

The Interim Habit Study recorded recreational angling at Duynefontyn beach, usually between May and early November. White steenbras is the species mainly caught nearest to the KNPS beach boundary, and catches up to 20 kg per person per year were reported for 2020. Catch volume increases beyond Melkbosstrand towards Blouberg Strand, where and up to 50 kg per person per year were caught (SRK & PSI Risk Consultants, 2020). Refer to ***Section 5.4*** for details on the consumption of sea food and time spent on recreational fishing.

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vi) River and Estuarine-based Recreation

Large estuaries in the site region include the Langebaan Lagoon, Diep/Riet, Sout, Disa, Wildevoël, Silvermyn, Zand, Zeekoë and Eerste estuaries.

Recreation and tourism activities that occur within and associated with estuaries in the site region include *inter alia* the following:

- Langebaan Lagoon: recreational fishing, recreational boating, water sports (e.g. kite surfing), canoeing and birdwatching;
- Diep/Rietvlei and Milnerton Lagoon: sailing, skiing, powerboats, birding, fishing, paddling and canoeing;
- Sout (Wes): limited angling and bait collection;
- Disa: recreation in the estuary is minimal and is confined to local recreational swimming, dog walking/paddling in the back ponding area and in the estuary mouth. No commercial fishing is permitted. The size and scale of the estuary does not facilitate broader recreational use such as boating or sailing.
- Wildevoël: fishing, birdwatching and horse riding – Horse riding occurs within the Noordhoek/Kommetjie wetlands and beach and the area that includes the Wildevoël Vlei and estuary. Most horse riders in Noordhoek belong to the Noordhoek Riding Association (NRA). The NRA has approximately 180 members, utilising the beach and wetlands on a daily basis.
- Silvermyn: recreation in the estuary is minimal and is confined to local recreational swimming and paddling in the back ponding area and in the estuary mouth.
- Zandvlei: birdwatching, board sailing, paddle boarding, kite surfing, yachting, canoeing and recreational fishing;
- Zeekoeë: recreation in the estuary is minimal – Recreational swimming in the back ponding area and in the estuary mouth is not allowed due to the discharge of treated sewage effluent. No commercial fishing is permitted, however limited recreational fishing occurs.
- Eerste: recreation in the estuary is minimal and is confined to occasional limited local recreational swimming. No commercial

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fishing is permitted; however limited recreational fishing occurs.

No large estuaries are located in the site vicinity.

vii) Bait Collection

Bait species are collected by recreational and subsistence fishermen. It is estimated that bait collection occurs in 84 per cent of South African estuaries. Commonly targeted species include *Upogebia africana* (mud prawn), *Callichirus kraussii* (sand prawn), *Solen spp.* (pencil bait), *Arenicola loveni* (bloodworm) and *Polybrachiorhynchus dayi* (ribbon worm).

Various bait species are collected in the site region, including bloodworm, sand prawn, coral worm, redbait, squid (chokka), venus ear, white mussel, wonderworm, prawn, moonlight worm and musselworm. Collection figures are not known.

A 2012 study (Petersen, et al., 2012) on wild harvesting within the Cape Metropolitan Area recorded 77 marine species that are collected for use as bait for catching food for human consumption. Of these, 73 were also traded or eaten as food. These species are either collected or fished (either with a permit or illegally) from the intertidal zone.

Species recorded for bait collection in the study included bloodworm, plough shells, mudprawn, black mussel, hoof limpets, smooth trough shell, periwinkle, octopus, limpets, false limpets, pink Port Alfred tellin, Allikreukel, screw shells, estuarine mud prawn, keyhole limpets, slipper limpets, top snails, tritons and barnacles.

Bait collection has been recorded in the site region within the following estuaries: Langebaan Lagoon, the Diep/Riet and Zand estuaries.

The Interim Habit Study recorded that white mussel was collected along the local inter-tidal zone in the site vicinity, but was mainly used as bait (SRK & PSI Risk Consultants, 2020).

viii) Sand Yachting

There are two demarcated sand yachting areas in the site region; at Strandfontein between Zonwabe and Cemetery Beach on the False Bay Coastline and at Duynefontein Beach to the south of the site. Refer to ***Figure 5.6.64*** and ***Figure 5.6.65***. The sand yachting area at Duynefontein is located in the site vicinity (Planning Partners, 2021c).

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Figure 5.6.64
Demarcated Sand Yachting Area on the False Bay Coastline

Figure 5.6.65
Demarcated Sand Yachting Area at Duynefontein Beach

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DUYNEFONTYN SITE

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Robben Island

Legend

- Public Coastal Resort Facilities
- Popular Amenity Beaches, Swimming Beaches and Tidal Pools
- Popular Surfing, Kite Surfing, Windsailing and Jet Skiing Spots
- Popular Angling Spots
- Small Craft Launching Facilities
- Eco-Tourism Sites
- River and Estuarine-based Recreation Spots
- Popular Sand Yachting Spots
- Popular Bait Collection Spots

0 2.5 5 10 15 20 25
Kilometers

COORDINATE SYSTEM Map projection: Gauss Conformal Datum: Hartebeeshoek 94 Spheroid: WGS84 Scale factor: 1 Central meridian: LO19 Units: International meter	Eskom	SITE SAFETY REPORT FOR DUYNEFONTYN
PLANNING PARTNERS	RECREATION AND TOURISM-RELATED ACTIVITIES (80 KM) SOURCE OF INFORMATION: Planning Partners	REV BY AUTH BY
COMP NJ 06/04/2021		DWG NO: 5.6.9 REVISION: 0
REV	RELEASED BY ESKOM	NOTE: For proper clarity this drawing must be printed at scale, A3 paper size.
SCALE 1:500 000		

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b) Marine Recreational Activities in the Site Region (80 km)

i) Marine-based Eco-tourism

Nature based eco-tourism within the maritime realm includes a broad spectrum of activities, *inter alia*:

- boat-based whale and dolphin watching;
- bird-watching on- and off-shore within estuaries and on the islands in the site region;
- seal watching at Seal Island in False Bay and in Hout Bay;
- shark cage diving.

South Africa is a popular destination for whale watching and shark cage diving (Planning Partners, 2021c).

ii) Boat-based Whale and Dolphin Watching

Boat-based whale and dolphin watching is the observation of whales and dolphins in their natural environment from sea-going vessels, while white shark cage diving involves observing free swimming great white sharks from vessels and/or from within a protective cage that is submerged in water. Both are regulated commercial operations contributing to coastal and marine tourism.

Twenty-eight boat-based whale watching areas are designated along the South African Coastline; of these, Cape Town, Hout Bay, Cape Point to Kalk Bay and Gordons Bay are located in the site region. Of the 18 permits allocated along the South African Coastline, 4 are in the site region for Gordons Bay, Cape Point to Kalk Bay, Hout Bay and Cape Town (refer to ***Figure 5.6.66***) (Planning Partners, 2021c).

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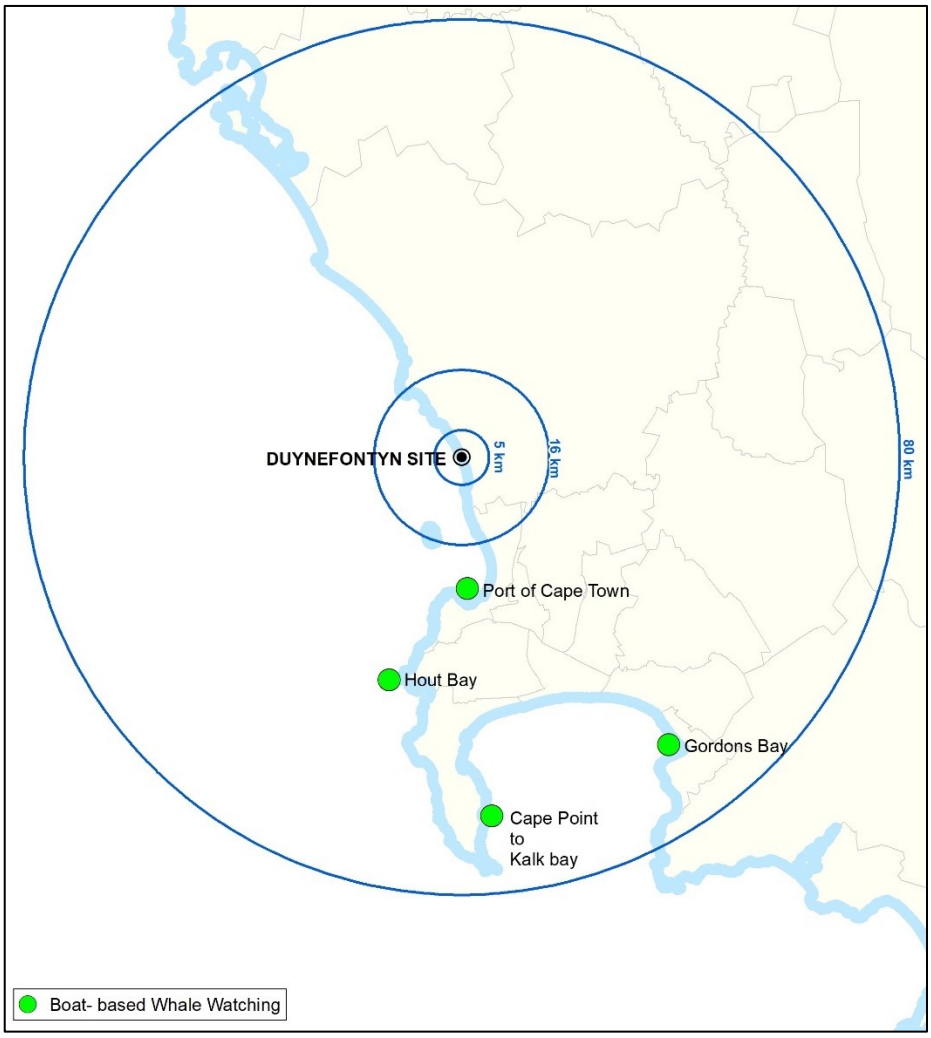

Figure 5.6.66
Boat-based Whale Watching Locations in the Western Cape and the Site Region

iii) White Shark Cage Diving

South Africa is one of five global destinations for white shark cage diving due to the naturally high abundance of white sharks and their preferred food source, seals. There are five designated areas along the South African Coastline, one of which is located in the site region at Seal Island in False Bay.

In terms of the 2017 Policy on white shark cage diving, permits could be allocated for a 10-year period. Applications were invited in 2017.

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Following on consideration of appeals submitted, the Minister of Environmental Affairs published the final list with three permits being allocated to the False Bay area (Planning Partners, 2021c).

iv) Small Craft Harbours and Boat-based Recreational Fishing

Sailing and deep-sea fishing are popular activities in the site region. The launching of motorised craft to access the marine environment is a common activity in the site region, conducted for varying purposes, including recreational activities and deep sea fishing.

Small craft harbours for tourist and recreational vessels in the site region include Murrays Bay Harbour (14 km south-southwest), Granger Bay Harbour (25 km south), with the adjacent Oceania Powerboat Club, Victoria and Alfred Basin (25 south), Royal Cape Town Yacht Club (26 km south), Hout Bay Harbour (42 km south), Simons Town Yacht Club (58 km south), Kalk Bay Harbour (50 km south), Harbour Island (66 km southeast) and the Gordon's Bay Harbour (67 km southeast) (see ***Drawing 5.6.9***) and ***Appendix C***).

There are three public jetties in the site region:

- Strand Jetty (34º7'6"S 18º49'39"E), built in 1934, provides a point of embarkation/disembarkation for crew of fishing boats launching at the Strand boat launch site.

- Harmony Park Jetty (34º8'21"S 18º50'46"E) forms part of the Harmony Park Resort and provides opportunities for recreational use, including fishing within the Resort.

- The Simon's Town Jetty (34º11'32"S 18º26'0"E) is administered by the City of Cape Town and forms part of the central tourism, recreation and commercial hub of Simon's Town. This Jetty is used primarily as a recreational asset and provides an operational access point for a number of eco-tourism operators (boat based whale watching, white shark viewing and site seeing boat tours) and is also used for refuelling.

The Cape Royal Yacht Club, located within the Port of Cape Town (27 km south), accommodates numerous recreational sailing yachts. Yachts and bayliners are also moored at the Victoria and Alfred basin (25.3 km south) and at Granger Bay Harbour (24.8 km south). The Volvo Ocean Race, which is the longest professional sporting event in the world, a round-the-world yacht race, is held every three years. It has been hosted

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in Cape Town 12 times in the past and last took place between 24 November to 10 December 2017. The race is scheduled to return to Cape Town in 2021/2022.

Murrays Bay Harbour on Robben Island (14.4 km south-southwest) is the only harbour located in the site vicinity. The harbour is scheduled to be used four times a day, weather dependant, by ferries transporting visitors to and from Robben Island.

There are several boat launching facilities in the site vicinity, located at KNPS, Melkbosstrand (5.8 km south), Big Bay (13.2 km south) and Bloubergstrand beach (15.3 km south-southeast), as illustrated in ***Drawing 5.6.9***. There are no jetties located in the site vicinity.

v) Surfing

There are numerous locations along the coastline in the site region where surfing occurs (refer to ***Drawing 5.6.9***). Notable surfing locations in the site vicinity include Gaschambers at Silwerstroomstrand, located north of the site; 11th Avenue, Tube Wave, Slabberts, Crayfish Reef at Melkbosstrand; Haakgat Point, Derde Steen, Horse trails in the Blaauwberg Nature Reserve, Big Bay, Little Bay and Blaauwberg to the south' Madiba's Left and Madiba's Point on the open ocean side of Robben Island, van Riebeekstrand, Melkbosstrand, Bloubergstrand, Clifton and Camps Bay.

The beach count conducted on 2 January 2018, by means of aerial photography identified surfing at the following beaches: van Riebeekstrand, Melkbosstrand, Bloubergstrand, Clifton and Camps Bay. The highest number of surfers (43) in the water at the time was recorded at Bloubergstrand. The Interim Habit Survey also recorded surfers at Melkbosstrand during 2020 (SRK & PSI Risk Consultants, 2020).

Cape Town hosted its fourth City Surf Series event in 2018, the Jordy Smith Cape Town Surf Pro from 15 to 17 June 2018. The primary contest venue is Big Bay at Bloubergstrand. In 2017 the event took place at Melkbosstrand and in 2018 at Melkbosstrand and Big Bay. The event is a World Surfing League Qualifying Series rated event and hosted 134 local and international contestants (Planning Partners, 2021c) (World Surf League, 2018).

vi) Kite Surfing

Kite surfing occurs in the site region (refer to ***Drawing 5.6.9***). To the south of the site, popular kite surfing locations are Strand (60 km

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southeast), Muizenberg (48 km south), Witsands (56 km south), Misty Cliffs (57 km south) and Scarborough (58 km south). Popular spots in the Table View area included Sunset Beach (27 km south), Dolphin Beach (17 km south-southeast), Kite Beach (17 km south-southeast), Doodles (15 km south-southeast), Big Bay (11 km south), Haakgat (8 km south) and Melkbos (5 km south-southeast). To the north of the site, popular kite surfing locations in the site region are found in the Langebaan Lagoon at Main Beach (75 km north-northwest and at Shark Bay (72 km north-northwest).

The annual *Red Bull King of the Air* kiteboarding contest is held in Cape Town during a window period between 1 to 16 February at Witsand/Misty Cliffs and/or Kite Beach. This international competition hosted 24 contestants in 2020; an estimated 9 000 spectators attended the event in 2019 (Planning Partners, 2021c).

vii) Jet Skiing

The use of jetskis is restricted along the coastline. In the site region jet skis launch at the Kommetjie slip way, Melkbos boat launch site, Miller's Point slipways, Strand slipway, Table View Slipway, Three Anchor Bay, Witsands slipway, Gordon's Bay Harbour and the Oceana Power Boat Club in Granger Bay (Planning Partners, 2021c).

5.6.6.8 Gas, Oil and Phosphate Mining in the Site Region

a) Offshore Oil and Gas

Approximately 98 per cent of South Africa's exclusive economic zone is subject to a right or lease for offshore oil and gas exploration or production, allocated to (i) exploration right lease areas, (ii) production right lease areas or (iii) technical cooperation permit areas. ***Figure 5.6.68*** indicates the relevant lease areas within the site region. Two exploration right lease areas are located in the site region, namely Rhino Oil (292ER) and Total, Shell and PetroSA (224ER) (Petroleum Agency South Africa, 2021).

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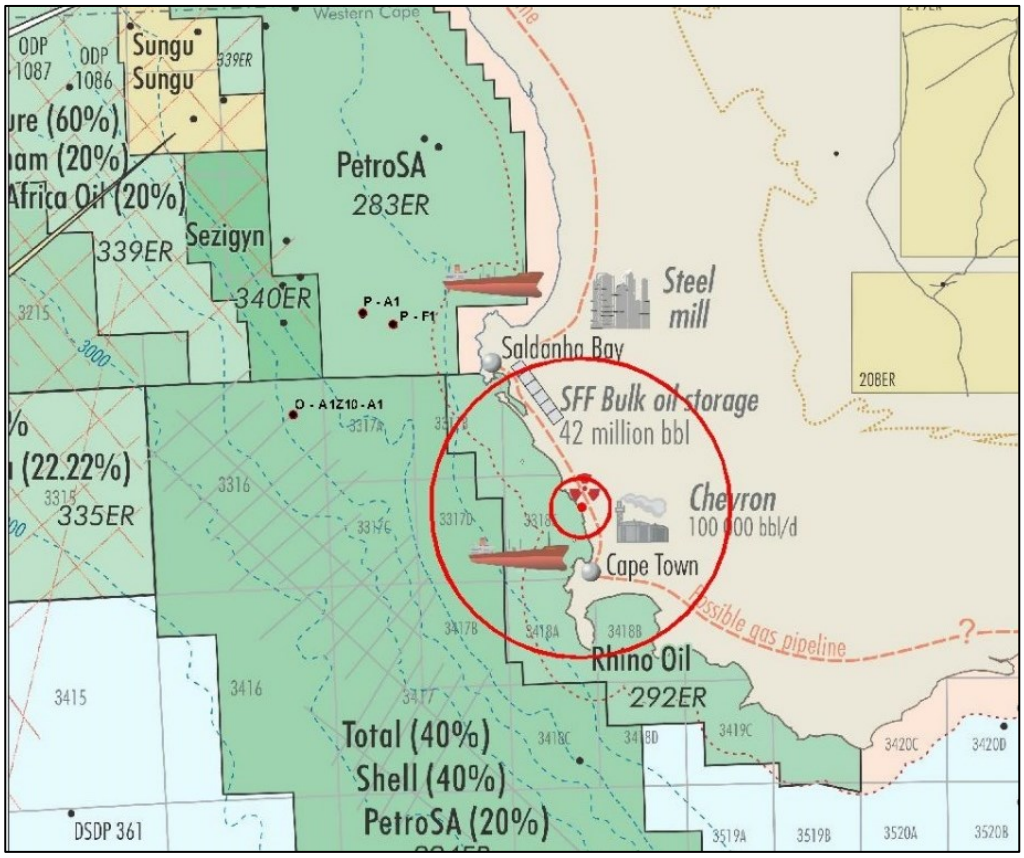

Figure 5.6.67
Petroleum Exploration and Production Activities Map

The Petroleum Agency of South Africa is responsible for the regulation of offshore exploration and production. Since 2006, there has been a rapid increase in the application and granting of offshore rights and leases by this company. The offshore oil and gas focus area of Operation Phakisa seeks to support the rapid development of the offshore oil and gas sector by "*creating an environment that promotes exploration*". As part of this project, thirty wells are planned to be drilled, along with infrastructure such as a phased gas pipeline network (Centre for Environmental Rights, 2021).

An exploration company has applied for an exploration right for inshore oil and gas exploration. The inshore licence area is located in the site region and stretches from Saldanha to Cape Agulhas. The application is pending (see ***Figure 5.6.68***) (Centre for Environmental Rights, 2021).

Figure 5.6.68 also indicates that there are no well-points located in the site region. The nearest well-points are located further than 150 km

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north-northwest of the site (Petroleum Agency South Africa, 2021).

b) Coastal Offshore Mineral Sand and Phosphate Mining

An increasing number of prospecting rights have been applied for and/or granted for offshore heavy mineral sands within the South African exclusive economic zone. Two phosphate prospecting rights areas are located in the site region (refer to ***Figure 5.6.69***) (Centre for Environmental Rights, 2016). According to this figure, seismic surveys are undertaken in the site region.

Figure 5.6.68
Phosphate Prospecting Rights Map

5.6.7 Adjacent Sea Use Activities within the Site EPZs

This section lists adjacent sea use relative to the EPZs as defined in ***Chapter 8*** to inform emergency planning.

The following data sets were analysed:

- fish processing facilities as set out in ***Subsection 5.6.6.2*** (refer to ***Drawing 5.6.8***);
- adjacent sea use activities as set out in ***Subsections 5 6.5*** and ***5.6.6***.

5.6.7.1 Fish Processing Establishments

Based on the regional analysis of fish processing establishments

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(Planning Partners, 2021b), the data were analysed per sector in terms of the site EPZs. The EPZs were superimposed on the 5 km 22.5° sectoral grid and the distribution of fish processing establishments per EPZ was determined, as set out in ***Table 5.6.30***.

Table 5.6.30
Number of Fish Processing Establishments within the Site EPZs (2020)

Distance (km)	Sector											
	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW
0 – 5	-	-	-	-	-	-	-	-	-	-	-	-
5 – 16	-	-	-	4	-	-	-	-	-	-	-	-
16 – 80	-	-	-	-	1	-	-	-	3	24	46	-
Total in Sector	**0**	**0**	**0**	**4**	**1**	**0**	**0**	**0**	**3**	**24**	**46**	**0**

a) 0 to 5 km

There are no fish processing establishments located within 0 to 5 km annulus, as illustrated in ***Drawing 5.6.8***, as required by the regulations on site licensing (Department of Energy, 2011).

b) 5 to 16 km

Four fish processing establishments are located within the 5 to 16 km annulus, as illustrated in ***Drawing 5.6.8***. They are concentrated in the 8 to 12 km north-northeast sectors in Atlantis. They represent processing and distribution points from which contaminated food may enter the food chain. These establishments therefore need to be taken into consideration with respect to emergency and remedial measures relating to food banning and monitoring (International Atomic Energy Agency, 2002).

c) 16 to 80 km

Beyond the 16 km radius from the site and up to the 80 km EPZ, there are a total of 74 fish processing establishments. Their distribution is concentrated within Cape Town in the south and south-southeast segments, as illustrated in ***Drawing 5.6.8***. They represent processing and distribution points from which contaminated food may enter the food chain. These establishments therefore need to be taken into consideration with respect to emergency and remedial measures relating to food banning and monitoring (International Atomic Energy Agency, 2002).

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5.6.7.2 Activities in the Sea and Associated with the Coastline

Based on the data presented in ***Subsections 5.6.5*** and ***5.6.6***, this section analyses activities that occur in the sea and the coastline within the 0 to 5 km and 5 to 16 km radii of the site (International Atomic Energy Agency, 2002).

a) Activities in the Sea

No MPAs are located within 0 to 5 km of the site.

No general activity (swimming, operation of sea vessels etc.) is allowed within the 2 by 3.2 km KNPS exclusion zone of the sea shore adjacent to the KNPS (Refer to ***Chapter 9*** for more detail).

Since fishing and other activities within this area are already restricted due to the KNPS exclusion zone, an additional exclusion zone would not add a significant limitation on activities. Fishing is, however, an important local activity with respect both to commercial and recreational activities. These activities therefore need to be taken into consideration with respect to emergency and remedial measures relating to food banning and monitoring (International Atomic Energy Agency, 2002).

The Robben Island MPA is the only MPA located within 5 to 16 km of the site. It comprises of three Controlled Zones within which certain activities are either prohibited or managed. Restrictions include no fishing without a permit, no collection of broodstock and no SCUBA diving without permission.

b) Activities associated with the Coastline

The section highlights characteristics that enable coastal access and lists activities that typically occur within a particular EPZ. Recreational activities that occur within the 0 to 5 km PAZ and the 5 to 16 km UPZ are illustrated in ***Drawing 5.6.9***.

i) 0 to 5 km

Due to the coastline falling within the Eskom held properties access to the area is restricted and is protected from all forms of utilisation. This zone is also located within the Koeberg Nature Reserve. No activities take place within this area. The establishment of an additional exclusion zone will result in a slight additional restriction on recreational activities within this zone, in accordance with the regulations on siting (Department of Energy, 2011).

ii) 5 to 16 km

The stretch of coastline located within this zone is characterised by long sandy beaches with mixed and exposed rocky shores. Duynefontyn is a

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popular swimming beach.

Sunbathing, swimming, shore angling, sand yachting, and bait collection will need to be taken into consideration in emergency and remedial measures relating to food banning, temporary restrictions on access, monitoring and public communication.

With respect to the expected numbers of persons engaged in these activities, cumulative population data are provided in more detail in ***Section 5.4***. This represents a conservative estimation of the expected numbers of persons present at any one time within the EPZ.

5.6.8 Main Activities Relevant to Safety of the Nuclear Installation(s) and Potential Non-radiological Impact of the Nuclear Installation(s) on Adjacent Sea Use

Based on the site investigation, the main characteristics and activities associated with the sea and the coastline are described in terms as follows.

5.6.8.1 Impact of Marine Organisms on Nuclear Installation Cooling Water Systems

The potential hazards presented by marine biota on the nuclear installation(s) may result from entrainment of marine organisms and settlement from marine organisms in the intake pipes, resulting in the partial or total blockage of the cooling water systems. This could result in a loss of cooling water supply to the nuclear installation(s). This hazard will be most relevant for the operational phase of the nuclear installation(s) (Eskom, 2016). Desalination is the preferred option to ensure fresh water supply to the site and the sea water intakes structures to the desalination plant will also need to be kept clear of potential sources of blockage (refer to ***Section 5.12***). Prevention and mitigation of this hazard is planned to be addressed at the design and operational stage of the facility.

(a) Sessile Organisms

Colonisation by sessile organisms may result in biofouling of the cooling water uptake pipes of the nuclear installation(s).

In order to prevent or mitigate the consequences of such a hazard, chlorine will be used to keep the cooling system free of marine growth. The chlorine will be produced by means of electrolysis, and has been found to provide effective control (***Section 5.9***). The KNPS experience showed that chlorine used within the cooling system only has a localised

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effect on marine organisms. Existing monitoring programmes are considered adequate for observation purposes and no additional monitoring or action is required as part of this DSSR (***Section 5.3***).

Section 5.9 concludes that the nuclear installation intakes could be designed to cope and to minimise the risk of complete blockage of the intake. In the extreme case of a loss of the ultimate heat sink an alternate cooling source will be required. This will need to be considered in more detail in the design phase.

5.6.8.2 Potential Non-Radiological Impacts of the Nuclear Installation on Adjacent Sea Use

(a) Increase of Water Temperature (Thermal Plume)

The site is situated within the cold Benguela Current system within the Namaqua marine bioregion. This section of coast is characterised by low marine species richness and very low endemicity, with no sites of special biological significance occurring within the area nor any sites of special conservation value for marine species within the immediate area (Eskom, 2016). A detailed description of the marine ecology surrounding the site is also provided in ***Section 5.3***. The characterisation of the thermal plume is described in ***Section 5.9***.

The main areas and species that could be affected from the expected temperature increase are the pelagic fishery, line fish and marine mammals as discussed below.

The East Coast and West Coast small pelagic fishery industries are integrally linked. Any adverse impact on the fishery associated with the Duynefontyn site has the potential to impact on the entire fishery along the South Coast of South Africa. However, the small pelagic fishery shoals of anchovy and sardines are highly migratory over the course of their lifecycle. They would therefore not stay inshore for any considerable length of time, where they may be affected by the warm water plume (Eskom, 2016).

The KNPS experience has shown that no significant effects of thermal pollution in sandy beach communities were detected. Also, to date, no invasion of warm water species into the site vicinity has been recorded. Based on the lack of significant impacts caused by the release of cooling water by KNPS, it is unlikely that the release of additional warmed water by both the KNPS and the proposed development will have a significant effect on the marine environment (Eskom, 2016).

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The trawl and long-line fisheries, as well as tuna and swordfish-directed line fisheries, operate at a considerable distance offshore. Fish targeted by these sectors are not expected to be affected by the warm water plume as the plume has been modelled to dissipate within a few kilometres of the outfall, even in the calmest conditions. A mean rise in sea surface temperature of 1 ºC will be limited to an area of roughly 1.6 km² for a 4 000 MWe plant. Also, no area of the seafloor will experience mean temperature increases above 1 ºC (Eskom, 2016). The initial assessment was conducted for a higher generating capacity plant than is currently envisaged.

Even organisms such as WCRL, which are found closer to shore and are not able to migrate as easily as fish, will not be affected, as the buoyancy of the warm water limits the ability of water to penetrate downwards to the seabed where rock lobster live. Non-migratory nearshore line fish species, such as reef dwelling fish, are not envisaged to be affected for the same reason (Eskom, 2016).

The release of warm water is not expected to have a significant effect on marine mammals, since the affected area is estimated to be relatively small and isolated and the downward penetration of the plume is limited by the buoyancy of the warmed water and the rapid mix with cold seawater (Eskom, 2016).

(b) Potential Impacts of the Desalination Plant (Brine Plume)

Section 5.12 reports on the investigation and assessment of potable water supply sources over the various development/operational stages of the nuclear installation(s). Desalination is seen as the preferred long-term supply option, and seawater desalination plants (reverse osmosis) are to be deployed in phases during the lifecycle of the project.

Brine from the desalination plant will be discharged beyond the surf zone during nuclear installation(s) construction and co-disposed with once through cooling water discharge during the nuclear installation(s) operation.

During construction, the estimated maximum brine discharge will be 156 ℓ/s, for which the following options were considered: through a pipe located on the upper beach profile or from a pipe located beyond the surf zone at a suitable depth. It is recommended to discharge the brine beyond the surf zone along the sandy seabed at sufficient velocities to enhance vertical mixing. Baseline monitoring and modelling of plume dispersal, which is likely to contain biocides, coagulants and neutralising

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agents, will be required to ensure that any environmental impacts are within predicted ranges and as approved by the regulatory authority.

During operation, the brine will be mixed with large volumes of cooling water discharged from the nuclear installation(s) (about 176 000 ℓ/s for a 13 200 MWe installation) to minimise any impacts, but is expected to be virtually undetectable (***Section 5.12***).

5.6.9 Management of Uncertainties

5.6.9.1 Current Uncertainties

The uncertainties associated with the current knowledge and understanding of adjacent sea use can be summarised as follows:

- DFFE were unable to provide data in the format required to analyse the spatial distribution of fishing effort and fish caught within the site region. Limited site-specific data related to the volumes of commercial fish species caught within the site region were, however, included.
- It is anticipated that a number of additional MPAs will be declared within the next four years along the South African coastline. If any new MPAs are declared within the site region, this may place additional restrictions on the public use of marine resources and the sea.
- Although small-scale fisheries practiced under license from DFFE can be quantified, illegal harvesting of marine resources for subsistence purposes cannot be quantified. The majority of fish caught by recreational fishermen is for own consumption, and the volume cannot be reliably quantified within the site region. Data on fish consumption rates have been collected in the Interim Habit Surveys.
- The background radionuclide content in the main elements of the food chain, e.g. fish, has not been determined for the purposes of this DSSR. Based on discussions with the NNR this is not required at this stage, since it is only required for the purposes of a construction licence (National Nuclear Regulator, 2008) and the results of this analysis will be presented in the Safety Analysis Report for new nuclear installation(s) in the next licensing stage.

5.6.9.2 For the Lifetime of the Nuclear Installation(s)

Future uncertainties are also envisaged, i.e.:

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- Although fish stocks are calculated annually in accordance with an ecosystem approach to fisheries management, making predictions for the lifetime of the nuclear installation(s) will not be possible. Changes to individual allocations are therefore made annually. Fluctuations in biomass estimates will provide information about the allocation of fishing rights per commercially caught species from year to year. Short to medium-term predictions and associated fishery allocations published by the DFFE can be reported on, but will need to be updated on a regular basis, at least every five years.
- The abundance, allocation and possible migration of stocks are subject to change over the nuclear installation lifetime. As with the above, short to medium-term predictions can be reported on, but not for the lifetime of the nuclear installation(s) and will therefore need to be updated on a regular basis, at least every five years.
- Activities related to recreational, tourist and small-scale fishing will change over time as they are directly linked to the growth of the tourism industry and development trends in the site region. Changes with respect to numbers of persons involved in these activities are dynamic in nature and prone to change. Therefore information included in this section of this DSSR will need to be updated on a regular basis.

5.6.10 Monitoring

5.6.10.1 Ongoing Activities

Currently no monitoring activities are being specifically implemented to inform the site characterisation set out in this section of this DSSR. The Koeberg Environmental Survey Laboratory however conducts periodic analysis of radionuclide levels in samples taken specifically for this purpose (Eskom, 2019). These monitoring programmes will remain in place for the lifetime of the nuclear installation(s). The programme *inter alia* includes marine monitoring of abalone, black mussel, crayfish, fish, kelp, sea sediment, sea water and white mussel.

5.6.10.2 Planned Activities for the Lifetime of the Nuclear Installation(s)

Information presented in this section must be updated on a regular basis in order to maintain an adequate and accurate understanding of the marine and coastal activities within the site region.

Monitoring is also required in order to ensure that timely intervention of Eskom will occur where an activity poses a potential threat to the nuclear installation(s) or increases the risk to the safety of the public and the

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environment. More specifically:

- In order to maintain an understanding of up-to-date information related to commercial fisheries, the data presented in this section will be updated at regular intervals in line with the requirements as contained in the siting regulations (Department of Energy, 2011) and safety re-evaluations/re-assessments during periodic reviews.
- In order to maintain an understanding of the location and extent of fish processing establishments in the site region, the data presented in this section will be updated at regular intervals .
- Sea products landed and processed in the site region are also exported nationally and internationally. Potential for exposure of an extended public exists. It is therefore important that monitoring of radionuclide concentration in marine organisms at fish processing establishments is carried out by the Eskom KNPS Radiological Environmental Survey Laboratory prior to the construction of the nuclear installation(s) in order to determine the background radioactivity levels as a baseline. Monitoring during the nuclear installation operation and termination is also necessary in order to identify any trends or risks to the public over the lifetime of the nuclear installation(s). Currently, this is not done for the KNPS.
- Information on tourism and recreational activities presented in this section will be updated at regular intervals and the emergency plan will need to be reviewed accordingly.
- Monitoring of the radionuclide concentration in marine organisms must be carried out prior to construction of the nuclear installation(s) in order to establish the radiological baseline as required by the NNR (Department of Energy, 2011). This aspect is already addressed in the existing monitoring programme that is in place for the site (Eskom, 2019).

5.6.11 Management System

The assessment and characterisation of present and future adjacent sea uses around the site and its region entailed the following components:

- desktop study;
- site investigations conducted for the purposes of this DSSR;
- data assessment and characterisation;
- use of computer software, in particular *Microsoft Excel* sheets to record data and a GIS, for the collation, interpretation and

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presentation of data;

- mapping and the creation of a Geographic Information System database.

A quality assurance programme for the adjacent sea use characterisation was established to control the effectiveness of the execution of the site investigation and data analysis. This conforms to the overall management system for this SSR (see ***Chapter 10***) and the Eskom guidelines, i.e. to the appropriate grading for safety classification in terms of RD-0034 (National Nuclear Regulator, 2008) and Eskom's NSIP02189 (Eskom, 2021) classification procedure. The evaluation of the sea use adjacent to a nuclear installation site was determined as Safety Level 3, Safety Qualification 3. The required management system is described in ***Chapter 10***.

The activities carried out as part of the characterisation of the site and the results achieved are presented and described in this section of this DSSR. The databases are referenced in this section of this DSSR and form part of the Geographic Information System database that was developed for this section. The results of the analyses are presented in tables and in drawings prepared for and presented in this section.

The following documents were compiled by the consultant and approved by Eskom to assist in quality assurance, and to present a clear and auditable trail showing how key decisions were made and conclusions reached:

- SRK's Integrated Quality Management System and associated Work Instructions;
- The project-specific Project Quality Plan;
- Method Statement;
- Quality Control Plans;
- Project Process Chart;
- Verification and Validation Plan;
- Verification and Validation Report.

The adjacent sea use characterisation has followed a peer review process, to ensure that the work was carried out using standard industry methodologies and approaches. The peer review was carried out by a suitably qualified, independent and experienced professional approved by Eskom. Quality assurance is therefore demonstrated through the preparation of:

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- process map containing reference to various data files;
- peer review reports.

Electronic records are stored in a secure central repository with regular off-site back-up procedures and subject to Eskom's approval. The overall quality system complies with that set out in ***Chapter 10***. All references cited are saved on the central repository.

Table 5.6.31 lists the activities carried out as part of the adjacent sea use characterisation with their respective links to other DSSR sections and chapters and the relevant quality control requirements.

Table 5.6.31
Summary of Activities, Links and Quality Requirements

Activity	Links		Quality Control Requirements
	Inputs	Outputs	
Characterisation of Adjacent Sea Use	***Section 5.1***: For the site centroid. ***Chapter 8*** (Emergency Planning): Determination of the EPZs.	Information on existing sea use to be used in identification of potential risk to the population and the environment (***Chapter 7***) and informs the feasibility of the emergency plan (***Chapter 8***).	Drawings and tables illustrating adjacent sea use topics. Officially accepted national database. Peer Review
External Hazards of a natural origin	***Section 5.3*** ***Section 5.9***	Information used to describe the potential impact of marine organisms on cooling water supply (***Section 5.9***) and state mitigation measures.	Description and conclusions extracted from ***Section 5.9*** and ***Section 5.3***. Peer Review
Impact of the nuclear installation(s) on the Environment	***Section 5.3*** ***Section 5.12***	Information used to describe the impact of desalination plant on the marine environment. Impact of the thermal plume on the marine environment.	Description and conclusions extracted from ***Section 5.12*** and ***Section 5.3***. Peer Review
Determination of Exposure Pathways		Information used in ***Chapter 7***, for determination of exposure pathways.	Peer Review

This section of this DSSR was developed in compliance with the applicable regulatory requirements as set out in ***Table 5.6.32*** below.

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Table 5.6.32
Regulatory and Guidance Compliance Matrix

Act / Regulation	Regulation	Issue	Section Where Covered
Regulations (Department of Energy, 2011)	5(3)(e)	Site-specific data: regional development	***Subsections 5.6.5 and 5.6.6***
Regulations (Department of Energy, 2011)	5(7)(a)	Exclusion zone for recreational commercial activities	***Subsection 5.6.7***
RG-0011 (National Nuclear Regulator, 2016)	6.1(1)(a), 7.1(2), 7.1(3), 7.4(1)	External natural events, i.e. biological infestation which could cause loss of function to structures, systems and components important to nuclear safety.	***Subsection 5.6.8.1***
RG-0011 (National Nuclear Regulator, 2016)	6.1(1)(b), 6.4(4), 8.2(2), 8.2(3)(d), 8.2(3)(e), 8.2(3)(g), 8.2(3)(h), 8.2(3)(i), 8.2(1),	Characteristics of the site and its environment which could influence the transfer of released radioactive material to persons, e.g. form part of the food chain, including commercial, individual and recreational fishing, including details of the aquatic species fished, their abundance and yield, as well as products exported from the site region and free foods.	***Subsections 5.6.6.1, 5.6.6.2, 5.6.6.3, 5.6.6.4, 5.6.6.5 and 5.6.6.7***
RG-0011 (National Nuclear Regulator, 2016)	8.2(4)	The present use of water which could be affected by changes in the water temperature and by radioactive material discharged from a nuclear power plant.	***Subsection 5.6.8.2***
RG-0011 (National Nuclear Regulator, 2016)	8.4.3(1)(a)	The general shore and bottom configuration in the region, and unique features of the shoreline, i.e. bathymetry.	***Subsection 5.6.5.1***
RG-0011 (National Nuclear	8.4.3(1)(h)	Spawning periods and feeding cycles of major	***Subsection 5.6.6.1***

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Act / Regulation	Regulation	Issue	Section Where Covered
Regulator, 2016)		fish species.	

5.6.12 Conclusions

The main conclusions to be drawn from this investigation are:

- The characteristics of adjacent sea use of the site vicinity and the site region have been identified.
- The current and expected future adjacent sea use characteristics in the site vicinity and the site region have been determined.
- The studies have been conducted to an adequate level of detail for the purpose of ***Chapter 7***.
- The studies have been conducted to an adequate level of detail for the purpose of ***Chapter 8***.
- The studies undertaken to compile this section of the DSSR were done in compliance with regulatory requirements.
- Appropriate monitoring programmes and controls, which include regular revision of this section of this SSR, to provide on-going assurance regarding the viability of the site over its lifecycle can be established in compliance with regulatory requirements.

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Appendix A: Fish Processing Establishments in the Site Region (2020)

Rights Holder	Physical Address 1	Physical Address 2	Telephone	Email Address	Rights App	Direction	Distance (km)
Atlantis Seafood Products (Pty) Ltd	Neil Hare Road	Atlantis Industrial	215774777		FPE150868	NNE	8.09
Atlantis Protein Products	Neil Hare Road 2	Atlantis Industrial	0215771067	lantisprof@vodamail.co.za	FPE150970	NNE	8.28
Cape Bio Land Pty Ltd	2 Neil Hare Road	Atlantic Industrial Area	0215771067		FPE150971	NNE	10.79
Malmesbury Starilisasie Anleg	Neil Hare Road	Atlantic Industrial Area				NNE	11.29
GSA Traders (Pty) Ltd	4 Daytona Road	Killarney Gardens	021-556 2223	joy@gsatraders.co.za	FPE150896	SSE	19.35
Blakes Seafoods (Pty) Ltd	Unit D Admiralty Park, 95-97 Kyalami Drive	Killarney Gardens				SSE	19.39
In 2 Food Group (Pty) Ltd	24-25 Donnington Road	Killarney Gardens				SSE	19.40
Marine Time Import and Export	Unit 7 Concept Park, Esso Road	Montague Gardens				SSE	21.56
Linshi (Pty) Ltd	Units 4, 5 & 6 Concept Park, Esso Road	Montague Gardens		dkhong@126.com	FPE155868	SSE	21.58
Breco (Pty) Ltd	4 Printers Way	Montague Gardens	0215518700		FPE150298	SSE	23.25
Quayside Fish Suppliers Cape (Pty) Ltd	Signal Road	Montague Gardens	0213721100	trevor@selectafish.co.za	FPE150913	SSE	23.53
BM Food Manufacturers (Pty) Ltd	2 Signal Crescent	Montague Gardens	0215513733	sales@bmfoodsct.co.za	FPE150230	SSE	23.65
African Cold Stores (Pty) Ltd	31 South Arm Road	Port of Cape Town				S	25.27
Quayfish Trawling (Pty) Ltd	4 South Arm	Port of Cape Town	0215512114	info@selectafish.co.za	FPE150910	S	25.33
Sevlac Investments No.51 CC	Unit 9, South Arm Road	Port of Cape Town	021 4223322	robeert@kaytrad.co.za	FPE150918	S	25.35
NSA Fishing Company (Pty) Ltd	4 South Arm Road	Port of Cape Town	021 419 4146		FPE150914	S	25.37
Bay-King Fishing Company-Viking Fishing	South Arm Road,Foreshore Docks	Port of Cape Town	021 4194140			S	25.41
Ruwekus Fishing (Pty) Ltd	Unit 15, South Arm Road	Port of Cape Town	021-421 3991	diane@flantrade.co.za	FPE150982	S	25.45
Benguella Tuna Fishing Company (Pty) Ltd	South Arm Road,Foreshore Docks	Port of Cape Town				S	25.48
Trying Trading Import and Export CC	4 South Arm	Port of Cape Town				S	25.49
Sistro Trawling (Pty) Ltd	4 South Arm	Port of Cape Town				S	25.52
Anglo Mar Atlantis (Pty) Ltd	South Arm Road,Foreshore Docks	Port of Cape Town	0215771300			S	25.55
Cape Frio Fishing (Pty) Ltd	4 South Arm Road	Port of Cape Town				S	25.58
Siyaloba Fishing Enterprises	4 South Arm Road	Port of Cape Town				S	25.64
Eyethu Trawling	4 South Arm Road	Port of Cape Town				S	25.65
Algoa Fishing	4 South Arm Road	Port of Cape Town				S	25.65
Premier Fishing SA (Pty) Ltd	3 South Arm Road, East Pier	Port of Cape Town	0214271400	garyw@premfish.co.za	FPE150210	S	25.65
Amawandle Hake (Pty) Ltd	South Arm Road,Foreshore Docks	Port of Cape Town	+27-214101400			S	25.65
Viking Fishing Co (Deep Sea) (Pty) Ltd	4 South Arm Road	Port of Cape Town	021 9279100	trevor@selectafish.co.za	FPE153663	S	25.67
Sentrawl	4 South Arm Road	Port of Cape Town				S	25.67
VIKING INSHORE FISHING (PTY) LTD	4 South Arm Road	Port of Cape Town	021 4194140	trevor@selectafish.co.za	FPE153664	S	25.67
Mfv Romano Paulo Vessel Co.	4 South Arm Road	Port of Cape Town				S	25.69
D Angelo Fresh Fish	4 South Arm Road	Port of Cape Town				S	25.69
D Angelo Fresh Fish	4 South Arm Road	Port of Cape Town				S	25.69

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Irvin & Johnson Limited	1 South Arm Road	Port of Cape Town				S	25.70
Irvin & Johnson Limited	1 South Arm Road	Woodstock	(021) 440 7800	marlons@ij.co.za	FPE153661	S	25.70
Offshore Fishing Company (Pty) Ltd	7 West Quay Road	Port of Cape Town	0214019000	frank@oranjevis.co.za;frank@oranjevis.co.za	FPE150806	S	25.85
Commercial Cold Storage (Pty) Ltd	20 Vrystaat Road	Paarden Eiland				S	26.01
Crossberth Cold Stores (Pty) Ltd	Tanker Basin, Portside Road	Port of Cape Town	021-448 1005		FPE150993	S	26.67
Xhantilomzi Fishing (Pty) Ltd	2nd Floor Crossberth Coldstore, Cnr Vanguard Monument Road	Port of Cape Town	021-4481005		FPE150999	S	26.67
Mallory Trade 35 (Pty) Ltd	Crossberth Coldstore Building, Monument Road	Port of Cape Town	021 4481005		FPE150229	S	26.68
Y & L Fishing Enterprises (Pty) Ltd	3 Seafarer Circle, Ben Schoeman Dock	Port of Cape Town	(021) 5117777		FPE155292	S	26.74
Table Bay Fishing (Pty) Ltd	3 Seafarer Circle, Ben Schoeman Dock	Port of Cape Town	0215117777		FPE155854	S	26.75
Commercial Cold Storage (Ports) (Pty) Ltd	Duncan Dock, K Berth	Port of Cape Town				S	26.82
Iceland On Sea CC	33a Koeberg Road	Maitland	021 5101434			S	27.50
Beadica 344 (Pty) Ltd	230 Victoria Road	Woodstock				S	28.19
Beadica 344 (Pty) Ltd	230 Victoria Road	Woodstock				S	28.20
Green Fish Traders cc	Berkley Square	Maitland				SSE	28.23
Cape Fish (Pty) Ltd	Unit 7 Marine Drive Industrial Park, 8 Marine Drive	Paarden Eiland	0735799475	kurt@capefish.co.za	FPE155875	S	28.70
Combined Fishing Enterprises (Pty) Ltd	Old Mill Park Unit 7B, 22 Old Mill Street	Ndabeni				SSE	28.93
Inkqubela Processors CC	Unit 1,Winelands Business Park	Stikland	021 949 2931			SE	33.33
Ocean Processors (Pty) Ltd	Schoonspruitweg 27	Malmesbury	0224821376		FPE150360	NE	34.35
Ukloba Fishing (Pty) Ltd	3 Manhattan Road	Airport Industria				SSE	35.10
Aquatic Foods CC	28 Madrid Road	Airport Industria	021 386 2389	amelda@aquaticfoods.co.za	FPE155877	SSE	35.29
Aquatic Foods PTY(Ltd)	28 Madrid Road	Airport Industria	021 386 2389	amelda@aquaticfoods.co.za		SSE	35.31
Adr Fishing (Pty) Ltd	3 Manhattan Street	Airport Industria	0213866578	rzeelie@vodamail.co.za	FPE150856	SSE	35.89
African Tuna Traders Cc	3 Manhattan Street CNR Manchester Street	Airport Industria	0215311611	rzeelie@vodamail.co.za	FPE150858	SSE	35.89
Quay Marine Factory	3 Manhattan Street	Airport Industria	0213850956	jonathan@africantuna.com	FPE155261	SSE	35.90
Snoek Wholesalers (Pty) Ltd	4 Vibra Street,Philippi	Philippi	(021) 6901400	fmoses@blueatlantic.co.za	FPE150256	SSE	37.04
Bayline Sea Foods (Pty) Ltd	3 Gibbs Close	Philippi	021 510 1804	avril@bayline.co.za	FPE150377	SSE	37.45
Selecta Sea Products (Pty) Ltd	Cnr Lanzerac and Stock Roads, Philippi	Philippi	213721100		FPE153665	SSE	39.30
Grey's Marine CC	34 Estmil Road	Diep River	021 712 5036		FPE153693	S	40.86
Mantos Foods (Pty) Ltd	11 Anfield Road	Blackheath Industria	0219053707		FPE150294	SE	41.17
Eerste River Women's Fish Packers (Pty) Ltd	11 Anfield Road	Blackheath Industria				SE	41.19
Pescaluna East Coast (Pty) Ltd	Lot 83A	Hout Bay Harbour	021 791 7000	clyde@molimoman.co.za	FPE153690	S	41.91
Impala Fishing (Pty) Ltd	Cnr. 5th Avenue & Italian Rd	Grassy Park	0215107924	celeste@impalafishing.co.za	FPE151000	S	42.24
Sea Freeze (Pty) Ltd	1 Harbour Rd	Hout Bay Harbour	021 790-4083		FPE150916	S	42.42
Sentinel Seafoods (Pty) Ltd	Jetty No. 3	Hout Bay Harbour	(021) 7901930	sensea@intekom.co.za	FPE153681	S	42.51
Glory Bay Trade CC	Harbour Rd	Hout Bay Harbour				S	42.55
Inkosi Keta Marine (Pty) Ltd	Lot 74 A, off Harbour Road	Hout Bay Harbour	021 790 0341	romano@inkosiketa.co.za	FPE153687	S	42.61
Cape Fish Processors Cc	Unit J6 Industrial Hive, Alpha Road	Beacon Valley	021-376 1047	capefish@webmail.co.za	FPE150831	SSE	44.38
Southern Cross Seafood Deli (Pty) Ltd	Unit C2 Enterprise Village, Capricorn Park	Muizenberg				S	46.63
Komicx Products (Pty) Ltd	25 Fish Eagle Place	Kommetjie	0422940432	michelle@komicx.co.za	FPE150821	S	50.96
Kelp Products (Pty) Ltd	Blue Water's Close	Simon's Town	021 786 2090			S	55.73
Beadica 343 CC	15 Gerber Blvd	Strand				SE	60.14
Equicap Trading (PTY) LTD	29 De Kock Street	Strand	0216855608		FPE150877	SE	62.16
Xolile Seafoods CC	21 Boundary Way	Strand	0218508395	jfsharks1@gmail.com	FPE150926	SE	62.67
Retro Foods (Pty) Ltd	4 Link Road, Mansfield Industria	Gordons Bay				SE	67.22

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TABULATED DISTRIBUTION OF FISH PROCESING FACILITIES

Location	Fish Processing Establishment	Distance (km)	Direction
Atlantis Industrial Area	Atlantis Seafood Products (Pty) Ltd	NNE	8.09
	Atlantis Protein Products	NNE	8.28
	Cape Bio Land Pty Ltd	NNE	10.79
	Malmesbury Starilisasie Anleg	NNE	11.29
Killarney Gardens Industrial Area	GSA Traders (Pty) Ltd	SSE	19.35
	Blakes Seafoods (Pty) Ltd	SSE	19.39
	In 2 Food Group (Pty) Ltd	SSE	19.40
Montagu Gardens Industrial Area	Marine Time Import and Export	SSE	21.56
	Linshi (Pty) Ltd	SSE	21.58
	Breco (Pty) Ltd	SSE	23.25
	Quayside Fish Suppliers Cape (Pty) Ltd	SSE	23.53
	BM Food Manufacturers (Pty) Ltd	SSE	23.65
Port of Cape Town	African Cold Stores (Pty) Ltd	S	25.27
	Quayfish Trawling (Pty) Ltd	S	25.33
	Sevlac Investments No.51 CC	S	25.35
	NSA Fishing Company (Pty) Ltd	S	25.37
	Bay-King Fishing Company-Viking Fishing	S	25.41
	Ruwekus Fishing (Pty) Ltd	S	25.45
	Benguella Tuna Fishing Company (Pty) Ltd	S	25.48
	Trying Trading Import and Export CC	S	25.49
	Sistro Trawling (Pty) Ltd	S	25.52
	Anglo Mar Atlantis (Pty) Ltd	S	25.55
	Cape Frio Fishing (Pty) Ltd	S	25.58
	Siyaloba Fishing Enterprises	S	25.64
	Eyethu Trawling	S	25.65
	Algoa Fishing	S	25.65
	Premier Fishing SA (Pty) Ltd	S	25.65
	Amawandle Hake (Pty) Ltd	S	25.65
	Viking Fishing Co (Deep Sea) (Pty) Ltd	S	25.67
	Sentrawl	S	25.67
	VIKING INSHORE FISHING (PTY) LTD	S	25.67
	Mfv Romano Paulo Vessel Co.	S	25.69
	D Angelo Fresh Fish	S	25.69
	D Angelo Fresh Fish	S	25.69
	Irvin & Johnson Limited	S	25.70
	Crossberth Cold Stores (Pty) Ltd	S	26.67
	Xhantilomzi Fishing (Pty) Ltd	S	26.67
	Mallory Trade 35 (Pty) Ltd	S	26.68

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	Y & L Fishing Enterprises (Pty) Ltd	S	26.74
	Table Bay Fishing (Pty) Ltd	S	26.75
	Commercial Cold Storage (Ports) (Pty) Ltd	S	26.82
	Offshore Fishing Company (Pty) Ltd	S	25.85
	Crossberth Cold Stores (Pty) Ltd	S	26.67
	Xhantilomzi Fishing (Pty) Ltd	S	26.67
	Mallory Trade 35 (Pty) Ltd	S	26.68
	Y & L Fishing Enterprises (Pty) Ltd	S	26.74
	Table Bay Fishing (Pty) Ltd	S	26.75
	Commercial Cold Storage (Ports) (Pty) Ltd	S	26.82
Paardeneiland	Commercial Cold Storage (Pty) Ltd	S	26.01
	Cape Fish (Pty) Ltd	S	28.70
Maitland/Ndabeni/Woodstock	Irvin & Johnson Limited	S	25.70
	Iceland On Sea CC	S	27.50
	Beadica 344 (Pty) Ltd	S	28.19
	Beadica 344 (Pty) Ltd	S	28.20
	Green Fish Traders cc	SSE	28.23
	Combined Fishing Enterprises (Pty) Ltd	SSE	28.93
Stikland	Inkqubela Processors CC	SE	33.33
Airport Industria	Ukloba Fishing (Pty) Ltd	SSE	35.10
	Aquatic Foods CC	SSE	35.29
	Aquatic Foods PTY(Ltd)	SSE	35.31
	Adr Fishing (Pty) Ltd	SSE	35.89
	African Tuna Traders Cc	SSE	35.89
	Quay Marine Factory	SSE	35.90
Malmesbury	Ocean Processors (Pty) Ltd	NE	34.35
Philippi	Snoek Wholesalers (Pty) Ltd	SSE	37.04
	Bayline Sea Foods (Pty) Ltd	SSE	37.45
	Selecta Sea Products (Pty) Ltd	SSE	39.30
Diep River Industrial Area	Grey's Marine CC	S	40.86
Blackheath Industria	Mantos Foods (Pty) Ltd	SE	41.17
	Eerste River Women's Fish Packers (Pty) Ltd	SE	41.19
Hout Bay Harbour	Pescaluna East Coast (Pty) Ltd	S	41.91
	Sea Freeze (Pty) Ltd	S	42.42
	Sentinel Seafoods (Pty) Ltd	S	42.51
	Glory Bay Trade CC	S	42.55
	Inkosi Keta Marine (Pty) Ltd	S	42.61
Grassy Park/Beacon Valley/Capricorn Park	Impala Fishing (Pty) Ltd	S	42.24
	Cape Fish Processors Cc	SSE	44.38
	Southern Cross Seafood Deli (Pty) Ltd	S	46.63
Kommetjie	Komicx Products (Pty) Ltd	S	50.96
Simon's Town	Kelp Products (Pty) Ltd	S	55.73
Strand/Gordon's Bay	Beadica 343 CC	SE	60.14
	Equicap Trading (PTY) LTD	SE	62.16
	Xolile Seafoods CC	SE	62.67
	Retro Foods (Pty) Ltd	SE	67.22

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Appendix B: Amenity Beaches in the Site Region

Name	Distance (km)	Direction
Melkbosstrand Beach	5.46	SSE
Little Bay Beach	7.82	S
Haakgat	8.27	S
Big Bay Beach	11.27	S
Silwerstroomstrand Tidal Pool	11.45	NW
Silwerstroomstrand	12.87	NW
Doodles	15.21	SSE
Bokbaai	15.25	NW
Kite Beach	17.29	SSE
Dolphin Beach	17.46	SSE
Blouberg Beach	17.93	SSE
Ganzekraal	20.58	NNW
Milnerton Beach	24.15	SSE
Mouille Point Beach	24.76	S
Three Anchor Bay Beach	25.61	S
Rocklands Beach	25.95	S
Milton Road Pool	26.69	S
Brokenbath Beach	27.02	S
Sea Point Pavillion	27.14	S
Sunset Beach	27.40	S
Queens Beach	27.60	S
Saunders Rocks Beach	27.85	S
Grotto Bay	27.85	NNW
Saunders Rocks Tidal Pool	27.91	S
Grotto Bay	28.05	NNW
Moses Beach	28.92	S
Clifton 1st Beach	29.16	S

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Name	Distance (km)	Direction
Clifton 2nd Beach	29.35	S
Clifton 3rd Beach	29.53	S
Clifton 4th Beach	29.72	S
Bachelors Cove	30.08	S
Maidens Cove Tidal Pool	30.20	S
Glen Beach	30.38	S
Camps Bay Beach	30.76	S
Camps Bay Tidal Pool	31.27	S
Jakkalsfontein	34.19	NNW
Llandudno Beach	37.68	SSW
Sandy Bay Beach	39.54	SSW
Hout Bay Beach	41.73	S
Yzerfontein Beach	45.37	NW
Strandfontein Beach	47.01	SSE
Strandfontein Tidal Pool	47.10	SSE
Mnandi Beach	47.51	SSE
Muizenberg Beach	48.00	S
Noordhoek Beach	48.26	S
St. James Beach	49.04	S
St. James Tidal Pool	49.09	S
Dalebrook Tidal Pool	49.63	S
Dalebrook Beach	49.67	S
Kalk Bay Beach	50.06	S
Woolleys Tidal Pool	50.58	S
Fishhoek Beach	51.21	S
Kommetjie Beach	51.89	S
Maccassar Beach	53.14	SE
Glencairn Beach	53.53	S

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Name	Distance (km)	Direction
Glencairn Pool	53.90	S
Shelley Beach	54.22	S
Soetwater 1 Tidal Pool	54.27	S
Soetwater 2 Tidal Pool	54.27	S
Witsands Beach	55.85	S
Long Beach	56.62	S
Misty Cliffs	56.70	S
Jubilee Beach Promenade	57.12	S
Seaforth Beach	57.33	S
Water Edge Beach	57.48	S
Boulders Beach	57.64	S
Windmill Beach	58.21	S
Scarborough Beach	58.45	S
Froggy Pond	58.48	S
Fishermans Beach	58.70	S
Strand Beach	59.59	SE
Olifantsbos Beach	64.54	S
Gordons Bay Beach	66.94	SE
Bikini Beach	67.10	SE
Langebaan Lagoon	68.10	NNW
Kraalbaai	69.97	NNW
Buffelsbaai Beach	71.11	S
Shark Bay	72.26	NNW
Koeël Bay Beach	72.78	SSE
Koeël Bay Sparks Bay Day Camp Tidal Pool	74.42	SSE
Langebaan Beach	74.87	NNW
Langebaan Main Beach	74.87	NNW
Rooi Els	77.84	SSE

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Appendix C: Commercial Ports, Small Harbours and Public Small Craft Launching Facilities in the Site Region

Facility	Distance (km)	Direction
Commercial Ports		
Port of Cape Town	26.2	S
Port of Saldanha (outside of site region)	84.3	NNW
Smaller Harbours		
Murrays Bay Harbour	14.4	SSW
Granger Bay Harbour	24.8	S
Victoria & Alfred Basins	25.3	S
Hout Bay Harbour	42.4	S
Simon's Town Harbour	57.0	S
Harbour Island	65.9	SE
Gordon's Bay Harbour	67.1	SE
Public Launching Facilities		
Melkbosstrand	5.8	S
Murrays Bay Harbour	14.4	SSW
Blouberg Beach (Doodles)	15.3	SSE
Ganzekraal	20.0	NNW
Oceana Power Boat Club	24.9	S
Three Anchor Bay	25.6	S
Victoria and Alfred Basin	25.8	S
Granger Bay Harbour	25.8	S
Port of Cape Town	27.0	S
Hout Bay Harbour	42.0	S
Yzerfontein Harbour	45.0	NW
Sonwabe Beach, Muizenberg	47.6	S
Kommetjie	52.0	S
Simon's Town Harbour	57.0	S
Melkbaai (Hottentots Holland)	59.8	SE
Strand Beach Road	61.1	SE

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Facility	Distance (km)	Direction
Miller's Point	62.	S
Harbour Island	65.7	SE
Gordon's Bay Harbour	67.0	SE
Langebaan Yacht Club	73.5	NNW
Rooi Els	78.9	SSE
Club Mykonos	78.9	NNW

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