

**ENVIRONMENTAL SCOPING, IMPACT ASSESSMENT AND MANAGEMENT  
PLAN FOR THE PROPOSED RANCHING AND COLLECTION OF ABALONE  
*HALIOTIS MIDAЕ* BY HANGANA ABALONE (PTY) LTD AT FARM 3 (TIGER  
REEF), LÜDERITZ, //KARAS REGION, NAMIBIA**

**APP-001452**



*Source: Dr Jessica Kemper*

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## ABBREVIATIONS / ACRONYMS / SYMBOLS / UNITS

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The following is a list of the abbreviations, acronyms, symbols, units, technical terms, and definitions used in this Report:

|      |                                    |
|------|------------------------------------|
| AIDS | Acquired Immunodeficiency Syndrome |
| ART  | Anti-retroviral Therapy            |
| AU   | African Union                      |
| CBD  | Convention on Biological Diversity |

|                 |  |
|-----------------|--|
| CBR             | Crude Birth Rate   |
| CDR             | Crude Death Rate   |
| CE              | Circular Economy   |
| CEDAW           | Convention on the Elimination of All Forms of Discrimination against Women |
| CEO             | Chief Executive Officer  |
| °C              | degrees centigrade   |
| DEA             | Directorate of Environmental Affairs                                       |
| DSP             | Diarrhetic Shellfish Poisoning   |
| EA              | Environmental Assessment   |
| EAP             | Environmental Assessment Practitioner                                      |
| EAPAN           | Environmental Assessment Professionals of Namibia                          |
| ECC             | Environmental Clearance Certificate  |
| EHS             | Environmental Health and Safety  |
| EIA             | Environmental Impact Assessment  |
| EMA             | Environmental Management Act   |
| EMP             | Environmental Management Plan  |
| EPA             | Environmental Protection Agency/Authority                                  |
| GIIP            | Good International Industry Practice                                       |
| GIS             | Geographic Information System  |
| GN              | General Notice / Government Notice   |
| GRN             | Government of the Republic of Namibia                                      |
| ha              | hectare  |
| HAB             | Harmful Algal Blooms   |
| HCT             | HIV Counselling and Testing  |
| HIV             | Human Immunodeficiency Virus   |
| I&APs           | Interested and Affected Parties  |
| IBA             | Important Bird Area  |
| ICESCR          | International Covenant on Economic, Social and Cultural Rights             |
| IEMA            | Institute of Environmental Management and Assessment                       |
| IFC             | International Finance Corporation  |
| ISO             | International Organization for Standardization                             |
| IUCN            | International Union for Conservation of Nature                             |
| IWM             | Integrated Waste Management  |
| km              | kilometre  |
| km <sup>2</sup> | square kilometre   |
| km/h            | kilometre per hour   |
| LAC             | Legal Assistance Centre  |
| LFPR            | Labour Force Participation Rate  |
| m               | metre  |
| mm              | millimetre   |
| MAWLR           | Ministry of Agriculture, Water and Land Reform                             |
| MET             | Ministry of Environment and Tourism  |
| MEFT            | Ministry of Environment, Forestry and Tourism                              |
| MFMR            | Ministry of Fisheries and Marine Resources                                 |
| MHSS            | Ministry of Health and Social Services                                     |
| ML              | Mining Licence   |
| MME             | Ministry of Mines and Energy   |
| MPA             | Marine Protected Area  |
| MTCT            | Mother-To-Child Transmission   |
| NAMPHIA         | Namibia Population-Based HIV Impact Assessment                             |
| NamPort         | Namibian Ports Authority   |
| NCE             | Namibia Chamber of Environment   |
| NDP5            | National Development Plan 5  |
| NHIES           | Namibia Household Income and Expenditure Survey                            |
| NHSS            | National HIV Sentinel Survey   |
| NIDS            | Namibia Inter-censal Demographic Survey                                    |
| NIMPA           | Namibian Islands' Marine Protected Area                                    |
| NLFS            | Namibia Labour Force Survey  |
| NMPCP           | National Marine Pollution Contingency Plan                                 |
| NSA             | Namibia Statistics Agency  |

|        |   |
|--------|---|
| NSF    | National Strategic Framework                    |
| NSP    | Neurotoxic Shellfish Poisoning                  |
| O&L    | Ohlthaver & List Group                          |
| OIE    | World Organisation for Animal Health            |
| PAYE   | Pay As You Earn                                 |
| PEA    | Potentially Economically Active                 |
| PEPFAR | U.S. President's Emergency Plan for AIDS Relief |
| PMTCT  | Prevention from Mother to Child Transmission    |
| PLHIV  | Person Living with HIV                          |
| PPE    | Personal Protective Equipment                   |
| PSP    | Paralytic Shellfish Poisoning                   |
| RIAM   | Rapid Impact Assessment Matrix                  |
| RSA    | Republic of South Africa                        |
| SA     | South Africa                                    |
| SADC   | Southern African Development Community          |
| SEA    | Strategic Environmental Assessment              |
| SHE    | Safety, Health, Environment                     |
| STIs   | Sexually Transmitted Infections                 |
| TB     | Tuberculosis                                    |
| UK     | United Kingdom                                  |
| UN     | United Nations                                  |
| UNAM   | University of Namibia                           |
| US     | United States                                   |
| USA    | United States of America                        |
| VAT    | Value Added Tax                                 |
| VLS    | Viral Load Suppression                          |

|                               |  |
|-------------------------------|--|
| Aquaculture                   | The farming and ranching of aquatic organisms (Aquaculture Act 18 of 2002).  |
| Aquaculture Facility          | It includes any equipment, construction or site in which aquaculture is conducted (Aquaculture Act 18 of 2002).  |
| Aspect                        | Element of an organization's activities or products or services that can interact with the environment (International Organization for Standardization (ISO), 2004).   |
| Biodiversity                  | Defined in the Convention on Biological Diversity (CBD) as "the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species, and of ecosystems."  |
| Circular Economy (CE)         | A CE is based on the principles of designing out waste and pollution, keeping products and materials in use, and regenerating natural systems (see <a href="https://www.ellenmacarthurfoundation.org/circular-economy/what-is-the-circular-economy">https://www.ellenmacarthurfoundation.org/circular-economy/what-is-the-circular-economy</a> ). Organisations need to engage in the transition from waste management to resource management. The Institute of Environmental Management and Assessment (IEMA) translated the concept into four practical areas of business action: i) <u>Efficiency</u> : making the most of material resources while minimising the production of waste; ii) <u>Effectiveness</u> : optimising resource efficiency to avoid environmental harm and drive societal benefits; iii) <u>Security</u> : responsibly sourcing a reliable and affordable supply of materials; and iv) <u>Cycling</u> : ensuring unused and end of use materials are returned to productive use (IEMA, 2014). Key materials may include: oil, steel, rare earth minerals, timber; there is also conflict materials and palm oil. |
| Disposal                      | The discharge, deposit, injection, dumping, spilling, leaking, or placing of any solid or hazardous waste on or in the land or water (United States (US), Environmental Protection Agency (EPA)).  |
| Environment                   | Surroundings in which an organization operates, including air, water, land, natural resources, flora, fauna, humans, and their interrelation (ISO, 2004).  |
| Environmental Assessment (EA) | The process of identifying, predicting and evaluating the effects of proposed activities on the environment. It should include information about the risks and consequences of activities, possible alternatives, and steps which can be taken to mitigate (minimise or offset) any negative impacts. It should also discuss steps to increase positive impacts and to promote compliance with the principles of environmental management. Both Government bodies and private persons or groups (such as private companies) can be   |

|   |   |
|---|---|
|   | required to carry out environmental assessments (Ministry of Environment and Tourism (MET) (now Ministry of Environment, Forestry and Tourism (MEFT)), 2008).   |
| Environmental Clearance Certificate (ECC)   | A certificate which allows a listed activity to go ahead. The certificate means that the Ministry of Environment and Tourism is satisfied that the activity in question will not have an unduly negative impact on the environment. It may set conditions for the activity to prevent or to minimize harmful impacts on the environment (MET, 2008).  |
| Environmental Management Plan (EMP)         | A key document that should consist of the set of measures to be taken during implementation and operation to eliminate, offset, or reduce adverse environmental impacts to acceptable levels. Also included in the plan are the actions needed to implement them (Directorate of Environmental Affairs (DEA), 2008).  |
| Erosion                                     | The breaking down and subsequent removal of either rock or surface material by wind, rain, wave action, freezing and thawing and other processes (The Northern Miner, 2007).  |
| Good International Industry Practice (GIIP) | The exercise of professional skill, diligence, prudence, and foresight that would reasonably be expected from skilled and experienced professionals engaged in the same type of undertaking under the same or similar circumstances globally or regionally. The outcome of such an exercise should be that the project employs the most appropriate technologies in the project-specific circumstances (International Finance Corporation (IFC), 2007a).  |
| (Grouped) Hazardous Substance               | Any substance, mixture of substances, product or material declared in terms of section 3 (1) to be a hazardous substance of any kind (Hazardous Substances Ordinance No. 14 of 1974).   |
| Hazardous Waste                             | Waste that poses substantial or potential threats to public health or the environment. There are four factors that determine whether or not a substance is hazardous: i) ignitability (i.e. flammable); ii) reactivity; iii) corrosivity; and iv) toxicity (Wikipedia).   |
| Impact                                      | Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's environmental aspects (ISO, 2004).   |
| Important Bird Area (IBA)                   | IBAs are discrete regions in which: i) significant assemblages of birds occur (defined as 5,000 birds at a national level, or 20,000 globally); ii) significant numbers of restricted-range or biome-specific birds occur; iii) significant numbers of threatened birds occur (i.e. globally and nationally threatened Red Data species); or iv) 1 percent (%) of the world population of any species occurs (Simmons <i>et al.</i> , 1999).  |
| Innovation Principle                        | Innovation Principle: policy or regulatory decisions and controls should consider the role of innovation as a driver for jobs, growth, social and environmental improvement (IEMA, 2017)  |
| Integrated approach                         | Integrated approach: systems thinking should underpin an integrated approach to environmental management, helping to prevent shifting environmental burdens and optimise outcomes (IEMA, 2017).   |
| Integrated Waste Management (IWM)           | Concept of employing several waste control and disposal methods to minimise the environmental impact of commercial and industrial waste streams (Business Dictionary). The generation of waste should be <u>avoided</u> as far as practicable; where it cannot be avoided, waste should be <u>reduced</u> , <u>re-used</u> and <u>recovered</u> (including recycling and composting); where waste cannot be reduced, re-used and/or recovered, it should be <u>disposed</u> of in an environmentally sound manner.  |
| Mitigation                                  | Any action intended to either reduce or avert exposure or the likelihood of exposure to sources that are not part of a controlled practice, or which are out of control as a consequence of an accident (DEA, 2008).  |
| Mitigation Hierarchy                        | Adoption of a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimise, or compensate/offset for risks and impacts to workers, Affected Communities, and the environment is widely regarded as a Good International Industry Practice (GIIP) approach to managing environmental and social risks and impacts:<br><u>Avoidance</u> requires the client to identify and, where available and technically and financially feasible, make changes to the project's design (or potential location) to avoid adverse risks and impacts on social and/or environmental features. Avoidance is considered to be the most acceptable form of mitigation.<br><u>Minimisation</u> : where avoidance is not possible, adverse impacts and risks can be minimised through environmental and social measures/treatments/design. Acceptable options to minimise will vary and include: abate, rectify, repair, and/or restore impacts, as appropriate.<br><u>Compensation/Offset</u> : where avoidance or minimisation measures are not available, it may be appropriate to design and implement measures that compensate/offset for residual risks and impacts. It should be noted that these measures do not eliminate the |

|                            |   |
|----------------------------|---|
|                            | identified adverse risks and impacts, but they seek to offset it with an (at least) comparable positive one (IFC, 2012).  |
| Monitoring                 | The repetitive and continued observation, measurement and evaluation of environmental data to follow changes over a period of time to assess the efficiency of control measures (DEA, 2008).  |
| Pollution                  | The direct or indirect introduction of something which is harmful to people, property, or the environment into the air, land, or water. Pollution can be caused by substances, vibrations, heat, radiation or noise. One of the key ideas behind the law is that the polluter must pay the costs of pollution (MET, 2008).  |
| Pollution Prevention       | Reducing or eliminating pollution at source based on taking an integrated approach to environmental protection (IEMA, 2017).  |
| Polluter Pays Principle    | The environmental costs of pollution should be borne by those who cause the pollution (IEMA, 2017).   |
| Precautionary Principle    | Where there is the potential for significant or irreversible environmental damage, lack of full scientific evidence should not be used as the basis for not taking appropriate measures to prevent or mitigate environmental harm (IEMA, 2017).   |
| Proximity Principle        | Environmental damage should be rectified, compensated or treated at or as near to source as practicable and waste should be dealt with as close as possible to where it is produced (IEMA, 2017).   |
| Sea Ranching               | The type of aquaculture in which aquaculture products are intentionally released, without restriction, into the marine environment for the purpose of harvesting them when they mature (Aquaculture Act 18 of 2002).  |
| Sewage                     | The subset of wastewater that is contaminated with faeces and/or urine; it includes domestic, municipal, or industrial liquid waste products disposed of, usually via a pipe or sewer or similar structure (Wikipedia).   |
| Significant Effect         | Having, or likely to have, a consequential qualitative or quantitative impact on the environment, including changes in ecological, aesthetic, cultural, historic, economic and social factors, whether directly or indirectly, individually or collectively (Environmental Management Act (EMA) 7 of 2007).   |
| Stormwater                 | Water that originates during precipitation (rainfall) events. Stormwater that does not soak into the ground becomes surface runoff. Stormwater is of concern for the following two reasons: one is related to the volume and timing of runoff water (for flood control and the supply of water) and the other is related to the potential contaminants that the water may be carrying and subsequent water pollution (Wikipedia). |
| Sustainable Development    | Meeting the needs of the present, without compromising the ability of future generations to meet their own needs (IEMA, 2017).  |
| Sustainable Use            | Using natural resources in a way and at a rate that does not lead to a long-term decline, so that the environment will be able to meet the needs of future generations, i.e. the natural resources of the earth must be shared fairly between present and future generations (MET, 2008).   |
| Transparency & Inclusivity | Multi-level and multi-sector stakeholder engagement, accountability and empowerment should underpin environmental policy development. Local level buy-in and participation should guide the design of local solutions (IEMA, 2017).   |
| Waste                      | An unwanted or undesired material or substance. It is also referred to as rubbish, trash, refuse, garbage, or junk, depending on the type of material. Litter is waste that has been carelessly disposed of in plain sight. Waste is “dumped” in order to avoid paying waste disposal fees (Wikipedia).   |
| Waste Management           | The collection, transport, processing, recycling or disposal, and monitoring of waste materials (Wikipedia).  |
| Wastewater                 | Any water that has been adversely affected in quality by anthropogenic (human) influences, i.e. liquid waste discharged by domestic residences, commercial properties, industry, and/or agriculture and can encompass a wide range of potential contaminants and concentrations (Wikipedia).  |

## 1 Introduction

### 1.1 Background

The Ohlthaver & List Group (O&L) is the largest, privately held group of companies in Namibia. Subsidiaries (O&L shareholding) include: Beer and Soft Drinks - Namibia Breweries Ltd (29.83%); Fishing - Hangana Seafood (Pty) Ltd (94.70%); Fresh Produce - Namibia Dairies (Pty) Ltd (97.85%), and Windhoek Schlachterei (Pty) Ltd (92.7%); Hospitality - O&L Leisure (Pty) Ltd (97.85%); Properties - Broll and List Property Management (Namibia) (Pty) Ltd (50.1%), Wernhil Park (Pty) Ltd (100%), Central Properties (Pty) Ltd (100%), and WUM Properties (Pty) Ltd T/A O&L Properties (97.85%); Retail - WUM Properties (Pty) Ltd T/A Model Pick n Pay (97.85%); Advertising - Weathermen & Co. Advertising (Pty) Ltd (50.1%); Centralised Services - Ohlthaver & List Centre (Pty) Ltd (100%); Energy - O&L Energy (Pty) Ltd (100%), and Organic Energy Solutions (Pty) Ltd (75%); and Engineering - Kraatz Marine (Proprietary) Limited (97.82%) (Ohlthaver & List Group, 2019).

Hangana Seafood (Pty) Ltd was established through a merger of Consortium Fisheries and Kuiseb Fish Products (Pty) Ltd in 1997 (Ohlthaver & List Group, 2019). In 2017, Hangana Seafood (Pty) Ltd acquired the first and only land-based abalone farm along the Namibian coast in Lüderitz (see Figure 1), //Karas Region, and the Company has since invested N\$60 million in Hangana Abalone (Pty) Ltd (Anon., 2020). The Hangana Abalone Farm was officially launched in September 2018.

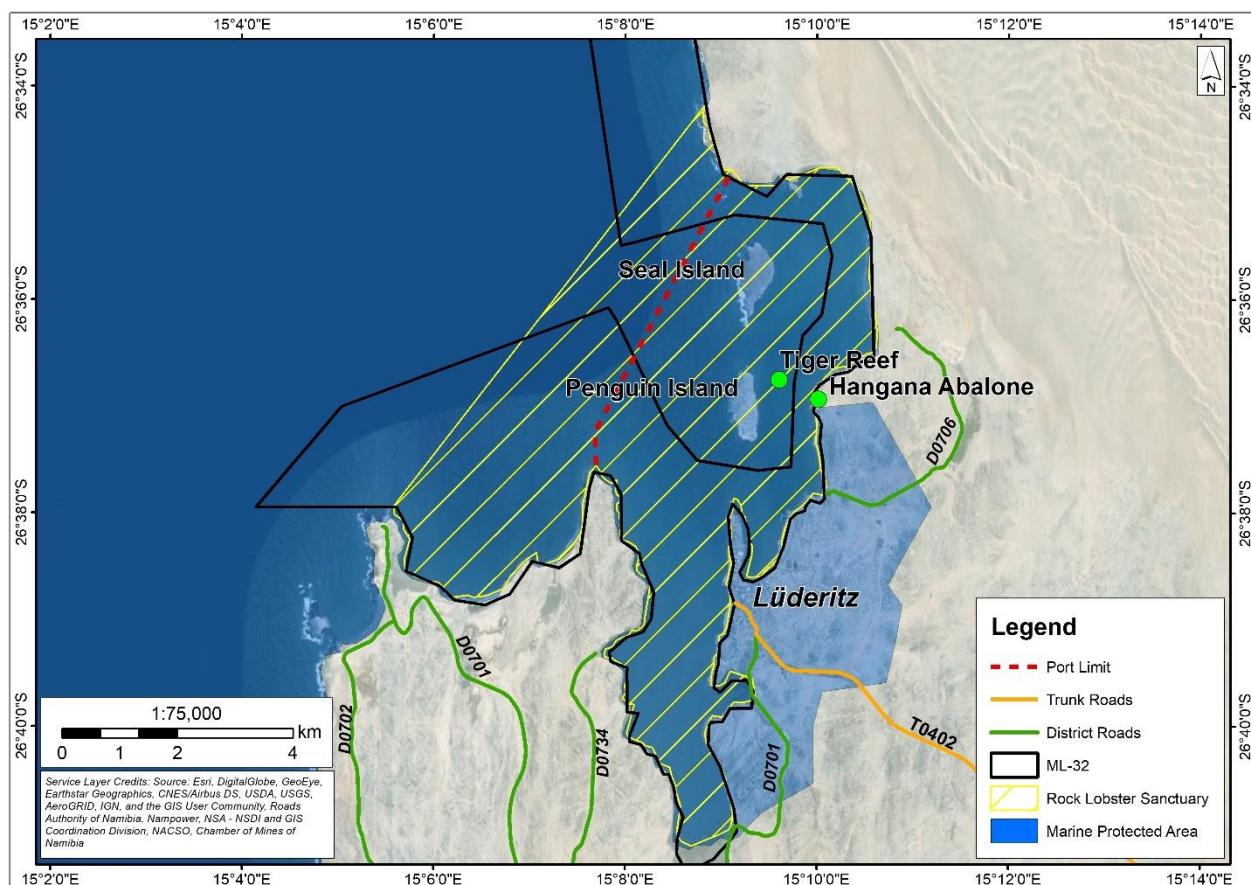


Figure 1: Map showing the location of Hangana Abalone (Pty) Ltd's land-based abalone farm, Lüderitz, //Karas Region, Namibia (Source: Miss Maike Prickett, GIS Specialist, May 2020).

The Ministry of Fisheries and Marine Resources (MFMR) issued an Aquaculture Licence to Hangana Abalone (Pty) Ltd to farm abalone *Haliotis midae* at Plot 514, Lüderitz, //Karas Region, Namibia on 03 October 2016. The Licence expires on 03 October 2030 (see Annexure A).

In 2018/19, Geo Pollution Technologies (Pty) Ltd conducted an Environmental Scoping and prepared an Environmental Management Plan (EMP) for the *Operations and Expansion of an Existing Abalone Mariculture Farm, Lüderitz* on behalf of Hangana Abalone (Pty) Ltd.

The Office of the Environmental Commissioner, Ministry of Environment and Tourism (MET) (now Ministry of Environment, Forestry and Tourism (MEFT)) issued an Environmental Clearance Certificate (ECC) for the Operations and Expansion of an Existing Abalone Mariculture Farm, Lüderitz, //Karas Region on 27 September 2019. The ECC is valid for a period of three years, that is until 27 September 2022 (see Annexure A).

The Environmental Scoping and EMP Reports were updated by Geo Pollution Technologies (Pty) Ltd in March 2020 (see Botha *et al.*, 2020a and Faul *et al.*, 2020a), and again in April 2020 (see Annexure A: Botha *et al.*, 2020b and Faul *et al.*, 2020b).

Reference is made to *LAND BASED MARICULTURE* *The land based facilities are located immediately next to the ocean and consist of both underroof and open infrastructure. A small area immediately offshore of the land-based operations, Mariculture Farm 4, is also utilized by Hangana Abalone for water supply and mariculture purposes and ABALONE RANCHING* *When abalone are moved from the hatchery, all slow growing abalone are set aside for ranching. This means they are not placed in grow-out tanks, but are moved to the ocean (uncaged) to predetermined locations around Seal Island and Penguin Island. The aquaculture licence allows for abalone ranching around the islands, from the spring tide low water mark up to a 100 m into the ocean. Here they feed in the natural environment and are recovered by divers once they reach market size* (see Annexure A: Botha *et al.*, 2020b).

Geo Pollution Technologies (Pty) Ltd also issued a Clarification Note (13 March 2020): *Experience gained by the mariculture industry indicates that the ranching of South African abalone (*Haliotis midae*) at Lüderitz, does not pose a threat of natural reproduction and proliferation along the Namibian coastline. Scientists and the industry role-players agree that abalone requires very specific environmental conditions for reproduction, mostly related to water temperature, and these conditions are not met along the Namibian coastline. This holds true for both Penguin and Seal islands in Lüderitz Bay, where abalone ranching is (and was historically) conducted. Monitoring of the ranching areas remain important to ensure local conditions do not change* (see Annexure A).

Hangana Abalone (Pty) Ltd is currently proposing to include a third abalone ranching area, that is at Tiger Reef, Lüderitz, //Karas region, Namibia.

## 1.2 Activities Requiring Environmental Clearance

The following activities may not be undertaken without an Environmental Clearance Certificate (ECC):

*AQUACULTURE ACTIVITIES: 7.8 The introduction of alien species into local ecosystems.*

In line with the Commencement of the Environmental Management Act (EMA), 2007 (Act No. 7 of 2007) (06 February 2012; Government Notice (GN) No. 28), the Listed Activities that may not be undertaken without an ECC (GN No. 29), and the Environmental Impact Assessment (EIA) Regulations (GN No. 30) (Government of the Republic of Namibia (GRN), 2012a), Hangana Abalone (Pty) Ltd thus applied to the Executive Director, Ministry of Fisheries and Marine Resources (MFMR) for an ECC on 26 May 2020 (see Annexure B). The Application was also registered online with the Ministry of Environment, Forestry and Tourism (MEFT) on 26 May 2020. On the same date, the MEFT indicated that *Your application has been registered with application number APP-001452* (see Annexure B). On 30 June 2020, the MEFT verified the application and requested the submission of the following documents: Scoping Report; EMP; Proof of Consultation; Project Site Area (Map); and Curriculum Vitae of designated EAP (Environmental Assessment Practitioner) (see Annexure B).

Hangana Abalone (Pty) Ltd has since prepared the application for an Aquaculture Licence to ranch abalone at Tiger Reef (to accompany this Report; see Annexure C).

### 1.3 Terms of Reference

LM Environmental Consulting was appointed by Hangana Abalone (Pty) Ltd to undertake a Scoping, conduct an Environmental Impact Assessment (EIA), and to prepare an Environmental Management Plan (EMP) for the Project in April 2020.

### 1.4 Environmental Assessment Practitioner and Specialist Team

The author of this Report is Dr Lima Maartens who has more than 27 years' experience in natural resource management (she gained her doctorate (Ph.D.) in Fisheries Science from Rhodes University, South Africa (SA) while working for the Namibian Ministry of Fisheries and Marine Resources (MFMR) in 2000, lecturing (University of Namibia (UNAM)), environmental science and management (De Beers Marine Namibia and the Canadian Forsys Metals Corp), and consulting). Dr Maartens is registered as a Lead Practitioner and Reviewer with the Environmental Assessment Professionals of Namibia (EAPAN) (she served on the Executive Committee during 2016/17), an Associate Member and Environmental Auditor with the Institute of Environmental Management and Assessment (IEMA) in the United Kingdom (UK), an Associate Member of the Namibia Chamber of Environment (NCE), and a Member of the Namibia Scientific Society. LM Environmental Consulting was established by Dr Maartens in October 2009.

Specialist input to the Report was obtained from: Miss Maike Prickett (Geographic Information System (GIS; Site Maps) and Dr Jessica Kemper (Ecology).

Miss Maike Prickett holds a B.Sc. degree in Information Systems & Geography, and has more than 14 years' experience with various GIS (Geographic Information System) systems. She is widely experienced in GIS Systems, socio-economic baseline studies, and technical drafting.

Dr Jessica Kemper is a freelance biologist, with a M.Sc. in botany from the Institute for Plant Conservation, University of Cape Town in 1997, and a Ph.D. in seabird demographics from the Animal Demography Unit, University of Cape Town in 2006. Dr Kemper has lived in Lüderitz for more than 20 years; while employed as the head of the Seabird Section of the Namibian Ministry of Fisheries and Marine Resources, she made a significant contribution in getting the first Namibian Marine Protected Area proclaimed. She has a sound knowledge of the local fauna and flora, particularly the local avifauna, and has a thorough understanding of relevant local and international conservation issues. Dr Kemper has previously conducted specialist studies, including for proposed wind energy generation and oil/gas exploration projects.

## 2 Description of the Project

### 2.1 Project Location

Hangana Abalone (Pty) Ltd currently operates at three Areas or Farms (see Figure 2): i) the land-based facility (Farm 4) is located on Erf 514, and the area is 3,1978 hectares (ha) in size; access to the area can be attained via Industry Road (partial gravel road), Industrial Area, Lüderitz; ii) Farm 1 is 38.5 ha in size and located off Seal Island; and iii) Farm 2 is 32.4 ha in size and located off Penguin Island.

The focus of this study is Farm 3 (Tiger Reef; see Figure 2). The area is situated around 800 metres (m) north-west of Farm 4 and is 2.1 ha in size.

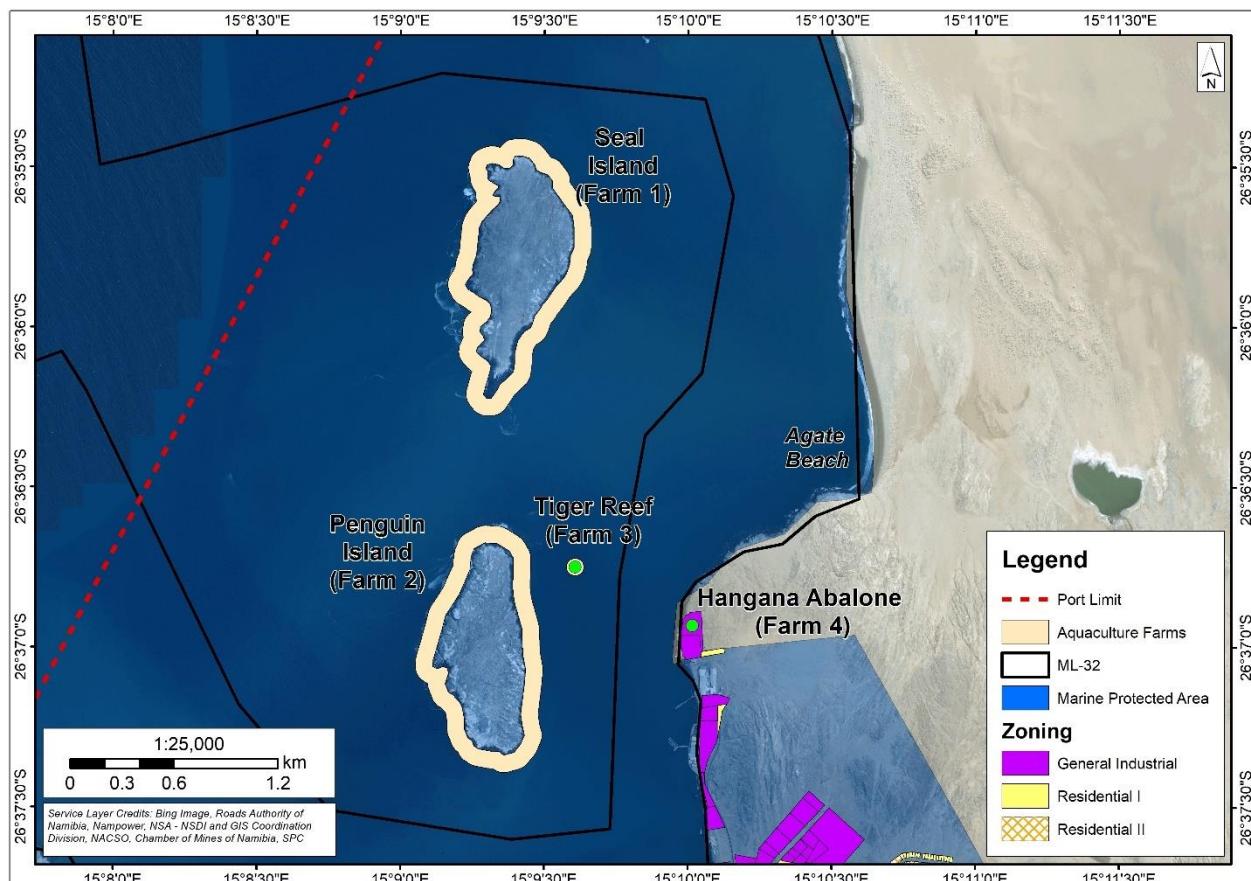


Figure 2: Map showing the location of Hangana Abalone (Pty) Ltd's current (Farms 1, 2 and 4) and proposed activities (Farm 3), Lüderitz (Source: Miss Maike Prickett, GIS Specialist, May 2020).

### 2.2 Land Use

Erf 514, on which Farm 4 is located, is zoned General Industrial (see Figure 2). Farms 1 to 3 fall within: i) the Port of Lüderitz operated by the Namibian Ports Authority (NamPort); ii) the Namibian Islands' Marine Protected Area (NIMPA); and iii) a rock lobster sanctuary. Tiger Reef, also falls within Mining Licence (ML) Area 32, the latter that was granted by the Ministry of Mines and Energy (MME) to the Namibian Diamond Company (Pty) Ltd on 17 February 2019.

**NamPort** noted on 23 June 2020 that Hangana Abalone (Pty) Ltd is paying to utilise the water areas around Tiger Reef and that the lease agreement will be concluded after all processes have been finalised by NamPort Management (see Annexure C).

The **NIMPA** was declared in 2009 (GRN, 2009). It stretches for 400 kilometres (km) from Meob Bay in the north to Chameis Bay in the south. The NIMPA extends roughly 30 km from the high water mark into the sea; Lüderitz is roughly at its centre (Currie *et al.*, 2009; Kemper, 2020).

Currie *et al.*, (2009) noted that it is intended that the Marine Protected Area (MPA) will contribute to: i) sound management and conservation of marine resources under Namibia's jurisdiction; ii) the protection of spawning and nursery grounds of the commercially exploited rock lobster (*Jasus lalandii*) and that of certain fish stocks and other marine resources, to promote stock recovery; iii) protection of the foraging requirements of top predators in the Benguela Upwelling Ecosystem, including a number of globally threatened seabirds; iv) MFMR's "precautionary principle" management strategy, whereby representative habitats are set aside to mitigate potential future threats, as well as MFMR's legal obligations to EAF (Ecosystems Approach to Fisheries Management) management; v) improved vigilance with regard to risks posed by shipping-related threats, such as oil spills; vi) continued collection of oceanographic and biological data from offshore island sites, constituting important monitored indicators of the state of Namibia's marine environment and coastal ecosystem (contributing an integral link to Namibia's environmental monitoring system); vii) awareness, in a regional context, regarding novel approaches to the declaration and management of offshore MPAs; and viii) enhancement of Namibia's international relations by illustrating steadfast commitment to international environmental treaties, regional and national needs and requirements, and international law.

The NIMPA is divided into four zones of protection (Currie *et al.*, 2009). Zone 4 represents areas of priority conservation and highest protection status (i.e. on the islands, islets, rocks, rock lobster sanctuaries and line fish sanctuaries). Zone 3 restrictions are enforceable to a perimeter of 120 m (or less in specified cases in the approved management zonations) around each island, islet or rock. Zone 2 enforceable conditions apply to near-shore and on-shore mining areas up to a water depth of 30 m (GRN 2012b; Tiger Reef falls into this zone) and Zone 1 represents the buffer zone with generalised and the fewest restrictions (GRN, 2012b).

Kemper (2020) indicated that none of the activity restrictions listed for Zone 2 has implications for Hangana's planned abalone ranching operations. However, Tiger Reef is close to two islands that are part of the NIMPA and that fall under Zones 3 and 4. Penguin Island (36 ha in size) is located approximately 300 m west of Tiger Reef at its closest point. The southernmost tip of Seal Island (44 ha in size) is about 1.3 km from Tiger Reef. Both Seal and Penguin Islands support populations of breeding, foraging and/or roosting coastal seabirds; several species that are considered threatened breed on the islands, and often in large numbers (see Table 1: Kemper, 2020).

Tiger Reef falls into a **rock lobster sanctuary** that extends from Diaz Point north to a point north of Lüderitz at 26°34'S. No person may, in any manner or for any purpose harvest rock lobster in this area (GRN, 2001). Kemper (2020) noted that rocky areas, including sub-tidal reefs, are important rock lobster recruitment areas (K. Grobler, pers. comm.) and that this sanctuary is considered an important recruitment settlement area because of the sheltered environment afforded by a number of narrow rocky bays and fjords, the lagoon, as well as Seal and Penguin Islands.

## 2.3 Abalone

Abalone, or "perlemoen" belongs to the Phylum Mollusca (including snails, mussels, octopus, and their kin), Class Gastropoda (snails (i.e. abalone) and sea slugs, and including winkles, whelks and limpets, nudibranchs, and false limpets), Family Haliotidae, and Genus *Haliotis*.

There are five different species endemic to Southern Africa: Perlemoen *Haliotis midae*; Spiral-ridged siffie *Haliotis parva*; Venus ear siffie *Haliotis spadicea*; Quekett's abalone *Haliotis queketti*; and Beautiful ear-shell *Haliotis speciose*.

*Haliotis midae* is the largest and most abundant of the abalone species in SA; it does not occur naturally in Namibia. In SA, it occurs predominantly between St. Helena Bay and Cape Agulhas (Western Cape), as well as along the coast of the Eastern Cape. It can be found on rocky reefs between the intertidal and subtidal zones, and up to a depth of 10 m, but it may also move to slightly deeper waters.

Life cycle (see Figure 3): abalone are broadcast spawners (i.e. there is no mating behaviour and spawning is initiated by the release of a sperm cloud that prompts the females to release their eggs; the peak spawning period is between April and June). Fertilisation takes place in the water column. The eggs hatch into

trocophore larvae that move actively in the water. Shortly after, the trocophore larvae develop into veliger larvae, followed by substrate settlement and metamorphosis.

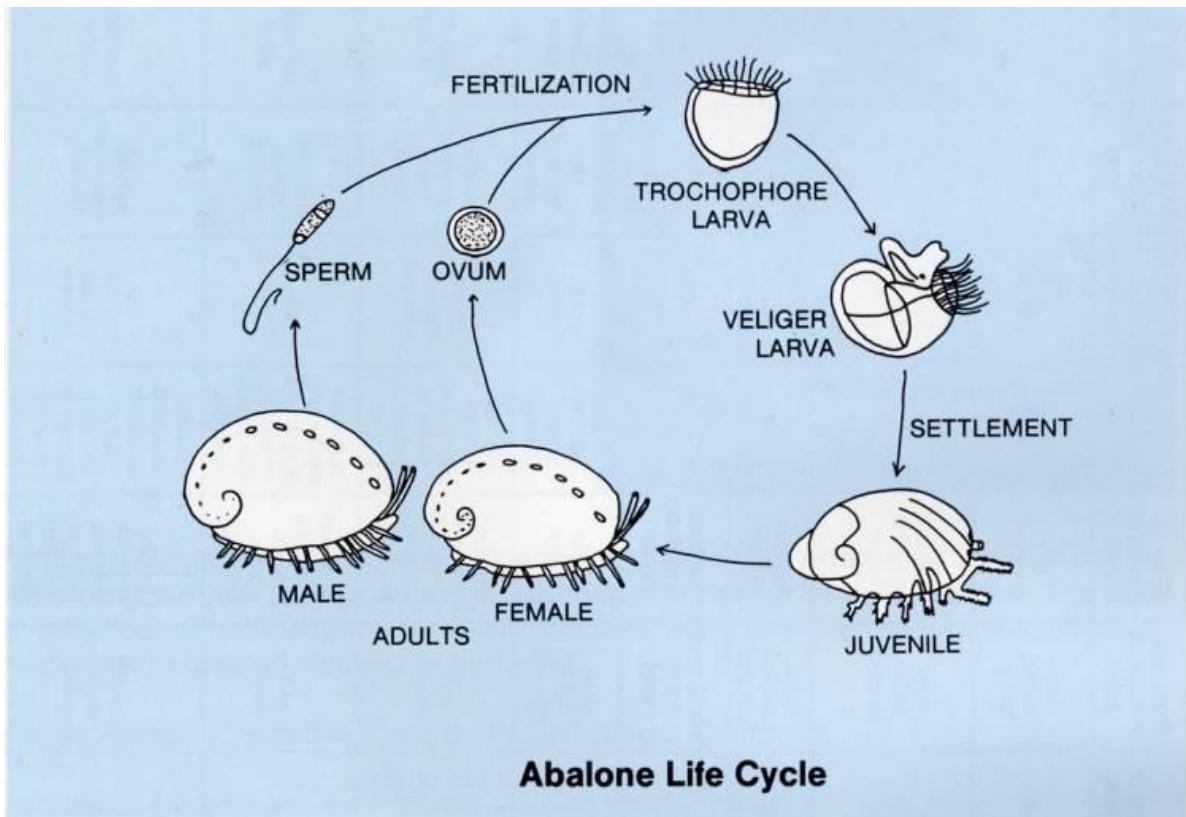


Figure 3: Life cycle of the abalone (Source: Vaughn, 2014).

*Haliotis midae* are herbivores; it rasps seaweeds or consumes floating bits of a range of seaweeds, particularly kelp, by trapping it under its large, muscular foot.

Survival rates are very low; it is estimated that less than one in 10,000 abalone survive to maturity. Predators include: rock lobsters *Jasus lalandii* (they outcompete young abalone for shelter, and prey on them); crabs; rays; and octopuses (Barkai and Griffiths, 1986: see Kemper, 2020; Tarr *et al.*, 1996: see Kemper, 2020; Branch *et al.*, 1994; Branch *et al.*, 2010: see Kemper, 2020; Van Zyl *et al.*, 2010: see Kemper, 2020; Bowen, 2017; and <https://www.sealifebase.ca/summary/Haliotis-midae.htm>).

## 2.4 Project Rationale

Namibia's 5th National Development Plan (NDP5; Working together towards prosperity (2017/18 – 2021/22)) supports the Project as follows: “*Fishery Strategies and Desired Outcomes, 2017-2022; Strategies include: Sustainable Fisheries Management; Enhance market access; Incentivize fish import for sustainable value addition; Increase value addition and investments in on-shore processes; Develop retail ready products in the Hake and other white fisheries such as monk; and Promote investment in Mariculture* (This strategy aims at promoting mariculture as a viable economic option by demarcating land in suitable places, and facilitating infrastructure and other services necessary for mariculture development)” and “Desired Outcomes are: By 2022, Namibia to be the key fisheries and processing hub in the South West Atlantic Ocean through increasing the volume of fish handled, canned or processed in Walvis Bay cumulatively by 40%”. Also, **aquaculture should be promoted**, employment creation should be maximised, and sustainable value addition of (horse mackerel) to 70% should be achieved (Republic of Namibia, 2017).

## 2.5 Project Activities

The operations at and expansion of the facilities at Farm 4 are described in detail by Botha *et al.* (2020b) (see Annexure A).

Abalone brood stock is kept in separate tanks at the onshore facility. The abalone are then spawned and hatched. The veliger larvae (see Figure 3) are moved to settlement tanks, and after about three months, the spat are transferred to weaning tanks. After approximately one year, the fast-growing abalone are moved from the hatchery to outside grow-out tanks (Botha *et al.*, 2020b).

Every four months, the slow-growing individuals are selected. When there is a reasonable amount, i.e. between 600 and up to 18,000 abalone, divers are contracted to collect the animals for release in the wild.

The divers, usually a team of four people, will transport the abalone in net mesh bags (one bag can hold between 400 and 900 animals) and via rubber duck from the onshore facility to sea.

Once the desired location is reached, the rubber duck is anchored and the mesh bags are suspended in the water (under the rubber duck); two of the four people will dive, whilst the other two persons will remain in the rubber duck looking after the air compressor and directing the divers' air hoses. Note that scuba tanks are used only during prospecting, i.e. when the divers mark the working area for the day when harvesting.

Divers work between five and 12 hours per day, depending on the time of sunset/sunrise, and the visibility. Apart from the placement of the abalone on the rocky/reef areas for ranching, the divers will also simultaneously harvest abalone. Thus, the rubber duck will travel back and forth to the onshore facility to return the empty mesh bags/harvested animals, and to take out the bags with animals to be ranned.

A spatula only is used when harvesting abalone and also only if the abalone is positioned properly. The remainder of the animals will be left for collection during the next harvesting run.

Harvested abalone are kept in mesh bags that are suspended in the water. Once the divers are ready to return to the onshore facility, the bags are lifted from the water and placed into the rubber duck. At Farm 4, the animals are then graded and taken to the baskets and new tanks.

The placement of 18,000 animals for ranching takes around two weeks (roughly 90 hours). The harvesting takes double the amount of time (once the abalone sense any movement, they tighten their grip on the rocky/reef areas).

Monitoring of the ranned abalone takes place every quarter. Divers look for abalone mortalities (any shells observed are collected), and whether there is enough food for the abalone in the area. Also, video footage is recorded for record keeping purposes. Some of the animals are tagged. It is planned to, in future, measure the tagged individuals to determine abalone growth rates. Currently, no water samples are collected for analysis of the water quality, etc. Also, no monitoring of any changes in the reef communities' structures are carried out (Me Aune Ndapanda Nantinda, General Manager, Hangana Abalone (Pty) Ltd, pers. comm.).

Abalone reach market size at between four and five years after hatching (Botha *et al.*, 2020b). The farm currently has the capacity to produce 90 tonnes of abalone per annum, and will further expand to produce 300 tonnes by 2025 (Anon., 2020). The proposed ranching capacity at Tiger Reef is expected to be around ten tonnes per annum (Me Aune Ndapanda Nantinda, General Manager, Hangana Abalone (Pty) Ltd, pers. comm.).

Currently the facility packs and exports live abalone only. It is foreseen that once the processing plant has been completed and a cold store put up, Hangana Abalone (Pty) Ltd's will also process abalone at Farm 4. Packaged abalone is transported via road from Lüderitz to Windhoek (Botha *et al.*, 2020b) and from there it is exported to mainly to China and Hong Kong (Anon., 2020).

## 2.6 Infrastructure and Bulk Services

Information re the water and power supply to Farm 4, the fuel storage, and solid and liquid waste disposal as a result of the activities at Farm 4 can be found under Annexure A (see Botha *et al.*, 2020b).

## 2.7 Alternatives

The land-based facility (Farm 4) is an existing aquaculture operation. Abalone ranching is already taking place off Seal (Farm 1) and Penguin Islands (Farm 2). No alternative location to Farm 3 (Tiger Reef) for abalone ranching is currently proposed.

### **3 Natural Environment**

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#### **3.1 Physical Environment**

##### **3.1.1 *Regional Setting***

The proposed Project falls within the //Karas Region. It is the southernmost region of Namibia, covering 161,235 square kilometres (km<sup>2</sup>) and 20% of the total surface area of the Country. The Region is bordered by the Hardap Region (north), the Atlantic Ocean (west), and the borders between Namibia and South Africa (south) and Namibia and Botswana (east).

The //Karas Region is considered a natural organic administrative and economic unit and comprises of seven constituencies: Keetmanshoop Urban, Keetmanshoop Rural, Berseba, Karasburg East and Karasburg West, Lüderitz (now !Nami=Nüs), and Oranjemund.

Keetmanshoop, the agricultural capital of the Region, seat the //Karas Regional Council. The town has direct air, railway and road links with Namibia's capital city, Windhoek. Other airstrips in the Region can be found at Kolmanskuppe (also called the "ghost town" of Kolmanskop) near Lüderitz, and at Aus, Bethanien, Rosh Pinah, and Oranjemund.

The //Karas Region is a predominantly small stock (sheep and goats) farming area. However, game and irrigation farming (at the Naute Dam and along the Orange River) have become increasingly important. Mining operations in the Region include: onshore diamond mining (Namdeb Holdings (Pty) Ltd - Northern Coastal Mines, Southern Coastal Mines, and Orange River Mines); offshore diamond mining (De Beers Marine Namibia (Pty) Ltd); zinc (Skorpion Zinc (Pty) Ltd); zinc and lead concentrate (Rosh Pinah Zinc Corporation) and tantalum pentoxide (African Tantalum Mine near Warmbad) (Ministry of Regional and Local Government, Housing and Rural Development, 2010; Chamber of Mines of Namibia, 2019).

Tourist attractions in the Region include: Hot Water Springs (Ai-Ais and Warmbad), the Kokerboom Forest (near Keetmanshoop), the Fish River Canyon (the second largest canyon in the world), Brukaros Mountain (near Berseba), the coastal town of Lüderitz (with fishing and boat building industries) and several guest and game farms (see <http://www.Karasrc.com/> and <http://www.namibweb.com/regions.htm>).

##### **3.1.2 *Climate***

The climate at Lüderitz is classified as very arid (desert). Approximately 127 fog-days are recorded at Lüderitz each year; the Town receives around seven to eight hours of sunshine per day. Precipitation increases from the west to the east of the //Karas Region and ranges between less than 50 millimetres (mm) (at Lüderitz) and 100 to 150 mm (at Keetmanshoop) per annum. Average annual temperatures range between less than 16 degrees centigrade (°C) (at the coast) and 20 to 22 °C (at Keetmanshoop). Maximum and minimum temperatures at Lüderitz during the hottest and coldest months range between 20 to 22 °C and 10 to 12 °C, respectively. Relative humidity in the Lüderitz area ranges between more than 90% during the most humid months and between 60 and 70% during the least humid months. The average annual rates of evaporation in the Lüderitz area range between 1,680 and 1,820 mm. Winds from the south predominate at Lüderitz (Mendelsohn *et al.*, 2009). During the summer months, sand storms occur frequently; average wind speeds of over 40 kilometres per hour (km/h) can be experienced at Lüderitz during summer afternoons. During the winter, high-pressure systems over the interior of southern Africa can cause occasional strong south to north-easterly winds. These "berg winds" can blow for a number of days and are characterised by very high temperatures and dry, dusty conditions (Mendelsohn *et al.*, 2009; GRN, 2016).

##### **3.1.3 *Archaeology***

There are no known heritage sites and/or sites of archaeological importance in the Tiger Reef-area.

### 3.1.4 Geology, Hydrology and Hydrogeology

Information re the geology and hydrogeology can be found under Annexure A (see Botha *et al.*, 2020b).

## 3.2 Biophysical Environment

During June/July 2020, Dr Jessica Kemper carried out a desktop study on the ecology of the area (see Annexure D). A brief summary of the findings / extracts from the report is provided below:

The rocky shores of southern Namibia generally support a greater biodiversity than the sandy shores. These rocky shores may extend into the sea as sub-tidal reefs where they provide the substrate for kelp bed communities and a host of associated sub-tidal fauna and flora. Kelp beds offer food, protection and shelter to various marine animals such as the rock lobster *Jasus lalandii*. Zoogeographic patterns of invertebrate communities associated with rocky shores show Lüderitz marking the boundary between the Cool Temperate North-West (Namibia) zone and the Cool Temperate South-West Coast (Namaqua) zone (Emanuel *et al.*, 1992: see Kemper, 2020).

Tiger Reef is situated in the Lüderitz upwelling cell, the largest and most intense upwelling area in the world. Due to the prevailing strong southerly winds which, together with the Benguela Current, move cold, nutrient-rich water from the ocean depths to the surface, the species diversity associated with rocky reefs is generally low but densities are typically high (Penrith and Kensley, 1970; Currie *et al.*, 2009: see Kemper, 2020). The reef itself is sheltered from wave action (and partially from the prevailing south-westerly winds) by Penguin Island to the west.

Tiger Reef primarily supports kelp beds of *Laminaria pallida* (Hangana Abalone *in litt.*; see Figure 4). Although the associated biota on Tiger Reef itself is not well documented in the literature, it is likely to be similar to that recorded during dive surveys in sub-tidal rocky reefs associated with islands to the north and south of Lüderitz (MFMR unpublished data). This includes various echinoderms (including urchins and starfishes), sponges, sea anemones, a variety of worms and crustaceans, mollusks (including whelks, mussels, octopus and cuttlefish), fish such as klipfish, and various seaweeds (Currie *et al.*, 2009: see Kemper, 2020). Some coastal birds may feed on fish and crustaceans sheltering in the kelp beds, such as crowned cormorants *Microcarbo coronatus* and bank cormorants *Phalacrocorax neglectus*. Occasionally, groups of up to about 400 Black-necked Grebes forage in the Tiger Reef area; these are considered Near-Threatened in Namibia (Simmons *et al.*, 2015: see Kemper, 2020). Small numbers of Cape fur seals *Arctocephalus pusillus* are seen foraging or commuting in the reef area regularly; other marine mammals that may occasionally be present in the area include resident Heaviside's dolphins *Cephalorhynchus heavisidii*, as well as transient bottlenose dolphins *Tursiops truncatus*, southern right whales *Eubalaena australis* and minke whales *Balaenoptera acutorostrata*.

Toxic (harmful) algal blooms (HAB) occasionally occur off Lüderitz although such events are generally less frequent than along the coast of central Namibia. Such blooms may impact the local ecosystem, including filter-feeding organisms such as mussels, but also fish and even seabirds feeding on affected fish (J. Kemper unpublished data). Toxic algal bloom events tend to occur mostly between March and July and may involve several species of planktonic diatoms or dinoflagellates, including *Alexandrium catenella*, *Dinophysis acuminata* and *Pseudonitzschia* spp. (MFMR unpublished data).

The reef is part of the greater port area of Lüderitz, which is managed by NamPort. It lies roughly 3 km to the north (and therefore upwind and up-current) of the main port activities and is clearly marked with a buoy. The occurrence and extent of impacts stemming from port activities on the biota associated with Tiger Reef, such as any pollution stemming from high heavy metal concentrations or from accidental fuel spills, sediment movement/increased turbidity from shipping traffic and occasional port dredging operations, or the introduction of alien organisms from ballast water is unclear.

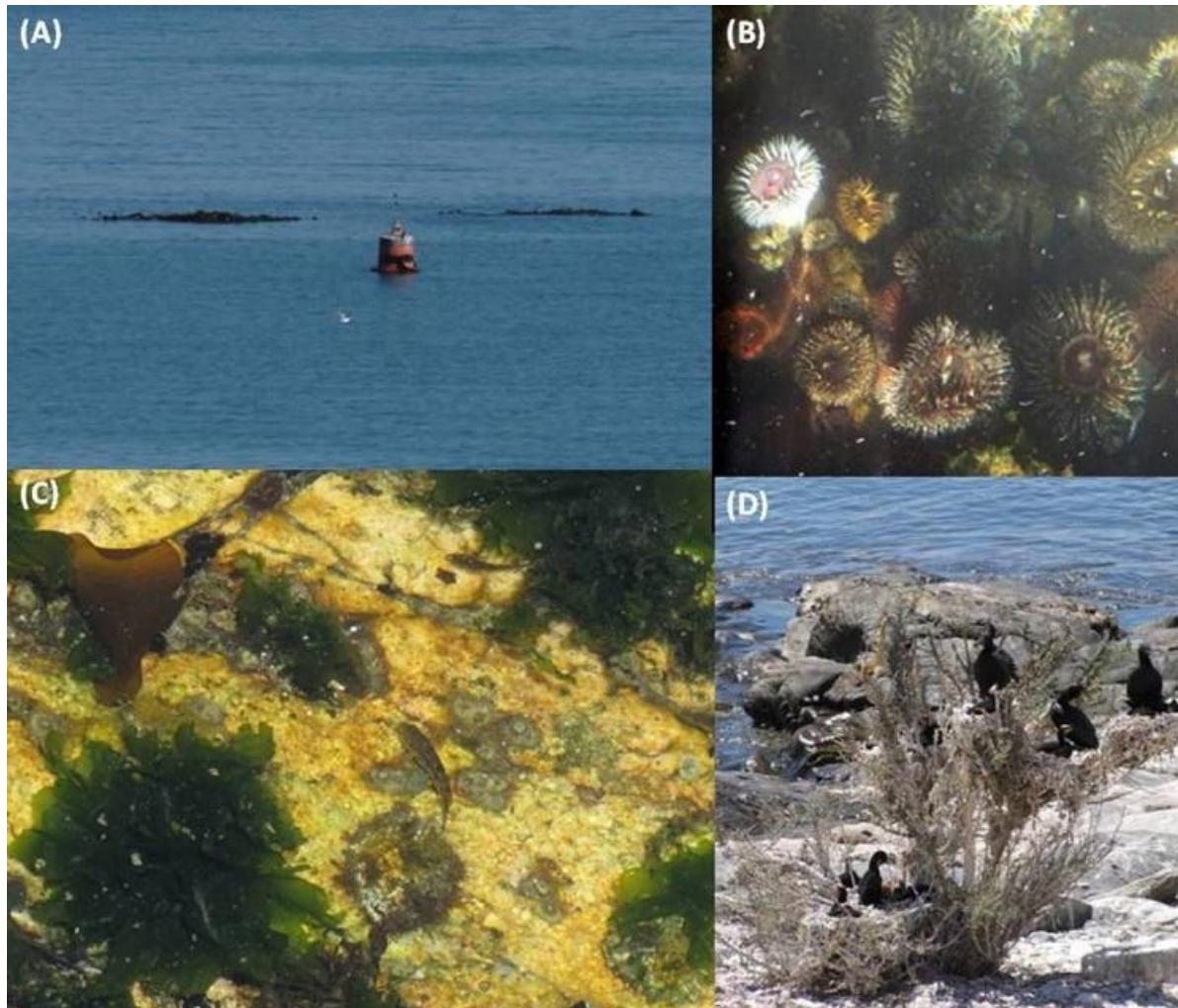


Figure 4: Flora and fauna associated with Tiger Reef and surrounding area. (A) *Laminaria pallida* forest visible above Tiger Reef with a buoy marking the position of the reef; (B) sea anemones in the intertidal zone of Penguin Island; (C) various algae providing some cover for a klipfish in a rock pool on the edge of Penguin Island; (D) crowned cormorants nesting near the water's edge on Penguin Island (Source: Kemper, 2020).

Important Bird Areas (IBA) are areas that are considered critical for birds at a global or regional scale. Although they do not carry legal weight, they provide decision-makers with an inventory of areas of high bird conservation importance. The Lüderitz Bay Islands global IBA consists of Penguin Island, Seal Island and nearby Halifax Island (Barnes, 1998: see Kemper, 2020). The island complex is considered to be globally important as it regularly supports more than 10,000 seabirds, many of which are threatened (see Table 1).

Table 1: Threatened seabirds breeding on Penguin and/or Seal Islands (Source: Kemper, 2020).

| Common name           | Scientific name                   | Conservation status  |                     | Comments <sup>3</sup>   |
|-----------------------|-----------------------------------|----------------------|---------------------|---|
|                       |                                   | Namibia <sup>1</sup> | Global <sup>2</sup> |   |
| African penguin       | <i>Spheniscus demersus</i>        | Endangered           | Endangered          | Was extinct from the two islands for a century; up to five breeding pairs have been recorded on Penguin Island since 2003.  |
| Bank cormorant        | <i>Phalacrocorax neglectus</i>    | Endangered           | Endangered          | Penguin Island currently supports the second largest breeding colony in the world.<br>Feeds mostly on rock lobster in nearby kelp beds as well as on fish in more open water. |
| Cape cormorant        | <i>Phalacrocorax capensis</i>     | Endangered           | Endangered          | Up to several thousand pairs may breed on both islands in some years.   |
| Crowned cormorant     | <i>Microcarbo coronatus</i>       | Near-Threatened      | Near-Threatened     | Breeds on both islands (up to several hundred nests).<br>Feeds on crustaceans and small fish in nearby kelp beds.   |
| African oystercatcher | <i>Haematopus moquini</i>         | Near Threatened      | N/A                 | Both islands support a large and globally significant number of breeding pairs.<br>Feeds on intertidal mollusks.  |
| Hartlaub's gull       | <i>Chroicocephalus hartlaubii</i> | Vulnerable           | N/A                 | Both islands may support several hundred breeding pairs in some years, often together with large numbers of (non-threatened) swift terns <i>Sterna bergii</i> .               |

<sup>1</sup>Source: Simmons et al. (2015) (see Kemper, 2020)

<sup>2</sup>Source: International Union for Conservation of Nature (IUCN) (2020) (see Kemper, 2020)

<sup>3</sup>Source: Ministry of Fisheries and Marine Resources (MFMR) unpublished data; J. Kemper pers. obs.

The following risks were identified by Kemper (2020):

- Abalone, as a non-native species, could potentially displace the natural fauna/flora and change the community structure on the reefs where it is being farmed;
- The introduction of abalone could decrease the density, diversity and/or species richness of the natural biota of Tiger Reef; this could also impact other organisms that are dependent on the reef, such as fish that shelter at reefs, or even seabirds such as crowned cormorants that feed on these fish;
- Abalone could propagate and disperse, potentially displacing the natural fauna/flora and change the community structure on other reefs or intertidal zones;
- Non-native abalone could introduce pathogens or parasites that may affect the native biota;
- Gear used and accidentally lost during the release, monitoring and/or collection of farmed abalone, such as ropes, mesh bags, box straps, cable ties, etc., could pose an entanglement threat to wildlife such as seabirds, seals, dolphins and whales;
- Accidental fuel spills during vessel operation could result in local wildlife (especially seabirds at the nearby Penguin and Seal Islands) being oiled; depending on the nature/amount of oiling, the consequences could be direct (mortalities through drowning, hypothermia or poisoning), as well as indirect (e.g. future reduction in breeding productivity through physiological damage);
- Operations at Tiger Reef could disturb seabirds and marine mammals at the reef itself, as well as at the two nearby islands – particularly at Penguin Island;
- Abalone may be prone to poaching; such activities may impact breeding seabirds on nearby Penguin and Seal Islands; and
- Tiger Reef could support a dense number of juvenile rock lobsters that may prey on young abalone.

Kemper (2020) noted that “The activities associated with abalone ranching and collecting are likely to be low intensity as they do not entail any construction of infrastructure, nor involve the use of structures such as ropes and permanent rafts that could pose an entanglement risk. Activities are limited to regular visits by a small team of staff / divers. As long as stocking rates of abalone do not change the community structure of the

*natural biota on the reef, and as long as it is guaranteed that abalone are not able to reproduce and disperse to other areas, the ranching of abalone at Tiger Reef is unlikely to pose significant risks to the natural sub-tidal and intertidal macrofauna and -flora in the area” and concludes that “from an ecological standpoint, there are no issues that would raise outright objections to the project.”*

The mitigations measures proposed by Kemper (2020) are contained in the EMP (see Section 7.4)

### 3.3 Socio-Economic Environment

A baseline socio-economic study was compiled using data from the following Government documents: the Namibia Household Income & Expenditure Survey (NHIES) 2009/2010 (Namibia Statistics Agency (NSA), 2012) and the NHIES 2015/2016 (NSA, 2018); the Namibia 2011 Population & Housing Census Main Report (NSA, 2013); the //Karas 2011 Census Regional Profile (NSA, 2014a) and the 2011 Population and Housing Census //Karas 2011 Regional Based on 4<sup>th</sup> Delimination (NSA, 2014b); the Namibia Inter-censal Demographic Survey (NIDS) 2016 Report (NSA, 2017a); the Namibia Labour Force Survey 2016 (NSA, 2017b) and the Namibia Labour Force Survey 2018 (NSA, 2019); the Surveillance Report of the 2016 National HIV Sentinel Survey (Ministry of Health and Social Services (MHSS), 2016); the Namibia Population-Based HIV (Human Immunodeficiency Virus) Impact Assessment (NAMPHIA) (MHSS, 2018); the Namibia Country Operational Plan (COP) 2016 Strategic Direction Summary (PEPFAR Namibia, 2016); and the Namibia COP 2019 Strategic Direction Summary (PEPFAR Namibia, 2019).

#### 3.3.1 Population Characteristics

During the 2011 Population and Housing Census, the population of the //Karas Region was estimated at 77,421 persons (NSA, 2013). In 2016, an estimated 85,759 persons lived in the Region (3.7% of the national population).

The annual growth rate (2011 to 2016) for //Karas was calculated at 2.0% (vs the national average of 1.9%). //Karas is the least densely populated region (0.5 persons per km<sup>2</sup>) in Namibia, followed by the Hardap and Kunene Regions (0.8 persons per km<sup>2</sup>) and the Omaheke Region (0.9 persons per km<sup>2</sup>). The most densely populated regions are the Ohangwena and Oshana Regions (23.9 and 21.9 persons per km<sup>2</sup>, respectively); the national average is 2.8 persons per km<sup>2</sup> (NSA, 2017a).

Ashby Associates cc (2014) indicated that “*Namibia has a highly mobile population characterized by a system of circular labour migration to mines, ports, farms and urban areas as well as transport corridors. This has resulted in growing informal settlements in cities, towns and smaller semi-urban localities.*” The level of urbanisation in the //Karas Region increased from 54% (in 2001 and 2011) to 61% (2016), compared to the national average of an urban growth rate of 45% between 2001 and 2011 (NSA, 2013; 2017a).

In 2011, there were 21,283 households (16,839 households in 2001) (4.2 vs 4.7 persons per household in 2011 and 2001, respectively) in the //Karas Region (NSA, 2013). The number of households is estimated to have increased to 26,348 in 2016 (3.3 persons per household) (NSA, 2017a).

In 2016, the population consisted of an estimated 57% Potentially Economically Active (PEA) persons (15 to 59 years of age), a junior population (37%; < 15 years of age), and a senior population (6%; > 60 years of age).

The Crude Birth Rate (CBR) per 1,000 population for //Karas was 33.7 in 2016 (and meaning that for every 1,000 population, there were around 34 births) (the national average is 32.6). The CBR was highest in the Kavango East and Kunene Regions (with 45.5 and 43.7 births, respectively) and lowest in the Erongo Region (22.5 births for every 1,000 population). In the 2016, the Crude Death Rate (CDR) per 1,000 population for //Karas was 9.7 (vs a national CDR of 10.8); the highest death rate was in Omaheke with 19.5 deaths per 1,000 people.

Three main languages are spoken in the //Karas Region and these are: Afrikaans (33%), Oshivambo 30%), and Nama/Damara (25%).

The literacy rate in the Region (15+ years) was estimated to be 96% (97% in 2011). In 2016, and estimated 5% of the population above the age of 15 had never attended school, around 8% was attending school, and about 85% had left school (NSA, 2017a).

The //Karas Region is subdivided into seven political constituencies: Berseba (population: 10,589), Karasburg (now Karasburg East and West; population: 16,470), Keetmanshoop Rural (population: 7,219), Keetmanshoop Urban (population: 19,447), Lüderitz (now !Nami≠Nūs; population: 13,859), and Oranjemund (population: 9,837) (NSA, 2014a).

Of the 13,859 persons (14,542 persons in 2001) residing in the !Nami≠Nūs constituency, 6,972 are males and 6,887 are females. The number of males per 100 females decreased from 130 to 101 males per 100 females between 2001 and 2011.

There are 4,362 households (3,649 households in 2001) (3.6 vs 3.1 persons per household in 2001 and 2011, respectively) in the !Nami≠Nūs constituency.

In 2011, the !Nami≠Nūs constituency had an estimated 66% PEA persons (15 to 59 years of age), a junior population (30%; < 15 years of age), and a senior population (4%; > 60 years of age).

Fertility (average number of children per woman) in 2011 was estimated at 3.0. Two percent (2.1%) of all children under the age of 18 years were orphaned by both parents; 9.0% of all children under the age of 18 have, either lost their mother, or their father.

The literacy rate was estimated at 98% (vs 97% in 2001). In 2011, around 5% of the population above the age of 15 had never attended school, around 10% was attending school, and about 82% had left school (NSA, 2014a).

### 3.3.2 *Economic Profile*

The economic context of the !Nami≠Nūs constituency (or //Karas Region where figures are not available for the constituency) is illustrated by means of economic indicators such as employment, source of income, and main working activities:

During 2011, approximately 78% of the population in the !Nami≠Nūs constituency formed part of the potential labour force (15+ years). Of these persons, about 72% had been absorbed by the economy and was actively working (vs the national average of ~63%); the remainder of the people (28%) was classified as unemployed (NSA, 2014a).

Results from the 2016 and 2018 Namibia Labour Force Surveys (NLFSs) indicate that the Labour Force Participation Rate (LFPR; the number of persons in the labour force given as a percentage of the working age population in that population group) for the //Karas Region was 75.5% (vs 69.4% for Namibia) and 74.0% (vs 71.2% for Namibia) during 2016 and 2018, respectively. The broad unemployment rate (i.e. people being without work, or who are available for work, irrespective of whether they are actively seeking work) for the //Karas Region was 23.0% (vs 34.0% for all the Regions of Namibia) during 2016 and 44.7% (vs 46.1% for all the Regions of Namibia) during 2018 (NSA, 2017b, 2019).

Key industries in the !Nami≠Nūs constituency, in terms of employment, are: agriculture, forestry and fishing (41.6%); administrative and support service activities (8.4%); manufacturing (7.5%); construction (6.1%); mining and quarrying (5.8%); and wholesale and retail trade; repair of motor vehicles and motorcycles (5.3%).

The occupation profile for the !Nami≠Nūs constituency in 2011 was made up by the following: elementary occupations (labourers and other unskilled occupations; 27.3%); skilled agricultural and fishery workers (22.9%); craft and related trades workers (12.0%); service workers (11.9%); professionals (5.7%); technicians and associate professionals (5.4%); clerks (5.2 %); %; plant and machine operators and assemblers (4.7%); legislators, senior officials, and managers (4.4%); armed forces (0.4%); and not stated (0.1%) (NSA, 2014b).

In 2011, the main source of income in the !Nami≠Nūs constituency was: salaries and wages (79%); business, non farming (8%); and pension (5%) (NSA, 2014a).

Hangana Abalone (Pty) Ltd's currently employs 40 staff (Me Aune Ndapanda Nantinda, General Manager, Hangana Abalone (Pty) Ltd, pers. comm.). With the expansion, and in a couple of years' time, it is expected that Hangana Abalone (Pty) Ltd will ultimately employ 300 employees (Anon., 2020).

### 3.3.3 Poverty Levels

According to the 2009/10 NHIES, the //Karas Region has an average household income of N\$68,885 and income per capita of N\$18,843 (vs the Kavango Region with the lowest (N\$5,682) income per capita) (NSA, 2012).

Households in the //Karas Region have an average household consumption of N\$116,875 (N\$119,065 for Namibia) and consumption per capita of N\$32,760 (N\$28,434 for Namibia) (2015/2016 NHIES figures). The highest per capita consumption was found in the Khomas Region (N\$58,807) and the lowest in the Kavango West (N\$12,006) and East (N\$12,091) Regions.

Households in the //Karas Region spend most of their money on food/beverages (31.5%), housing (28.5%), other (recreation, culture, accommodation services and miscellaneous goods and services: 16.9%), transport/communication (9.8%), furnishing/equipment (5.9%), clothing/footwear (3.2%), education (2.4%), and health (1.9%).

There are very high levels of poverty in the Kunene, Kavango East, Zambezi and Omaheke Regions (with poverty levels above the National average of 17.4%). Lower levels of poverty are observed in the Khomas, Erongo, and //Karas Regions (NSA, 2018).

### 3.3.4 Housing

According to the 2011 Population and Housing Census, 40.4% of households in the !Nami≠Nūs constituency lived in detached houses and around 34.4% lived in impoverished housing (shacks). The remainder of the households lived in semi-detached houses (9.4%), apartments/flats (7.7%), single quarters (6.1%), guest flats (0.9%), part commercial/industrial (0.5%), mobile homes (0.3%), other (0.2%), and traditional dwellings (0.1%) (NSA, 2014b).

### 3.3.5 Information Communication Technology

In 2011, seventy four percent (74%) of the population in the //Karas Region had access to a radio, i.e. the most widespread means of communication in Namibia. In the !Nami≠Nūs constituency, 15.8% of households had access to a radio, 12.7% had access to a television, 15.6% and 2.6% had access to a mobile phone and fixed line, respectively, whilst only 3.2% of households had access to a computer/laptop and 1.2% had access to internet (NSA, 2014a).

In 2016, 85.3% of people older than 15 years in the //Karas Region owned a mobile phone and 19.9% of people older than 15 years used his/her own computer or laptop (in the last three months). At the time, and in the last three months, 75.3% of people older than 15 years did no use the internet; 9.8% used it on their mobile phone/computer/laptop/tablet, 8.5% used the internet on their own mobile phone; and 6.0% used the internet on a computer/laptop/tablet (NSA, 2017a).

### 3.3.6 Access to Services

#### Water

During 2011, 92% of households in the //Karas Region had access to safe drinking water (NSA, 2013). The majority of the households in the !Nami≠Nūs constituency obtained their drinking water via piped water inside (38.6%), piped water outside (31.7%), and public pipe (28.8%), and (NSA, 2014b).

#### Energy

In 2011, the majority of households in the !Nami≠Nūs constituency (48.8%) prepared their food using gas; the remainder of the households made use of electricity from the main grid (45.9%), and wood/charcoal from wood (4.0%) to cook their food.

Energy for lighting was mainly obtained through using electricity from the main grid (76.7%) and candles (16.0%) (NSA, 2014b).

### Sanitation

In 2011, 9.5% of households in the !Nami≠Nūs constituency had no toilet facility. Around 37.7% and 39.7% of households had access to private and shared flush toilets (connected to the main sewer), respectively. The remainder of the households used shared flush toilets connected to a septic/cesspool (5.1%), bucket toilets (3.9%), pit latrines with ventilation (2.0%), covered pit latrines without ventilation (1.1%), private flush toilets connected to a septic/cesspool (0.7%), and uncovered pit latrines without ventilation (0.1%) (NSA, 2014b).

### Health Care

The //Karas Regional Health Directorate has the following facilities: three hospitals; three health centres, and 13 Primary Health Care Clinics (see <http://www.mhss.gov.na/regionals>). In the !Nami≠Nūs constituency, one can find a District Hospital, Clinic and District Health Office.

Privately run facilities in the !Nami≠Nūs constituency include: Elizabeth Bay Clinic, Namdeb Hospital, Oranjemund Primary Health Care Clinic, Pocket Beaches Clinic, Rosh Care Clinic, and Sedadic Clinic (see Namibia Master Health Facility List; <https://mfl.mhss.gov.na/>).

### Education

There are five government schools in Lüderitz, i.e. Helene van Rhijn Primary School, Lüderitz Junior Primary School, Nautilus Primary School, Diaz Junior Secondary School, and Nautilus Secondary School (see [http://www.arc.org.na/home.php?pn=karas\\_schools](http://www.arc.org.na/home.php?pn=karas_schools)), as well as two private schools, i.e. Brightstart Montessori School and the Lüderitz Christian School.

#### *3.3.7 Human Immunodeficiency Virus*

National data related to the HIV/AIDS epidemic in Namibia can be summarised as follows: i) AIDS is the leading cause of deaths amongst adults in Namibia; in 2019, an estimated 3,952 people were expected to die of HIV/AIDS; ii) HIV is mainly transmitted through heterosexual and mother-to-child transmission (MTCT); iii) approximately 203,296 (8.1%) of people are estimated to be living with HIV of which an estimated 8,905 are youths in the age group <15 years; iv) HIV prevalence amongst people aged 15-24 was estimated at 4.8% for females and 2.8% for males; in the age group 25+ HIV prevalence was estimated at 17.8% for females and 13.5% for males (2019); v) the incidence rate for Namibia is 0.24% and equal to 5,518 new infections in 2019; the highest proportion of the estimated new infections is amongst females aged 15 to 29 (34%) (vs 24% for males in the age group 20-35); vi) key factors maintaining the high levels of HIV in Namibia are: high levels of multiple and concurrent partnerships; low and inconsistent condom-use; inter-generational sex; and transactional sex (i.e. prostitution); vii) Tuberculosis (TB) is the number one killer of people living with HIV and Namibia has a co-infection rate of about 35.5% (2018); there is a decline in the total number of TB cases and thus TB mortality in Namibia (Ashby Associates cc, 2014; Haidula, 2016; PEPFAR Namibia, 2019).

The 2016 National HIV Sentinel Survey (NHSS), the 13<sup>th</sup> such survey conducted in Namibia, revealed the following: i) the percent HIV prevalence among pregnant females between 15 and 24 years in age in Lüderitz declined from 14.1 (2012) to 6.1 (2014), but increased to 8.5 (2016) (statistically significant increase in HIV prevalence); ii) in the age group 25 to 49, percent HIV prevalence among pregnant females in Lüderitz increased from 27.4% (2012) to 31.3% (2014) and then declined to 19.6 (2016); iii) Namibia's HIV/AIDS epidemic remains in a period of stabilisation with slow yet sustained decreases in HIV prevalence among pregnant women since 2004; iv) the highest age-specific prevalence in Namibia was observed among pregnant women age 35-39 years (32.3%) and pregnant women age 45-49 years (31.6%); HIV prevalence was lowest among pregnant women age 15-19 years (5.7%) and pregnant women age 20-24 years (10.2%) (the continuing shift in peak HIV prevalence from younger to older age groups can be expected in a mature and stabilised generalised HIV epidemic); v) the overall HIV prevalence among pregnant women age 15-24 years was 8.5% and is 3.5% higher than Namibia's 2015/16 National Strategic Framework (NSF) target of 5%; new HIV infections thus continue to occur among young women across Namibia at a rate that will sustain a generalised epidemic into the foreseeable future; vi) in Namibia, the highest HIV prevalence was observed at the north central and eastern sites and ranged above 20% to 33%; there were no apparent differences in the observed HIV prevalence between pregnant women residing in urban areas vs pregnant women residing in rural areas; vii) 62.5% of all women who tested HIV positive during the 2016 NHSS were already on ART (Anti-

retroviral Therapy) before the survey (vs 49.1% in 2014); this indicates a notable success of the ART and PMTCT (Prevention of Mother to Child Transmission) programs (MOHSS, 2016).

Between June and December 2017, the Namibia Population-Based HIV Impact Assessment (NAMPHIA), a cross-sectional household-based survey to assess the progress of Namibia's National HIV response, was carried out. NAMPHIA was led by the MHSS, with funding from PEPFAR (the U.S.A.'s President's Emergency Plan for AIDS Relief), and technical assistance through the U.S.A.'s Centers for Disease Control and Prevention (CDC). It was concluded that: i) in Namibia, the HIV prevalence was 12.6% among adults aged 15 to 64 years (i.e. approximately 176,000 people were living with HIV (PLHIV)) in 2017; HIV prevalence varies across the Namibian Regions, with the highest prevalence in the Zambezi (22.3%) and Oshikoto (17.3%) Regions and the lowest prevalence in the Kunene (7.6%) and Khomas (8.3%) Regions; ii) the annual incidence was 0.36% (i.e. around 4,500 new cases of HIV annually) for persons aged 15 to 64 years in 2017; iii) Namibia's HIV interventions have resulted in excellent progress towards the UNAIDS' targets; women in Namibia have achieved the UNAIDS 90-90-90 goals; iv) once diagnosed, over 90% of both female and male PLHIV were linked to ART and were virally suppressed; and v) prevalence of Viral Load Suppression (VLS) among HIV-positive adults aged 15 to 64 years was 77.4%, showing that Namibia has surpassed the UNAIDS 90-90-90 target for VLS (73.0%) (MHSS, 2018).

### 3.3.8 *Gender*

Legislation that promotes equal gender participation in all aspects of the Namibian society includes: i) Articles 10 and 23(3) of the Constitution of the Republic of Namibia 1990; ii) Affirmative Action (Employment) Act 29 of 1998; and iii) National Gender Policy (2010 – 2020).

## 4 Regulatory Framework

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The most pertinent legislation (Ruppel and Ruppel-Schlichting, 2016; Legal Assistance Centre (LAC), 2019), with the aim of informing Hangana Abalone (Pty) Ltd of the legal requirements pertaining to proposed ranching and collection of abalone *Haliotis midae* at Farm 3 (Tiger Reef) is listed in Table 2.

Table 2: Regulatory framework for the ranching and collection of abalone *Haliotis midae* by Hangana Abalone (Pty) Ltd at Farm 3 (Tiger Reef), Lüderitz, //Karas Region, Namibia.

| <b>National Law</b>   |
|---|
| <b>Acts of Parliament, Regulations, Ordinances, Proclamations</b>   |
| The Constitution of the Republic of Namibia 1990 (and First Amendment Act 34 of 1998, Second Amendment Act 7 of 2010, and Third Amendment Act 8 of 2014)  |
| Public Health Act 36 of 1919 (as amended by SWA Proclamation 36 of 1920) (to be repealed by the Public and Environmental Health Act 1 of 2015 when that Act comes into force)   |
| Employees' Compensation Act 30 of 1941 (as amended in South Africa prior to Namibian independence)<br>(Amendment Act 5 of 1995 amends the Act substantially and changes its name from the Workmen's Compensation Act to the Employees' Compensation Act) (and the General Regulations 1961 (as amended))  |
| Water Act 54 of 1956 (as made applicable in Namibia)  |
| Sea Shore Ordinance 37 of 1958  |
| Soil Conservation Act 76 of 1969 (as amended in South Africa to March 1978)   |
| General Health Regulations (Government Notice 121 of 14 October 1969 as amended)  |
| Hazardous Substance Ordinance 14 of 1974 (and the General Regulations 1979; no post-independence regulations have been promulgated)   |
| Atmospheric Pollution Prevention Ordinance 11 of 1976 (Regulations are authorised by several sections of the Act; no post-independence regulations have been promulgated)   |
| Regional Councils Act 22 of 1992 (and Amendment Acts 17 of 1997, 30 of 2000, 12 of 2002, 12 of 2010, 16 of 2010, and 7 of 2017) (and the Regulations: Commercialisation Regulations 2001; Joint Business Venture Regulations 2001; and Tender Board Regulations 2001)   |
| Local Authorities Act 23 of 1992 (and amendments) (and the Model Pound Regulations 1994, the Model Electricity Supply Regulations 1996, Model Water Supply Regulations 1996, Model Sewerage and Drainage Regulations 1996, Model Regulations for the Control of Dogs in Local Authority Areas 2008, Commercialisation Regulations 2001 (amended in 2007), Joint Business Venture Regulations 2001 (amended in 2007), and Tender Board Regulations 2001 (replaced in 2011), and Recruitment and Selection Regulations for Local Authority Councils 2019) |
| Local Authorities Act 23 of 1992 Town of Lüderitz: Regulations relating to waste management   |
| Namibian Ports Authority Act 2 of 1994 (as amended by the National Transport Services Holding Company Act 28 of 1998, the Namibian Ports Authority Amendment Act 12 of 2000, and the State-owned Enterprises Governance Act 2 of 2006) (and the Port Regulations 2001)  |
| Social Security Act 34 of 1994 (as amended by the State-owned Enterprises Governance Act 2 of 2006/ Public Enterprises Governance Act 2 of 2006, and the Labour Act 11 of 2007 (and the General Regulations 1995, and amendments))  |
| Namibia Water Corporation Act 12 of 1997 (and amendments: Namibia Water Corporation Amendment Act 17 of 2001; Water Resources Management Act 24 of 2004 (not yet been brought into force); State-owned Enterprises Governance Act 2 of 2006 (re-named the Public Enterprises Governance Act 2 of 2006); and the Water Resources Management Act 11 of 2013 (not yet been brought into force))  |
| Affirmative Action (Employment) Act 29 of 1998 (as amended by Act 6 of 2007 and the Labour Act 11 of 2007) (and the General Regulations 1999)   |
| Road Traffic and Transport Act 22 of 1999 (as amended by the Road Traffic and Transport Amendment Act 6 of 2008) (and the Road Traffic and Transport Regulations 2001)  |
| Marine Resources Act 27 of 2000 (and the Regulations relating to the Exploitation of Marine Resources 2001 and the Namibian Islands' Marine Protected Area 2012)  |
| Aquaculture Act 18 of 2002 (and the Aquaculture (Licensing) Regulations 2003 and the Regulations relating to import and export of aquatic organisms and aquaculture products 2010)  |
| Research, Science and Technology Act 23 of 2004 (amended by the State-owned Enterprises Governance Act 2 of 2006/Public Enterprises Governance Act 2 of 2006) (and the Regulations 2011 (amended 2016))   |
| Electricity Act 4 of 2007 (and the Electricity Regulations: Technical 2004, the Electricity Regulations: Administrative 2011, and the Namibian Electricity Safety Code 2011 (amended 2012))   |
| Environmental Management Act 7 of 2007 (and the Environmental Impact Assessment Regulations 2012)   |
| Labour Act 11 of 2007 (and the Labour Amendment Act 2 of 2012) (and the Regulations relating to the Health and Safety of Employees at Work 1997, and the Labour General Regulations 2008)   |
| Water Resources Management Act 11 of 2013 (to be brought into force on a date set by the Minister by notice in the Government Gazette)  |
| Public and Environmental Health Act 1 of 2015 (to be brought into force on a date set by the Minister by notice in the Government Gazette)  |
| <b>Policies, Guidelines, National Strategies &amp; Action Plans</b>   |

| <b>Policies</b>   |
|---|
| Conservation of Biotic Diversity and Habitat Protection 1994  |
| Namibia: National Code on HIV/AIDS in Employment 2000   |
| Towards Responsible Development of Aquaculture Namibia's Aquaculture Policy 2001  |
| Namibia's Aquaculture Strategic Plan 2004   |
| Namibia's Marine Resources Policy Towards Responsible Development and Management of the Marine Resources Sector 2004  |
| National Policy on HIV/AIDS 2007  |
| National Gender Policy 2010 - 2020  |
| National Health Policy Framework 2010-2020 - "towards quality health and social welfare services"   |
| National Policy on Climate Change for Namibia 2011  |
| National Policy on Coastal Management for Namibia 2012  |
| <b>National Strategies &amp; Action Plans</b>   |
| Namibia's Green Plan 1992   |
| Vision 2030 2004  |
| Towards a Coastal Policy for Namibia, Green Paper 2009  |
| Draft Master Plan for Marine Aquaculture in Namibia 2012 (AquaStel (Pty) Ltd, 2012a; b)   |
| National Climate Change Strategy & Action Plan (2013 – 2020)  |
| Namibia's Second National Biodiversity Strategy and Action Plan (NBSAP 2) (2013 – 2022)   |
| Namibia's 5th National Development Plan (NDP5) – Working together towards prosperity (2017/18 – 2021/22)  |
| Ministry of Fisheries and Marine Resources Strategic Plan 2017 (2017/18 - 2021/22)  |
| National Marine Pollution Contingency Plan (NMPCP) 2017   |
| National Solid Waste Management Strategy 2018   |
| <b>Town Planning Schemes, Structure Plans, &amp; Land Use Plans</b>   |
| Lüderitz Town Planning Amendment Scheme No. 5 2003  |
| Lüderitz Structure Plan: Towards A Model Town. Volume 1, <i>Final Draft</i> 2014  |
| <b>Strategic Environmental Assessments (SEAs)</b>   |
| Strategic Environmental Assessment (SEA) for the coastal areas of the Hardap and //Karas Regions 2012   |
| <b>International Law</b>  |
| <b>African Union (AU)</b>   |
| African Charter on Human and Peoples' Rights (Banjul Charter) 1981, the Protocol to the African Charter on Human and Peoples' Rights on the establishment of the African Court on Human and Peoples' Rights 1998 (non-binding), and the Protocol to the African Charter for Human and Peoples' Rights on the Rights of Women in Africa 2003   |
| Convention for Cooperation in the Protection and Development of the Marine and Coastal Environment of the West and Central African Region and Protocol (Abidjan Convention) 1981 (Additional Protocol to the Abidjan Convention concerning Cooperation in the Protection and Development of Marine and Coastal Environment from Land-based Sources and Activities in the Western, Central and Southern African Region 2012) |
| Agreement for the Establishment of the Intergovernmental Organization for Marketing Information and Cooperation Services for Fishery Products in Africa (INFOPECHE) 1991  |
| Revised (Algiers) Convention on the Conservation of Nature and Natural Resources 2003   |
| African Convention on the Conservation of Nature and Natural Resources (Revised Version) 2003 (non-binding)   |
| Agreement for the Establishment of the Africa Institute for the Environmentally Sound Management of Hazardous and Other Wastes Agreement 2004   |
| Regional Policy Guidelines Economic Instruments for the Environmentally Sound Management of Waste Oil 2013  |
| <b>Southern African Development Community (SADC)</b>  |
| Treaty of the Southern African Development Community (SADC) 1992 (and Agreement Amending the Treaty 2001; Agreement Amending Article 22 of the Treaty 2007; Agreement Amending the Treaty 2008; Agreement Amending the Treaty 2009 – DES; and Agreement Amending the Treaty 2009 – ORGAN)   |
| Protocol on Fisheries 2001  |
| Charter of Fundamental Social Rights in SADC 2003   |
| SADC Protocol on Environmental Management for Sustainable Development 2014 (non-binding)  |
| <b>United Nations (UN) / International Conventions</b>  |
| International Convention on the Elimination of All Forms of Racial Discrimination 1966  |
| International Covenant on Economic, Social and Cultural Rights (ICESCR) 1966  |
| Convention Concerning the Protection of the World Cultural and Natural Heritage 1972  |
| Declaration of the United Nations Conference on the Human Environment 1972  |
| Convention on the Elimination of All Forms of Discrimination against Women (CEDAW) 1979 and Optional Protocol to the Convention on the Elimination of all Forms of Discrimination against Women 1999  |
| Convention for Cooperation in the Protection and Development of the Marine and Coastal Environment of the West and Central African Region and Protocol (Abidjan Convention) 1981; Additional Protocol to the Abidjan Convention concerning Cooperation in the Protection and Development of Marine and Coastal Environment from Land-based Sources and Activities in the Western, Central and Southern African Region 2012  |
| Vienna Convention for the Protection of the Ozone Layer 1985 and Montreal Protocol on Substances that Deplete the Ozone Layer 1987 (and Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer, Adopted at the Second Meeting of the Parties on 29 June 1990; Amendment to the Montreal Protocol on Substances that  |

|   |
|---|
| Deplete the Ozone Layer, Adopted at the Fourth Meeting of the Parties at Copenhagen on 25 November 1992; Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer, Adopted by the Ninth Meeting of the Parties at Montreal on 17 September 1997; and Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer, at the Eleventh Meeting of the Parties on 3 December 1999) |
| Convention on Biological Diversity (Biodiversity Convention) 1992, the Cartagena Protocol on Biosafety to the Convention on Biological Diversity, Montreal 2000, and the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity 2010  |
| United Nations (UN) Framework Convention on Climate Change 1992 and the Kyoto Protocol to the UN Framework Convention on Climate Change 1997  |
| Convention for the Safeguarding of the Intangible Cultural Heritage 2003  |
| Convention on the Protection and Promotion of the Diversity of Cultural Expressions 2005  |
| United Nations Guiding Principles on Business and Human Rights 2011   |
| Benguela Current Convention 2013  |
| Paris Agreement (United Nations Framework Convention on Climate Change) 2016  |
| <b>International Best Practice</b>  |
| International Finance Corporation (IFC) Environmental Health and Safety (EHS) Guidelines 2007 and the EHS Guidelines for Aquaculture 2007   |

## **5 Stakeholder and Public Consultation**

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### **5.1 Objectives**

The purpose of Public Participation is to provide stakeholders, including the public, an opportunity to participate in the Environmental Assessment Process, in order to ensure that the intended development initiatives consider broad-based concerns. It further improves governance in that the intended development must consider a wide range of issues, e.g. the need to conserve the natural environment and the need to maintain a functioning ecology.

### **5.2 Consultation Process**

Communication with stakeholders re the proposed Project was facilitated through the following methods:

- Key stakeholders were identified from contacts of the Project Team (see Annexure E: List of Interested and Affected Parties (I&APs) Consulted);
- A laminated notice (with the Notice of the Environmental Assessment Process) was put up (27 May 2020) at the OK Grocer in Lüderitz (see Annexure E: Notices Displayed);
- Written notices were sent via e-mail on 27 May 2020: the Office of the Governor, //Karas Regional Council; the Regional Councilor !Nami#Nus Constituency; the Mayor/Chairperson of Council/Local Economic Development and Chief Executive Officer (CEO), Lüderitz Town Council; the Acting CEO, Seaflower Group of Companies; the Mining Commissioner, Ministry of Mines and Energy (MME); the CEO, Namdeb Diamond Company (Pty) Ltd; the Port Manager, SHE (Safety, Health, Environment) Officer and Port Health Officer, NamPort; the Executive Director, Ministry of Agriculture, Water and Land Reform (MAWLR); the Executive Director, Director: Aquaculture & Inland Fisheries, Deputy Director, Mariculture, Freshwater Aquaculture and Inland Fisheries, Chief Biologist Mariculture, Chief Fisheries Biologist Subdivision Environment, and Head: Lüderitz Marine Research, Ministry of Fisheries and Marine Resources (MFMR); representatives from Lüderitz Mariculture and Five Roses Aquaculture; the Managing Director and Head Environmental Officer, Namibia Power Corporation (Proprietary) Limited; and the Senior Environmentalist, Water Quality and Environmental Services, Namibia Water Corporation Ltd (see Annexure E: List of I&APs Consulted, Notification Letter, and Correspondence with I&APs);
- Advertisements (Notice of an Environmental Assessment Process) were placed in the Market Watch Section of three National newspapers, Republikein, Allgemeine Zeitung and Namibian Sun, on 27 May and 03 June 2020 (see Annexure E: Advertisements);
- The notice/poster, written notices, and advertisements provided details re the application; stated also was that the application was submitted to the Executive Director, MFMR in terms of the EIA Regulations: EMA 7 of 2007, the nature and location of the proposed Project/Activities, and where, how and from whom additional information on the application/activity can be obtained;
- A register of I&APs was opened (see Annexure E: Register of I&APs; also see Annexure E: Correspondence with I&APs); two persons registered as I&APs;
- An electronic copy of the *Draft Environmental Scoping, Impact Assessment and Management Plan Report* and Annexures was made available via e-mail to the registered I&APs for comment (30 July 2020); and
- The 14-day comment period commenced on 31 July 2020 and ended on 14 August 2020; feedback was received from two I&APs (see Annexure E: Correspondence with I&APs).

### **5.3 Summary of Issues and/or Concerns**

To date, no issues/concerns were raised during the Public Consultation Process.

## **6 Environmental Impact Assessment**

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### **6.1 Introduction**

Certain aspects related to Hangana Abalone (Pty) Ltd's proposed activities (i.e. ranching and collection of abalone *Haliotis midae* at Farm 3 (Tiger Reef)) may cause potential impacts to the environment. These impacts can occur under normal conditions, but also under abnormal and potential emergency conditions (e.g. fires (unlikely), flooding (unlikely), explosions (unlikely), spills, and any accidents/incidents/near-misses (causing uncontrolled releases to air, water and land).

*Aspect* is defined by the International Organization for Standardization ISO 14001:2004 as an “element of an organization's activities or products or services that can interact with the environment”; *environment* is defined as “surroundings in which an organization operates, including air, water, land, natural resources, flora, fauna, humans, and their interrelation” and *impact* is defined as “any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's environmental aspects.”

Management actions (i.e. the adoption of the “mitigation hierarchy”, and including monitoring), with the aim of avoiding, minimising, or compensating/offset the potential negative impacts (and maximising the potential positive impacts), are provided in the Environmental Management Plan (EMP) (see Section 7).

### **6.2 Methodology**

The Rapid Impact Assessment Matrix (RIAM) Software Package (Pastakia, 1998) was used for the assessment of the potential impacts. Scoring takes place within a matrix, the latter that was designed to allow subjective judgements to be quantitatively recorded. The system thus provides an impact evaluation, as well as a record that can be re-assessed in the future (e.g. should more information become available).

First, through the process of scoping, specific assessment/environmental components, falling into four categories, needs to be defined:

|                            |  |
|----------------------------|--|
| Physical/Chemical (PC)     | “all physical and chemical aspects of the environment, including finite (non-biological) natural resources, and degradation of the physical environment by pollution”                            |
| Biological/Ecological (BE) | “all biological aspects of the environment, including renewable natural resources, conservation of biodiversity, species interactions, and pollution of the biosphere”                           |
| Sociological/Cultural (SC) | “all human aspects of the environment, including social issues affecting individuals and communities; together with cultural aspects, including conservation of heritage, and human development” |
| Economic/Operational (EO)  | “the economic consequences of environmental change, both temporary and permanent, as well as the complexities of project management within the context of the project activities”                |

Second, the impacts are scored using certain assessment criteria and scales.

|   |  |
|---|--|
| The assessment criteria fall into two groups: |  |
| A   | These criteria are of importance to the condition          |
| B   | These criteria are of value to the situation               |
| The assessment scales are as follows:         |  |
| Group A – Importance of condition (A1)        |  |
| 4   | Important to national/international interests              |
| 3   | Important to regional/national interests                   |
| 2   | Important to areas immediately outside the local condition |
| 1   | Important only to the local condition                      |
| 0   | No importance  |
| Group A - Magnitude of change/effect (A2)     |  |
| +3  | Major positive benefit                                     |
| +2  | Significant improvement in status quo                      |
| +1  | Improvement in status quo                                  |
| 0   | No change/status quo                                       |
| -1  | Negative change to status quo                              |
| -2  | Significant negative dis-benefit or change                 |
| -3  | Major dis-benefit or change                                |
| Group B - Permanence (B1)                     |  |
| 1   | No change/not applicable                                   |
| 2   | Temporary  |
| 3   | Permanent  |
| Group B - Reversibility (B2)                  |  |
| 1   | No change/not applicable                                   |
| 2   | Reversible   |
| 3   | Irreversible   |
| Group C - Cumulative (B3)                     |  |
| 1   | No change/not applicable                                   |
| 2   | Non-cumulative/single                                      |
| 3   | Cumulative/synergistic                                     |

Third, by means of a series of formulae, a value is ascribed to each of the groups of criteria. The use of a multiplier for Group A is important for it ensures that the weight of each score is expressed. Scores for Group B are added together, ensuring that the individual value scores cannot influence the overall score, but that the collective importance of all values in Group B is fully taken into account. The sum of the Group B scores is then multiplied by the result of the Group A scores and a final environmental (assessment) score (ES) for the condition is obtained:

$$\begin{aligned}
 (a1) \times (a2) &= aT \\
 (b1) + (b2) + (b3) &= bT \\
 (aT) \times (bT) &= ES
 \end{aligned}$$

where

(a1) and (a2) are the individual criteria scores for Group A

(b1) to (b3) are the individual criteria scores for Group B

aT is the result of multiplication of all Group A scores

bT is the result of summation of all Group B scores

ES is the environmental score for the condition

Finally, a matrix is produced for each project option and individual ES scores calculated and recorded. These individual ES scores are then banded together into ranges (Range Values (RV)) (see Table 3). For ease of

interpretation, significant and major positive impacts are indicated in green and significant and major negative impacts in red.

Table 3: The range bands used for the Rapid Impact Assessment Matrix (Source: Pastakia, 1998).

| <b>Environmental Score<br/>(ES)</b> | <b>Range Value<br/>(RV)<br/>(Alphabetic)</b> | <b>Range Value<br/>(RV)<br/>(Numeric)</b> | <b>Description of Range Band</b>    |
|-------------------------------------|--|---|-------------------------------------|
| 72 - 108                            | E  | 5   | Major positive change/impact        |
| 36 - 71                             | D  | 4   | Significant positive change/impact  |
| 19 - 35                             | C  | 3   | Moderate positive change/impact     |
| 10 – 18                             | B  | 2   | Positive change/impact              |
| 1 - 9                               | A  | 1   | Slight positive change/impact       |
| 0                                   | N  | 0   | No change/status quo/not applicable |
| -1 - -9                             | -A   | -1  | Slight negative change/impact       |
| -10 - -18                           | -B   | -2  | Negative change/impact              |
| -19 - -35                           | -C   | -3  | Moderate negative change/impact     |
| -36 - -71                           | -D   | -4  | Significant negative change/impact  |
| -72 - -108                          | -E   | -5  | Major negative change/impact        |

The lower limits of ‘significant change’, for example, can be taken as the point when a condition is outside local boundaries (A1 = 2), but is of major importance (A2 = 3), yet is temporary (B1 = 2) and reversible (B2 = 2), and non-cumulative (B3 = 2). A ‘major change’ can be taken as the point when the condition extends to a regional/national boundary (A1 = 3), is of major importance (A2 = 3), is permanent (B1 = 3) and irreversible (B2 = 3), and non-cumulative (B3 = 2) (Pastakia, 1998).

### 6.3 Ranching and Collection of Abalone at Tiger Reef

The various aspects and the potential related impacts per environmental component (PC, BE, SC and EO) for Hangana Abalone (Pty) Ltd’s activities are summarised in Table 4.

Note that the RIAM does not include an assessment scale for Probability of Occurrence; the following scale was used to rate (the probability of occurrence of) the various impacts and the results are included in Table 4.

| Probability of Occurrence |   |
|---------------------------|---|
| Definite                  | Impact will occur                               |
| Highly probable           | Impact is most likely to occur                  |
| Probable                  | Distinct possibility that the impact will occur |
| Low                       | Possibility of impact occurring is low          |

Table 4: The potential impacts, and probability of occurrence, that certain aspects related to Hangana Abalone (Pty) Ltd's activities may have on the environment (PC = Physical/chemical; BE = Biological/ecological; SC = Sociological/cultural; and EO = Economic/operational).

| <b>Impact Code</b> | <b>Potential Impact</b>   | <b>Activity/Aspect</b>  | <b>Probability of Occurrence</b> |
|--------------------|---|---|----------------------------------|
| PC 1               | Contamination of seawater (spills of hazardous materials)   | Hazardous materials management (spills of fuel and hydraulic oil) | Low                              |
| BE 1               | Displacement/loss of native reef fauna/flora (introduction of non-native species)   | Introduction of a non-native species                              | Probable                         |
| BE 2               | Change in native fauna/flora reef community structure (introduction of non-native species)  | Introduction of a non-native species                              | Probable                         |
| BE 3               | Change/loss in abundance, density, richness or diversity of other organisms indirectly associated with Tiger Reef biota (indirect mortalities or wider community changes through introduction of non-native species)              | Introduction of a non-native species                              | Low                              |
| BE 4               | Loss of reef fauna/flora and changes in community structure due to ranched abalone "escaping" and settling/reproducing elsewhere, or if abalone are allowed to reproduce on the reef and larvae disperse to settle at other reefs | Spread of non-native species elsewhere                            | Low                              |
| BE 5               | Loss of reef fauna/flora (direct and indirect mortalities), possibly with ecosystem-wide implications (introduction of pathogens/parasites)   | Introduction of infected abalone individuals                      | Low                              |
| BE 6               | Injuries/loss of fauna (seabirds and marine mammals) from entanglement in lost gear   | Loss of gear/inadequate waste management                          | Low                              |
| BE 7               | Injuries/loss of marine fauna and flora (spills of hazardous materials, especially fuel/hydraulic oils)   | Hazardous materials management (spills fuel and hydraulic oil)    | Low                              |
| BE 8               | Noise pollution and disturbance/displacement of nesting/roosting birds at Penguin Island or birds foraging in the kelp beds at Tiger Reef   | Presence of dive team and equipment                               | Low                              |
| BE 9               | Noise pollution and disturbance of transiting or foraging marine mammals  | Presence of dive team and equipment                               | Low                              |
| BE 10              | Disturbance to wildlife, including to nesting/roosting seabirds at Penguin/Seal Island  | Abalone poaching (that involve accessing Penguin or Seal Islands) | Probable                         |
| BE 11              | Contribution to scientific knowledge (ecology)  | Desktop Study (ecology)   | Definite                         |
| SC 1               | Increased demand/need for basic infrastructure (e.g. housing, water, sanitation, electricity, waste management systems, and parking)  | Ultimate employment of up to 300 persons (vs the current 40)      | Definite                         |
| EO 1               | Permanent job creation  | Operational phase   | Definite                         |
| EO 2               | Permanent economic benefits (direct/indirect/induced/GRN revenue)   | Operational phase   | Definite                         |
| EO 3               | Loss of/damage to abalone (toxic dinoflagellate and diatom blooms)  | Toxic dinoflagellate and diatom blooms                            | Definite                         |
| EO 4               | Loss of abalone (juvenile rock lobsters feeding on young abalone)   | Ranching of abalone in a rock lobster sanctuary                   | Highly probable                  |

The Rapid Impact Assessment Matrix is summarised in Table 5.

Table 5: Rapid Impact Assessment Matrix for Hangana Abalone (Pty) Ltd's activities.

| Impact Code | Potential Impact  | ES  | RV | A1 | A2 | B1 | B2 | B3 |
|-------------|---|-----|----|----|----|----|----|----|
| PC 1        | Contamination of seawater (spills of hazardous materials)   | -12 | -B | 2  | -1 | 2  | 2  | 2  |
| BE 1        | Displacement/loss of native reef fauna/flora (introduction of non-native species)   | -8  | -A | 1  | -1 | 3  | 3  | 2  |
| BE 2        | Change in native fauna/flora reef community structure (introduction of non-native species)  | -6  | -A | 1  | -1 | 2  | 2  | 2  |
| BE 3        | Change/loss in abundance, density, richness or diversity of other organisms indirectly associated with Tiger Reef biota (indirect mortalities or wider community changes through introduction of non-native species)              | -8  | -A | 1  | -1 | 3  | 3  | 2  |
| BE 4        | Loss of reef fauna/flora and changes in community structure due to ranched abalone "escaping" and settling/reproducing elsewhere, or if abalone are allowed to reproduce on the reef and larvae disperse to settle at other reefs | -24 | -C | 3  | -1 | 3  | 3  | 2  |
| BE 5        | Loss of reef fauna/flora (direct and indirect mortalities), possibly with ecosystem-wide implications (introduction of pathogens/parasites)   | -54 | -D | 3  | -2 | 3  | 3  | 3  |
| BE 6        | Injuries/loss of fauna (seabirds and marine mammals) from entanglement in lost gear   | -16 | -B | 2  | -1 | 3  | 3  | 2  |
| BE 7        | Injuries/loss of marine fauna and flora (spills of hazardous materials, especially fuel/hydraulic oils)   | -12 | -B | 2  | -1 | 2  | 2  | 2  |
| BE 8        | Noise pollution and disturbance/displacement of nesting/roosting birds at Penguin Island or birds foraging in the kelp beds at Tiger Reef   | -12 | -B | 2  | -1 | 2  | 2  | 2  |
| BE 9        | Noise pollution and disturbance of transiting or foraging marine mammals  | -12 | -B | 2  | -1 | 2  | 2  | 2  |
| BE 10       | Disturbance to wildlife, including to nesting/roosting seabirds at Penguin/Seal Island  | -28 | -C | 2  | -2 | 2  | 3  | 2  |
| BE 11       | Contribution to scientific knowledge (ecology)  | 24  | C  | 3  | 1  | 3  | 3  | 2  |
| SC 1        | Increased demand/need for basic infrastructure (e.g. housing, water, sanitation, electricity, waste management systems, and parking)  | -24 | -C | 2  | -2 | 2  | 2  | 2  |
| EO 1        | Permanent job creation  | 72  | E  | 3  | 3  | 3  | 3  | 2  |
| EO 2        | Permanent economic benefits (direct/indirect/induced/GRN revenue)   | 72  | E  | 3  | 3  | 3  | 3  | 2  |
| EO 3        | Loss of/damage to abalone (toxic dinoflagellate and diatom blooms)  | -24 | -C | 2  | -2 | 2  | 2  | 2  |
| EO 4        | Loss of abalone (juvenile rock lobsters feeding on young abalone)   | -8  | -A | 1  | -1 | 3  | 3  | 2  |

One negative impact (PC 1) was identified under the physical/chemical component (see Table 5).

One significant negative (BE 5), two moderate negative (BE 4 and BE 10), four negative (BE 6, BE 7, BE 8 and BE 9), three slight negative (BE 1, BE 2, and BE 3), and one moderate positive (BE 11) impacts were identified under the biological/ecological component (see Table 5).

Diseases/parasites may be introduced through the introduction of a non-native species and this may impact on the native biota (Kemper, 2020) (BE 5).

The World Organisation for Animal Health (OIE; Office International des Epizooties)-listed diseases, infections and infestations for molluscs in force in 2020 include: infection with abalone herpesvirus, *Bonamia exitiosa*, *Bonamia ostreae*, *Marteilia refringens*, *Perkinsus marinus*, *Perkinsus olseni*, and *Xenohaliotis californiensis* (see <https://www.oie.int/animal-health-in-the-world/oie-listed-diseases-2020/>).

As a rule, the MFMR requests the following test results for aquatic animal health (as per the OIE listed diseases for abalone): abalone herpesvirus; *Halioticida noduliformans* (fungus); *Perkinsus olseni*; and *Xenohaliotis californiensis* (Mr Frikkie Botes, Chief Biologist Mariculture, Ministry of Fisheries and Marine Resources, pers. comm.).

CAB International (CABI) provides a detailed coverage of invasive species threatening livelihoods and the environment worldwide (<https://www.cabi.org/isc/>):

The abalone herpesvirus (AbHV), caused by abalone herpesvirus (AbHV) [Haliotid herpesvirus 1], is a contagious disease of abalone species in Australia (greenlip abalone *H. laevigata* and blacklip abalone *H. rubra* and hybrids of these two species) and Taiwan (*H. diversicolor supertexta*). AbHV has been reported in both farmed and wild abalone populations and is associated with high mortality rates in all age classes (<https://www.cabi.org/isc/datasheet/121524#tooverview>).

*Perkinsus olseni* is a protozoan that infects a number of commercially important marine molluscs (e.g. abalone *Haliotis rubra* and *H. laevigata*, clams and oysters) in Asia (China, India, Japan, South Korea, and Vietman), Europe (France, Italy, Portugal, and Spain), Oceania (Australia and New Zealand), and South America (Uruguay) (<https://www.cabi.org/isc/datasheet/70074#tooverview>).

*Xenohaliotis californiensis* (also called WS-RLO) is a bacterium that causes a fatal disease called Withering Syndrome (WS)/Withering Disease/Foot Withering Syndrome/Abalone Wasting Disease in abalone. It has been reported in Asia (China, Israel, Japan, Taiwan and Thailand), Europe (Iceland, Ireland, and Spain), North America (Mexico, US, California), Seas Areas (Atlantic – Northeast, Pacific - Eastern Central, Pacific – Northwest, Pacific – Southeast, and Pacific - Western Central), and South America (Chile) (Bower, 2010; <https://www.cabi.org/isc/datasheet/90287#tosummaryOfInvasiveness>).

The fungus *Halioticida noduliformans* is the cause of abalone tubercle mycosis disease that has been occurring in South Africa since 2006. Affected aquaculture facilities have suffered significant production losses (around 90% mortality in spat and 30% mortality in older animals) (Macey *et al.*, 2011).

Other diseases found to infect *Haliotis midae* are: Vibrio spp. (bacterial diseases); sabellid polychaete infestation disease; ciliates (numerous species of ciliates in the orders Thigmotrichida, Peritrichida, Heterotrichida and Hypotrichida); kidney coccidia (*Margolisiella haliotis*); Trematode Metacercariae (various species of Digenea including species in the family Allocreadiidae and possibly Opeocoilidae); and Shell-boring polychaetes/Blister worms/mudworms (Bower, 2010; Hutchings *et al.*, 2019)

Kemper (2020) noted that as abalone are not native to Namibian waters, there is a concern that the ranched abalone could reproduce and disperse to other areas, thus potentially posing a threat to naturally occurring species with similar habitat requirements (BE 4).

Botha *et al.* (2020b) stated that *The abalone, Haliotis midae, ... requires very specific environmental conditions in order to reproduce. This is typically related to water temperature changes which must follow a specific pattern. Although the Namibian waters are excellent to produce good quality abalone, the conditions for natural reproduction in the ocean are not met in Namibian waters. Abalone released around Seal and Penguin Island will therefore not reproduce, unless dramatic changes in the current ocean temperatures in the area occurs and Geo Pollution Technologies again indicated that Experience gained by the mariculture industry indicates that the ranching of South African abalone (*Haliotis midae*) at Lüderitz, does not pose a threat of natural reproduction and proliferation along the Namibian coastline. Scientists and the industry role-players agree that abalone requires very specific environmental conditions for reproduction, mostly related to water temperature, and these conditions are not met along the Namibian coastline* (see Annexure A: Clarification Note, 13 March 2020).

Kemper (2020) made reference to a study by Wood and Buxton (1996) and concluded that as abalone reach market size before they reach sexual maturity (~seven years old), it is thought to be unlikely that ranching abalone at Tiger Reef will pose a threat to the native biota.

Wood and Buxton (1996) referred to a study by Newman (1967) on abalone from the west coast of South Africa and who remarked about the importance of temperature as a stimulus for gonad maturation and spawning, but who also cautioned that other possible influences may be involved. Abalone on the east coast of South Africa's peak spawning period is between April and July. The onset of sexual maturity is between 20 and 25 mm shell width; size at 50% sexual maturity ranged between 33.8 and 37.7 mm (2-3 years of age) (and considerably smaller than the 80 mm shell width at 50% maturity observed by Newton (1967) for west coast abalone and that would be equivalent to an animal 7 years old). It was concluded that populations of *H. midae* on the east and west coasts of South Africa appear to exhibit the same overall reproductive characteristics, but with notable differences in the timing of events, i.e. size at maturity and breeding season.

However, Kemper (2020) did indicate that ranned abalone that may have dispersed from Tiger Reef elsewhere, may remain uncollected and therefore could reach sexual maturity.

Kemper (2020) noted: Abalone are a sought-after, high-value "status symbol" delicacy - especially in East Asia - and demand is greater than what can be supplied legally. As a result of catch regulations limiting the abalone fishery in SA, an illicit trade began booming there in the early 1990s (De Greef and Raemaekers, 2014: see Kemper, 2020). Sophisticated transnational networks of criminal syndicates are now involved in abalone poaching in SA, threatening the natural population of abalone with extinction. Abalone farming has become an increasingly important element in the legal abalone fishery, alleviating some pressure from the natural populations. Poaching activities are typically shore-based or boat-based, with divers often accessing reefs at night. In the southern Cape of SA, these operations sometimes involve divers accessing nearby seabird breeding islands (particularly Dyer Island near Gansbaai) to operate from the islands' shores, out of sight of law enforcement patrols. This in turn can cause significant disruption to breeding seabirds on these islands (L. Waller, pers. comm.). Although the emergence of sophisticated abalone poaching syndicates in the relatively remote Lüderitz area are perhaps less likely than elsewhere, it needs to be kept in mind that poaching of farmed abalone could indirectly pose a serious risk to the seabirds breeding at Penguin and Seal Islands (BE 10).

Any gear used (e.g. ropes, mesh bags, box straps, cable ties, etc.) and accidentally lost during the release, monitoring and/or collection of ranned abalone, could pose an entanglement threat to wildlife such as seabirds, seals, dolphins and whales (Kemper, 2020) (BE 6).

Any accidental hydrocarbon spills during vessel operation could result in fauna (especially avifauna/seabirds at Penguin and Seal Islands) being oiled. This could result in direct impacts (mortalities through drowning, hypothermia or poisoning), as well as indirect impacts (e.g. future reduction in breeding productivity through physiological damage), depending on the nature/amount of oiling (Kemper, 2020) (BE 7).

One of the threats to the seabirds in the area, particularly when they are breeding, is human disturbance. For this reason, access to the islands and the immediate surroundings is not allowed in the NIMPA. The operations at Tiger Reef could disturb seabirds (BE 8) and marine mammals (BE 9) at the reef itself, as well as at the two nearby islands – particularly at Penguin Island. The effect of human disturbance on nesting seabirds may be exacerbated during the Kelp Gull *Larus dominicanus* breeding season (between November and February), and when aggressive gulls use the opportunity to raid nests of birds that are distracted during a disturbance event. Cormorants in particular are easily disturbed by human activities and will readily abandon their nests *en masse* if disturbed (Kemper, 2020).

The introduction of a non-native species could result in: i) the displacement/loss of the native reef fauna and flora (BE 1); ii) change in the community structure on the reefs where the abalone is being ranned (BE 2); and iii) a decrease in the density, diversity and/or species richness of the natural biota of Tiger Reef; this could also impact other organisms that are dependent on the reef, such as fish that shelter at reefs, or even seabirds such as crowned cormorants that feed on these fish (BE 3) (Kemper, 2020).

As far as the sociological/cultural components are concerned, one moderate negative impact (SC 1) was identified (see Table 5). The employment of additional staff (300 vs the current 40; see below) will result in an increased demand/need for basic infrastructure (e.g. housing, water, sanitation, electricity, waste management systems, and even parking).

One moderate negative (EO 3), one slight negative (EO 4), and two major positive (EO 1 and EO 2) impacts were identified under the economical/operational component (see Table 5).

Hangana Abalone (Pty) Ltd's currently employs 40 staff (Me Aune Ndapanda Nantinda, General Manager, Hangana Abalone (Pty) Ltd, pers. comm.). With the expansion, and in a couple of years' time, it is expected that Hangana Abalone (Pty) Ltd will ultimately employ 300 employees (Anon., 2020) (EO 1).

In addition to other direct, indirect and induced economic impacts/benefits, Government revenue will also be generated through a range of taxes (i.e. VAT (Value Added Tax) on goods and services, VAT derived from personal spending by employees and contractors, PAYE (Pay As Your Earn), as well as employment insurance contributions to the Social Security Commission and Workmen's Compensation Fund) (EO 2).

Kemper (2020) noted that toxic HAB occasionally occur off Lüderitz and mostly between March and July and may involve several species of planktonic diatoms or dinoflagellates, including *Alexandrium catenella*, *Dinophysis acuminata* and *Pseudonitzschia* spp. (MFMR unpublished data).

Paralytic Shellfish Poisoning (PSP) is caused by the dinoflagellate *Alexandrium catenella*. Normally, white and black mussels, anchovy, herring, mackerel, and sardine are impacted, but the toxins may also be transferred through the food web to whales and seals (see <https://archive.bigelow.org/hab/saf.html>). In South Africa, the future of the abalone industry is threatened by the inability of abalone to detoxify or depurate accumulated PSP toxins below the regulatory levels (Pitcher *et al.*, 2001) (EO 3). The dinoflagellates *Dinophysis* spp. (including *D. acuminata*, *D. hastata*, *D. rotundata*, and *D. fortii*) cause Diarrhetic Shellfish Poisoning (DSP) that is common along the west and south coasts of South Africa. The dinoflagellate *Gymnodinium cf. mikimotoi* is responsible for Neurotoxic Shellfish Poisoning (NSP); in 1989, 30 tonnes of abalone were killed on the south coast of South Africa after a *G. mikimotoi* bloom (see <https://archive.bigelow.org/hab/saf.html>).

Tiger Reef could support a dense number of juvenile and immature rock lobsters (as the area is a rock lobster recruitment sanctuary) that may prey on the young abalone (EO 4). Captive studies have shown that rock lobsters may show a preference to abalone (Van Zyl *et al.*, 2010; see Kemper, 2020) over other available natural foods, such as mussels, urchins, coralline algae and polychaete worms (Mayfield, 1998 in Currie *et al.*, 2009; see Kemper, 2020).

A summary of the scores is provided in Table 6. It is evident that one significant negative, four moderate negative, five negative, four slight negative, one moderate positive, and two major positive impacts were identified.

Table 6: Summary of scores for Hangana Abalone (Pty) Ltd's activities (PC = Physical/chemical; BE = Biological/ecological; SC = Sociological/cultural; and EO = Economic/operational).

|       |             |            |            |            |          |        |        |          |          |          |           |
|-------|-------------|------------|------------|------------|----------|--------|--------|----------|----------|----------|-----------|
| Range | -108<br>-72 | -71<br>-36 | -35<br>-19 | -18<br>-10 | -9<br>-1 | 0<br>0 | 1<br>9 | 10<br>18 | 19<br>35 | 36<br>71 | 72<br>108 |
| Class | -E          | -D         | -C         | -B         | -A       | N      | A      | B        | C        | D        | E         |
| PC    |             |            |            | 1          |          |        |        |          |          |          |           |
| BE    |             | 1          | 2          | 4          | 3        |        |        |          | 1        |          |           |
| SC    |             |            | 1          |            |          |        |        |          |          |          |           |
| EO    |             |            | 1          |            | 1        |        |        |          |          |          | 2         |
| Total | 0           | 1          | 4          | 5          | 4        | 0      | 0      | 0        | 1        | 0        | 2         |

The impact assessment histogram for Hangana Abalone (Pty) Ltd's activities is shown in Figure 5.

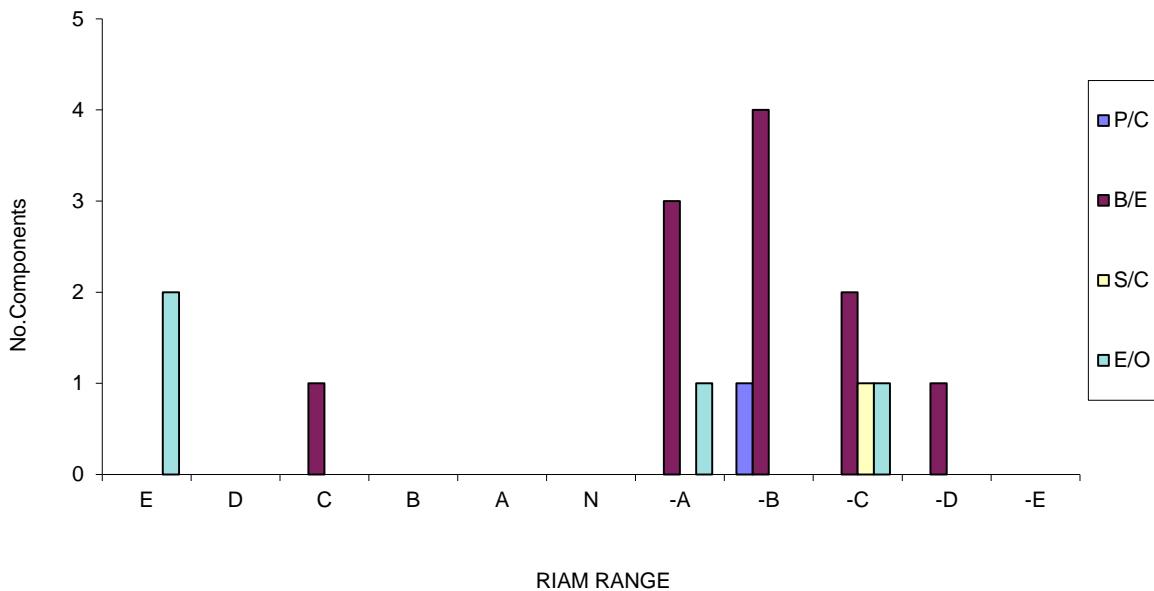


Figure 5: Impact assessment histogram for Hangana Abalone (Pty) Ltd's activities (*PC = Physical/chemical; BE = Biological/ecological; SC = Sociological/cultural; and EO = Economic/operational*).

#### 6.4 Conclusion

Hangana Abalone (Pty) Ltd's proposed activities (i.e. ranching and collection of abalone *Haliotis midae* at Farm 3 (Tiger Reef)) will have potential impacts on the environment and these will be of a positive, as well as a negative nature: one significant negative, four moderate negative, five negative, four slight negative, one moderate positive, and two major positive impacts were identified (see Table 6 and Figure 5).

The significant negative, moderate negative, negative, and slight negative impacts can be relatively easily mitigated through the implementation of certain management measures (see Section 7.4: EMP).

## **7 Environmental Management Plan**

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### **7.1 Goal, Aim and Structure of the Environmental Management Plan**

The ultimate goal of an Environmental Management Plan (EMP) is to ensure that the physical, biophysical and socio-economic objectives are met to such an extent that the overall product of the activity will not result in a net negative impact.

The aim of the EMP is to assist Hangana Abalone (Pty) Ltd and their sub-contractor(s) to ensure that the day-to-day operations are carried out in an environmentally responsible manner, thereby preventing or minimising the negative effects and maximising the positive effects of the activities.

Once approved by the DEA, MEFT, in the form of an ECC, the EMP will become a legally binding document and Hangana Abalone (Pty) Ltd and their sub-contractor(s) are required to abide to the conditions stipulated in the EMP.

The EMP is presented as a comprehensive matrix: for each Activity/Process and related Aspects and Impacts, Management Actions required to address the impacts arising directly and indirectly from the various aspects of Hangana Abalone (Pty) Ltd's activities are listed.

A copy of the EMP should be made available at the Office at Farm 4.

External auditing (and monitoring) should be carried out to ensure compliance with the EMP. Parties responsible for transgression of the EMP should be held responsible for any rehabilitation that needs to be undertaken.

Note that the EMP is not a static document and that the document should be updated as the Project progresses/more information re the activities becomes available.

### **7.2 Permits and Approvals**

The most pertinent legislation, with the aim of informing Hangana Abalone (Pty) Ltd of the legal requirements pertaining to the activities, is listed under Section 4 of this Report.

A summary of the relevant legislation and regulatory authorities (including contact details) as far as permits and/or approvals are concerned, is provided:

| <b>Legislation</b>   | <b>Regulatory Authority</b>                       | <b>Permit/Approval</b>  | <b>Contact Details</b>   |
|--|---|---|--|
| Aquaculture Act 18 of 2002 (and the Aquaculture (Licensing) Regulations 2003 and the Regulations relating to import and export of aquatic organisms and aquaculture products 2010) | Ministry of Fisheries and Marine Resources (MFMR) | Aquaculture Licence and Application for registration as importer of aquatic organism / Registration as importer of aquatic organisms / Application for a permit to import aquatic organisms / Permit to import aquatic organisms / Application for a licence to operate a quarantine facility for aquatic organisms listed in Annexure I / Licence to operate a quarantine facility for aquatic organisms listed in Annexure I / Application for registration as an exporter of aquatic organisms or aquaculture products / Registration as | Dr Moses Maurihungirire<br>Executive Director<br>Tel. 061-2053911<br>mmaurihungirire@mfmr.gov.na |

| <b>Legislation</b>                     | <b>Regulatory Authority</b>  | <b>Permit/Approval</b>   | <b>Contact Details</b>   |
|--|--|--|--|
|  |  | exporter of aquatic organisms or aquaculture products / Application for permit to export aquatic organisms or aquaculture product/ Permit to export live aquatic organisms or aquaculture products / |  |
| Environmental Management Act 7 of 2007 | Ministry of Environment, Forestry and Tourism (MEFT), Directorate of Environmental Affairs (DEA) | Environmental Clearance Certificate  | Mr Timoteus Mufeti<br>Environmental Commissioner<br>Tel. 061-2842751<br>Timoteus.Mufeti@met.gov.na |
| Labour Act 11 of 2007                  | Ministry of Labour, Industrial Relations and Employment Creation                                 | Permission is needed to run 12-hour shifts (should it be required)   | Mr Henri Kassen<br>Labour Commissioner<br>Tel. 061-379100<br>hkassen@mol.gov.na                    |

### 7.3 Roles and Responsibilities

Hangana Abalone (Pty) Ltd is responsible for fulfilling the requirements in the EMP pertaining to the Project.

In addition to the before-mentioned, the following actions are proposed:

1. The provision by Hangana Abalone (Pty) Ltd of, on an on-going basis, sufficient management sponsorship and human and financial resources for the implementation of the EMP;
2. The development of a monitoring programme(s) (as needed) (see Section 7.5); and
3. External auditing (by an independent, external auditor) of the management actions as contained in the EMP for Hangana Abalone (Pty) Ltd's activities.

### 7.4 Environmental Management Plan

This Section contains the EMP for Hangana Abalone (Pty) Ltd's activities at Tiger Reef only (see Table 7) (an EMP for Hangana Abalone (Pty) Ltd's operations was prepared by Botha *et al.*, 2020b and Faul *et al.*, 2020b; see Annexure A) (also see IFC, 2007a; b; Hutchings *et al.*, 2019; Kemper, 2020).

Table 7: Environmental Management Plan for Hangana Abalone (Pty) Ltd's activities i.e. ranching and collection of abalone *Haliotis midae* at Farm 3 (Tiger Reef), Lüderitz, //Karas Region, Namibia.

| Aspect                                       | Impact                               | Mitigation   |
|--|--------------------------------------|--|
| <b>Social and Environmental Performance</b>  |                                      |  |
| Management and Monitoring                    | Social and Environmental Performance | <p>Adhere to all Namibian Legislation, including Best Practice Guidelines.</p> <p>Ensure that all aspects related to the Environmental Management Plan (EMP) are implemented.</p>  |
| Consultation and Disclosure                  | Social and Environmental Performance | <p>Maintain open and direct lines of communication with the Authorities and Interested and Affected Parties (I&amp;APs) (e.g. representatives from the Lüderitz Town Council, the Ministry of Fisheries and Marine Resources (MFMR), the Ministry of Environment, Forestry and Tourism (MEFT), the Ministry of Health and Social Services (MHSS), the Namibian Ports Authority (NamPort), etc.) with regards to environmental matters.</p> <p>Consult with I&amp;APs throughout the project process and adequately incorporate I&amp;APs' concerns.</p>              |
| Grievance Mechanism                          | Social and Environmental Performance | <p>Implement a grievance mechanism for receiving and resolving any concerns and grievances related to the project's social and environmental performance throughout the project life cycle.</p> <p>Inform all I&amp;APs about the mechanism.</p> <p>Address concerns promptly and transparently and in a culturally appropriate manner.</p> <p>Keep a register of all concerns/issues received from I&amp;APs, as well as the measures taken to address these.</p>   |
| Training, including awareness and inductions | Social and Environmental Performance | <p>Train employees in matters related to the project's social and environmental performance and Namibia's regulatory requirements.</p> <p>Ensure adequate environmental awareness training for all personnel.</p> <p>Give environmental induction presentations to all personnel.</p>  |
| Employment and procurement opportunities     | Social and Environmental Performance | <p>Source contracting companies/service providers/workers based on merit and expertise giving preference to local contractors/service providers/workers on condition that the local contractors/service providers/workers have the required experience and expertise.</p> <p>Ensure that contractors/service providers adhere to the Namibian Labour, Social Security, Health and Safety, and Affirmative Action laws.</p> <p>Source maximally from local resources to ensure maximum economic beneficiation of local businesses in terms of new business sales.</p> |
| Labour and Working Conditions                | Social and Environmental Performance | <p>Establish, maintain and improve the worker-management relationship. Base the employment relationship on equal opportunity and fair treatment and no discrimination to be allowed.</p> <p>Comply with Namibia's labour and employment laws.</p>  |

| Aspect   | Impact                                   | Mitigation   |
|--|--|--|
|  |  | <p>Promote safe and healthy working conditions and the protection and promotion of worker health.</p> <p>Document and communicate the Working Conditions and Terms of Employment.</p> <p>Respect Collective Agreements and the right of workers to organise and bargain collectively.</p> <p>Implement a Grievance Mechanism.</p>  |
| Occupational and Community Health and Safety and Security                                | Social and Environmental Performance     | <p>Adhere to all Namibia's Health and Safety Regulations (Labour Act, 1992: Regulations Relating to the Health and Safety of Employees at Work).</p> <p>Ensure that an <b>HIV/AIDS Policy and Programme</b> and <b>Health and Safety Plan</b> is in place.</p> <p>A SHE (Safety, Health, Environment) Representative to be appointed once the staff complement reaches 20.</p> <p>Occupational Health and Safety Training to be provided to all employees.</p> <p>Ensure that qualified first aid can be provided at all times.</p> <p>Comply with all safety regulations re. electricity supply.</p> <p>Ensure that employees are trained in the use of appropriate fire fighting equipment and ensure that such equipment is on hand at all times.</p> <p>Provide and ensure the active use of Personal Protective Equipment (PPE).</p> <p>Make suitable arrangements, as far as practicable, for the maintenance of health, the prevention and overcoming of outbreaks of disease (e.g. Tuberculosis (TB)) and of adequate first aid services.</p> <p>Prevent communicable disease (e.g. Sexually Transmitted Infections (STIs) such as HIV transmission); provide surveillance and active screening and treatment of employees; prevent illness among employees (through health awareness and education initiatives); ensure ready access to medical treatment, confidentiality and appropriate care, particularly with respect to migrant workers; and promote immunization.</p> <p>Ensure that security arrangements are in place.</p> |
| <b>Ranching and Collection of Abalone at Tiger Reef</b>                                  |  |  |
| Introduction of infected (diseases/parasites) <i>Haliotis midae</i> (non-native species) | Negative impact on the native reef fauna | <p>The slow-growing individuals earmarked for ranching at Tiger Reef need to be certified disease/parasite free by suitably qualified veterinarians before release.</p> <p>Periodically test the ranched abalone (and their surrounding fauna) for signs of disease or parasites.</p>  |

| <b>Aspect</b>  | <b>Impact</b>   | <b>Mitigation</b>   |
|--|---|---|
| Introduction of <i>Haliotis midae</i> (non-native species)   | Negative impact on the native reef fauna and flora / reef community structure / density, diversity and/or species richness of the natural biota of Tiger Reef (and other organisms that depend on the reef) | Monitor the abalone stocking rate in relation to Tiger Reef's benthic community structure (so that the natural community structure of Tiger Reef is maintained).  |
| Spread (escape or settling/reproducing or dispersion of larvae to other reefs) of <i>Haliotis midae</i> (non-native species) | Negative impact on the native reef fauna and flora / changes in reef community structure  | Measure/monitor the primary environmental parameters that are key to abalone reproduction (sea temperature and possibly a few others relating to sea chemistry) (to ensure that no natural reproduction can occur).   |
| Poaching of abalone  | Disturbance of fauna and avifauna (nesting/roosting seabirds on Penguin and Seal Islands)   | Ensure that security measures are in place to prevent poaching of abalone from the Tiger Reef-area.   |
| Accidental loss of gear used by the dive team  | Entanglement of wildlife such as seabirds, seals, dolphins and whales   | Do not use any permanent structures such as floating rafts, growth cages, or rope arrays at Tiger Reef.<br><br>Return all equipment (e.g. ropes, crates, bags, nets) used in the transfer of abalone to and from the reef to land (to minimise any entanglement risks to seabirds or marine mammals).   |
| Accidental hydrocarbon spills  | Negative impact on fauna/avifauna (mortalities through drowning, hypothermia or poisoning and/or future reduction in breeding productivity through physiological damage)                                    | Immediately report (Lüderitz office of MFMR, so that searches for and rescue and rehabilitation of oiled wildlife (mainly seabirds) can be coordinated if necessary) and clean up any accidental hydrocarbon spill.<br><br>Manage hydrocarbon spills according to protocols outlined in the Namibian National Marine Pollution Contingency Plan (NMPCP) (2017). |
| Operational activities at Tiger Reef   | Noise pollution (and disturbance of avifauna and marine mammals)  | Do not interfere with any whales, dolphins or seabirds passing through the area.<br><br>Do not access / land on Penguin Island or Seal Island. In case of an emergency (e.g. to retrieve lost gear), permission needs to be obtained from the Lüderitz office of MFMR.  |
| Ranching of abalone in a rock lobster sanctuary  | Loss of abalone   | Perceived losses of ranched abalone to rock lobster predation not to be managed by removing rock lobsters from the Tiger Reef-area.   |
| Toxic dinoflagellate and diatom blooms   | Loss of/damage to abalone   | Abalone to be tested for Paralytic Shellfish Poisoning (PSP) toxins before export / human consumption.  |
| Dive teams / personnel   | Occupational safety   | Provide lifejackets and harnesses with safety clips (karabiners) that lock on to lines or fixed points.<br><br>Ensure that personnel and divers are experienced swimmers.<br><br>Train personnel in safety at sea, including procedures for supervision of personnel.<br><br>Require that personnel wear lifejackets at all times on exposed sites and at sea.  |

## 7.5 Monitoring and Reporting

The following monitoring and reporting, at least but not limited to, need to be carried out:

| Type  | Parameter   | Frequency   | Responsible Parties  |
|---|---|---|----------------------|
| Benthic community structure of Tiger Reef     | *Abalone stocking rate (abalone densities and ecosystem health status)                                  | At least twice a year   |                      |
| Abalone reproduction and spread               | Those key to abalone reproduction (sea temperature and possibly a few others relating to sea chemistry) | E.g. sea temperature to be monitored daily  |                      |
| Ranched abalone (and their surrounding fauna) | Diseases or parasites   | Every time abalone is released for ranching and when routine (quarterly) monitoring is done   | Designated Person(s) |
| Toxic dinoflagellate and diatom blooms        | Paralytic Shellfish Poisoning (PSP) toxins  | Ad hoc  |                      |
| Environmental Management Plan                 | Environmental performance / corrective measures to be taken as or when required                         | Bi-Annual Environmental Reports to be submitted to the Ministry of Fisheries and Marine Resources (MFMR) and the Directorate of Environmental Affairs (DEA), Ministry of Environment, Forestry and Tourism (MEFT) |                      |

\*Hutchings *et al.* (2019) refer to a study done by Hutchings and Clark (2008) at Kleinzee, Namaqualand coast, South Africa where a density of 2.53 abalone per m<sup>2</sup> resulted in successful ranching, but noted that regular monitoring needs to be conducted to determine if stocking densities need to be adjusted to bring them in line with the assumed carrying capacity of the proposed area.

## **8 Conclusions and Recommendations**

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Hangana Abalone (Pty) Ltd's proposed activities (i.e. ranching and collection of abalone *Haliotis midae* at Farm 3 (Tiger Reef)) will have impacts on the environment, both positive, as well as negative in nature.

One significant negative, four moderate negative, five negative, four slight negative, one moderate positive, and two major positive impacts were identified. The potential significant negative, moderate negative, negative, and slight negative impacts can be relatively easily and effectively mitigated through the implementation of certain management measures contained in the Environmental Management Plan.

It is advised that Hangana Abalone (Pty) Ltd (and their employees and sub-contractors) should implement and observe the Environmental Management Plan on an ongoing basis. Environmental performance should be regularly monitored (so that the lessons learnt can be incorporated into the improvement of the Environmental Management Plan over time) and corrective measures taken as or when required.

*Lima Maartens*

Dr Lima Maartens  
LM Environmental Consulting

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