



INCEPTION REPORT

Project: BEHP/CEA/03/04:

Assessment of Cumulative Impacts of Scouring of Sub- Tidal Areas and Kelp Cutting by Diamond Divers in Near-Shore Areas of the BCLME Region

Prepared for

**Benguela Current Large
Marine Ecosystem
Programme**

July 2004

By

Andrea Pulfrich

**Pisces Environmental
Services (Pty) Ltd**



Contact Details:

Dr A. Pulfrich
P O Box 31228, Tokai 7966
South Africa
Tel: +27 21-7154238
Fax: +27 21-7150563
Email: apulfrich@pisces.co.za

Executive Summary

Project BEHP/CEA/03/04 consists of two major components; a review of existing information, and the gathering of quantitative data on the effects of kelp cutting by diamond diver operations and the discharge of sediments by shore-based processing plants on the near-shore environment. A manipulated kelp cutting experiment will be set up in demonstration areas near Lüderitz during the initial field survey planned for September 2004. This will provide a scientifically robust baseline for future monitoring programmes.

The terms of reference for the project are listed. During a visit to the Elizabeth Bay area in March 2004, it was determined that not all of the study locations originally proposed are appropriate for the purposes of the experiment. The modifications to the original work plan are outlined, and the reasons for the required changes are discussed. Photographs of the study sites are provided. Construction of puerulus collectors has commenced and a photograph of a collector is included. A revised work schedule for the project is presented.

A suitable MSc candidate has been identified, and contact has been made with MFMR Swakopmund to negotiate the possibilities of her involvement in the Project.

Contents

Executive Summary.....	ii
Contents.....	iii
List of Figures & Plates	iv
List of Acronyms, Symbols and Abbreviations	v
1 INTRODUCTION.....	1
1.1 Terms of Reference.....	1
2 APPROACH AND METHODOLOGY.....	2
2.1 Study Site Accessibility.....	3
2.2 Puerulus Collectors	7
2.3 Project Timetable.....	8
3 CAPACITY BUILDING AND TRAINING.....	10

List of Figures & Plates

Figure 1. Map of the Elizabeth Bay study area showing the positions of the proposed survey sites. The approximate position of the Elizabeth Bay Mine fines deposits outlet is indicated by an asterisk.	4
Plate 1. View of the South Jetty study site with the sea water intake jetty and Elizabeth Bay Mine in the background.	5
Plate 2. View of Atlas Bay showing the extent of the kelp bed. The access track to the study site ends in the bottom left hand corner of the photograph.	5
Plate 3. View of the Wolf Bay. The access track to the study site ends at the bottom right of the photograph. North Long Island (which supports seals) can be seen in the right of the picture.	6
Plate 4. View of Reef Bay. Vehicle access is possible at two points in this bay.	6
Figure 2. Diagrammatic illustration of the kelp cutting experimental design. The shaded lanes indicate the areas where kelp sporelings are removed during successive surveys.	7
Plate 5. Booth crevice collector and base-plate.	8

List of Acronyms, Symbols and Abbreviations

BCLME	Benguela Current Large Marine Ecosystem
MFMR	Ministry of Fisheries and Marine Resources
M	metres
m²	square metres
MSc	Master of Science
SANCOR	South African Network for Coastal and Oceanic Research
BENEFIT	Benguela Environment Fisheries Interaction and Training Programme

1 INTRODUCTION

Project BEHP/CEA/03/04 : *Assessment of cumulative impacts of scouring of sub-tidal areas and kelp cutting by diamond divers in near-shore areas of the BCLME region* consists of two major components. The first of these is a review of existing information on the cumulative effects of scouring of benthic communities by sediment discharges from diver-assisted diamond mining operations. The second, and more substantial component, involves the gathering of quantitative data on the effects of kelp cutting by diamond diver operations and the discharge of sediments by shore-based processing plants on the near-shore environment. This will be undertaken by developing a scientifically robust baseline and monitoring programme, involving a manipulated kelp cutting experiment, within demonstration areas near Lüderitz in order to obtain a data time series.

1.1 Terms of Reference

The monitoring programme will address the following key questions:

- What are the physical characteristics (topographical features, distribution of seabed types) at selected sites in the study area ?
- What is the abundance and distribution of kelp at these sites ?
- What is the abundance and size distribution of rock lobsters at these selected sites, and how are they affected by increase sedimentation and/or decreasing kelp abundance ?
- What is the composition of the benthic and epi-faunal community assemblages, and how are these affected by increase sedimentation and/or decreasing kelp abundance ?
- What is the rock lobster recruitment rate at the selected sites, and how is this affected by increase sedimentation and/or decreasing kelp abundance ?

The following key questions from BEHP/CEA/03/03: *Assessment of the Cumulative Effects of Sediment Discharges from On-shore and Near-shore Diamond Mining Activities* have also been included :

- How does the potential loss of kelp bed habitat [by long-term deposition of sediments] affect the abundance and distribution of rock lobsters, and the recruitment success of the stocks ?
- How does the periodic and/or long-term deposition of sediment on reefs affect the density and extent of kelp beds, and how does this compare with the loss of kelp bed habitat as a result of kelp cutting by shore-based divers ?

2 APPROACH AND METHODOLOGY

The study will focus on a number of small, protected bays located in the area between Elizabeth Bay and Lüderitz, in Namibia. Although the area between Grossebuch and Elizabeth Bay is rarely visited by the commercial rock lobster fleets, the West Coast rock lobster *Jasus lalandii* is abundant in the subtidal reef community associated with kelp beds (mainly *Laminaria pallida*) commonly occurring in these bays.

During a biological baseline survey conducted in the Elizabeth Bay area by Pisces in March/April 2004, the various small bays were visited in order to assess their suitability as study sites for the kelp-cutting experiment. During this exercise it was determined that not all of the study locations originally proposed are appropriate for the purposes of the experiment. The principle reasons for this are:

- The existing kelp bed is not extensive enough to allow for the clearing of lanes.
- Access to the kelp bed from the shore by the research divers is too difficult or is unsafe (see also below).

The work plan outlined in the original tender proposal thus requires minor modifications in order to ensure the success of the project. These are outlined briefly below.

1. Four survey sites have been identified along the coast north of Elizabeth Bay (Figure 1 and Plates 1-4). Vehicular access to within a few metres of the upper intertidal zone can be easily gained on existing tracks at each of the sites. This is particularly important during the setting-up survey as machinery and equipment will need to be located as close to the shore as possible.
2. At each of the study sites, two 5-m wide lanes will be cleared, perpendicular to the shore, through the kelp bed (Figure 2). The lanes will be cleared by cutting the stipes just above the holdfast. No holdfasts will be removed. The cleared

lanes will be separated by a 10-m “buffer zone” which will remain uncut and serve as the control. Two puerulus collectors will be secured in each of the cut lanes, and a further two in the control lane. Each study site will therefore have both the “Kelp Impact” and “Kelp Control” treatments thereby avoiding excessive variability as a result of heterogeneity between sites. The Jetty South site will serve as the “Sediment Impact” treatment, and the other 3 sites (Atlas Bay, Wolf Bay and Reef Bay) as “Sediment Control” sites.

3. The proposed puerulus collector sites in Lüderitz lagoon and alongside the MFMR jetty will remain the same. No kelp cutting is involved at these sites.

2.1 Study Site Accessibility

Easy accessibility to the kelp beds in which the experiment will be conducted is important for the following reasons:

1. Whilst clearing the lanes through the kelp bed, cut kelp plants (which may measure over 5 m in length) will be collected from random 1 m² areas. These must be swum ashore by a diver where they will be placed in separate piles in order to subsequently determine plant mass, frond mass, and stipe length. The kelp bed must therefore, by necessity, be located close to shore in order to avoid having to move the cut kelp over extensive distances in the water.
2. During installation of the crevice collectors, a pneumatic drill is used to drill holes into the reef in order to bolt down the base-plates. This is powered by air fed through an airline from a low pressure compressor located on the shore. The kelp bed must therefore be located in close proximity to a point on the shore accessible by vehicle, as carrying of such heavy equipment for long distances over the rocky intertidal shore is best avoided.
3. During routine monitoring conducted from Lüderitz the crevice collectors will be changed, and any sporelings which may have settled in the cleared lanes will be removed. The diver will retrieve the collectors by swimming out to the collector, placing a mesh bag around the collector to avoid loss of juvenile lobsters, detach the collector from the base-plate and float the collector back to shore. Once the lobsters have been rinsed from between the crevices, the collector will be swum back to the site and secured to its base-plate. In order to avoid having to transport equipment over extensive distances through the water, the kelp bed must therefore, by necessity, be located close to shore.



Figure 1. Map of the Elizabeth Bay study area showing the positions of the proposed survey sites. The approximate position of the Elizabeth Bay Mine fines deposits outlet is indicated by an asterisk.



Plate 1. View of the South Jetty study site with the sea water intake jetty and Elizabeth Bay Mine in the background.



Plate 2. View of Atlas Bay showing the extent of the kelp bed. The access track to the study site ends in the bottom left hand corner of the photograph.



Plate 3. View of Wolf Bay. The access track to the study site ends at the bottom right of the photograph. North Long Island (which supports seals) can be seen in the right of the picture.



Plate 4. View of Reef Bay. Vehicle access is possible at two points in this bay.

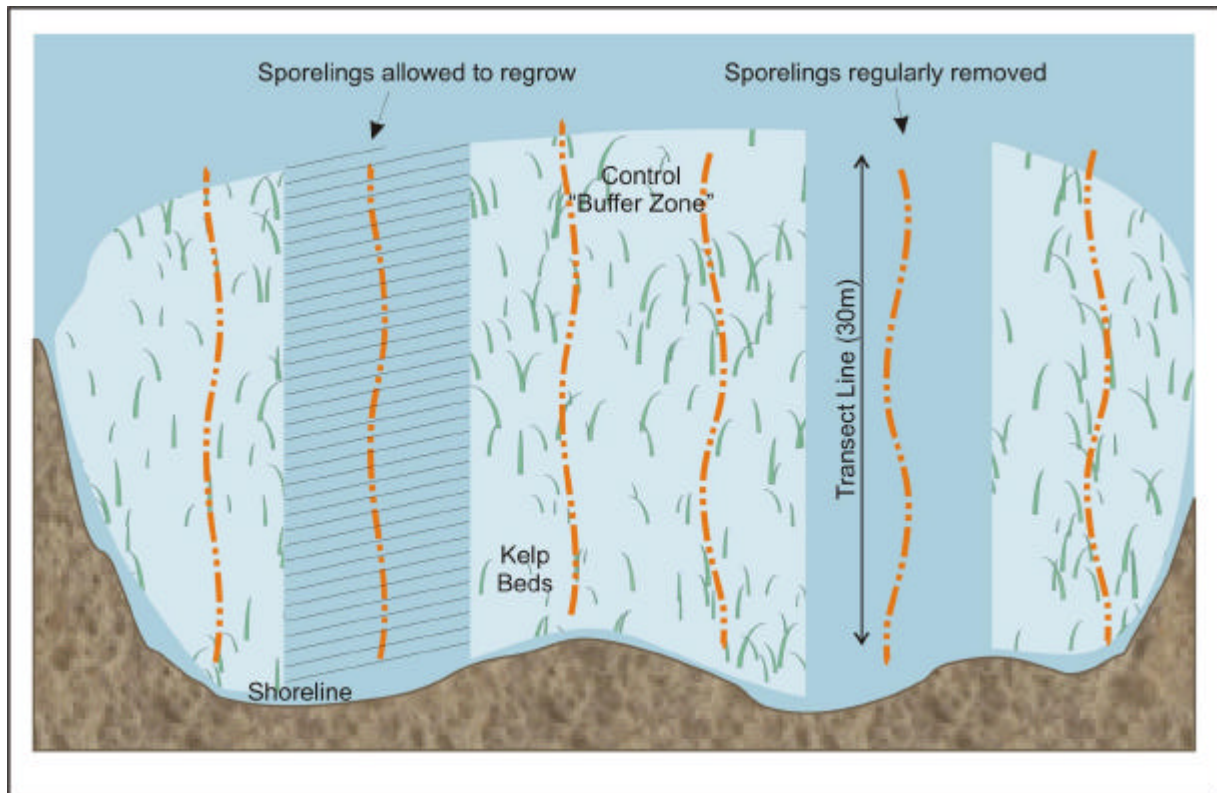


Figure 2. Diagrammatic illustration of the kelp cutting experimental design. The shaded lane indicates the area where kelp sporelings are removed during successive surveys.

2.2 Puerulus Collectors

During the Elizabeth Bay Upgrade survey in March/April 2004, negotiations with MFMR in Lüderitz were initiated for the use of their puerulus collectors during the project. Twelve collectors were located, some of which need substantial maintenance before they can be re-installed. Furthermore, the existing collectors all require base-plates in order to secure them to the reef. The construction of a further 12 Booth crevice collectors and base-plates has been commissioned (Plate 5). Due to the unexpectedly high costs of materials required for the construction of a collector, only a limited number of collectors can be purchased on the existing allocated budget. Extra funds for the additional collectors required for the Lagoon and MFMR Jetty sites will be secured from other sources.



Plate 5. Booth crevice collector and base-plate.

2.3 Project Timetable

In accordance with the contract, the assignment officially commenced on 1 July 2004. The revised work schedule for the project are shown in the Table below.

The work plan for the experimental portion of the project incorporates three intensive two-week field surveys conducted at six monthly intervals, with monitoring being conducted approximately every 46 weeks in the intervening time (if feasible) from Lüderitz by the MSc student.

Provided that work visas and Namdeb security clearances are issued in time, the initial setting-up field survey is proposed for September 2004. In the interim, information gathering and literature searching will commence. This will continue in close collaboration with BCLME project BEHP/CEA/03/02. The first of the follow-up surveys would be scheduled for March/April 2005, with the final follow-up survey being conducted in late September 2005.

3 CAPACITY BUILDING AND TRAINING

Capacity building, training and technology transfer from developed to developing regions is a high priority in the BCLME Programme. A student scholarship at the MSc level has been incorporated into this project, and suitable students were actively sought by advertising the project on the SANCOR and BENEFIT mailing lists in April 2004, as well as at the various Universities. Only one response was received. The applicant was, however, unsuitable and did not have the necessary BSc degree required to register for an MSc.

During preparation of the project proposal, contact was made with potential MSc supervisors at various Universities, and enquiries made as to availability of prospective students. During this initiative, Ms Janine Basson, who has been employed as an intertidal researcher in the Environmental Section at MFMR in Swakopmund since February 2004, was identified as the most promising candidate. Contact has been made with Dr Ben van Zyl and Mr Chris Bartholomae at MFMR Swakopmund to negotiate the possibilities of Ms Basson's involvement in the Project.