

# **Environmental perspectives on Marine Mining in the Southern African Region**

**Kerry Sink and Kirsty McQuaid**

**South African National Biodiversity Institute**

**With input from colleagues at the Benguela Current  
Commission, Regional EBSA Workshop participants  
& SADAC representatives**

**SANBI**  
Biodiversity for Life



# Introduction

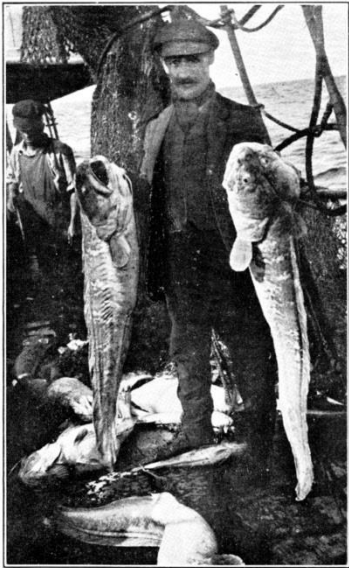
- SANBI developed the first **National Marine Ecosystem Map**
- Marine chapter of the **National Biodiversity Assessment**  
Reports on State of Biodiversity at species & ecosystem level incl.
  - Ecosystem Threat Status
  - Ecosystem Protection levels
  - Outlines Priority Actions for the Biodiversity Sector
- Represented South Africa **EBSA** workshops: 15 EBSAs in EEZ
- Engages marine production sectors to support **mainstreaming** of biodiversity in fisheries, petroleum, mining and other sectors
- SANBI is undertaking technical work to developed a **Network of Offshore MPAs for Operation Phakisa**

# Overview

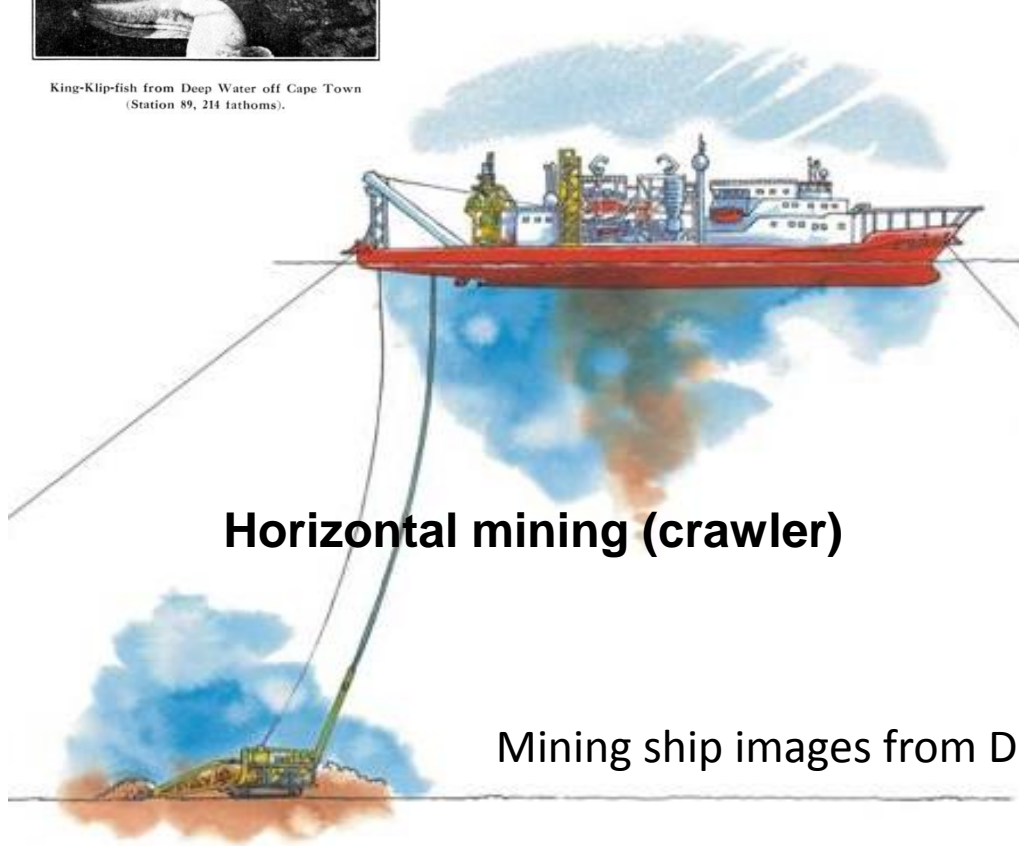
- **History of Resource use in the region**
- **Expansion and diversification of marine mining activity**
- **Biodiversity Impacts**
- **Regional overview of biodiversity knowledge**
- **Challenges, opportunities and capacity building requirements**

© Jaco Barendse

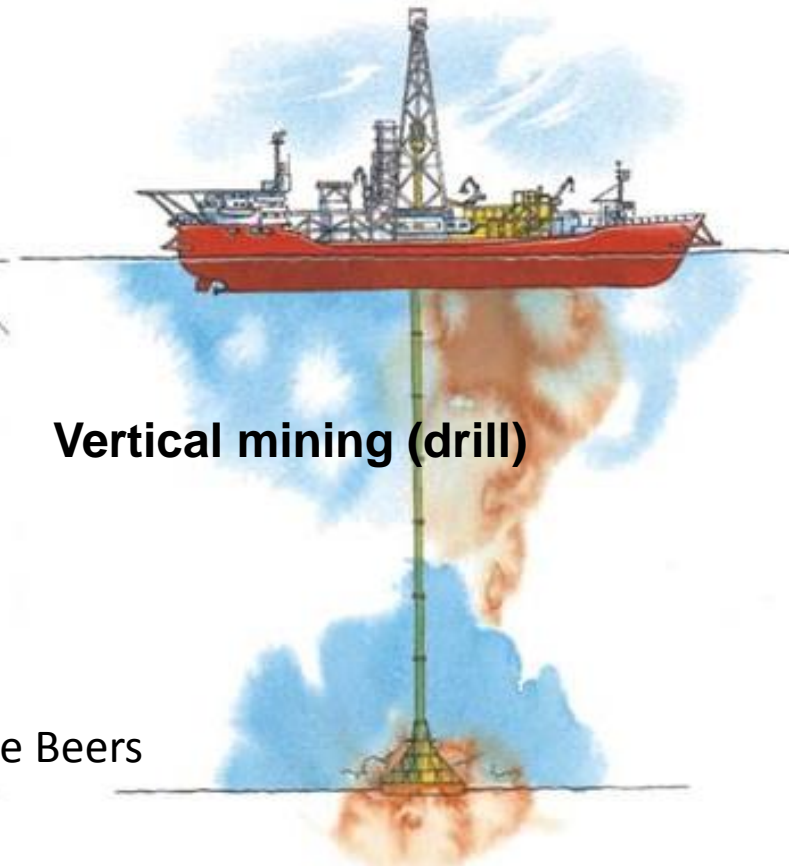




King-Klip-fish from Deep Water off Cape Town  
(Station 89, 214 fathoms).



**Horizontal mining (crawler)**



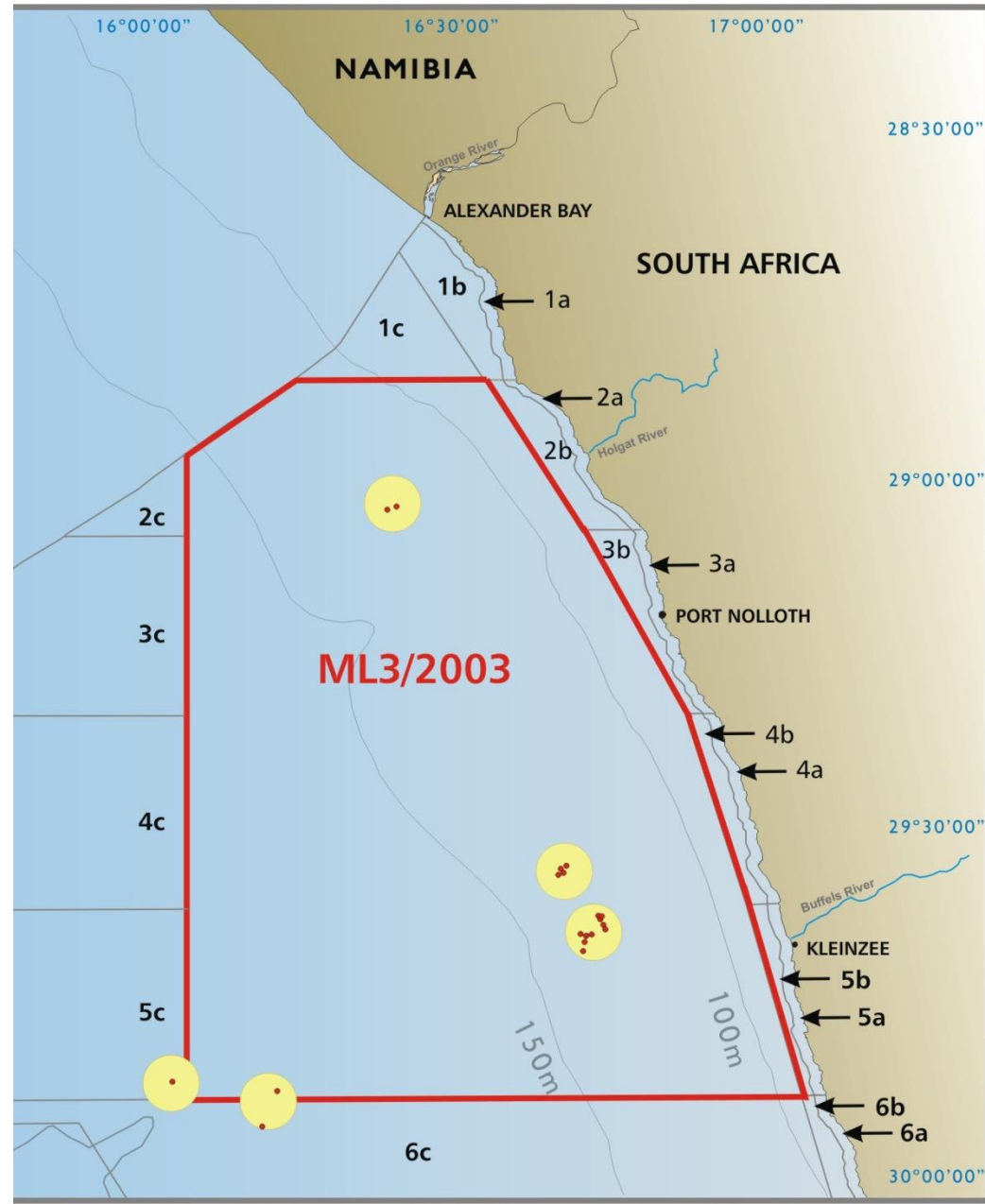
**Vertical mining (drill)**

Mining ship images from De Beers

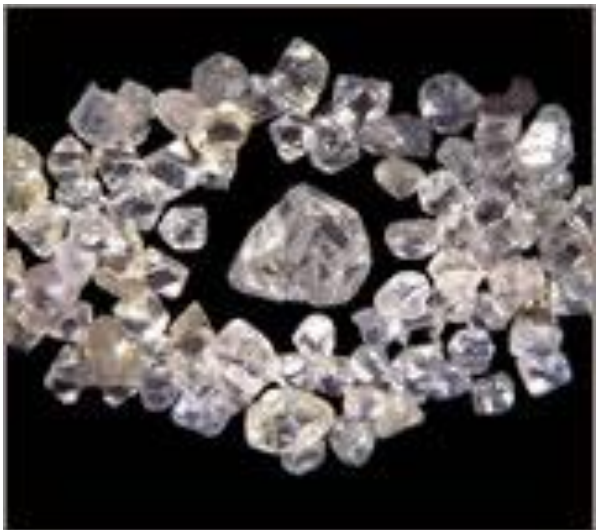
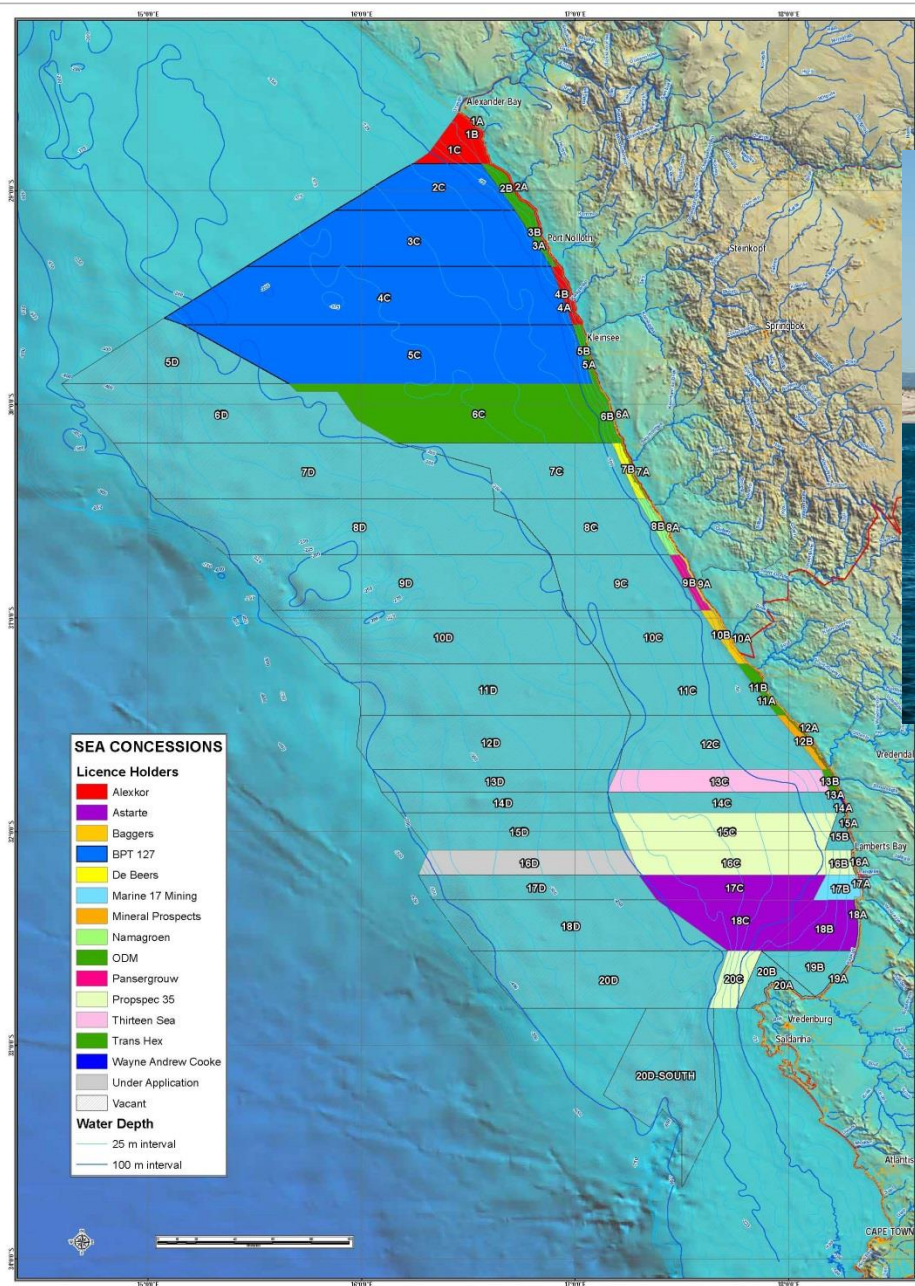


## Work by De Beers in ML3

- *JAGO* submersible dives
- Research on habitat impacts & pollution
- De Beers Biodiversity Action Plan



## Expansion & diversification





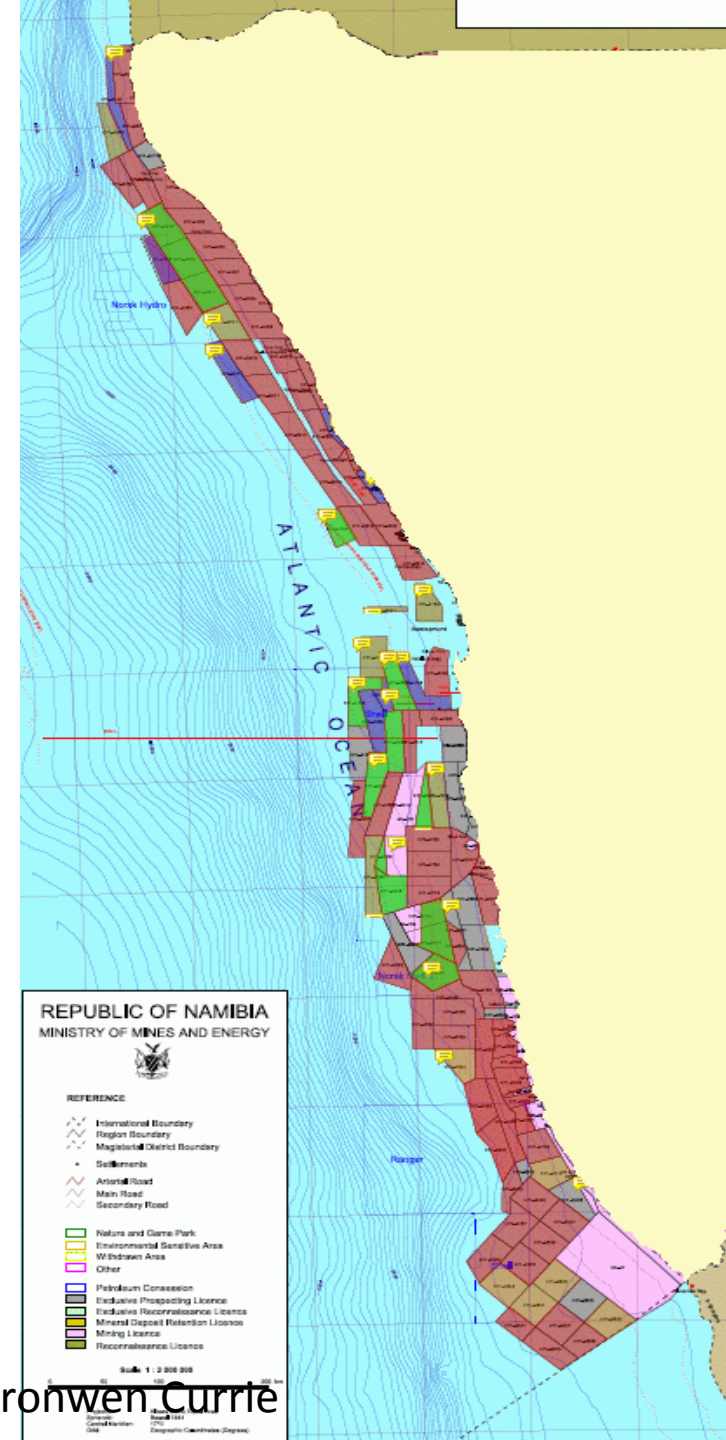
*EPL localities from Ministry of  
Mines and Energy website*

**Listed 2012:**

-  EPL for industrial minerals
-  Expired EPL
-  Pending EPL (as on 2 April 2012)
-  EPL s active
-  EPL for diamonds and precious stones (no industrial minerals)
-  Mining licenses granted (diamonds or industrial minerals)

**Note: no seabed mining for phosphates has taken place**

Slide from Benguela Current Commission Presentation, Bronwen Currie



**RICH PICKINGS**

The mineral sands mine on the West Coast is expected to inject more than R1 billion a year into the provincial economy over the next five years

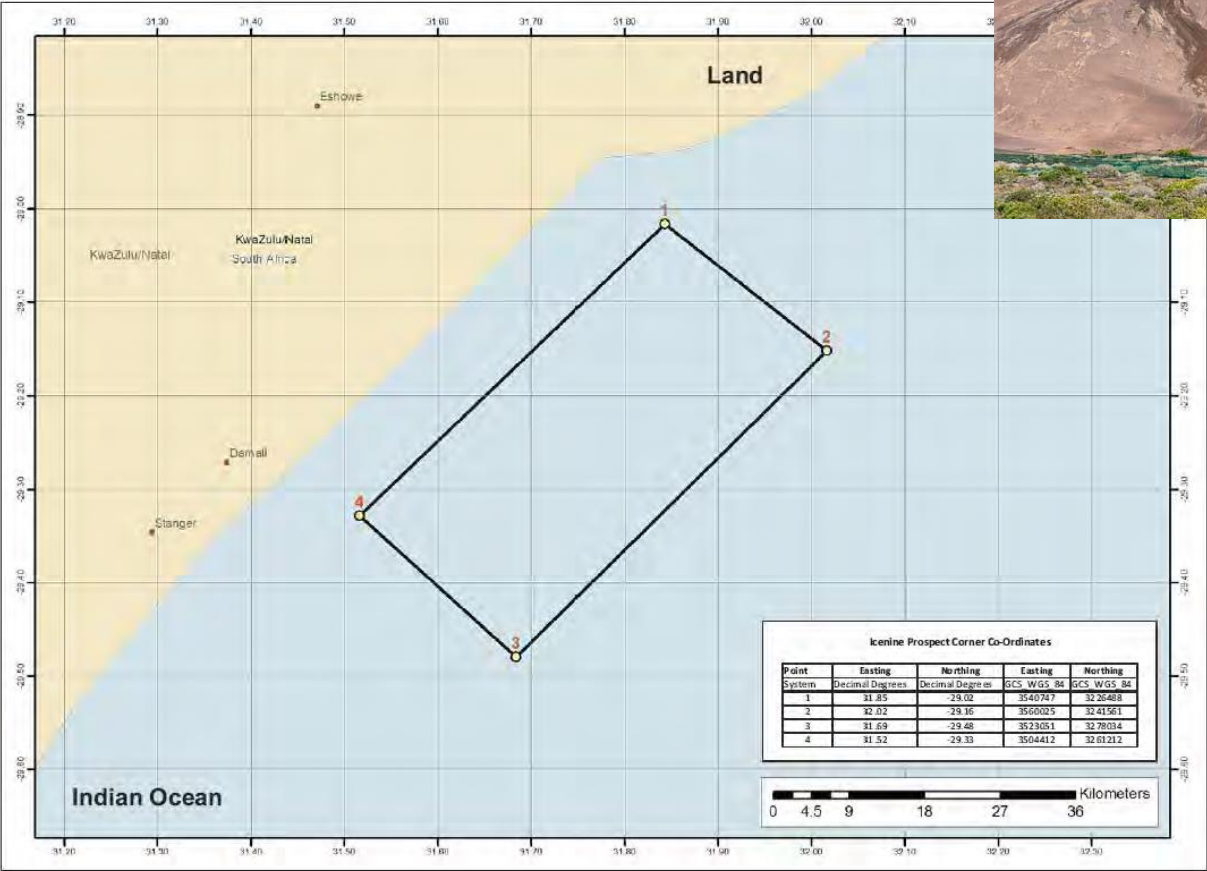
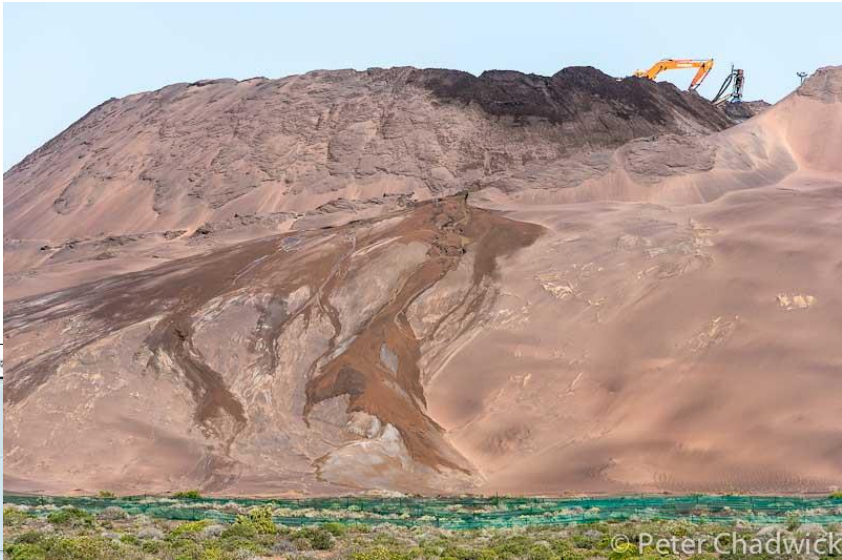
# SAND MINING BOOM

**TORMIN PROJECT:** Mine predicted to bring money, jobs to Western Cape



# Garnets, offshore heavy minerals (Titanium)

Lease applications :  
East and West coast



uThukela Banks

# Environmental Management Plan (EMP) for the proposed Marine Phosphate Prospecting by Diamond Fields International Ltd in the Outeniqua West Licence Area on the Eastern Agulhas Bank, Offshore Mossel Bay

## Background Information Document (BID)

Department of Mineral Resources (DMR)  
Reference number WC 30/5/1/1/2/10138PR

February 2013



**DIAMOND FIELDS**  
INTERNATIONAL LTD.

**CSIR**  
Centre for  
Future Energy Science

Expansion & diversification

## Proposed phosphate prospecting on the Eastern Agulhas Bank

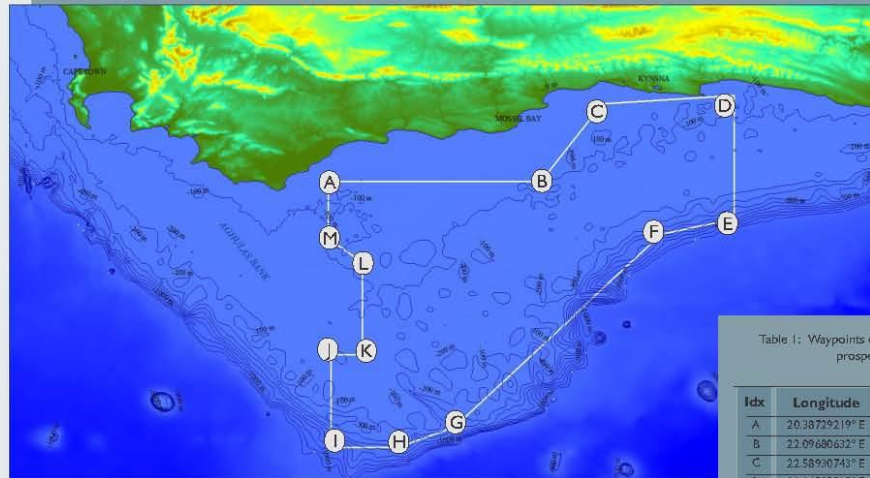


Figure 1: Location of the Outeniqua West prospecting licence area on the eastern Agulhas Bank, offshore Mossel Bay. Neighbouring and overlapping oil and gas exploration and production licence areas are also shown.

Table 1: Waypoints demarcating the Outeniqua West prospecting licence area.

Idx	Longitude	Latitude	Length
A	20.38729219° E	34.76256674° S	156.51 km
B	22.09680632° E	34.76256674° S	79.929 km
C	22.58930743° E	34.16861409° S	97.677 km
D	23.64525535° E	34.10214824° S	105.3 km
E	23.64525535° E	35.05139078° S	54.787 km
F	23.06152325° E	35.16878941° S	222.09 km
G	21.40130340° E	36.64603566° S	43.944 km
H	20.94864420° E	36.80105594° S	48.014 km
I	20.41062519° E	36.80180268° S	79.247 km
J	20.41062519° E	36.08765900° S	22.839 km
K	20.66421132° E	36.08765900° S	77.758 km
L	20.66421132° E	35.38684846° S	32.356 km
M	20.38729219° E	35.26379123° S	48.95 km

Lease over Agulhas Bank, South Africa  
47 464 km<sup>2</sup>

# **Diamond Fields Announces Granting of South African Marine Phosphate Exploration Licence**



VANCOUVER, BRITISH COLUMBIA, Jan 13, 2014 (Marketwired via COMTEX) -- Diamond Fields International Ltd. [CA:DFI](#) +25.00% ("DFI" or the "Company") is pleased to announce that it has been granted a marine exploration license for phosphate and associated minerals by the Government of the Republic of South Africa. The exploration license is valid for a period of five years in the first instance, and extends over an area of approximately 47,468 km<sup>2</sup> within the Outeniqua Basin in the South Western Cape. The license was awarded following an extensive environmental management plan compiled by the Council for Scientific and Industrial Research and public consultation with interested and affected parties.



**KEY**

- Oil/GAS CONCESSION (SUBJECT TO REINVESTMENT OF 3%)
- Oil/GAS SUBLEASES
- MAJOR COAL-FIRED POWER PLANT
- COAL FIELD
- NATIONAL ELECTRICITY GRID
- POSSIBLE FUTURE GAS PIPELINE
- OFFSHORE WELL
- KOEBERGER NUCLEAR POWER PLANT

**KUDU GAS FIELD**  
(Tullow Oil 100%)  
Discovered in 1974 by a Chevron / Regent / Soekor consortium. The reservoir comprises Barremian (Early Cretaceous) aeolian sandstones with average porosities up to 22 % at 4400 m. Under appraisal.

**FOREST INTERNATIONAL (OPERATOR) PETROSA ANSCHUTZ**  
Block 2A: Appraising Ibhubesi gas field for development.  
Block 2C: Evaluating deep water oil potential.

**IBHUBESI GAS FIELD**  
Being appraised for development by Forest with 3D seismic and appraisal wells. This Albian (Early Cretaceous) fluvial play (part of the Orange Delta) extends northwards into Block 1 and upside gas resources are estimated at 25 Tcf for the combined area of Block 1 and 2A.

**F-A GAS FIELD AND SATELLITES**  
(PetroSA 100%)  
These fields currently produce at an average daily rate of 195 MMcf/d gas and 5-100 bbl condensate. The reservoirs comprise Early Cretaceous shallow marine sandstones at the top of the rift succession. Separate 9" km pipelines convey gas and condensate to the PetroSA CTL syngas refinery at Mossel Bay where petrol, diesel and kerosene are produced.

**BHP BILLITON (OPERATOR) SASOL PETROLEUM INTERNATIONAL**  
Evaluating shallow water gas potential.

**BHP BILLITON (OPERATOR) OCCIDENTAL GLOBAL OFFSHORE OIL**  
Evaluating deep water oil potential.

**NON EXCLUSIVE SEISMO-SURVEY ACQUIRED BY PGS IN 2002 (3685 LINE KM)**

**SABLE OIL FIELD**  
(PetroSA 55 %, Pioneer 45 %)  
Production from Aptian (Early Cretaceous) age deep marine channel sands is currently about 17 000 BOED.

**ORIBI / ORYX OIL FIELD**  
(PetroSA 100%)  
Combined production from Oribi and Oryx is at 7 000 BOED - from submarine fan deposits of Albian (Early Cretaceous) age, via Orca floating production facility.

**PETROSA - BLOCK 9**  
(With co-venturers Pioneer Natural Resources, Tullow). Ongoing exploration and production together with appraisal and development of oil and gas fields.

**PETROSA - BLOCK 11a**  
Early Cretaceous shallow marine gas fields currently under appraisal.

**CNR - BLOCK 11B/12B**  
Acquired deep water 2D seismic survey in 2001 and is evaluating deep water potential for oil and gas.

**COAL-BED METHANE EXPLORATION**

**PANDE GAS FIELD**  
Discovered in 1991 by a Qullfinne consortium. The reservoir comprises Late Cretaceous shallow marine sandstones with porosities up to 40 % at 1-100 m. The field will be linked to the Temane-Secunda pipeline in 2009.

**TEMANE GAS FIELD**  
Temane 4 found at 29.5 Mm depth (through a 1.18" choke). Thus confirming the presence of a potentially significant natural gas accumulation which was first discovered by GULF Oil in 1956.

**EXPLORATION AND MINING LEASES IN BLOCK 9**

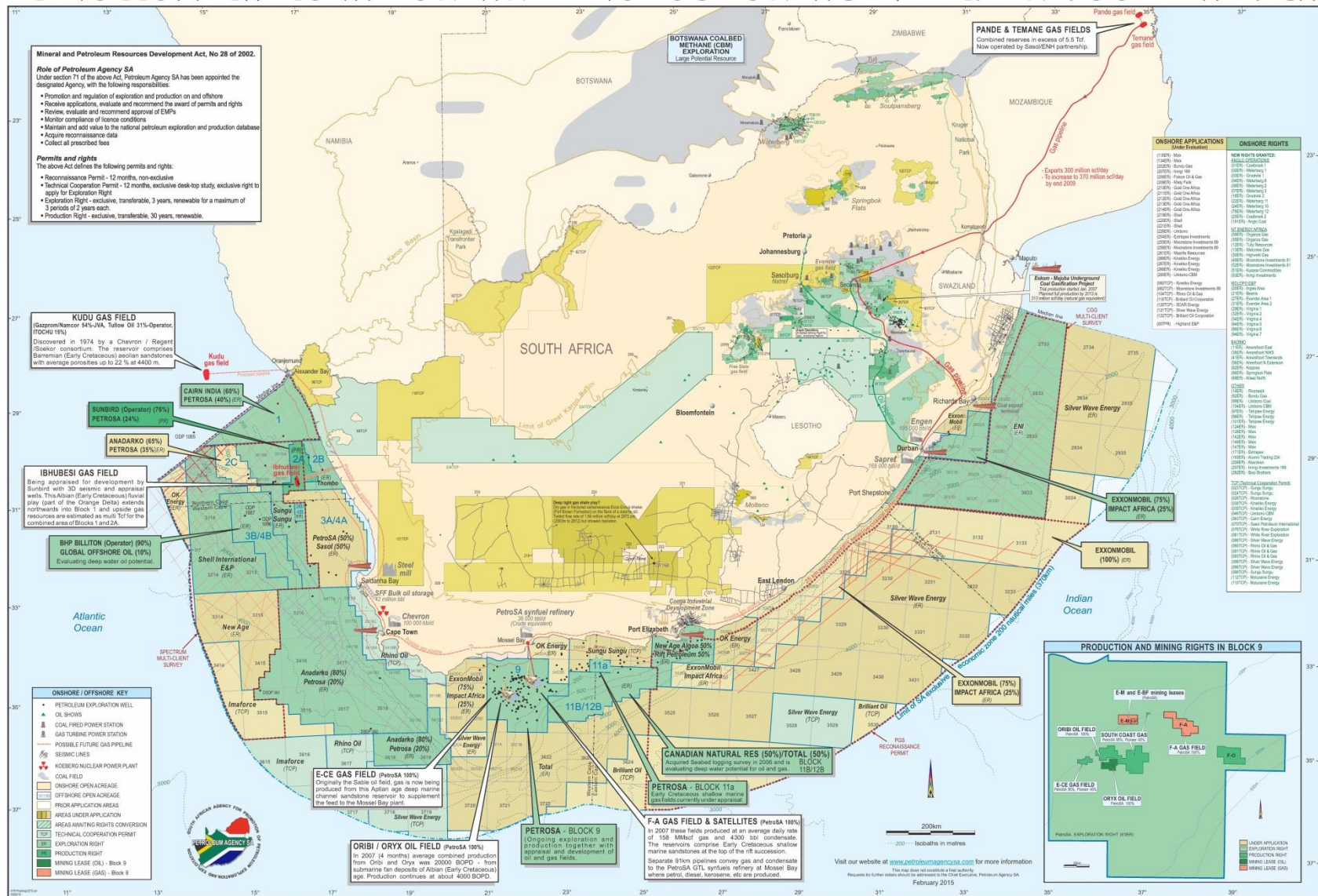
- Mineral Lease (ML)
- Mineral Lease (DAL)
- Proprietary tract operated by PetroSA with joint venture partners not specified.
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- Proprietary tract operated by PetroSA with joint venture partners not specified.
- Proprietary tract operated by PetroSA with joint venture partners not specified.

Visit our website at [www.petro.co.za](http://www.petro.co.za) for more information

2015

Expansion &amp; diversification

# PETROLEUM EXPLORATION AND PRODUCTION ACTIVITIES IN SOUTH AFRICA





# Impacts in Southern Africa

Biodiversity impacts

- Direct physical disturbance
  - Physical removal of benthic organisms, kelp cutting
  - Deposition of tailings
  - Habitat loss or alteration incl. sediment type
  - Irreversible damage that can transform habitat
  - Temperature changes
- Sediment plumes and pollution
- Benthic pelagic coupling impacts
- Underwater Noise
- Alien and Invasive species

**Key literature:** Barkai and Bergh 1992, Parkins and Branch 1995, Parkins and Branch 1996, Savage 1996, Van der Merwe 1996,, Parkins and Branch 1997, Pulfrich 1998, Pulfrich & Penney 1999, Winckler 1999, Attwood 2000, Savage *et al.* 2001, Pulfrich *et al.* 2003a, 2003b, Penny and Pulfrich 2004, Steffani and Pulfrich 2004, Roos 2005, Pulfrich 2007, Steffani and Pulfrich 2007 Penney *et al.* 2008, Sink et al. 2010 )



Introduced invasive anemones on petroleum pipe, PetroSA



# Key considerations



## **Biodiversity significance**

How important is the area in contributing towards biodiversity goals?



## **Species of concern**

Are threatened or sensitive species associated with the area and to what degree are they likely to be impacted?



## **Threatened and sensitive habitats**

Does the area include threatened and sensitive habitats?



## **Ecosystem services**

What are the key services in the area and to what extent will these be negatively affected?



# Fisheries

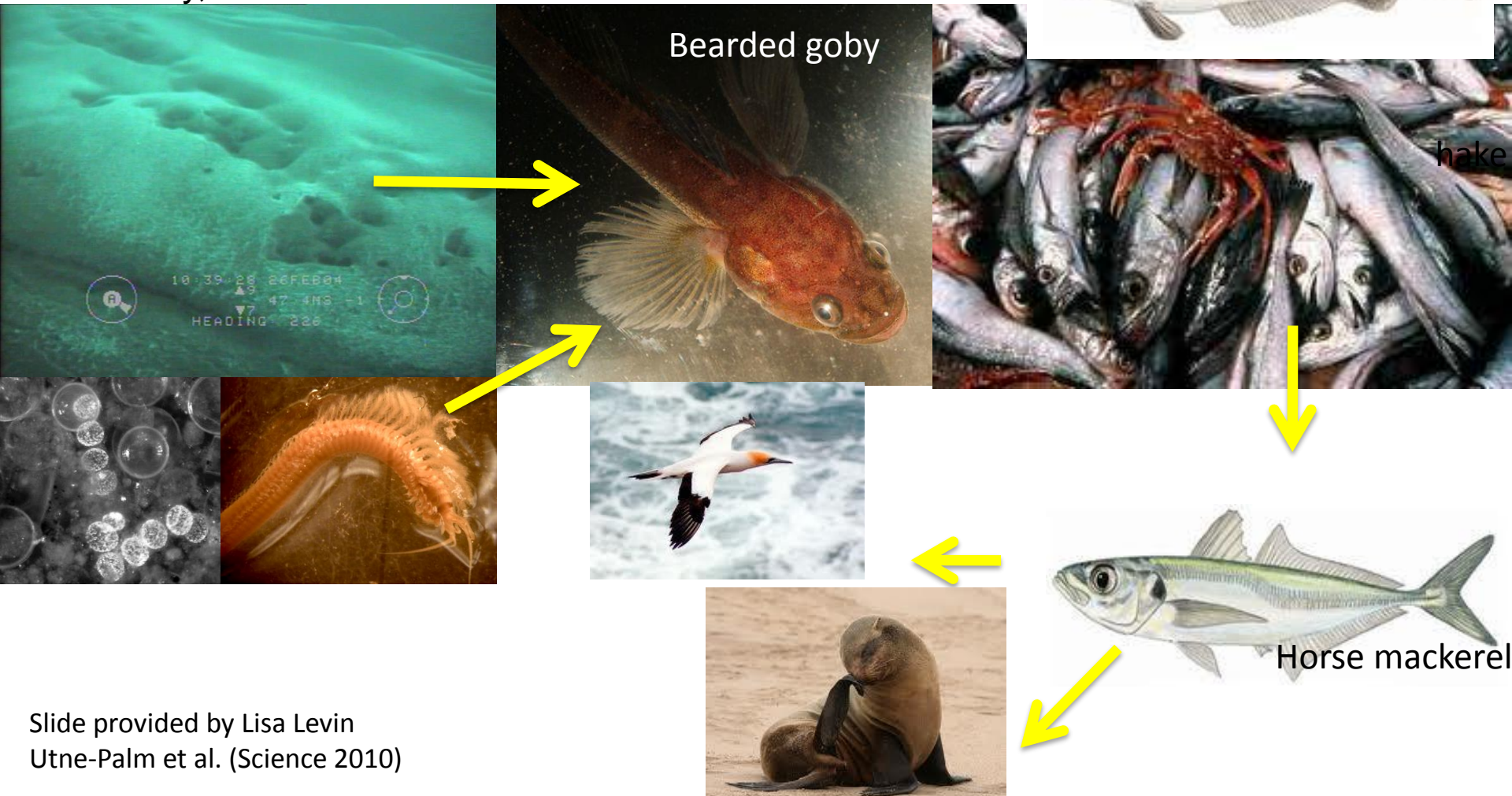
1. Fishing is an important ecosystem service that should be maintained
2. South Africa has 18 fishery sectors
3. Many associations & groups, many overlapping rights





# Namibian phosphate mining interests overlap with fishery habitat

*Beggiatoa* and *Thiomargarita* mats,  
Walvis Bay, Namibia





# ***Investigation of cumulative impacts on the marine ecosystem from mining of phosphorites off the Namibian coast***



Namibia Seabed Environmental  
Assessment Project  
Ministry of Fisheries and Marine  
Resources  
NAMIBIA

## **Progress to date and where Namibia is at now:**

- Submission by the Minister of Fisheries and Marine Resources led to a Cabinet Decision in 2013 to impose a Moratorium on industrial minerals marine mining activities
- Cabinet directed that
  - a Strategic Environmental Assessment (SEA) be conducted to assess the cumulative impacts (specified to phosphates)
  - an independent scoping study and a comprehensive Environmental Impact Assessment is being carried out
- Following I&AP circulation of the draft report, final report will be submitted to the proponent Ministry of Fisheries and Marine Resources for decision and further action

# Ecologically and Biologically Significant Areas (EBSAs)

- Secretariat of the Convention of Biological Diversity
- Regional workshops to identify sites that meet EBSA criteria
- 7 Criteria to define EBSAs

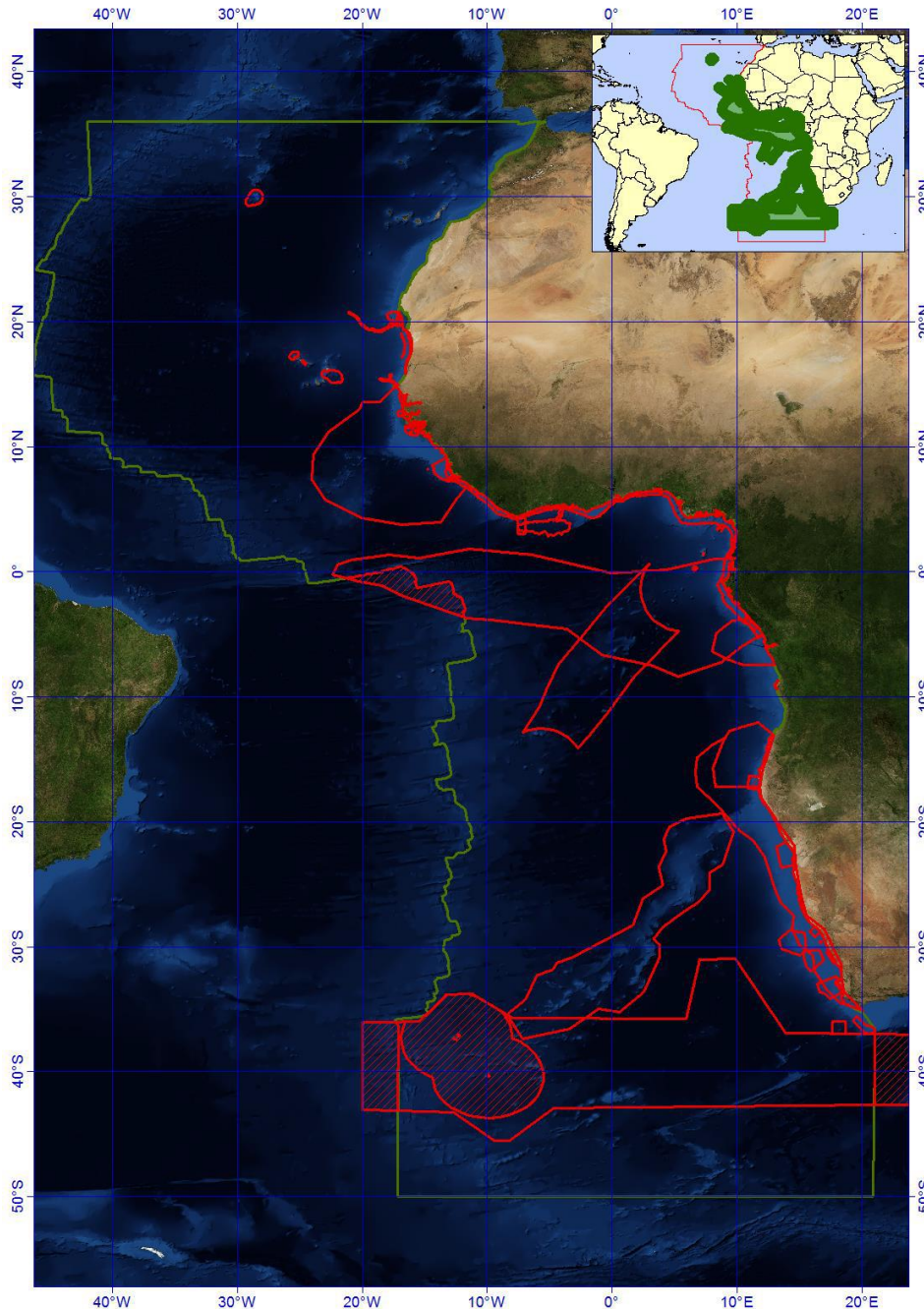


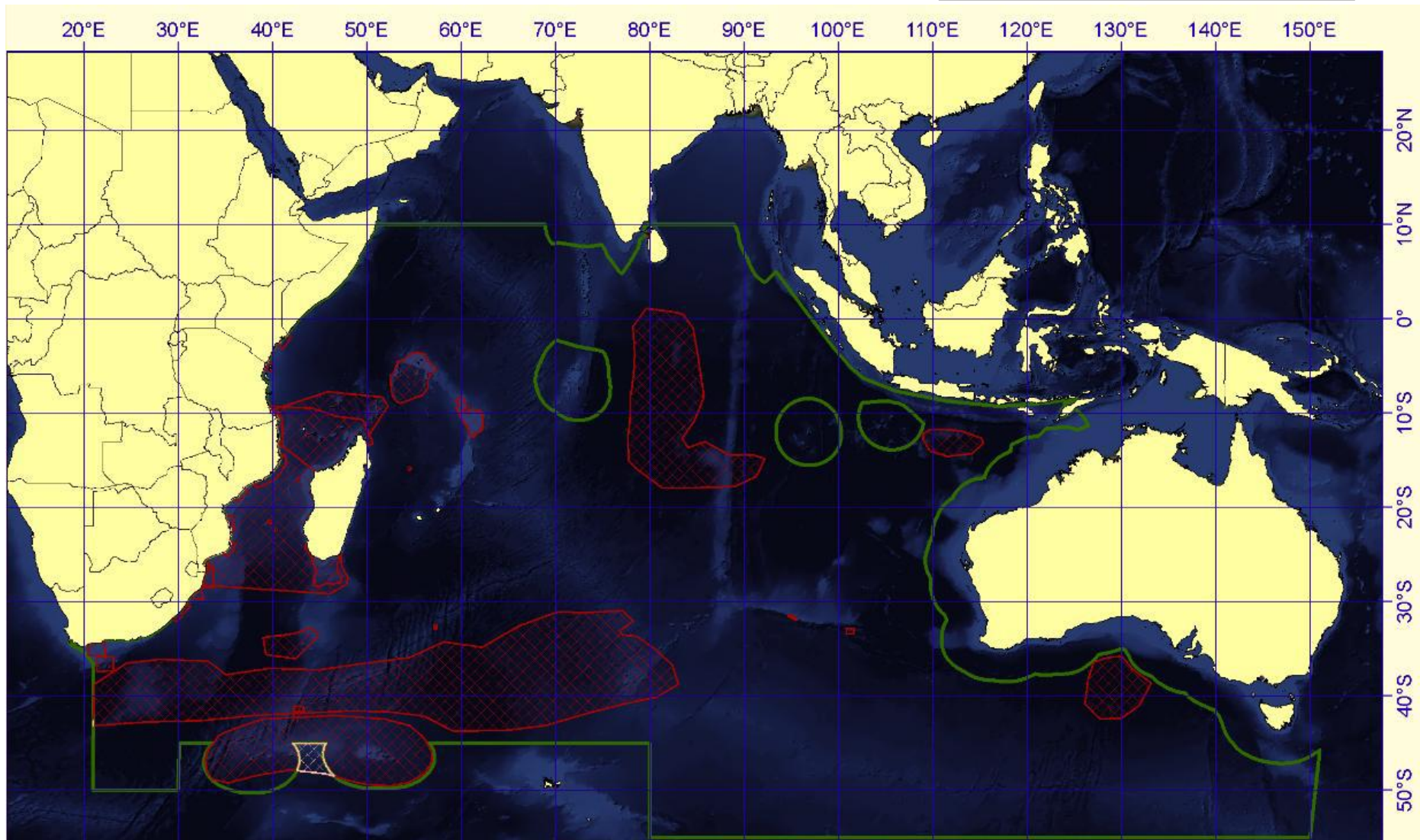
Geoff Spiby



# Ecologically and Biologically Significant Areas

**35 AREAS MEETING EBSA  
CRITERIA IN THE SOUTH-EASTERN  
ATLANTIC**



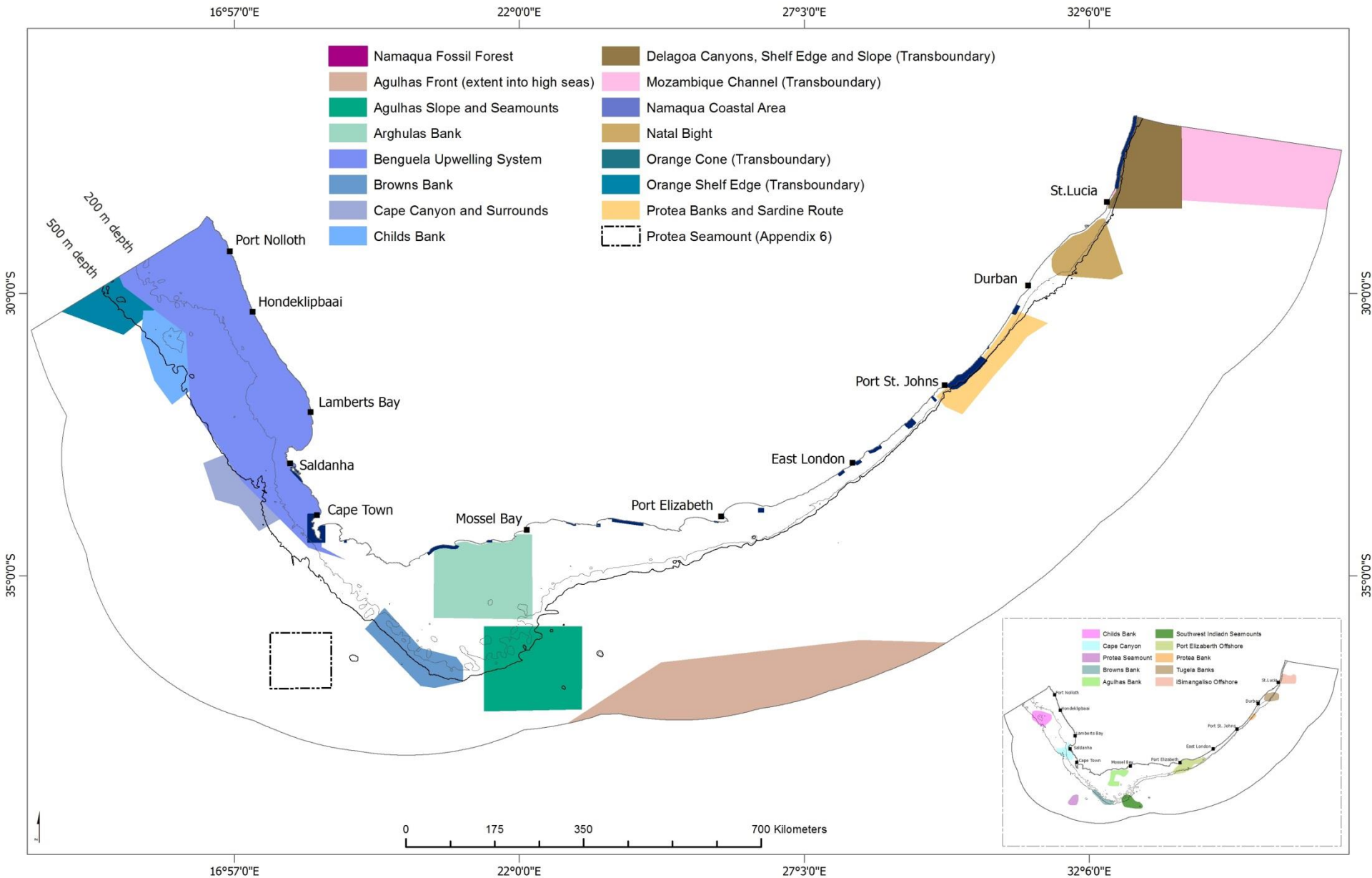


**39 AREAS MEETING EBSA CRITERIA IN THE SOUTHERN INDIAN OCEAN REGION, Workshop report**



# 15 EBSAs in South Africa

Biodiversity knowledge





# Sensitive seabed habitats in the region

Biodiversity knowledge

- Fragile, three dimensional habitats like cold water coral reefs
- Habitats of very limited extent  
eg. Some gravel and mud ecosystem types
- Threatened habitat types



# Sensitive species in the region

- Fragile species with slow growth rates
- Species known from very few localities
- Threatened species
- Species sensitive to noise



Heaviside's dolphin, ©Peter Chadwick



©Geoff Spiby



# Vulnerable Marine Ecosystems

- Food and Agriculture Organisation (FAO) - International Guidelines for the Management of Deep-sea Fisheries in the High Seas
- VME Criteria
- Triggers
- Identification guides
- Lots of information
- Habitats vulnerable to fishing may be vulnerable to mining



## The Science behind the Guidelines:

A Scientific Guide to the FAO Draft International Guidelines (December 2007)  
for the Management of Deep-Sea Fisheries in the High Seas and Examples of  
How the Guidelines may be Practically Implemented

Alex D Rogers, Malcolm R Clark, Jason M Hall-Spencer, Kristina M Gjerde



IUCN Global Marine Programme

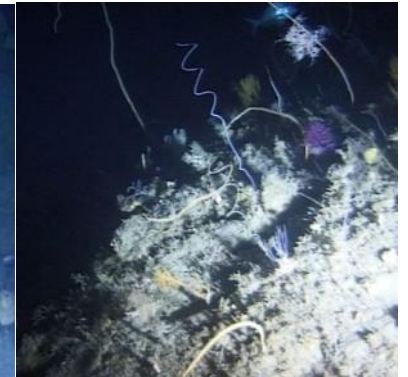
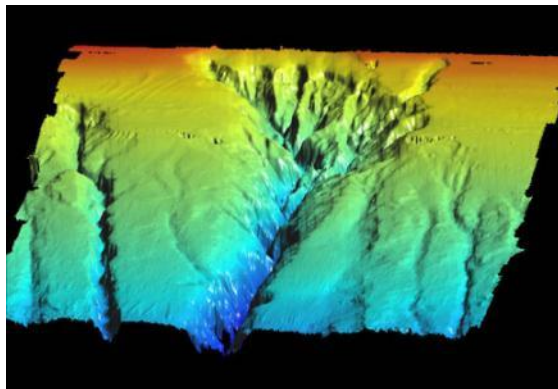
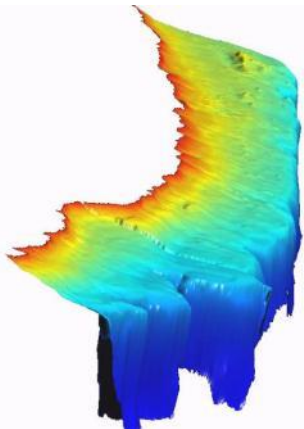


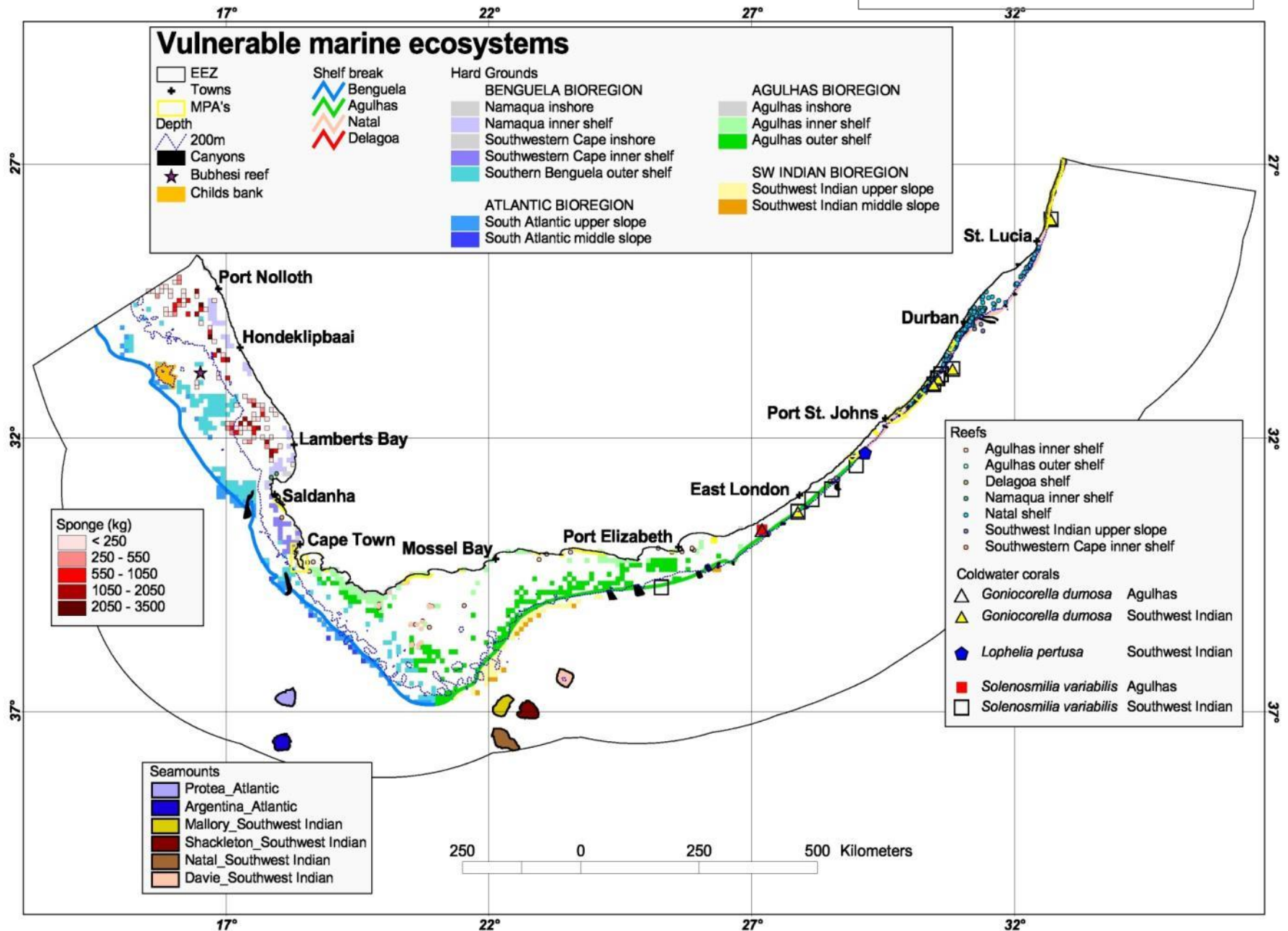


# South Africa's Vulnerable Marine Ecosystems

Biodiversity knowledge

- Topographic features that can support VMEs
- Reef-building cold water corals  
*Lophelia pertusa*, *Gonichorella dumosa* and *Solenosmilia variabilis*  
Sponge grounds *Suberites* sp. nov. and *Pheronema* spp.
- Octocoral, bamboo, black & lace coral grounds

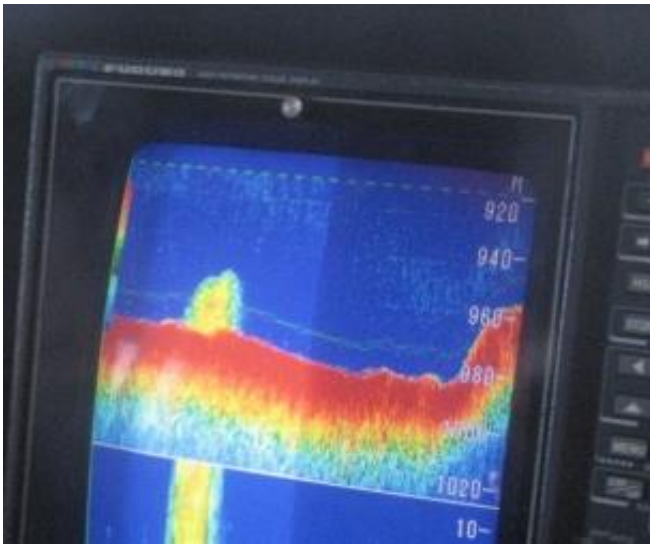




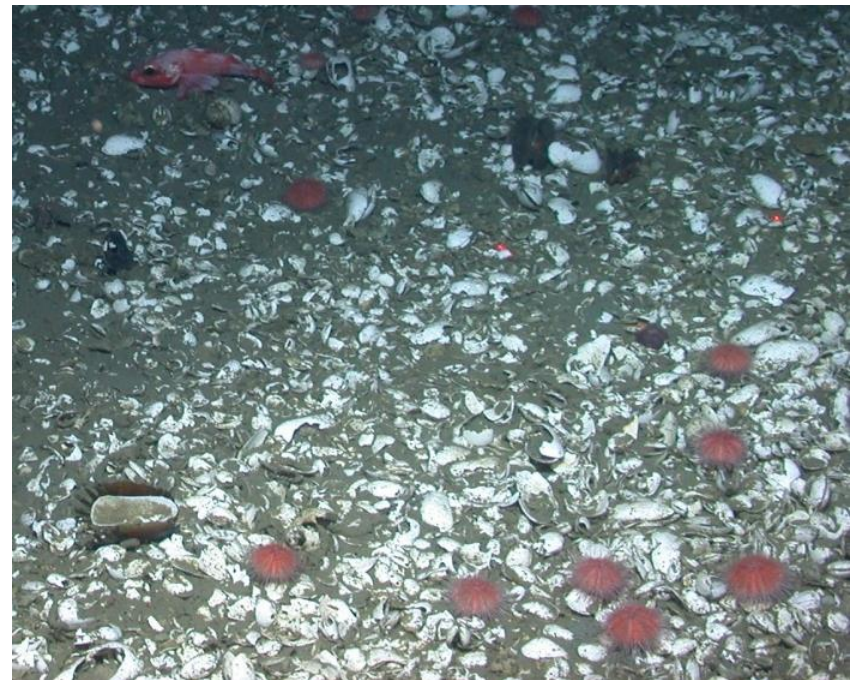


# Research Priorities

- Marine taxonomy and biodiversity data management
- Ecosystem classification and mapping
- Sensitive Ecosystems incl. VMEs, cold seeps etc
- Ecosystem services



Echosounder image of cold water coral reef, 900m, Larry Hutchings

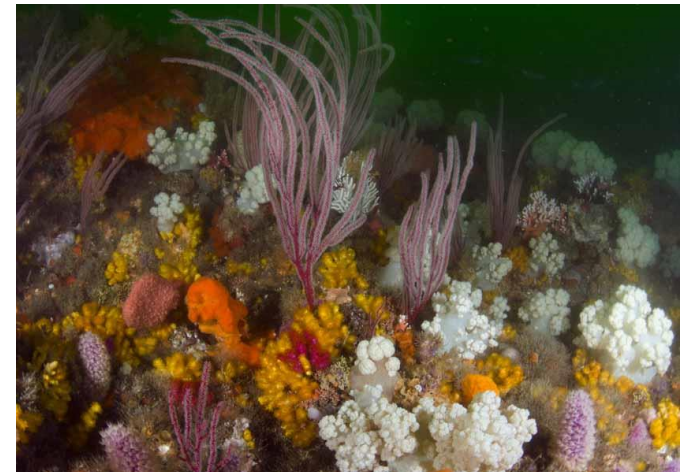


Seep habitat, 600m, Image provided by Lisa Levin



# Key challenges

1. Poor offshore information base, technological & capacity challenges
2. Inadequate protection of offshore ecosystems
3. Overlap with Biodiversity Priority Areas
4. Weak EIAs & lack of scientific input
5. Low awareness of activities, potential impacts & governance framework



# Garnet Mining on East Coast

Key challenges

**PROPOSED PROSPECTING ON THE ICENINE PROSPECT, TUGELA BANKS, FAST PACE  
TRADE AND INVESTMENT (PTY) LTD.**

1.3 Map showing the spatial locality of all environmental, cultural/heritage and current land use features identified on site.

**“None.”**

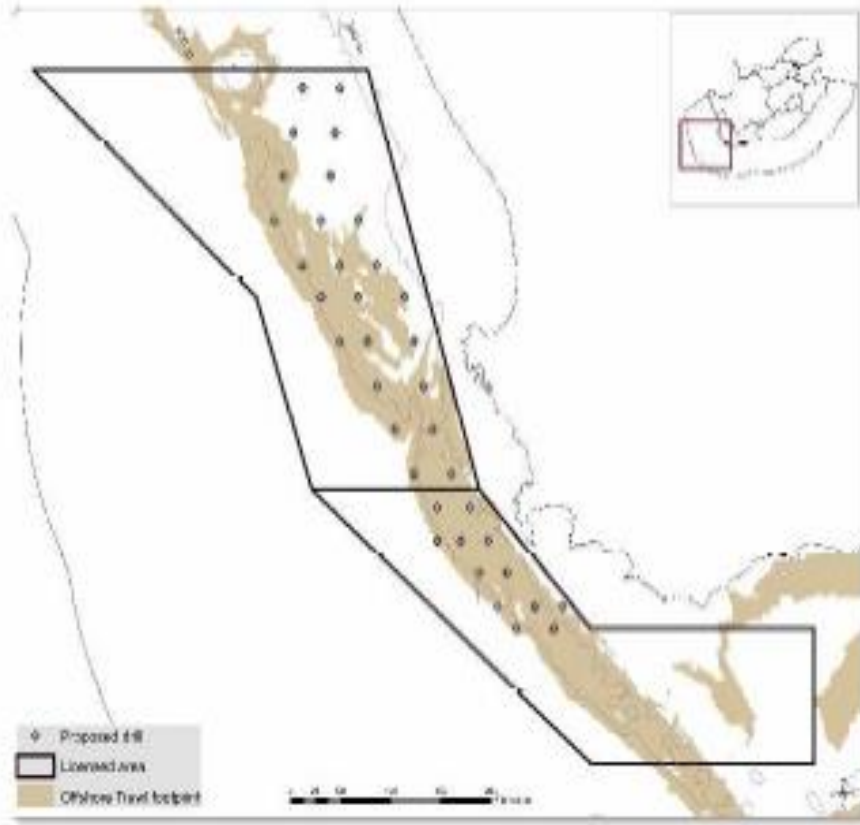
1.4 Confirmation that the description of the environment has been compiled with the participation of the community, the landowner and interested and affected parties:

**“Not applicable (since the prospect area is situated on the marine continental shelf there are no communities and landowners).”**

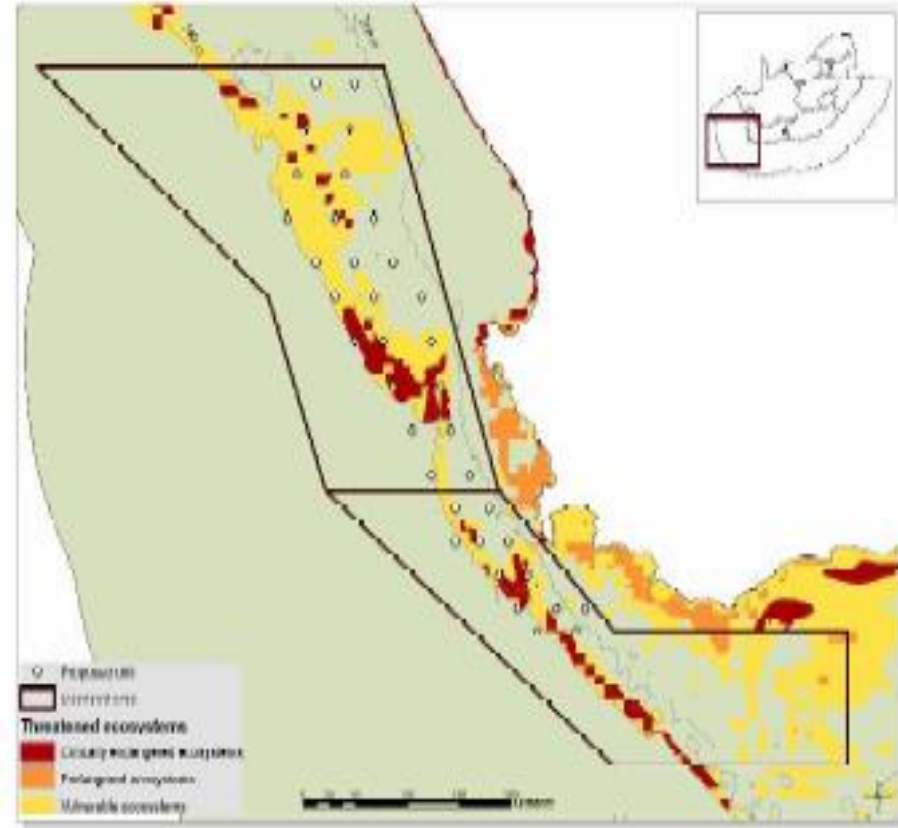
# Green Flash Trading Phosphate Prospecting Areas

Key challenges

GFT 251 and 257 prospecting licence areas.



Overlap with demersal trawl  
fishery

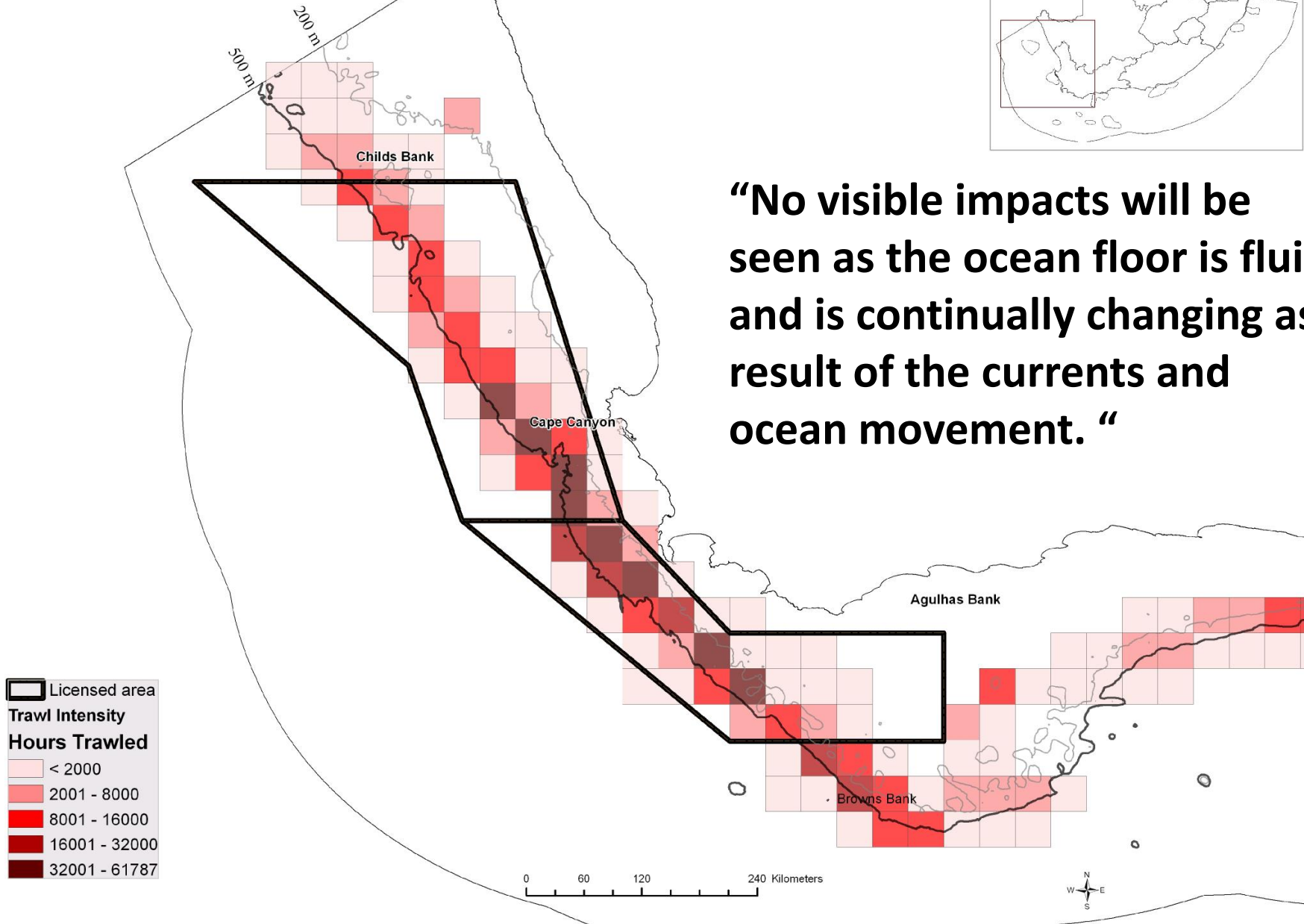


Overlap with Threatened and  
Unprotected ecosystems



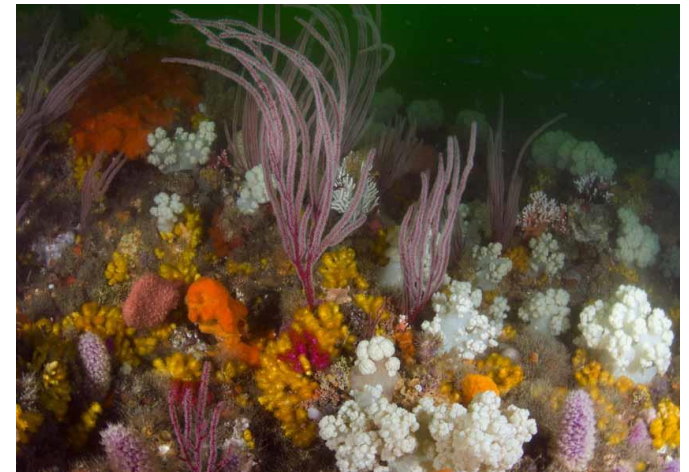
# GreenFlash phosphate prospecting application

Key challenges



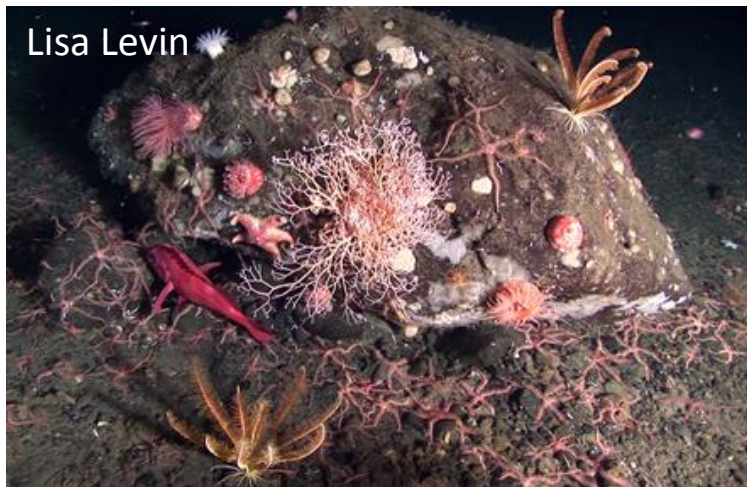
# Key challenges

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# Opportunities to address challenges

1. Increasing priority and funding for this research
2. Opportunities for co-operative & collaborative research
3. Biodiversity priority areas, Marine Spatial Planning & MPA networks
4. Mining and Biodiversity guidelines, Biodiversity GIS & EIA practitioner training
5. Targeted capacity building, awareness raising & opportunities for improved co-ordination







**SAIAB**

South African Institute  
for Aquatic Biodiversity



**SAEON**

South African Environmental  
Observation Network



**science  
& technology**

Department:  
Science and Technology  
**REPUBLIC OF SOUTH AFRICA**



**agriculture,  
forestry & fisheries**

Department:  
Agriculture, Forestry and Fisheries  
**REPUBLIC OF SOUTH AFRICA**

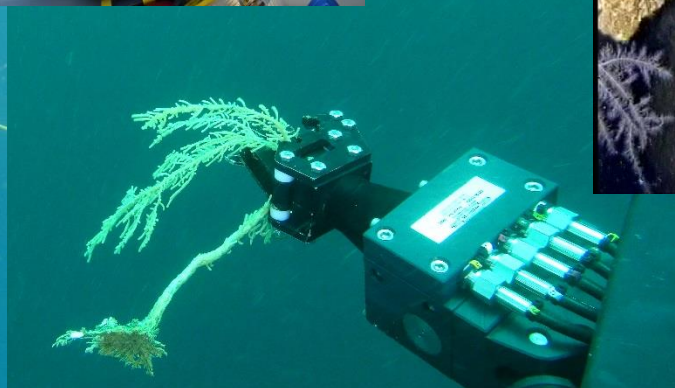
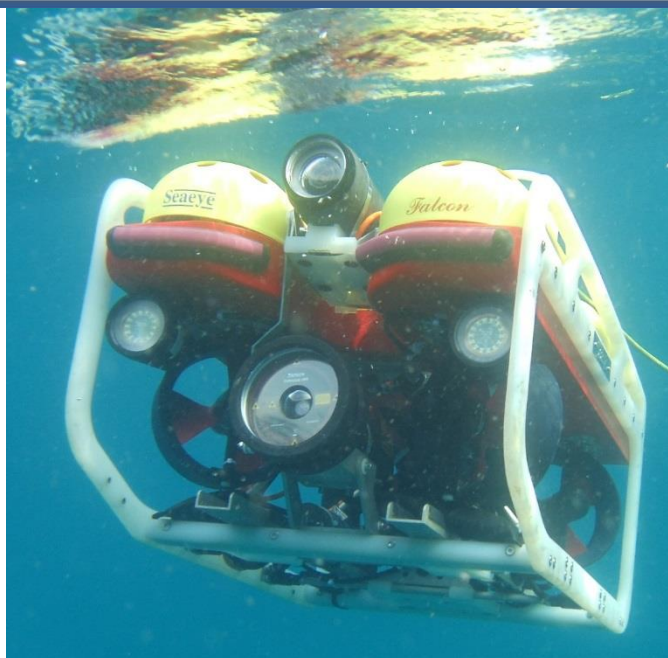


**environmental affairs**

Department:  
Environmental Affairs  
**REPUBLIC OF SOUTH AFRICA**



**South African  
NATIONAL PARKS**



**African Coelacanth  
Ecosystem Program**





# Mining and Biodiversity Guideline

Mainstreaming biodiversity into the mining sector



**Chamber of Mines CEO Bheki Sibiba with Minister of Water and Environmental Affairs Edna Molewa**

Environmental Affairs  
Mineral Resources

**SANBI**  
Biodiversity for Life  
South African National Biodiversity Institute

**CHAMBER OF MINES OF SOUTH AFRICA**  
*Putting South Africa First*

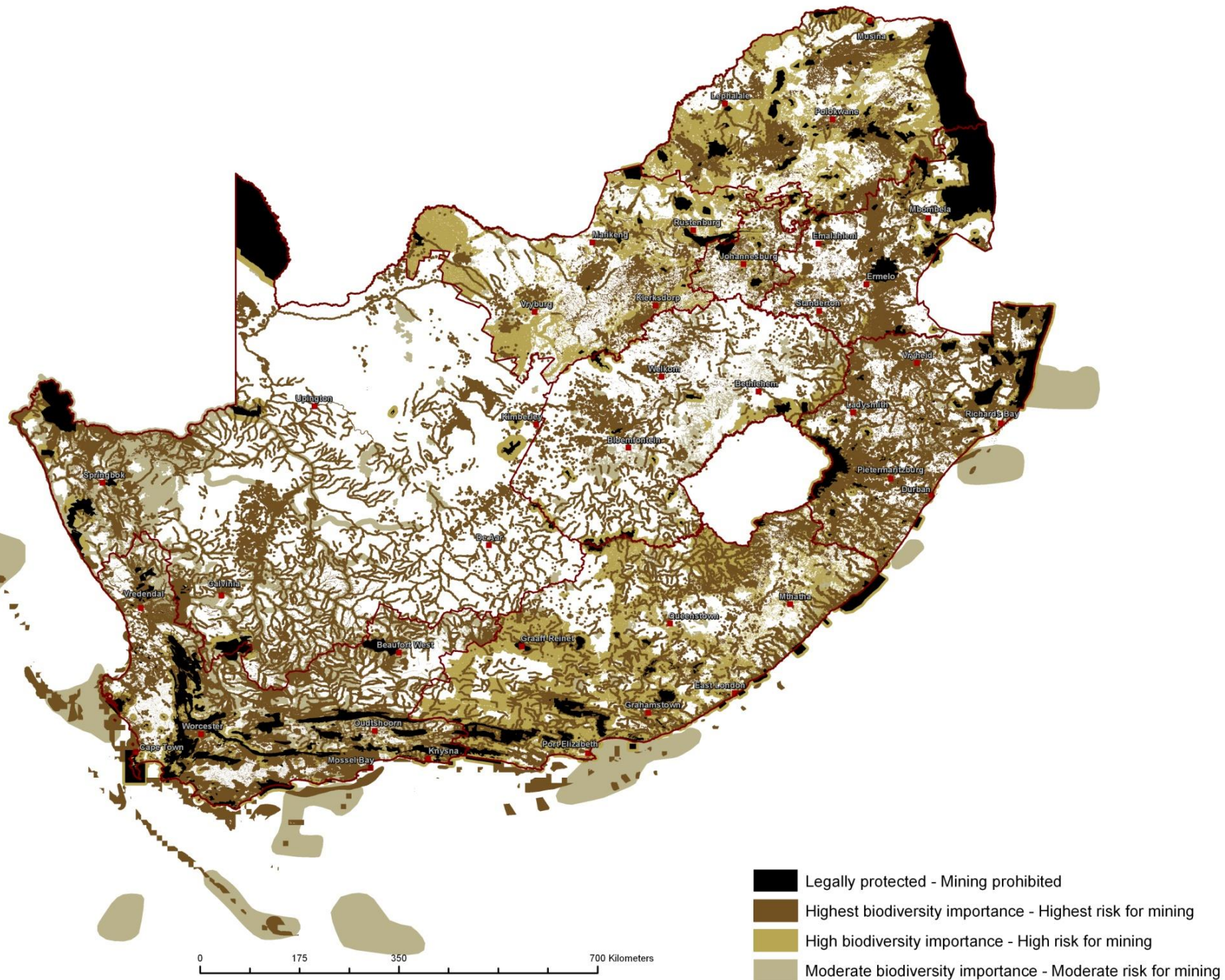
**SOUTH AFRICAN MINING AND BIODIVERSITY FORUM**

**grasslands**  
LIVING IN A WORKING LANDSCAPE

**UNDP**

**gef**

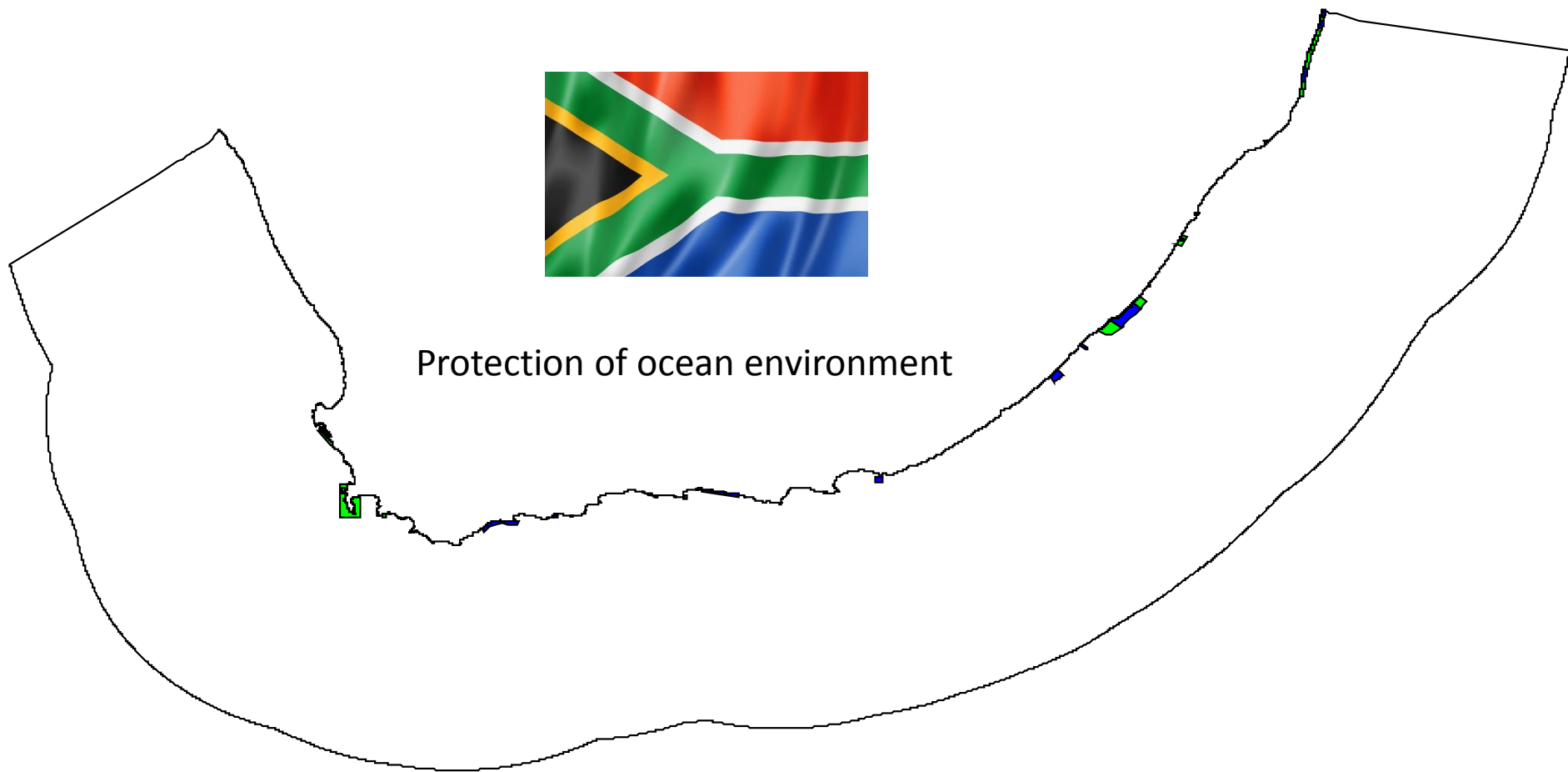








Protection of ocean environment

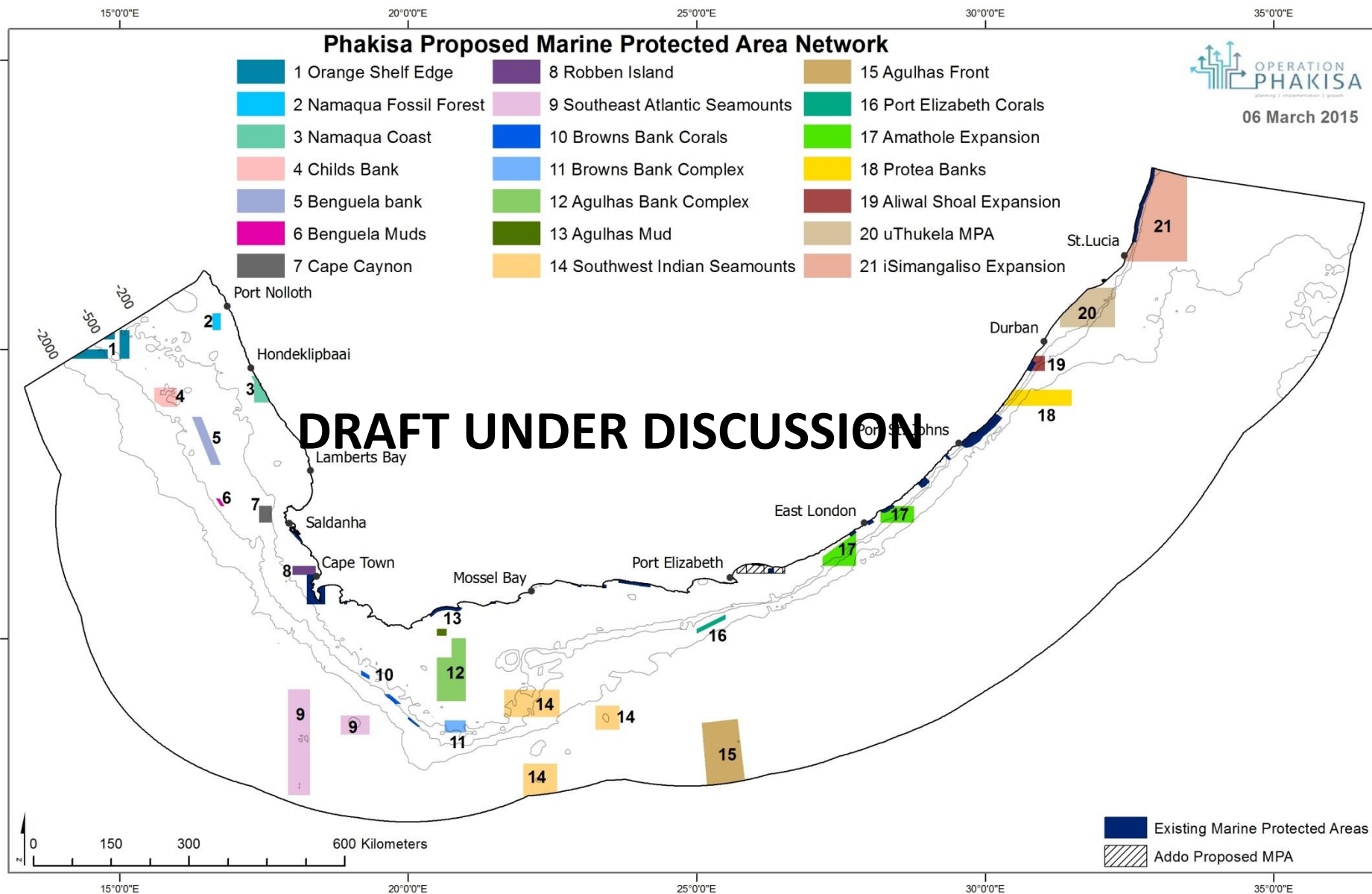


06 March 2015

## Phakisa Proposed Marine Protected Area Network

- |                         |                                |                           |
|-------------------------|--------------------------------|---------------------------|
| 1 Orange Shelf Edge     | 8 Robben Island                | 15 Agulhas Front          |
| 2 Namaqua Fossil Forest | 9 Southeast Atlantic Seamounts | 16 Port Elizabeth Corals  |
| 3 Namaqua Coast         | 10 Browns Bank Corals          | 17 Amathole Expansion     |
| 4 Childs Bank           | 11 Browns Bank Complex         | 18 Protea Banks           |
| 5 Benguela bank         | 12 Agulhas Bank Complex        | 19 Aliwal Shoal Expansion |
| 6 Benguela Muds         | 13 Agulhas Mud                 | 20 uThukela MPA           |
| 7 Cape Caynon           | 14 Southwest Indian Seamounts  | 21 iSimangaliso Expansion |

**DRAFT UNDER DISCUSSION**



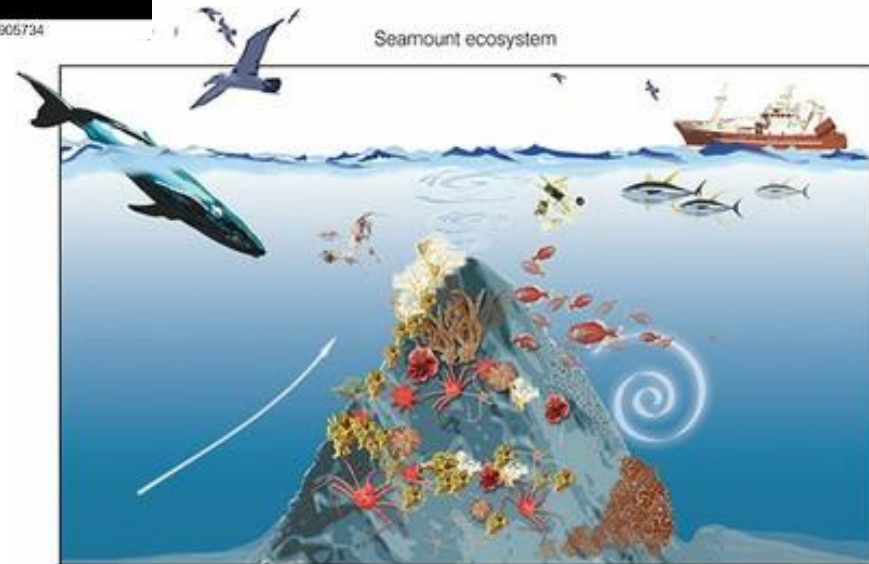
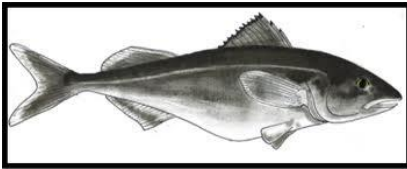
# A Need for Deep-Ocean Stewardship

## The Goal:

Balance the use of resources with the need to maintain the integrity of deep-ocean ecosystems for future generations.



© Can Stock Photo - csp12905734





# Deep-Ocean Stewardship Initiative



- Promote scientific research & observation
- Rectify Governance Gaps
- Ecosystem-based strategies
- Engage Stakeholders: Industry, Government, Scientists, Civil Society
- Unify Expertise: biology, economics, policy and law, technology, behavior
- Assist Developing Nations: Awareness, Technology, Training