

Research to inform Marine Spatial Planning in South Africa (with considerations for climate change)

Mandy Lombard
CMR - NMMU



What is marine spatial planning?



Marine Spatial Planning –

Proactive, comprehensive, science-based decisionmaking process that proactively considers:

- Where human uses can take place on, in, or near coastal and marine ecosystems; and
- What standards should apply to those uses with an overall goal of sustaining or enhancing ecosystem health and function.

Summary



Challenges in developing a marine spatial plan



Protecting Ecosystem Health



Incorporating Fishing Sectors



Addressing Cumulative Impacts



Taking Climate Change into Account

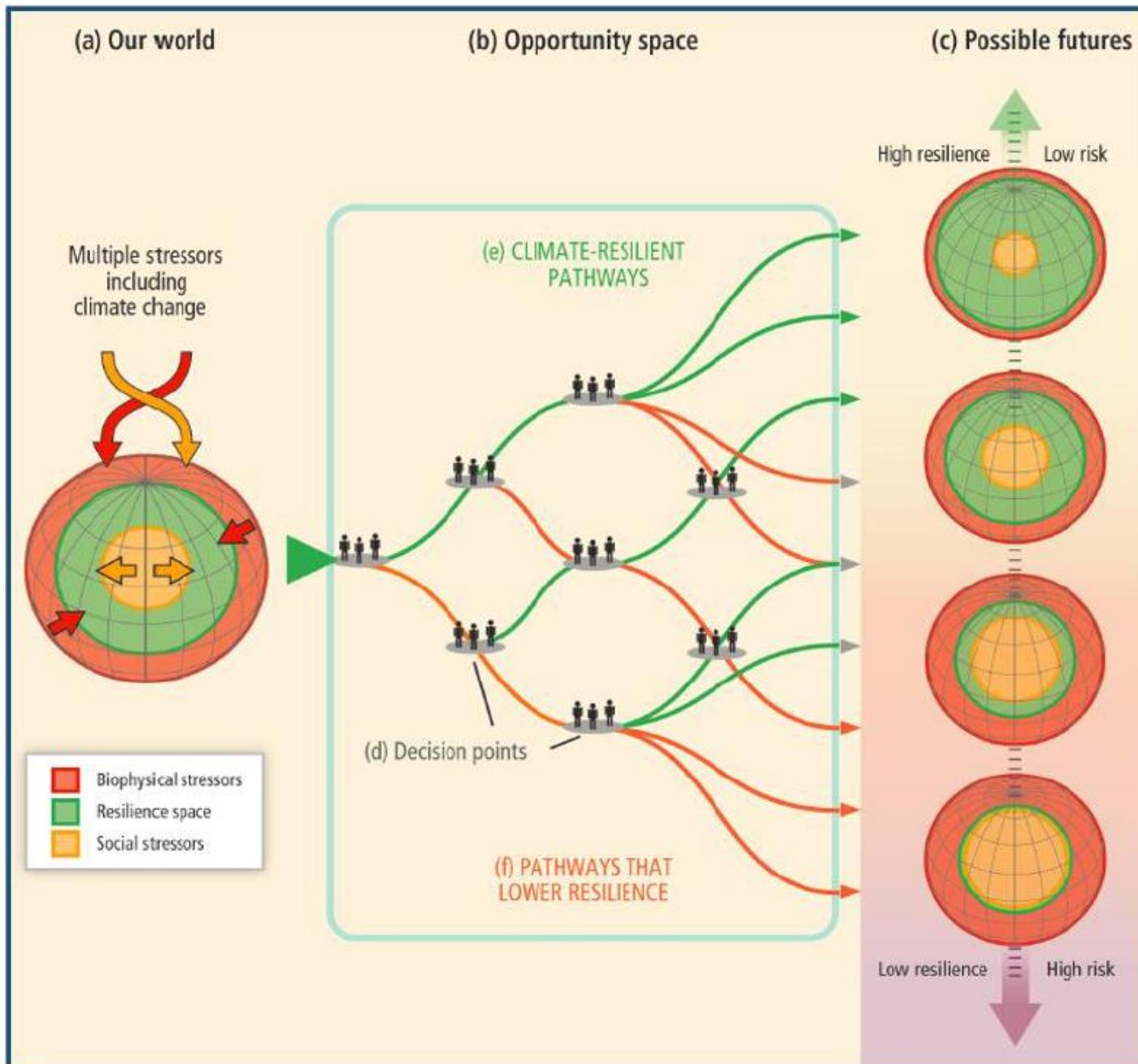


Making the Land-Sea Connection

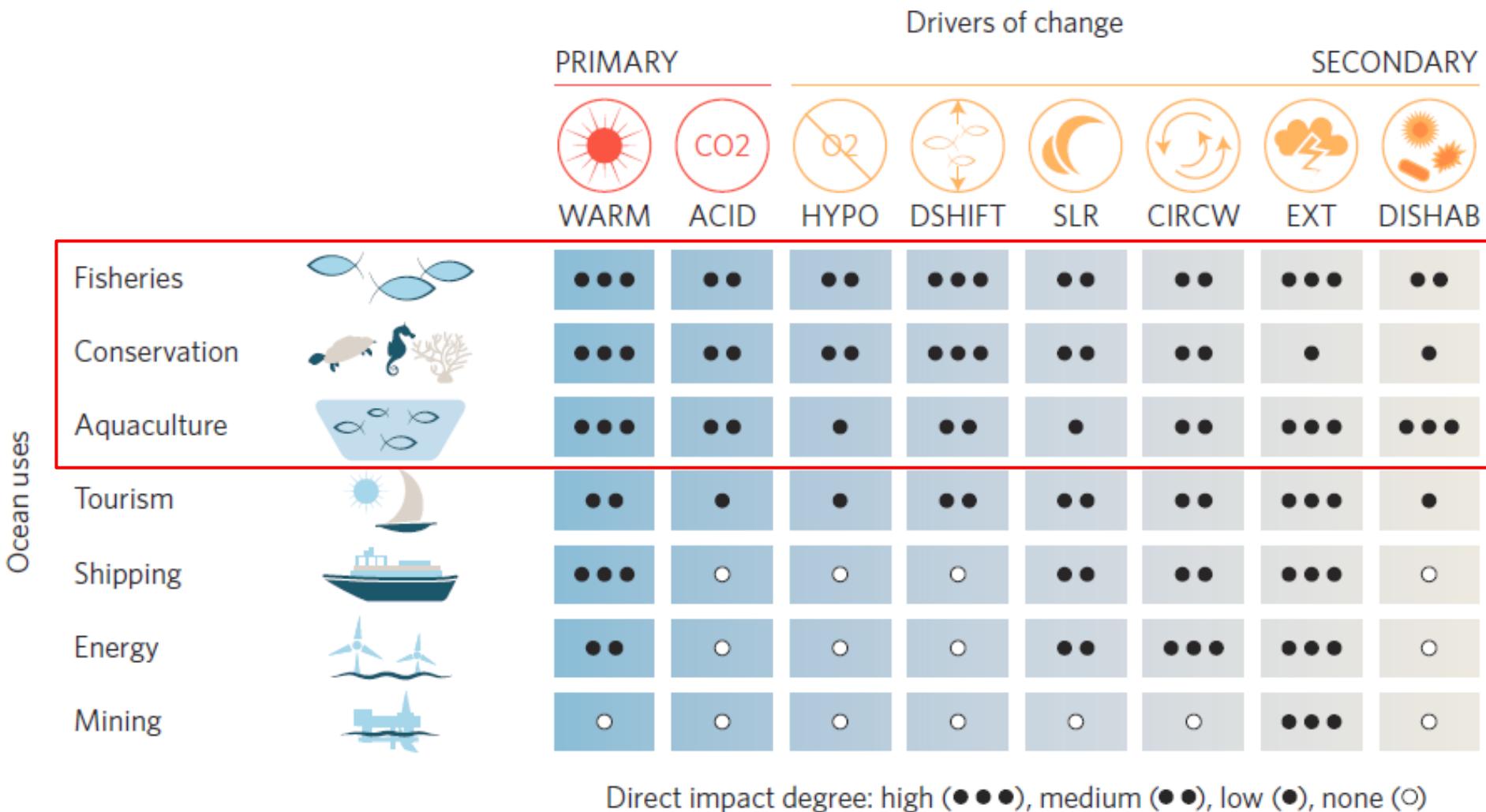


Using a Robust Structure & Process

Climate change strategy for Marine & Coastal Environment



Vulnerability of ocean uses to climate change

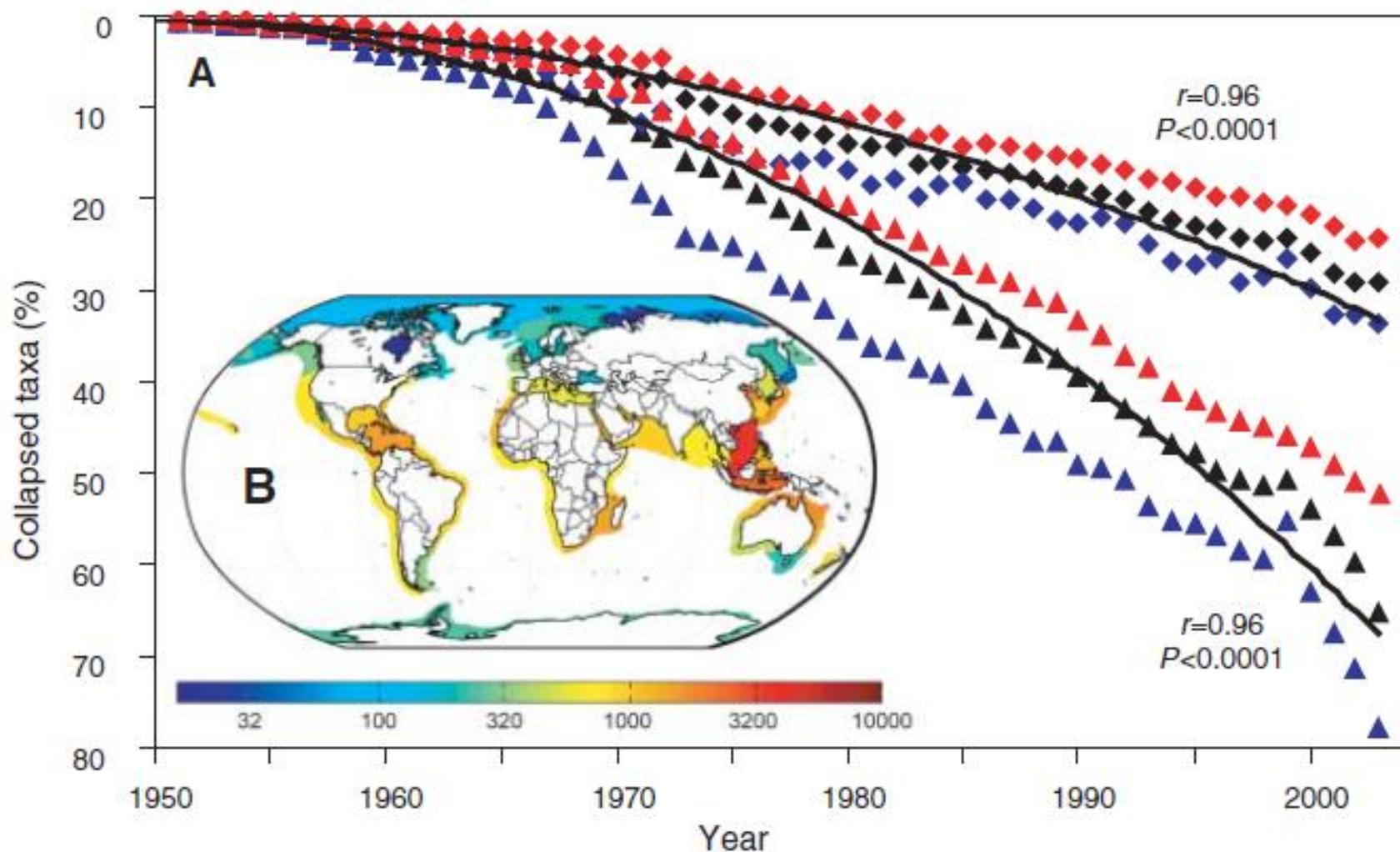


Competition for space and resources



How do we inform ecosystem-based MSP?

Impacts of Biodiversity Loss on Ocean Ecosystem Services



Global loss of species from LMEs

Worm et al. (2006)

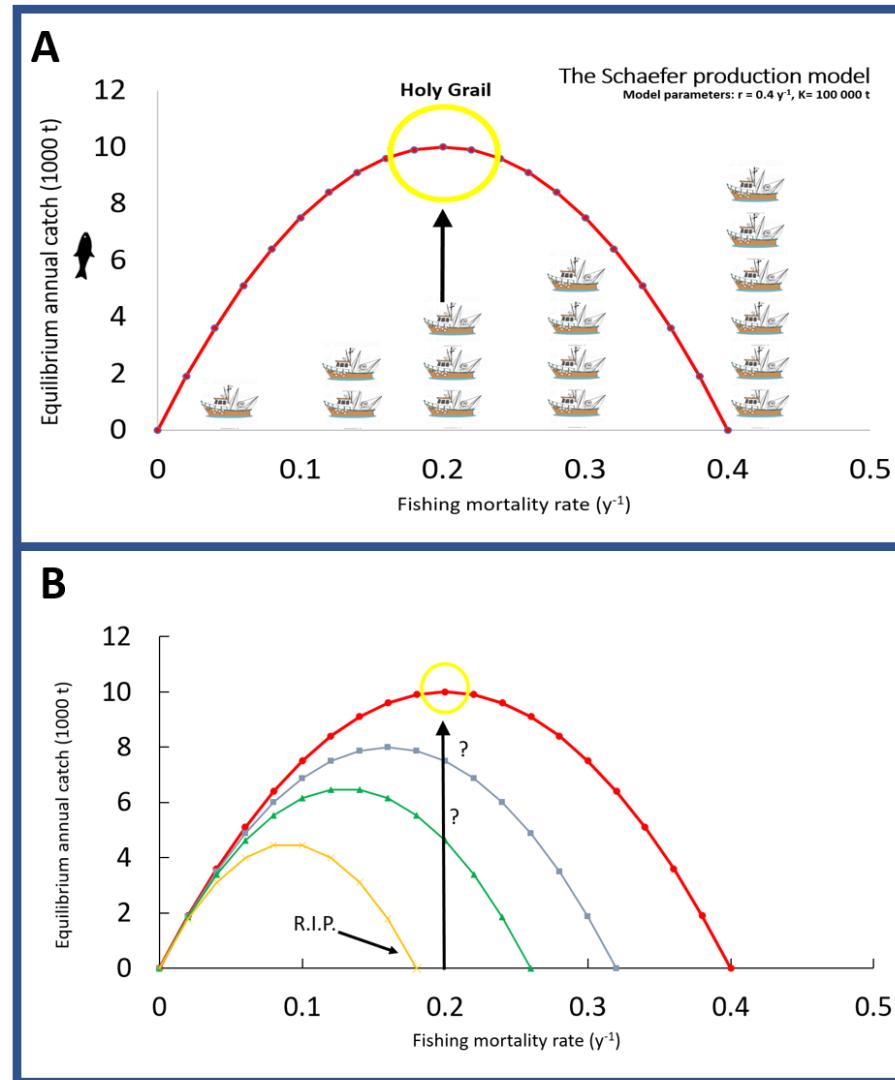
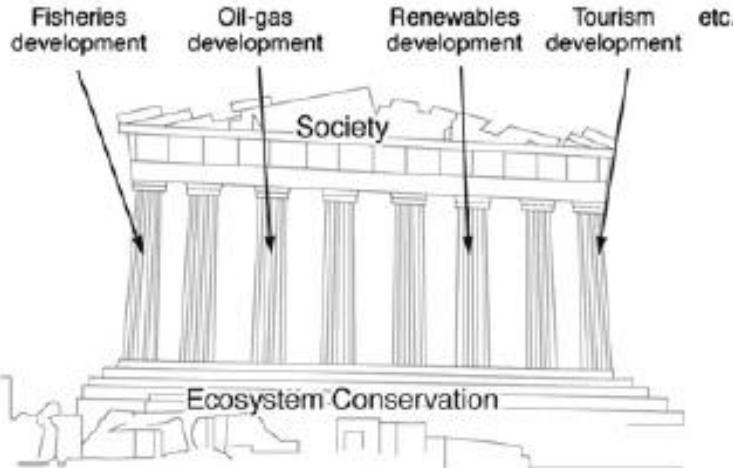


Figure 1: In a mixed species fishery, when the fishing effort is at maximum sustainable yield (MSY) - “the Holy Grail” as shown in box A above - for the most productive and fast-growing fish species (red line), there is a high risk that species that are less fecund or slower-growing (yellow line) will be over-fished (yellow). Adapted from Prof Colin Attwood’s presentation given at the SADSTIA- hosted debate on “MPAs – do we need them” in August last year.



Our foundation

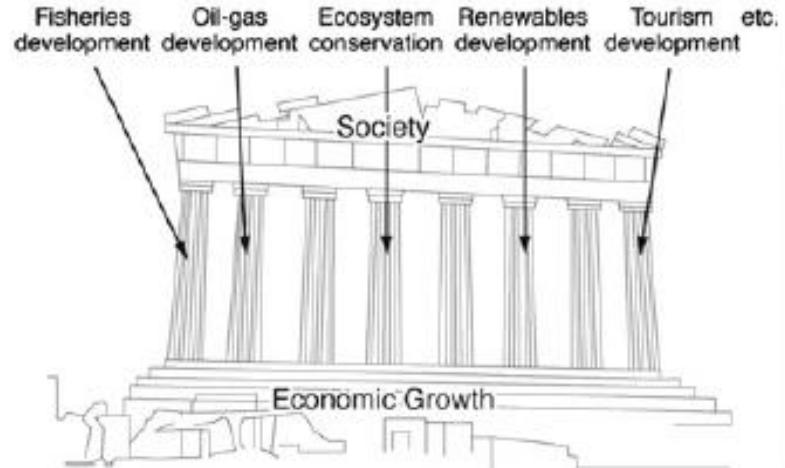
Ecosystem based MSP - hard sustainability



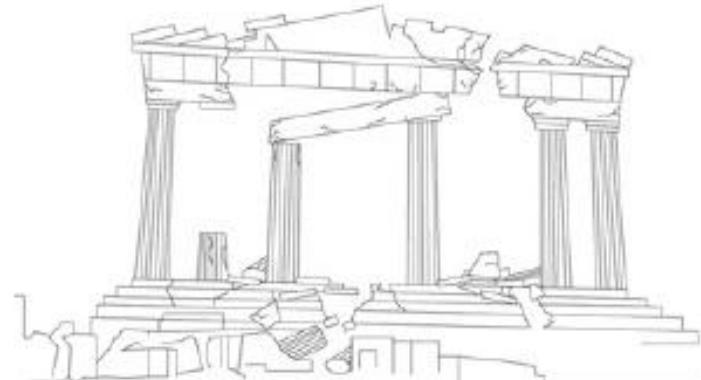
If ecosystems collapse.....

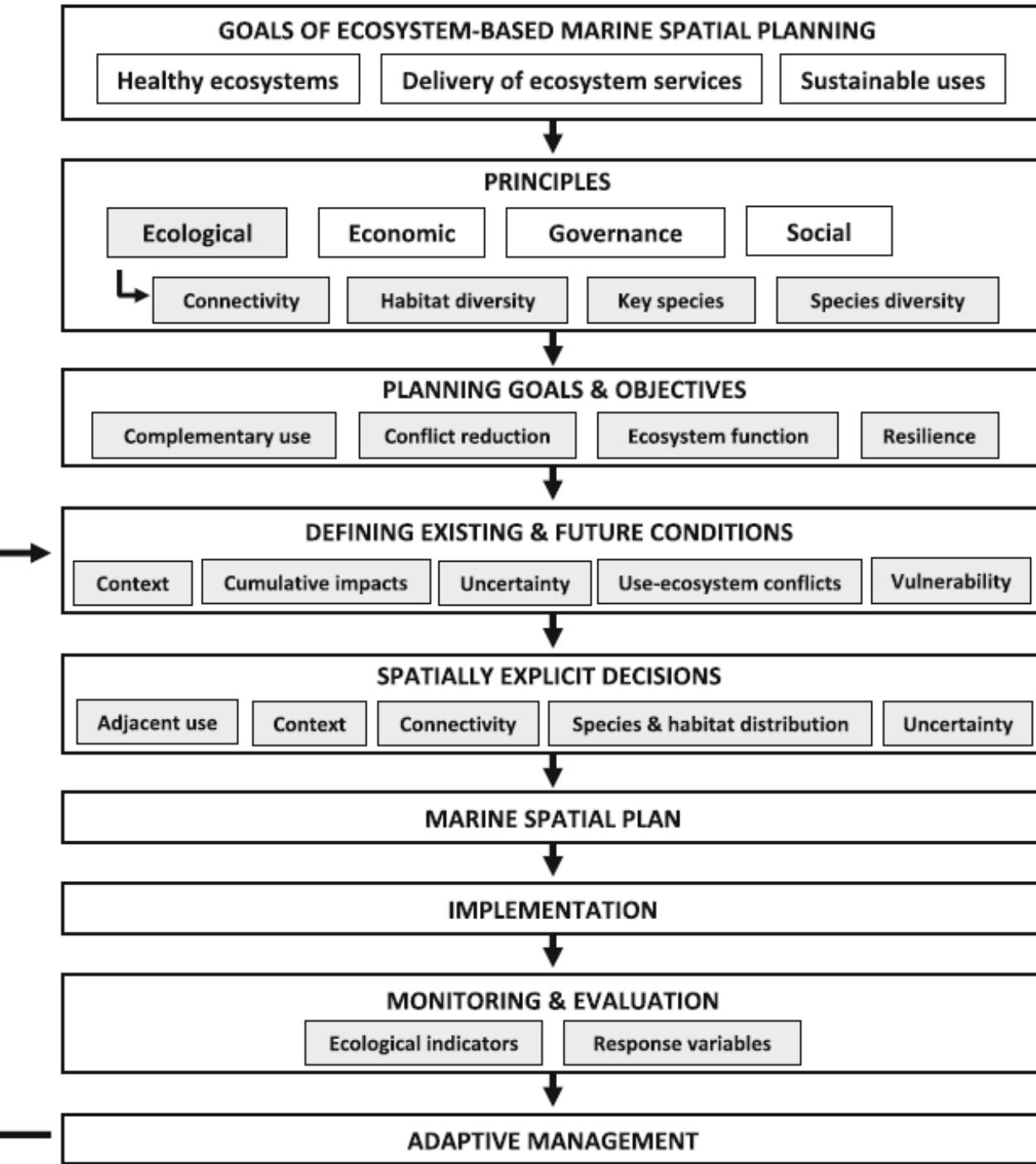


Integrated use MSP - soft sustainability



If economic sectors and growth collapse.....

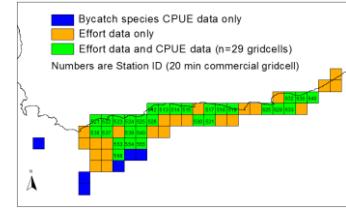
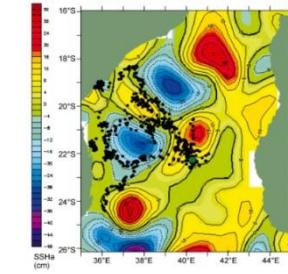
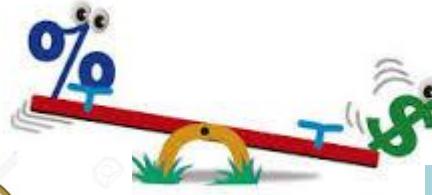
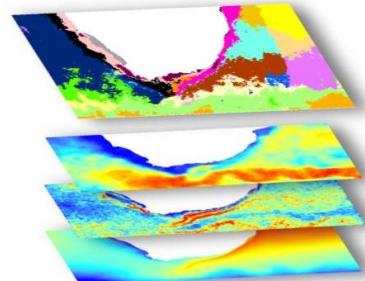
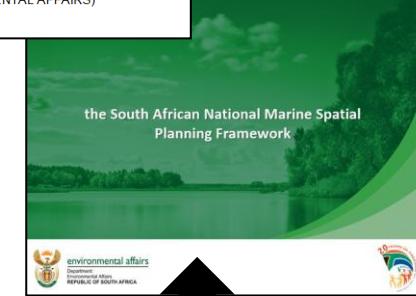
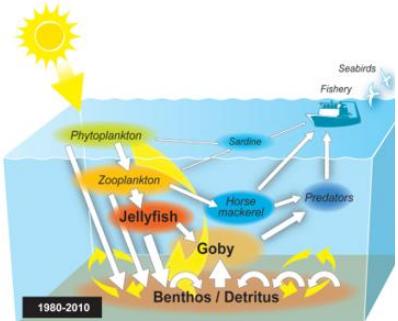
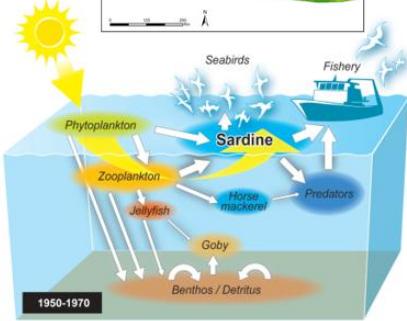
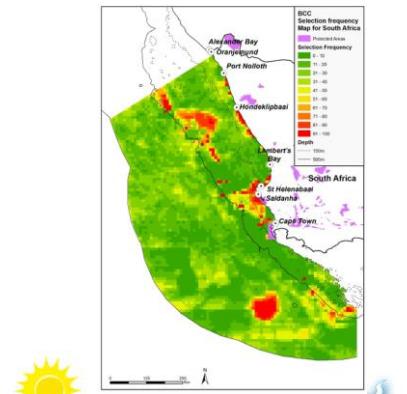






Our objectives

Trans-disciplinary research



Conceptual Contributions

OPEN  ACCESS Freely available online



Accommodating Dynamic Oceanographic Processes and Pelagic Biodiversity in Marine Conservation Planning

Hedley S. Grantham^{1*}, Edward T. Game², Amanda T. Lombard³, Alistair J. Hobday⁴, Anthony J. Richardson^{1,5,6}, Lynnath E. Beckley⁷, Robert L. Pressey^{1*}, Jenny A. Huggett^{8,9}, Janet C. Coetzee⁸, Carl D. van der Lingen^{8,9}, Samantha L. Petersen¹⁰, Dagmar Merkle⁸, Hugh P. Possingham¹

Antarctic Science 19 (1), 39–54 (2007) © Antarctic Science Ltd Printed in the UK

DOI: 10.1017/S0954102007000077

Conserving pattern and process in the Southern Ocean: designing a Marine Protected Area for the Prince Edward Islands

A.T. LOMBARD^{1*}, B. REYERS², L.Y. SCHONEGEVEL², J. COOPER³, L.B. SMITH-ADAO², D.C. NEL⁴, P.W. FRONEMAN⁵, I.J. ANSORGE⁶, M.N. BESTER⁷, C.A. TOSH⁷, T. STRAUSS⁸, T. AKKERS⁸, O. GON¹⁰, R.W. LESLIE⁹ and S.L. CHOWN¹¹

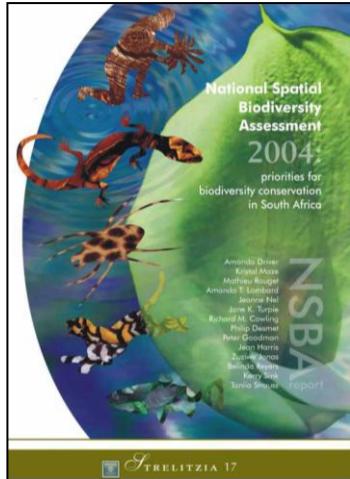
Opinion



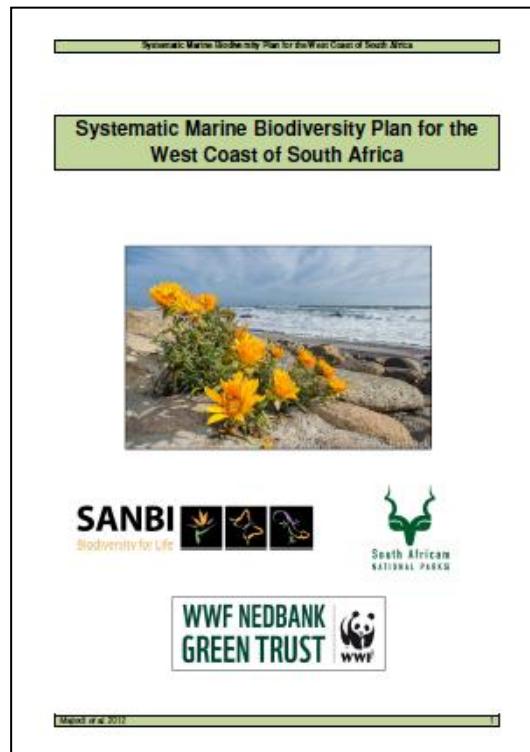
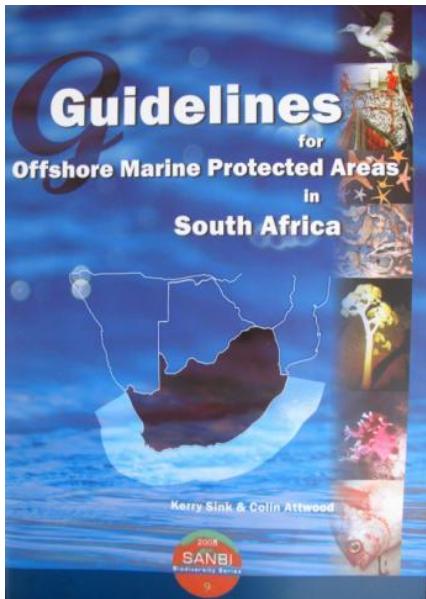
Pelagic protected areas: the missing dimension in ocean conservation

Edward T. Game^{1,2}, Hedley S. Grantham², Alistair J. Hobday³, Robert L. Pressey⁴, Amanda T. Lombard⁵, Lynnath E. Beckley⁶, Kristina Gjerde⁷, Rodrigo Bustamante⁸, Hugh P. Possingham² and Anthony J. Richardson^{2,8,9}

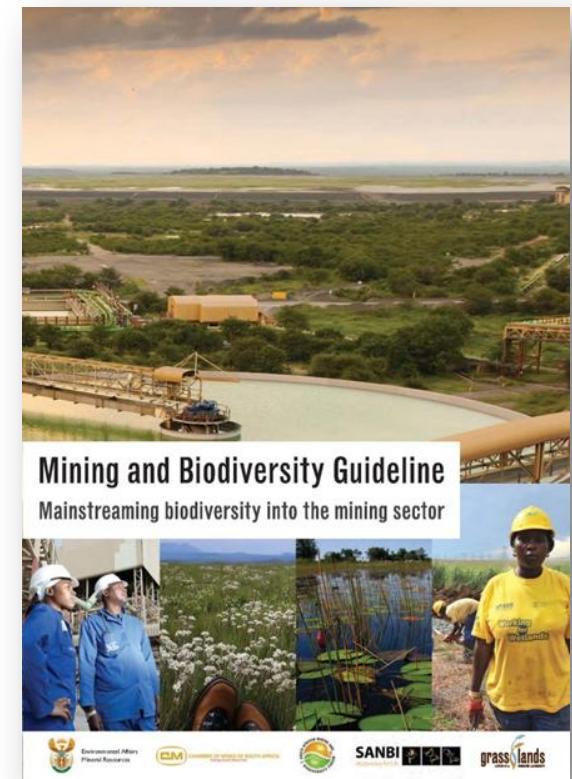
Spatial Assessment & Systematic Conservation Plans 2001-2016 (Kerry Sink)



- 2 National Assessments
- 1 National Offshore Plan
- 4 Fine-scale Plans



- 4 Sector Specific Products
- 1 Habitat Specific Plan (Beaches)
- 1 Regional Plan
- Ecologically and Biologically Significant Areas



Mining and Biodiversity Guideline
Mainstreaming biodiversity into the mining sector



Our post docs



Theoni Photopoulou (Postdoctoral Research Fellow)

Research: Quantifying the impact of environmental change on the movement ecology of marine top predators with applications to marine spatial planning

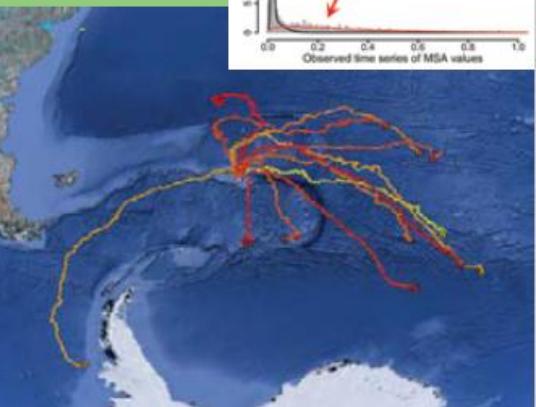
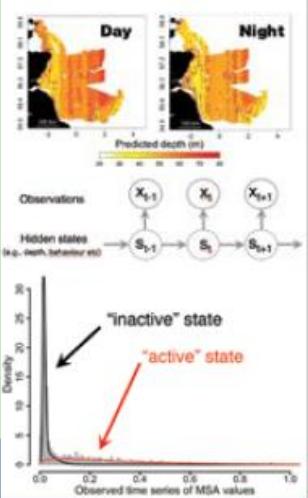
Res Altwegg (UCT).

Collaborators:

Dr Alison Kock (Shark Spotters, South Africa); Dr Pierre Pistorius (NMMU); Dr Ian Durbach (UCT); Dr David Borchers (University of St Andrews, Scotland).

Why I am Interested in Marine research:

My special interest in the ocean and particularly its widely ranging top predators, stems from the ocean's vastness, its complexity and all of the secrets it still holds. Animals like albatross, sharks, whales and elephant seals manage to navigate and sometimes still thrive in an environment we exploit heavily but do not fully understand. I am interested both in blue sky science, because I believe it inspires people and embodies our natural curiosity, as well as producing results that can have real life impacts on the conservation and management of marine ecosystems.



Gwenith Penry (Post Doctoral Researcher)

Title: Abundance, Spatio-temporal distribution patterns and genetic identify of Bryde's whales for incorporation into Marine Spatial Planning in South Africa.

Collaborators:

Dr Peter Best, Mammal Research Institute, University of Pretoria (not sure how to deal with this because Peter died last year, but some of the data I am using still belongs to MRI/UP and Peter was my supervisor).

Prof Philip Hammond, Sea Mammal Research Unit (SMRU), St Andrews University; Dr Vic Cockcroft, Centre for Dolphin Studies/ NMMU.

Why I am interested in Marine research:

As one of the largest resident predators of the Southern African coastal waters, the role of the inshore Bryde's whale in the marine ecosystem is poorly understood. The species has long been overlooked despite its year-round occurrence in our inshore waters. I want my work to raise the profile of the Bryde's whale as an important top predator in the coastal environment and to understand their spatial and temporal overlap with anthropogenic activities that could threaten their survival.





Our students

Rachael Chasakara (LLM candidate)

Research: Legal aspects of Marine Spatial Planning

- Constitutional Law Aspects
- Environmental Law Aspects
- Planning Law Aspects
- The recently published Marine Spatial Plan Bill.

Collaborators:

Prof. P.H.G. Vrancken – Incumbent of the Southern African research chair in law of the sea and development in Africa; Prof. M Lombard – Research chair in Marine Spatial Planning at NMMU.

Why I am interested in Public Law of the Sea:

Whenever I looked at the sea, I had a lot of questions which I did not know the answers to. It is these questions that captured my interest in the public law of the sea. Some of these questions are:

- Who looks after our seas? Does everyone manage our seas? Because to me it seemed to be only over used and polluted.
- Who is responsible for managing competing uses and protecting natural resources in the seas?



THE LAW OF THE SEA



Zoleka Filander (PhD)

Title: Identifying and mapping offshore sensitive ecosystems.

Supervisors:

Dr Amanda Lombard (NMMU); Dr Kerryn Sink (SANBI); Dr Lara Atkinson (SAEON); Dr Toufieck Samaal (DEA).

Why I am interested in Marine research:

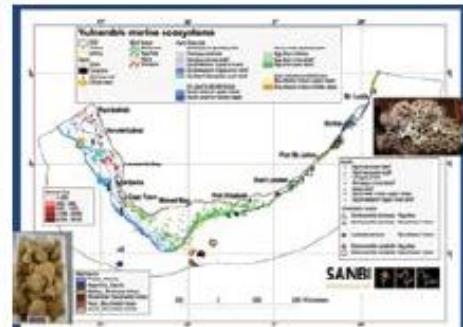
My interest in marine spatial planning and conservation planning was ignited by my interaction with the community of Dwessa-Cweba nature reserve. I first encountered this incredibly beautiful reserve when I was doing my Honors degree in Marine biology, for which Dwessa was my study area. I would occasionally meet members of the local community of all different age groups. One topic always came up when they discovered I was an upcoming scientist, and this was their perception of the demarcated MPA (what this meant for them and their livelihoods). There seemed to be a common message, along the lines of "we do not understand why the government was taking away our food". This really hit home, as a person who comes from a disadvantaged background, so I wanted to be their voice in such consultations. I soon learnt that this process is not as straight forward as anticipated. So, in a nutshell, I am particularly interested in this field because of its complexity and not just the idea that I could be in a position of being the voice for communities like Dwessa, but also that I will help them understand the reason behind MPA's.



Leadsman & Chaka
in northern KZN



Potential sensitive systems mapped to date
(Sink & Samaal, In press)



Unidentified cold-water coral species



Dead reef-building coral specimens collected from a dredge sample off the Cape Canyon head (2016)



Kaylee Smit
(PhD candidate)

Research: Assessment of ecosystem condition of consolidated and unconsolidated benthic habitats on the east coast of South Africa.

Collaborators:

Supervisor: Prof. Amanda Lombard - Nelson Mandela Metropolitan University (NMMU);
Co-Supervisor: Dr. Anthony Bernard - South African Institute for Aquatic Biodiversity (SAIAB);
Co-Supervisor: Dr. Kerry Sink - South African National Biodiversity Institute (SANBI).

Why I am interested In Marine research:

I'll take a bad sea over an office day always, I love being outdoors, in nature and on the ocean doing research that I am passionate about, and contributing to marine conservation in South Africa. I have grown up on the coast, and really appreciate all that it has to offer, from years of snorkelling, SCUBA diving, learning to surf and later collecting data on various fieldtrips. I've realised the impact that we are having on our environment, and I want to do everything that I can to understand this and prevent it, ensuring the sustainability of our marine ecosystems.



Jodie Reed
(PhD candidate)

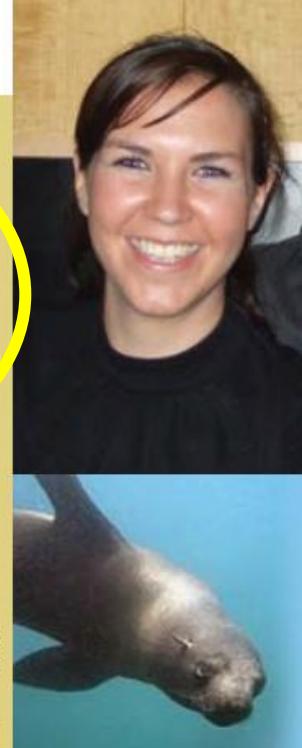
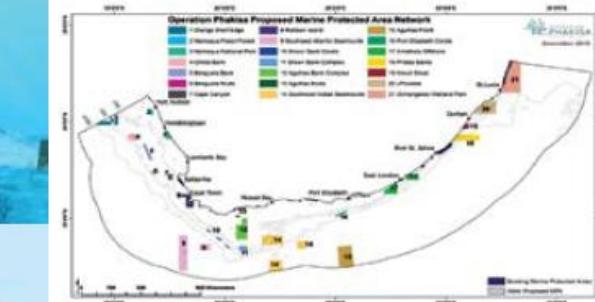
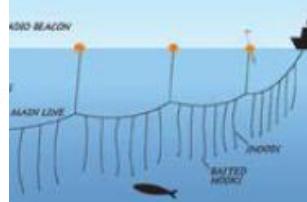
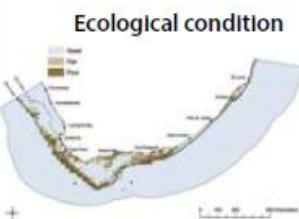
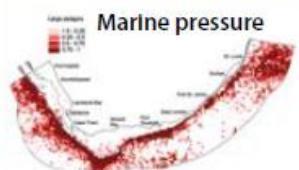
Research: Analysis of legal instruments to support spatial management of fisheries for ecosystem-based management: Case studies of specific industries.

Collaborators:

Dr Kenny Zink (SANBI); Prof. James Blignaut (University of Pretoria); Dr Sven Krüger (DAPP).

Why I am interested in Marine research:

I have been interested in marine research since my undergrad days where a part-time job as a research assistant had me hopping along our rocky shores. Since then my focus has moved towards marine conservation and the sustainable use of our marine resources. With the increasing demand on these resources, I see Marine Spatial Planning as an invaluable tool to reduce conflict in the marine environment as ecological, economic and social objectives are taken into consideration while ensuring that ecosystems remain healthy and biodiversity is conserved.



Nokuthula Daweti (MSc candidate)

Title: Using Baited Remote Underwater Video (BRUV) systems to assess deep water benthic fish communities of the KwaZulu-Natal (KZN) shelf to inform Marine Spatial Planning.

Project Collaborators:

Mandy Lombard, Nelson Mandela Metropolitan University, Port Elizabeth; Henning Winkler, South African Biodiversity Institute, Kirstenbosch, Cape Town; Bruce Mann, Oceanographic Research Institute, 1 King Shaka Avenue, Point, Durban.

Why I am interested in Marine research:

The marine environment became interesting to me at an early age. That was when I first discovered that planet earth was more ocean than land. I then developed an interest in different fish species that occur in the ocean – their biology and diversity. It was only during the second year of my B.Sc in Zoology that I developed interest in ocean management. Having completed a BSc in marine biology and learning about the conflicting interests for use of ocean space and biodiversity conservation needs, I am now even more passionate about marine biodiversity conservation.

I also learned that for management purposes, marine spatial planning and ecosystem based management are feasible options to minimize the conflicts. This facilitates equitable benefit sharing of ecosystem services the ocean provides without putting biodiversity at risk. Being involved in marine spatial planning work to me is very exciting; especially in recent times when we are seeing an expansion on the scale of ocean exploration globally.

Phakisa proposed Reef MPA site



Hannah Raven (MSc candidate)

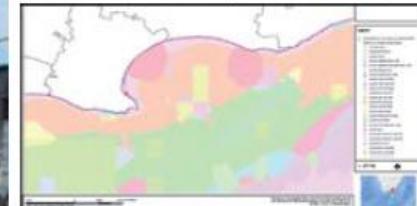
Research: Habitat characterisation and epibenthic biodiversity in Algoa Bay.

Collaborators:

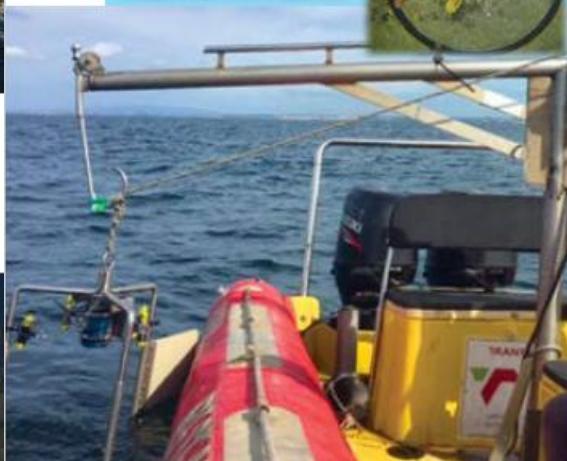
Dr Lara Atkinson (SAEON), Dr Charles von der Meden (SAEON).

Why I am interested in Marine research:

I have been passionate about our oceans since a young age growing up in Cape Town and want to assist management in providing the best available knowledge of benthic ecology to utilise marine resources sustainably while conserving vital biodiversity.



Exploring benthic diversity using underwater jump camera in order to characterize benthic habitats in Algoa Bay
Mapping of spatial patterns of biodiversity within Algoa Bay to assess implications for long term monitoring



Tsamaelo Malebu
(PhD candidate)

Research: Identifying and mapping strategic fisheries resource areas to support Marine Spatial Planning.

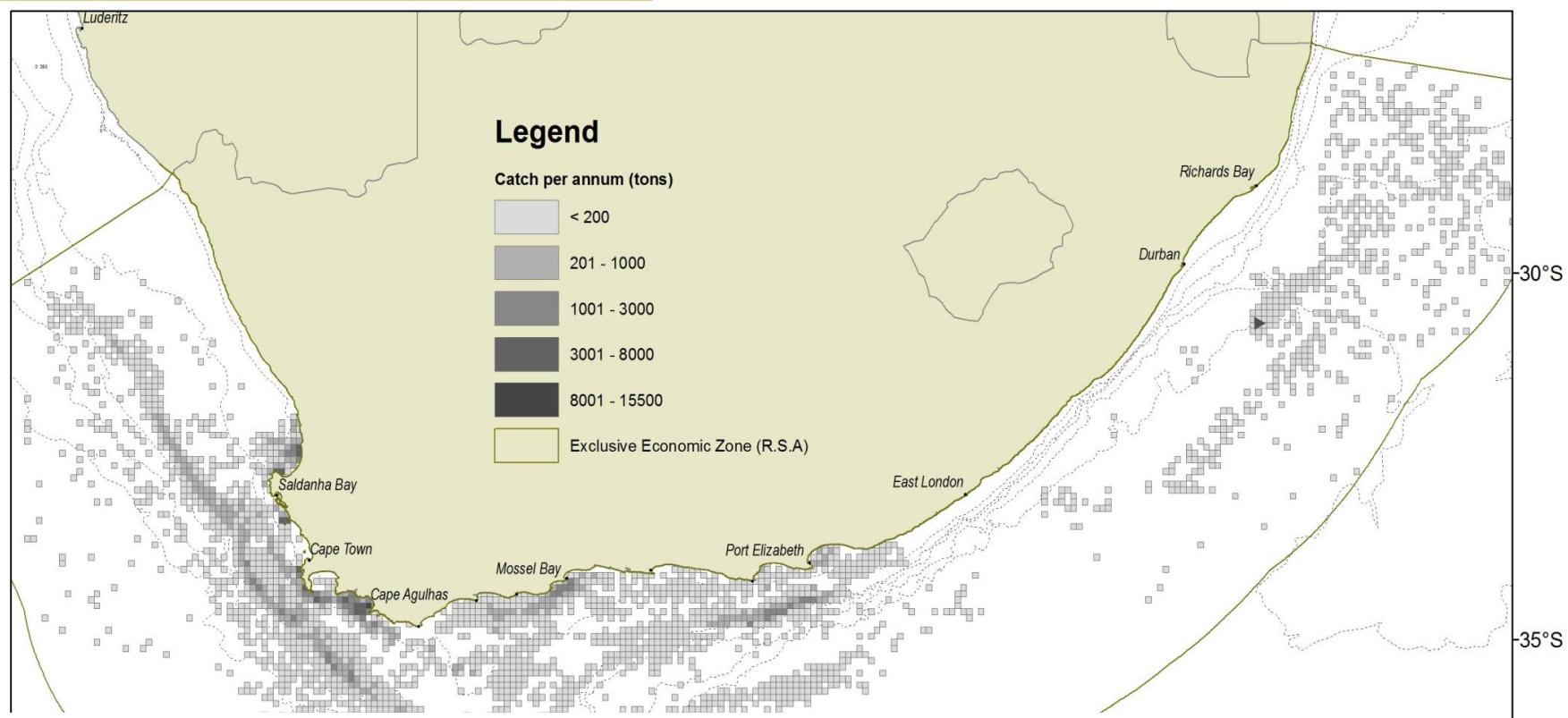
Collaborators:

Dr Kerry Sirek, South African National Biodiversity Institute (SANBI); Dr Carl van der Lingen, Department of Agriculture, Forestry and Fisheries (DAFF).



Strategic Fisheries Resource Areas

Average cumulative catch per annum



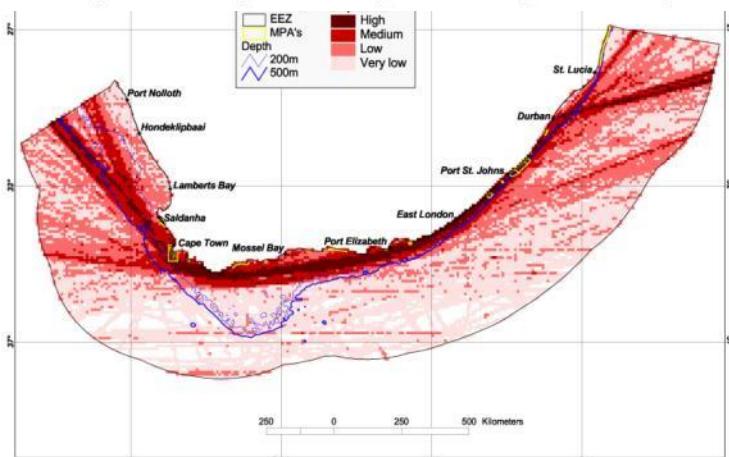
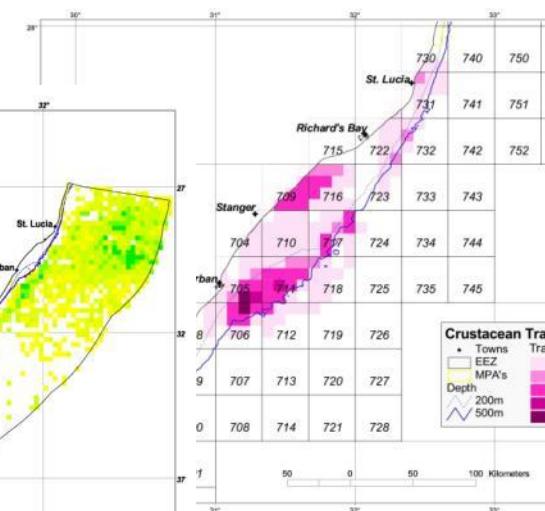
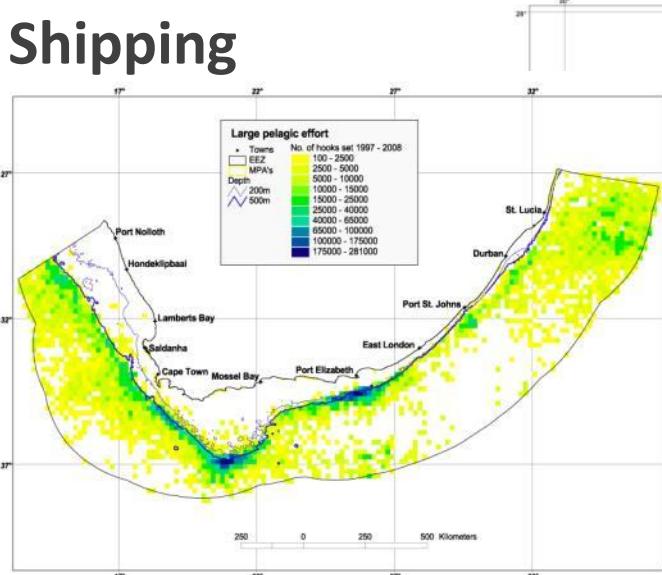
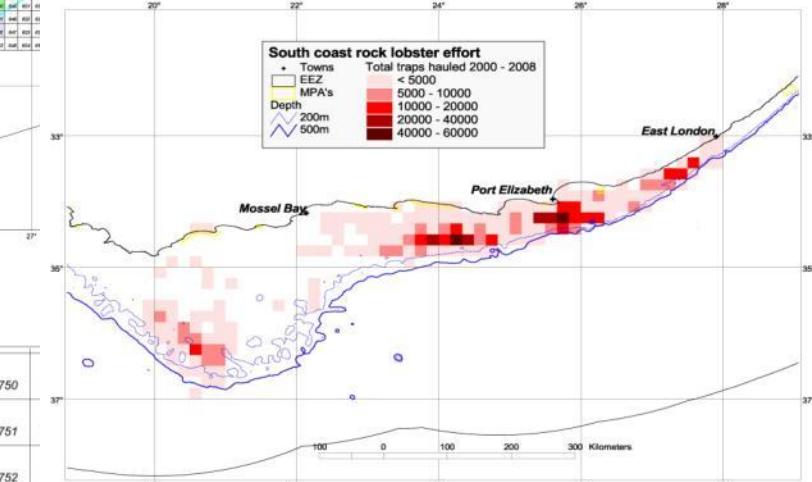
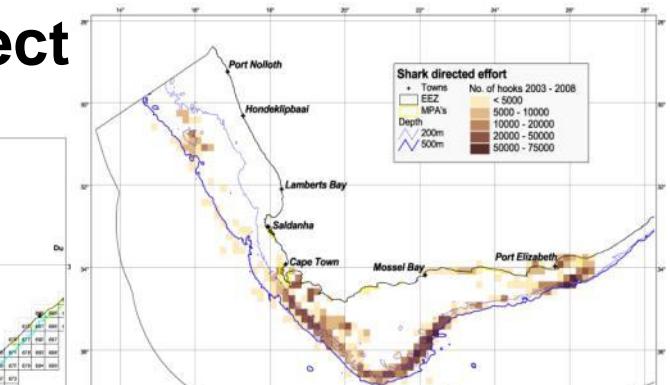
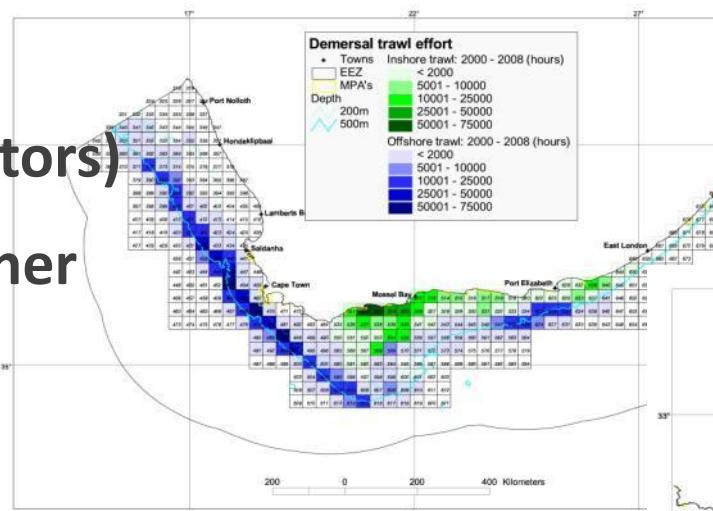
Includes: Demersal trawl, demersal longline, pelagic longline, tuna pole, small pelagics, SC rock lobster

Sarah Wilkinson

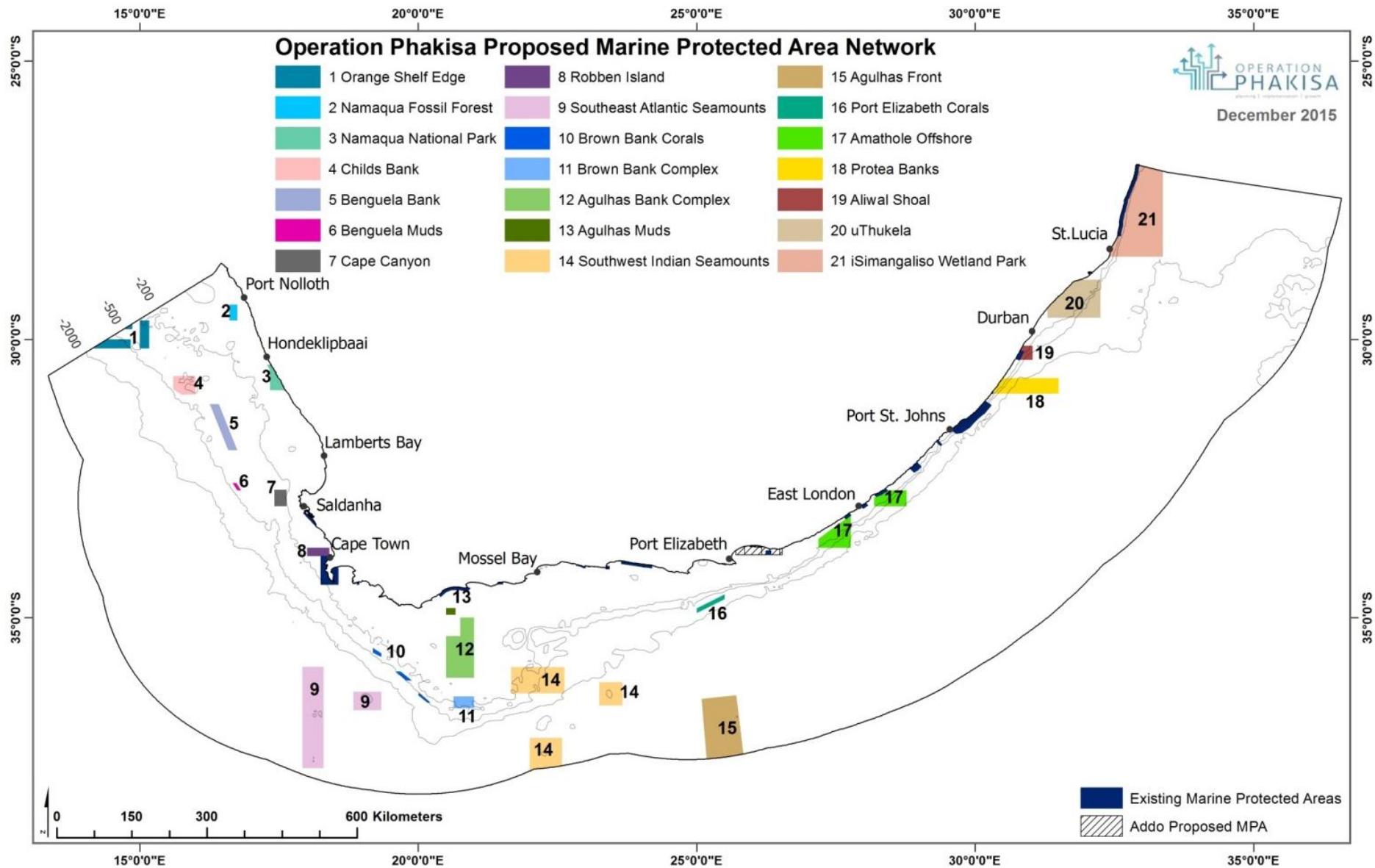
Offshore Marine Protected Area Project

Sink et al. 2010

- Fishing (18 sectors)
- Diamond & other mining
- Petroleum
- Shark control
- Shipping

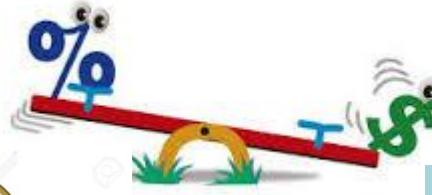
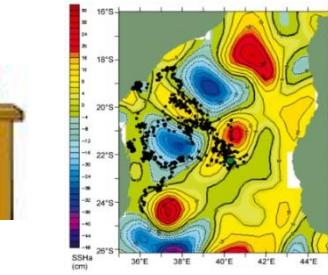
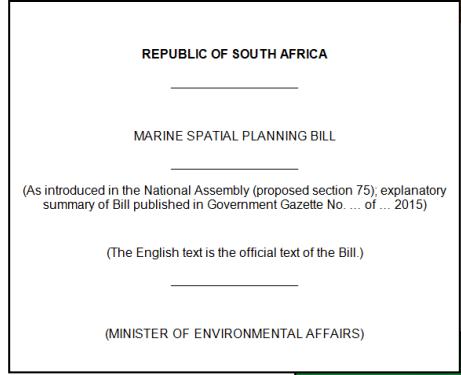
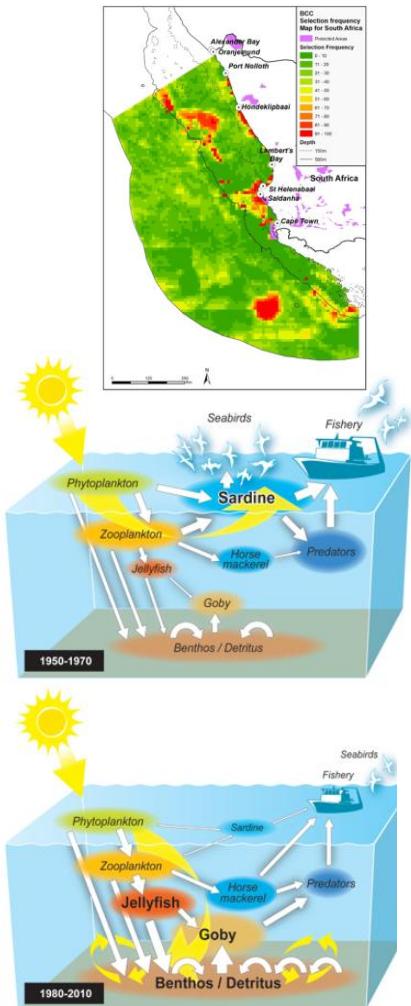


21 proposed MPAs

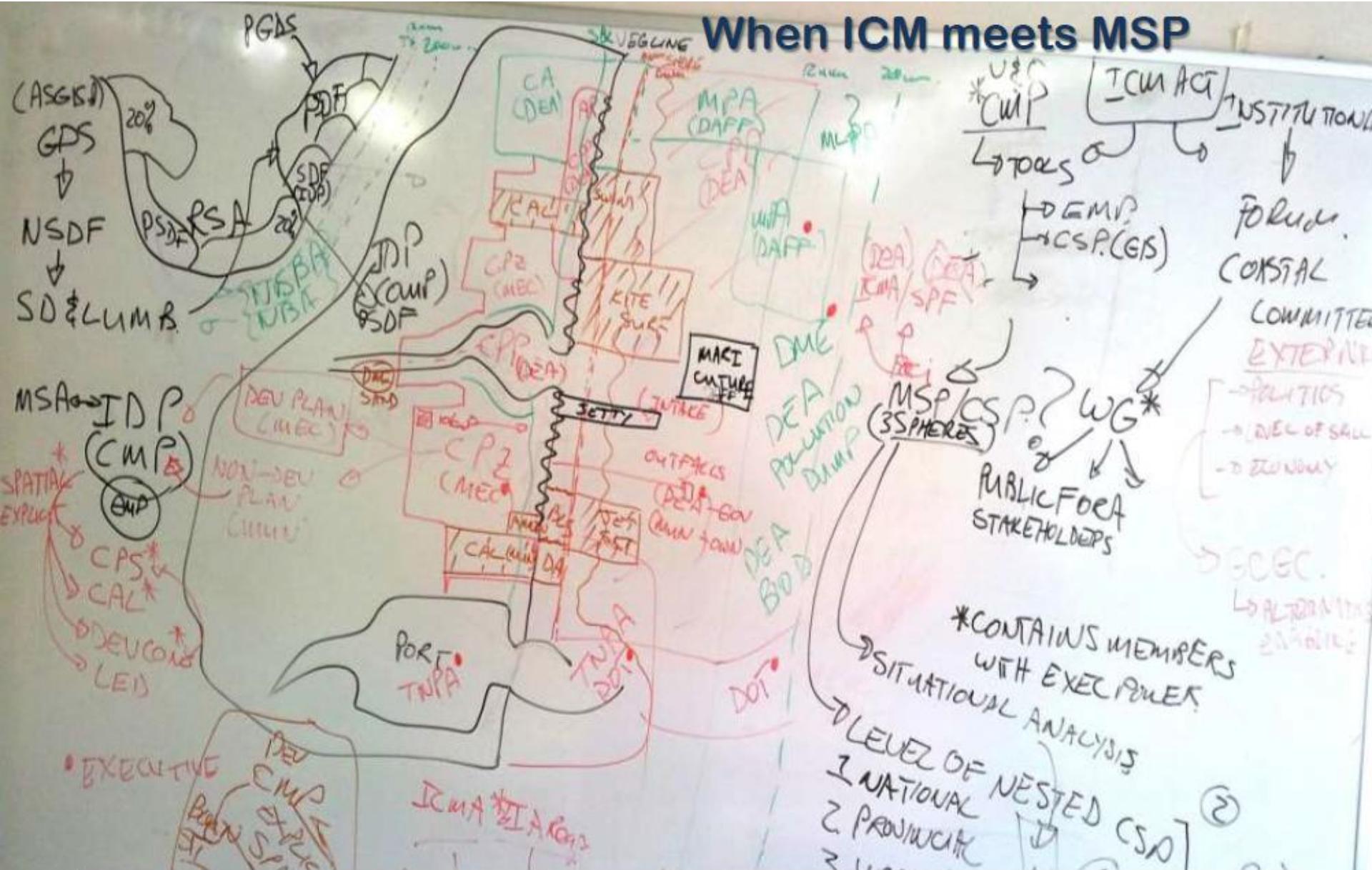


Research priorities

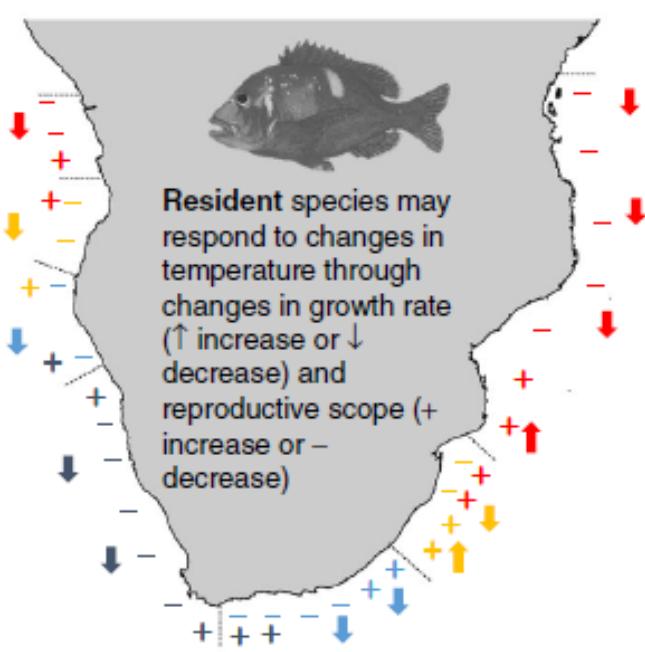
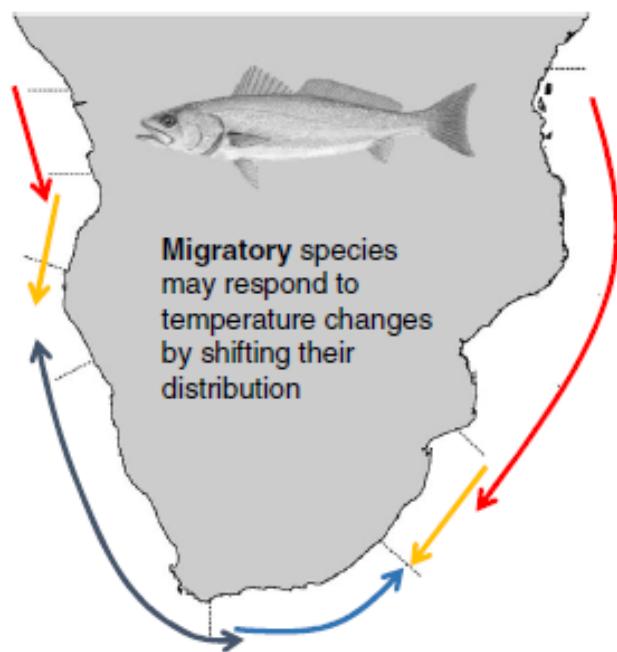
Trans-disciplinary research



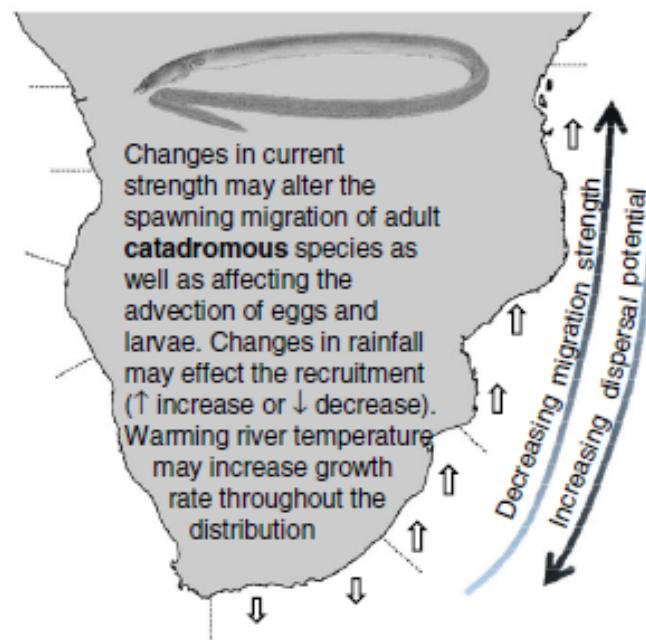
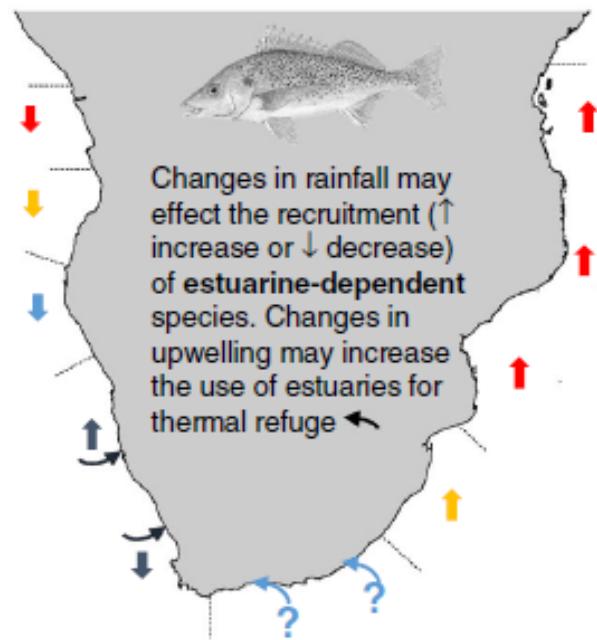
When ICM meets MSP



National Case Study: Folding MSP into the ICM framework (provided there is recognition of the marine boundaries within ICM) (Taljaard et al 2013; Taljaard & van Niekerk, 2013)



Research priorities include the need for process-based fundamental research programs



Potts et al. (2015)

Species
Tropical
Subtropical
Warm-temperate
Cool-temperate

Fig. 4 Predicted climate driven impacts for southern African coastal migratory, resident, estuary dependent and catadromous fishes

MSP, Ecosystem Service Evaluation and Ecosystem Accounting at CPUT



Ken Findlay
Research Chair: Oceans Economy
Cape Peninsula University of Technology



- Dynamic, real-time spatial management schemes emerging as innovative & promising approaches for managing bycatch & discards
- Using real-time information to manage fisheries more responsively to fish stock dynamics
- Real-time spatial management has allowed for better management & utilization of target & bycatch quotas,
 - catch share programs / risk pools / ITQ



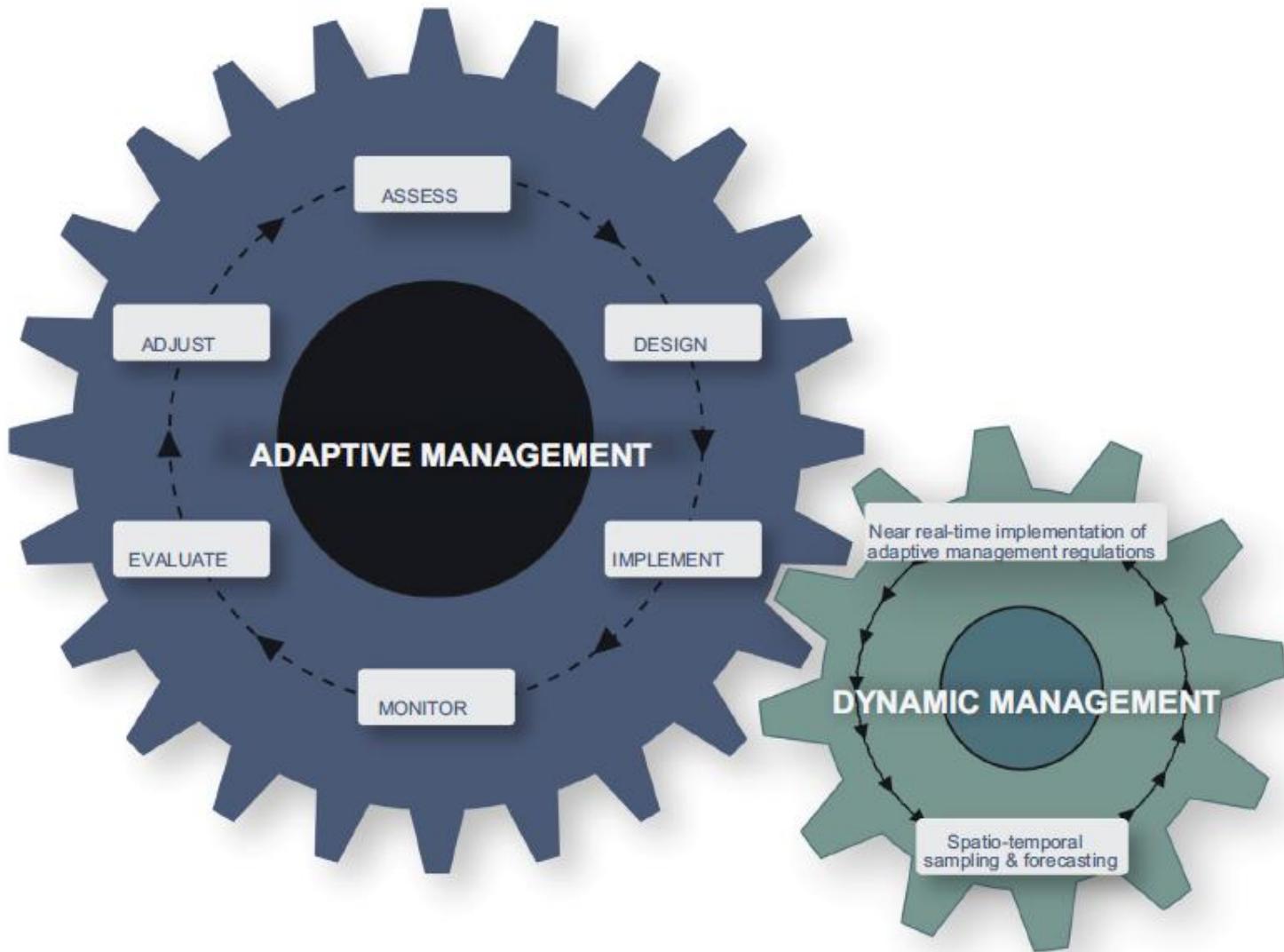
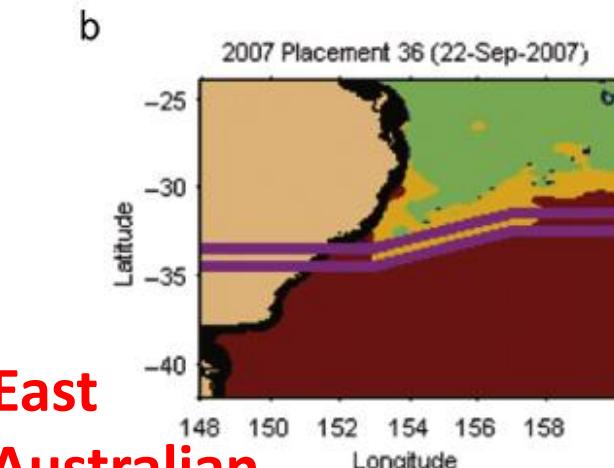
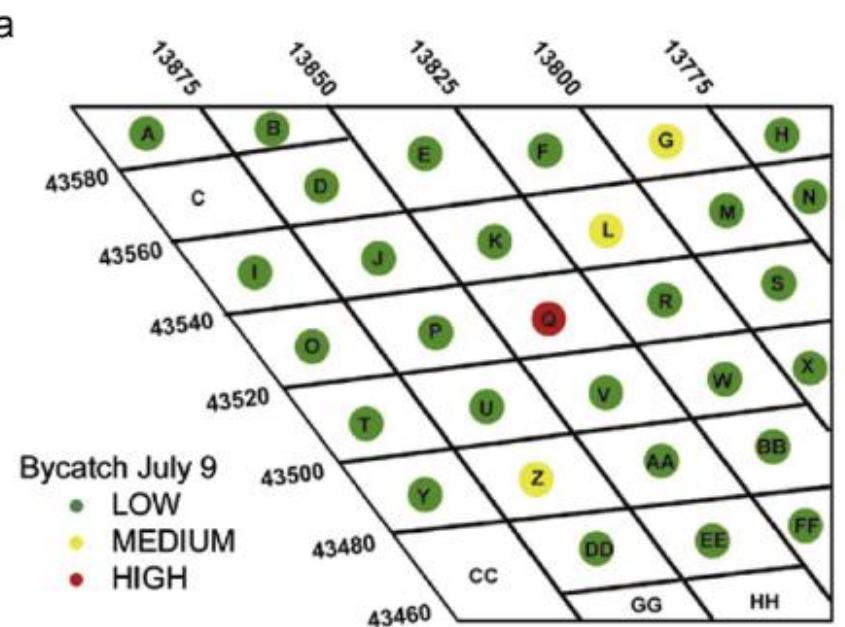
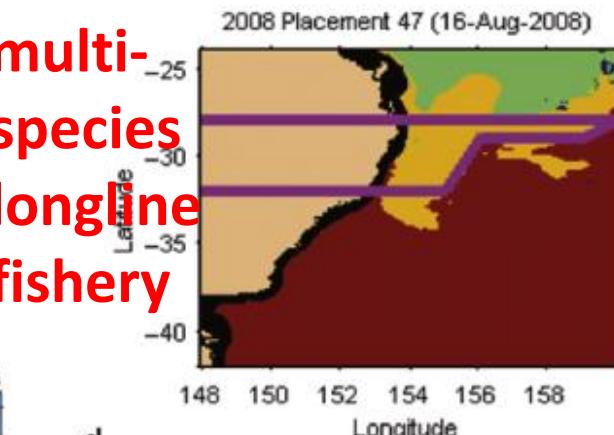


Fig. 4. Integration of dynamic ocean management with adaptive management. Adaptive management is constructed of several steps including making value judgments about how marine resources will be managed. Dynamic ocean management couples into the adaptive management process by using spatio-temporal data to rapidly implement adaptive management protocols in near real-time as conditions change on-the-water.

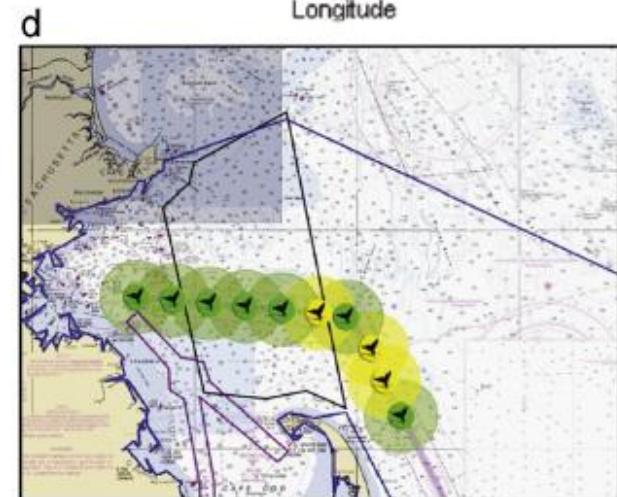
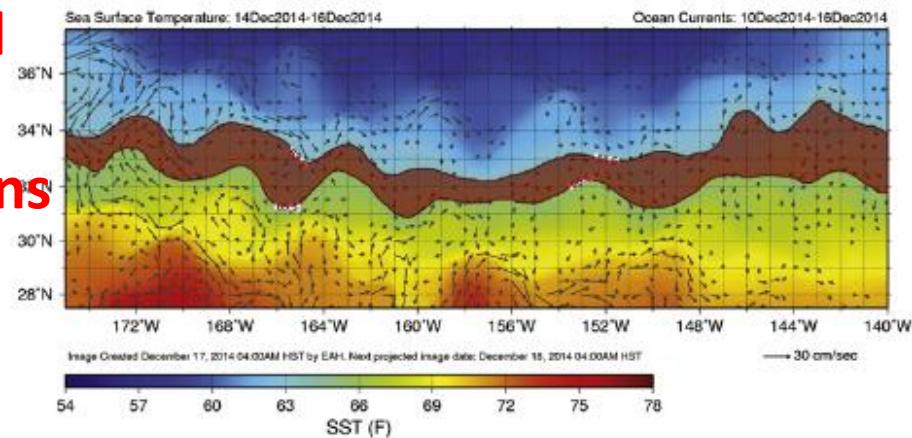
New England scallop fishery, Bycatch, Daily



East Australian multi-species longline fishery



Turtle and Whale interactions





Dynamic ocean management: Defining and conceptualizing real-time management of the ocean



Maxwell
et al.
(2015)

Fig. 1. Schematic of dynamic ocean management. Multiple data types can be integrated in dynamic management including biological, remotely-sensed, socio-economic and user distribution data. Data is processed and then distributed to users (e.g., managers, resource users), often taking advantage of mobile data-sharing technologies such as smartphones and tablets.

<http://www.catchreport.co.za/>

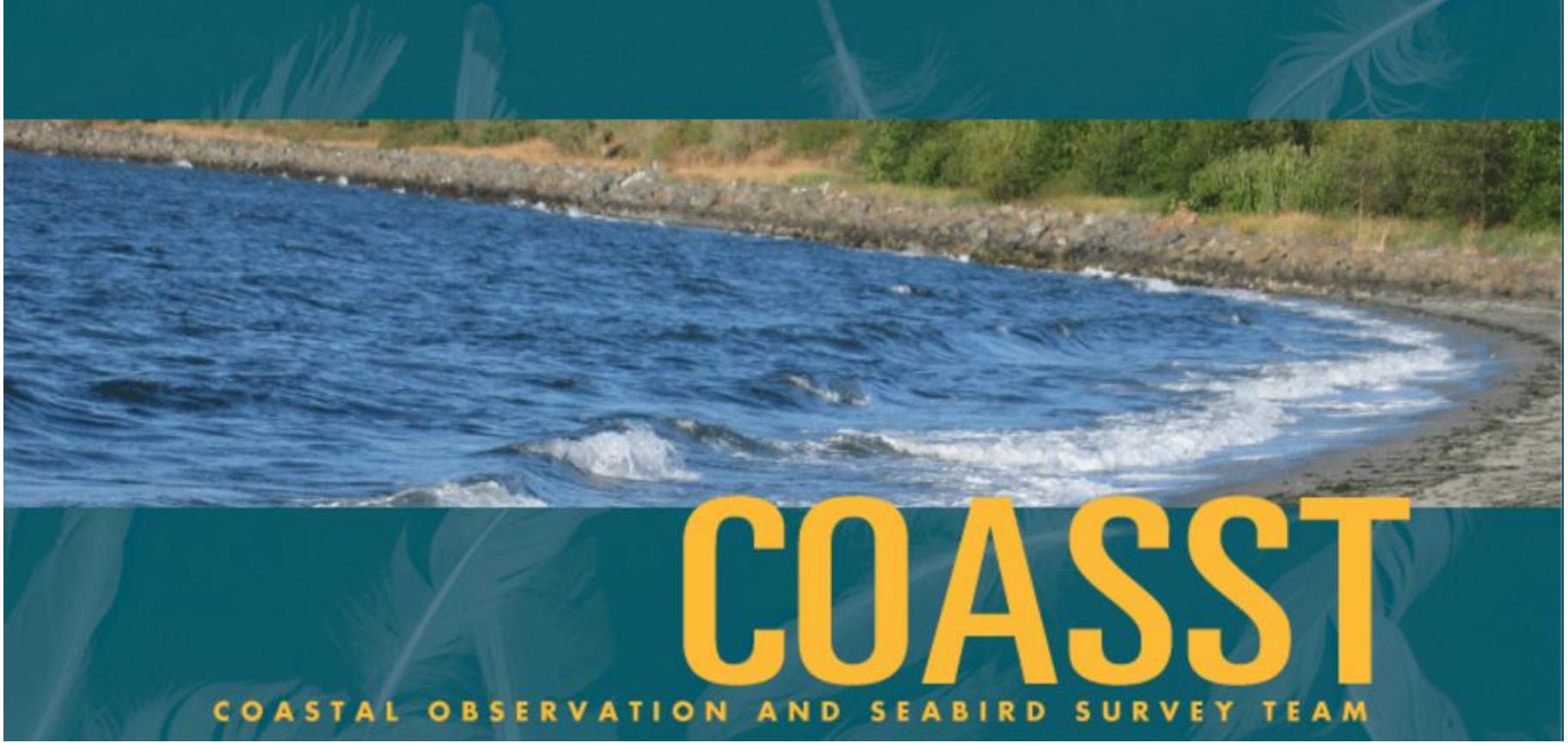


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National Recreational Database
Available on

Desktops and Laptops
Tablets and Smartphones

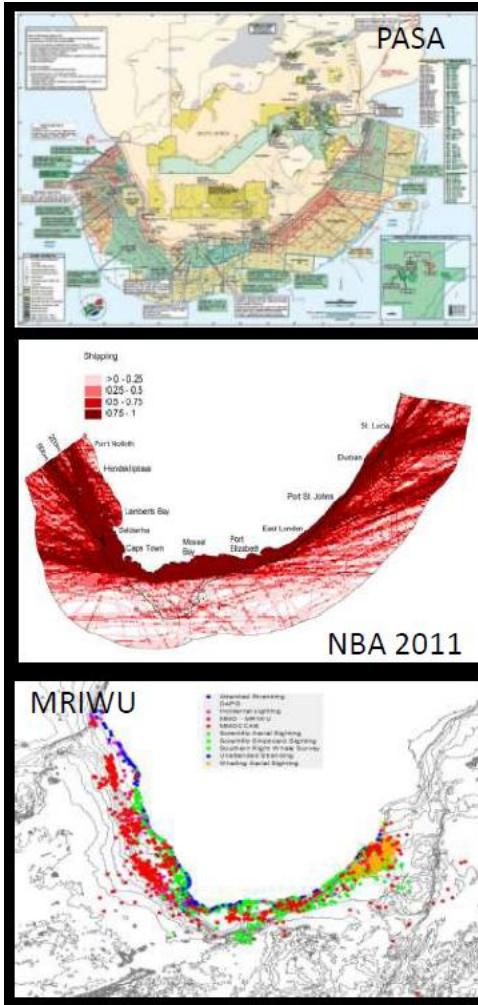




COASST

COASTAL OBSERVATION AND SEABIRD SURVEY TEAM

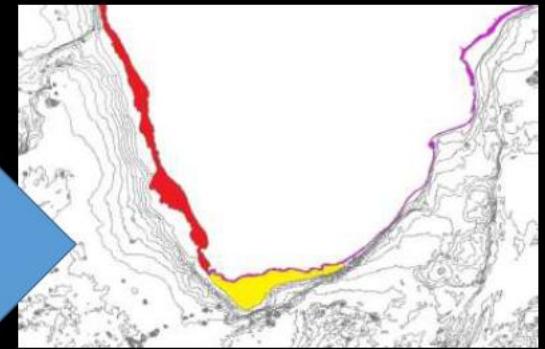
Scenario planning



*GIS
Authority Layers*

Trade-offs between ecological,
social and economic objectives
and need for scenario planning

*Remote Sensed
Layers*



Decision Support Tools
(e.g. INVEST, MIMES, ARIES)

A composite image showing an underwater scene with three scuba divers swimming over a coral reef, and an oil rig structure visible in the distance above the water surface.

End

Marine Spatial Planning Research
NMMU 2016