



January 2017

## **Southern Cape Interdisciplinary Fisheries Research (SCIFR) Project**

### **Research Questions**

How are natural and social changes in the southern Cape shaping and interacting with marine social-ecological systems?

More specifically, how are selected natural resources users in this area responding to global change and how are they shaping change in their region?

How can the knowledge of the current state of the social-ecological system be used to build more resilient systems?

### **Context**

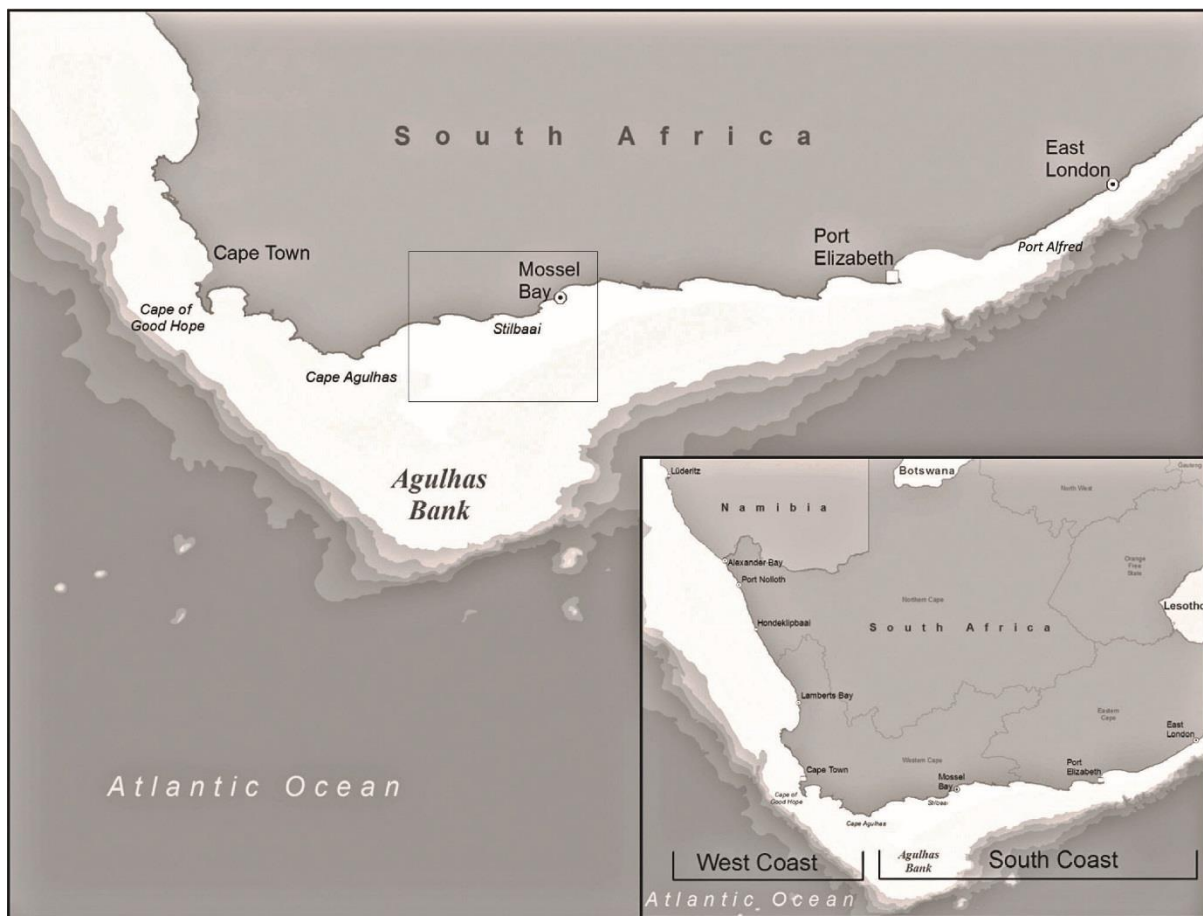
Natural and human systems are not mutually exclusive and they cannot be thought of, nor worked with, separately (Ommer et al., 2011). This project recognises that these systems are overlapping spheres of mutual influence that are connected through multiple inter-linkages at multiple scales. The study of these systems requires working with multiple bodies of knowledge, several methodologies and the expertise of various academic disciplines, with the experience of natural resources users and other stakeholders (Lambin, 2005; Folke, 2006).

The relationship between humans and the environment, which in this context implies the oceans, is a two-way relationship resulting in a need to regard humans and the sea as interdependent (Ommer et al., 2011). Past failures to recognise that the oceans form an integrated social-ecological system (Berkes et al., 2003), as well as the social-ecological linkages within such systems, has led to a situation where ocean resources are depleted and dependent communities are impacted including the southern Benguela (Van Sittert 2002; Isaacs 2006; Jarre et al. 2013; Duggan et al., 2014). Fisheries remain a major source of food, income, and livelihood for millions of people across the world, most particularly those in developing countries (Garcia et al., 2003).

The past two decades have witnessed a suite of challenges in South Africa's fisheries issuing from events in both the human and biophysical spheres of the system (Hutchings et al. 2012; Mead et al., 2013; Sowman et al., 2011, 2013; Van Sittert et al., 2006). Some of these challenges include shifts in the distribution of various commercially-significant fish stocks (Howard et al., 2007; Blamey et al., 2012), increases in intra-seasonal wind and temperature variability (Reason & Hermes, 2011; Moloney et al., 2013; Jarre et al., 2015), the implementation of the 1998 Marine Living Resources Act (MLRA), the 2000 declaration of the linefish emergency (Petersen et al., 2010), the subsequent 2003/4

restructuring of the commercial handline fishery (DEAT, 2005a,b), and the ongoing global economic instability. The research questions focus on mounting concerns over the well-being of natural resources and resource users, fish and fishers in particular, in order to explore new ways working with these concerns.

The Benguela Current Large Marine Ecosystem (BCLME) is one of four large marine ecosystem boundary current systems that is dominated by coastal upwelling and is a very productive region that sustains important fisheries for Angola, Namibia and South Africa (<http://www.benguelacc.org>). It displays a high amount of variability and consists of four near shore subsystems of which the Agulhas bank off the southern Cape coast is one (Hutchings et al., 2009, Jarre et al., 2015). The research area of this project, located in the southern Cape, is an important but under-researched part of the social-ecological system of the southern Benguela (refer to Figure 1 below).



**Figure 1: Map of Southern Africa's coastal region showing the Agulhas Bank with the SCIFR project area outlined (adopted from Shannon et al., 2010)**

The research area for the Southern Cape Interdisciplinary Fisheries Research (SCIFR) project specifically focuses on fishing coastal communities located in Witsand, Slangrivier, Vermaaklikheid, Stilbaai, Melkhoutfontein, Gouritsmond and Mossel Bay along the southern Cape coast. The research also includes an agricultural component which focuses on farming communities located in the Duiwenhoks and Goukou catchment areas. Figure 1 shows the location of the South Coast in relation to South Africa with the Agulhas Bank, as well as the specific research area (enclosed by a box on the map) highlighting the locations of Stilbaai and Mossel Bay.



Gouritz River Mouth



Still Bay Harbour



Mossel Bay Township



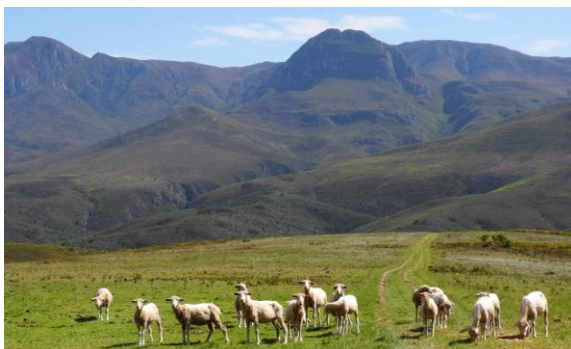
Duiwenhoks River Mouth



Docked Ski Boat



Local Market Fish



Langeberg Mountains with Sheep



Canola Field in Goukou Catchment



## Research Team

In consultation with academic experts and local fishers, a range of academic disciplines have been identified with the aim to address the key SCIFR research questions. These include:

Already involved in project:



- Knowledge co-production (local fishers, school learners)
- History
- Environmental geography
- Environmental & social anthropology
- Environmental science
- Fish biology
- Marine ecology
- Oceanography

Future involvement/collaboration:

- Economy
- Education
- Structured decision support
- Environmental (change) management

Name	Role/Affiliation	Research focus	Email
<b>Prof Astrid Jarre</b>	<b>Project leader</b> , SA Research Chair in Marine Ecology & Fisheries at UCT	Ecosystem modelling; ecosystem approach to fisheries management	Astrid.Jarre@uct.ac.za (021) 650- 5454
<b>Hon Prof Larry Hutchings</b>	Collaborator, honorary retired UCT professor, former DEA	Oceanography; fisheries	
<b>Mr Greg Duggan</b>	<b>Current PhD student</b> – anthropology (M.SocSci UCT)	Return to the realm of the Kob Kings: Interdisciplinary, collaboration, communication, education and co-design in a traditional small-scale handline fishery	greguct@gmail.com
<b>Ms Louise Gammage</b>	<b>Current PhD student</b> with M.Sc completed in SCIFR – environmental geography (M.Sc UCT)	M.Sc: Vulnerability and current responses to change (case study)  PhD: Development of a scenario-based approach for adaptation to change in fishery systems	louisegammage@gmail.com
<b>Ms Catherine Ward</b>	<b>Current PhD student</b> – environmental science (M.Sc Rhodes University)	Global change in socio-ecological systems of the southern Cape, with a focus on farming communities	catherine.d.ward@gmail.com
<b>Dr Natascha Visser</b>	Past SCIFR post-doctoral fellow, past GULLS post-doctoral fellow and collaborator (2015/2016)	History of inshore fisheries in area (oral histories), vulnerability assessment (GULLS)	nvisser@live.com
<b>Dr James Howard</b>	Past GULLS Post-doctoral fellow and collaborator (2014/2015)	Vulnerability within traditional fisher communities (GULLS framework)	James.Howard@uct.ac.za
<b>Dr Marieke Norton</b>	Associated PhD thesis – social anthropology (PhD UCT)	PhD: At the Interface: Marine compliance inspectors at work in the Western Cape (2014)	Marieka.Norton@uct.ac.za

## Milestones and expected outputs

 <p><b>SARChI</b> MARINE ECOLOGY &amp; FISHERIES 1st funding cycle</p>	<p><b>2010</b> Preliminary work conducted in SCIFR area through Greg Duggan’s M.SocSci research</p> <p><b>2012</b> Conception of SCIFR based on GLOBEC 74 WG and Canadian ‘Coasts under Stress’ project</p>
 <p><b>SARChI</b> MARINE ECOLOGY &amp; FISHERIES 2nd funding cycle</p>	<p><b>2013</b> <b>SCIFR project officially started under the South African Research Chair for Marine Ecology and Fisheries (SARChI ME&amp;F) with Prof Astrid Jarre (UCT) as project leader</b> Greg Duggan is appointed SCIFR project manager and begins exploration of PhD research Louise Gammage begins her M.Sc as SCIFR’s first official student Natascha Visser begins as SCIFR’s post-doctoral fellow</p> <p><b>2014</b> Catherine Ward joins SCIFR as a PhD student</p> <p><b>2015</b> Greg Duggan completes his role as project manager and becomes a full-time PhD student Louise Gammage finishes her M.Sc and continues as PhD student (thesis publication) Start of PhD fieldwork for Catherine Ward Natascha Visser completes her SCIFR post-doc (paper publication)</p> <p><b>2016</b> Completion of fieldwork for Greg Duggan Continuation of fieldwork for Catherine Ward Start of PhD fieldwork for Louise Gammage Contributions to Benguela Symposium (Nov 2016) at UCT by SCIFR students Expected two paper publications from Louise Gammage’s M.Sc As contribution to Belmont GULLS project, plan and conduct adaptation workshops in comparative manner with other GULLS case studies by Louise Gammage</p> <p><b>2017</b> PhD project completion for Greg Duggan Completion of data analysis and thesis drafts for Catherine Ward and Louise Gammage Include other disciplines if possible Expected one collaborative paper publication on SCIFR project <b>End of current SCIFR funding (current SARChI funding cycle ends)</b></p>
<p><b>Possible</b> 3rd funding cycle</p>	<p><b>2018</b> PhD project completion for Catherine Ward and Louise Gammage <b>to</b> Expected three to six paper publications from PhD theses</p> <p><b>2022</b> If new funding obtained: Enlarge circle of collaborators and pool of disciplines Continue research as part of Resilience Alliance?</p>

## **Current Projects**

There are currently three PhD projects running for the SCIFR research group. A brief description is given for each project below:

### **Greg Duggan (M.SocSci UCT)**

*PhD Title: Return to the realm of the Kob Kings: Interdisciplinary, collaboration, communication, education and co-design in a traditional small-scale handline fishery*

This PhD is a continuation of work conducted in the southern Cape through my M.SocSci and subsequently my role as project manager for SCIFR. From my long-standing relationship with fishers in the research area, I have fortified trust-building in handline fishing communities. My PhD focuses on the collaborative development of water samplers operated from fishers' ski-boats to measure temperature at the ocean surface, bottom and fishing depth. This aims to fill the gap in scientific data by joining the conversation on temperature variability/change. A secondary output of my project has designed an integrated curriculum on ocean climate and fisheries that target school pupils in grade seven to nine in previously disadvantaged areas of the local fishing communities. This aims to build awareness around topical issues of climate change and local fisheries to promote education that is relevant for children living in the SCIFR research area. The third focus area for my project will examine challenges around commercial handline associations in the southern Cape.

### **Louise Gammage (M.Sc UCT)**

*PhD Title: Development of a scenario-based approach for adaptation to change in fishery systems*

Building on my own M.Sc research with handline fishers in the southern Cape (Gammage, 2015) and recent work in connection with the GULLS project undertaken by Dr James Howard, this project will firstly examine hidden interrelationships, feedback loops, and multi-scalar interaction of stressors that lead to different adaptations to change in the selected fishery system than would be immediately apparent from the geographic position and history of fishing communities. This will be approached using qualitative and semi-quantitative modelling methodology, including causal diagrams and Bayesian network mapping and analysis. This knowledge will then be used to develop, in conjunction with stakeholders and resource users, possible future scenarios for adaptation for implementation by those communities. The research aims to:

- (1) Establish interactions and feedback loops that exist and interact at various scales that may lead to an increase of fishers' vulnerability to change within and among the two inshore fisheries sectors operating in the Southern Cape.
- (2) Develop scenarios of future change together with multiple stakeholders in the inshore fishery and explore adaptation strategies using an interactive and iterative approach.

**Catherine Ward (M.Sc Rhodes University)**

*PhD Title: Global change in socio-ecological systems of the southern Cape, with a focus on farming communities*

The broad aim of this project is to examine social-ecological systems in the southern Cape with a focus on climate variability from the farming communities' perspective, to gain insight into the larger network interplay between terrestrial and marine systems. The first and major component of this project explores the relationship between farming and climate variability. This will be achieved through examining local climate knowledge with a focus on farming and weather data over the last few decades, focusing on terrestrial weather systems in Goukou and Duiwenhoks catchments. The second component desires to look at the larger interplay of terrestrial and marine systems by comparing and contrasting farmers' and fishers' perceptions of climate variability in relation to change observed by scientists in the proposed study area over the past few decades. This will be achieved through a two-fold approach – climate change and variability will be assessed through analysing detailed climate/environmental data within the region and local knowledge on climate changes within social-ecological systems will be assessed through engaging farming communities and other key stakeholders. These two approaches will be used in synergy to gain insight into the larger network interplay between terrestrial and marine social-ecological systems.



## **SCIFR affiliated publications**

### *Papers in peer-reviewed journals*

Gammage, L. C., Jarre, A., & Mather, C. 2017a. A case study from the southern Cape linefishery 1: The difficulty of fishing in a changing world. *South African Journal of Science*, 113(5/6), 1-8. <https://doi.org/10.17159/sajs.2017/20160252>

Gammage, L. C., Jarre, A., & Mather, C. 2017b. A case study from the southern Cape linefishery 2: Considering one's options when the fish leave. *South African Journal of Science*, 113(5/6), 1-10. <https://doi.org/10.17159/sajs.2017/20160254>

Jarre, A; Hutchings, L; Kirkman, S.P; Kreiner, A. Tchipalanga, P; Kainge, P; Uanivi, U, Van der Plas, A; Blamey, L.K; Coetzee, J; Lamont, T; Samaal, T; Verheye, H.M; Yemane, D; Axelsen, B.E; Ostrowski, M; Stenevik, E.K, Loeng H. 2015. Synthesis: Climate effects on biodiversity, abundance and distribution of marine organisms in the Benguela. *Fisheries Oceanography* 24 (Suppl. 1): 122 -149.

Visser, N. 2015. The origins of the present: economic conflicts in the fisheries of the South African south coast, circa 1910 to 1950. *Maritime Studies* 14(9): 1-31. DOI 10.1186/s40152-015-0029-6

Duggan G., Rogerson J., Green L.J.F., Jarre A. 2014. Opening dialogue and fostering collaboration: different ways of knowing in fisheries Research. *South African Journal of Science* 110 (7/8), Art. #2013-0128, 9 dOI: 10.1590/sajs.2014/20130128

Duggan G., Green L.J.F., Jarre A. 2014. "Thinking like a fish": adaptive strategies for coping with vulnerability and variability emerging from a relational engagement with kob. *Maritime Studies* 13(4): 1-21.

Blamey, L.K; Howard, J.A.E, Agenbag, J; Jarre, A. 2012. Regime-shifts in the southern Benguela shelf and inshore region. *Progress in Oceanography* 106: 80-95. DOI:10.1016/j.pocean.2012.07.001

### *Peer-reviewed chapters in books*

Anderson, T.-A., Draper, K. , Duggan, G., Green L.F., Jarre, A., Rogerson, J., Ragaller, S., van Zyl, M. 2013. Conservation conversations: improving the dialogue between fishers and fisheries science along the Benguela coast. Chapter 8 In L.F. Green (Ed.): *Contested Ecologies: Dialogues in the South on nature and knowledge*. HSRC Press, Cape Town, South Africa.

### *Mimeos, Reports, Working Group Documents*

Duggan, G., Rogerson, J., Green, L.F., Jarre, A. 2013. Enactments, disconcertments and dialogues: regarding marine social-ecological systems through the lens of relational ontologies. P 160-172. In: Attwood., C., Booth, T., Kerwath, S., Mann, B, Marr, S., Bonthuys, J., Duncan, J. and Potts, W. (Eds) *A decade after the emergency: the proceedings of the 4th Linefish Symposium*. WWF South Africa Report Series 2013/Marine/001.

### *Theses*

Gammage, Louise. 2015. Considering One's Options When The Fish Leave. A Case Study Of The Traditional Commercial Hand Line Fishery Of The Southern Cape. MSc Thesis. University of Cape Town.

Norton, Marieke. 2014. At the Interface: Marine Compliance Inspectors at Work in the Western Cape. PhD Thesis. University of Cape Town.

Duggan, G.L. 2012. In the realm of the Kob Kings: Rethinking knowledges and dialogue in a small-scale fishery. MSocSi Thesis. University of Cape Town.

## Glossary of terms:

**Adaptation:** “proactive and anticipatory planning of individual or collective actions based on knowledge or experience of past or anticipated future changes and that will likely result in no regrets or sustainable social- ecological outcomes” (Bennett et al, 2014: 5)

**Coastal fisheries:** coastal fisheries operating in the research area include the traditional commercial handline fishery, the small-scale fishery and the inshore-trawl fishery.

**Communities:** used in this context, we refer to communities of practise (e.g. a community of fishers or community of farmers). We acknowledge that communities are not homogenous and not necessarily geographically bound.

**Interdisciplinary:** Draws from different disciplines to work towards a common goal.

**Natural resource users:** in this context refers to fishers and farmers that form part of the social-ecological system in the coastal region of the research area (including associated catchment areas).

**Resilience:** “the amount of change the system can undergo and still retain the same controls on function and structure; the degree to which the system is capable of self-organisation; and, the ability [of the system] to build and increase the capacity for learning and adaptation” (Resilience Alliance, 2010)

**Social-ecological systems:** “A coupled system of humans and nature that constitutes a complex adaptive system with ecological and social components that interact dynamically through various feedbacks” (Simonsen et al, 2015).

**Stakeholders:** a group of people with common interests or concerns in something.

**Transdisciplinary:** “is the understanding of the present world through contextualisation of knowledge” (Paterson et al. 2010: 783)

**Vulnerability:** “Vulnerability is the degree to which a system, subsystem, or system component is likely to experience harm due to exposure to a hazard, either a perturbation or stress/stressor” (Turner et al, 2003: 8074).

## Acronyms

**BCLME:** Benguela Current Large Marine Ecosystem

**DAFF:** Department of Agriculture, Forestry, and Fisheries

**DEAT:** Department of Environmental Affairs

**MLRA:** Marine Living Resources Act (No 18 of 1998)

**SCIFR:** Southern Cape Interdisciplinary Fisheries Research project

**UCT:** University of Cape Town

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