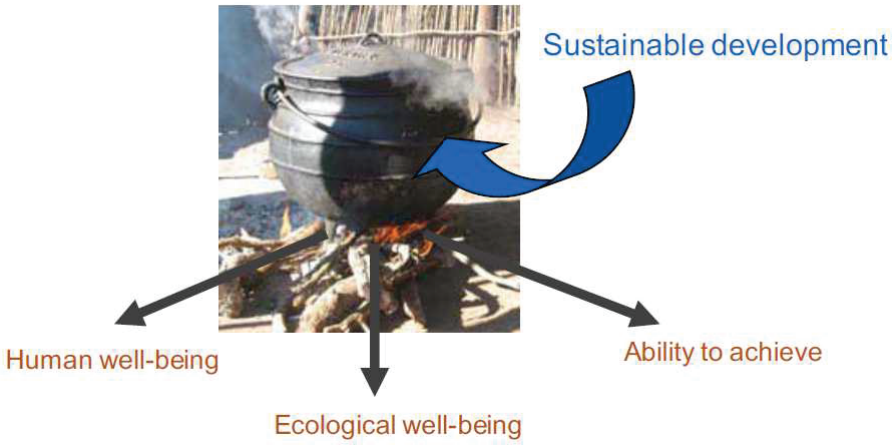
WORKSHOP OUTCOMES: A DECADE OF THE ECOSYSTEM APPROACH TO FISHERIES IN SOUTH AFRICA, 2005-2015

Emily S. Mc Gregor[1], John A. Duncan[2], Jessica D. Greenstone[2], Lynne J. Shannon[1] and Astrid Jarre[1]

[1]Marine Research Institute and Department of Biological Sciences, University of Cape Town

[2]Marine Programme, WWF South Africa



RESPONSIBLE FISHERIES ALLIANCE – WORKING TOGETHER TOWARDS RESPONSIBLE FISHING

SARChI MARINE ECOLOGY & FISHERIES

Table of Contents

1. Executive summary

In August 2015 the South African Research Chair in Marine Ecology & Fisheries, WWF-South Africa and the Responsible Fisheries Alliance hosted a 1.5 day stakeholder workshop to review a decade of progress towards implementing an Ecosystem Approach to Fisheries (EAF) in South Africa. Key focus areas were identified and actions to be taken in the short (1-2 years) and medium (2-5 years) term were proposed to further the implementation of an EAF in South Africa.

Four key themes were explored: Fisheries bycatch, top predator - fishery interactions, small-scale fisheries and spatial management of fisheries. Small groups met to identify and prioritise actions, which are reported here. With the three dimensions of an EAF in mind - ecological well-being, human well-being and ability to achieve – discussion around further opportunities for research highlighted the need for methodology to improve the 'ability to achieve' dimension, as well as better understanding the linkages between all dimensions. Integration of good data with good processes is essential.

Social learning was introduced to the participants as a new concept to support the development and implementation of an EAF, and interactions in the diverse group of stakeholders participating in the workshop were facilitated with this concept in mind. If the workshop outcomes are followed through, further support for EAF and more effective, positive stakeholder engagement can be developed. The need for continued integration and co-ordination of the complex EAF implementation process was highlighted in a panel discussion, and there was consensus that regular review workshops such as this one would be useful and could fulfil an overarching, coordinating role in the implementation of the ecosystem approach to fisheries in South Africa.

Citation:

McGregor, E.S., Duncan, J.A., Greenstone, J.D., Shannon, L.J. & Jarre, A. (2016). Workshop outcomes: A decade of the ecosystem approach to fisheries in South Africa, 2005-2015. 30 pp.

Availabe from www.eafsa.uct.ac.za (Tabs: Publications - 2016)

2. Introduction

South Africa continues to be committed to implementing an ecosystem approach to fisheries (EAF) since its signature to this goal at the World Summit on Sustainable Development (WSSD), held in Johannesburg in 2002. Notable progress during this time has included the agreement on a wider set of management objectives for a number of fisheries (Shannon et al. 2006, Nel et al. 2007, Petersen et al. 2012) through ecological risk assessments (ERAs), the development of ERA review methodology (to measure progress towards achieving those objectives, notably in terms of indicators and a knowledge-based tool, Paterson & Petersen 2010), spatialised approaches (Sink et al. 2013) as well as methodology for forecasting the likely effect of different management strategies in a systems context (e.g., Shannon et al. 2010, Smith et al. 2011, Cooper 2015, McGregor 2015, Watermeyer 2015, Weller et al. 2016). Much of the methodology was developed collaboratively between a number of management agencies and academic partners, both in South Africa and internationally. The University of Cape Town (UCT), the Department of Agriculture, Forestry and Fisheries (DAFF), the Department of Environmental Affairs (DEA) and the Worldwide Fund for Nature (WWF-SA), in consultation and collaboration with industry stakeholders, notably members of the Responsible Fisheries Alliance (RFA), have applied some of this methodology as a basis for informing management decisions.

A decade after the first ERA, the ERA process has come to halt due to a lack of capacity and resources within DAFF. Many of the stakeholders involved in driving the process of implementing an EAF in South Africa felt the need to review the progress that had been achieved since then, highlight achievements, communicate around current issues in the southern Benguela, and to agree on a joint way forward. The need for continued collaboration and action among all stakeholders was re-enforced, particularly in the light of the disbanding of DAFF's EAF scientific working group.

A one-and-half day workshop was conducted in August 2015, funded by the RFA, WWF-SA and the South African Research Chair in Marine Ecology and Fisheries, and convened by Dr Emily McGregor (UCT). A core group comprising Mr John Duncan (WWF-SA), Prof Astrid Jarre (UCT), Mr Junaid Francis (RFA), Ms Jessica Greenstone(WWF-SA), and Dr Lynne Shannon (UCT) assisted Dr McGregor in selecting four "key" themes for breakaway group discussions, namely bycatch, top predators – fishery interactions, small-scale fisheries and spatial management.

The morning of the first day was devoted to providing an overview of EAF-related research and implementation initiatives since the WSSD in 2002, and background presentations to the four specific themes (Appendix 1). Breakaway groups, one addressing each of the four themes, met in the afternoon of the first day to develop and agree on action items that participants could push forward to facilitate progress on these issues over the next two to five years. Summaries of each of these discussions are provided in Section 3 of this report. More than 50 participants participated across different key fisheries and stakeholders (Appendix 2).

The second day was open to a much wider audience, advertised through the core group's professional networks as well as through the SANCOR mailing list. The chairs of the breakaway groups provided feedback of their sessions to this wider group of participants. Additionally, new research concerning social learning around the implementation of an EAF had been introduced to the participants and reflections on the role of the workshop and the approach to further EAF in South Africa was provided (Section 4). A panel discussion was subsequently held on general views around EAF implementation in South Africa (Section 5), and the concluding session reflected on opportunities for strategic research and development that had emerged during the workshop (Section 6).

3. Parallel sessions – key EAF topics

The following four sections report back on the breakaway sessions in the afternoon of Day 1. Each group had been given the brief to discuss key issues and next steps towards solutions in the short (1 -2 years) and medium (2-5 years) term.

3.1 Fisheries bycatch

Co-chairs: John Duncan and Jessica Greenstone (WWF-SA), Rapporteur Dr Rachel Cooper (UCT)

The group understood that the theme was to address issues associated with "bycatch" in South African commercial fisheries. For the purposes of this workshop, bycatch was defined as the following: Bycatch consists of non-target species that are retained or discarded, which may include endangered, threatened or protected (ETP) species. For clarification, "non-target" is taken to be from a regulatory perspective since in some cases fishers actively target "bycatch" species. The group focused on fish bycatch (including cartilaginous fishes); thus, seabird, mammal and turtle bycatch issues were not addressed in this session and were rather addressed in the top predator-fishery interactions parallel session.

The group started the session by identifying the South African fishing sectors that have a substantial fish bycatch component (it was noted that while other sectors do have an associated bycatch component, the focus was on those with the most substantial bycatch). This information is summarized in Table 1, below.

Table 1. The 12 South African commercial fisheries perceived to have substantial issues regarding bycatch (as defined above). For these fisheries, the applicable DAFF scientific working group (SWG) and preliminary lists of the key bycatch species/groups, concerns, and any current EAF initiatives underway are provided.

Commercial Fishery	**DAFF Scientific Working Group**	**Key bycatch Species/groups**	**EAF initiatives (relating to fish species only)**
Demersal shark longline	LSWG	• Bronze whalers • Dusky sharks • Hammerhead species (*Sphyrna* spp.) • Cow sharks (*Notorynchus cepedianus*) • St. Joseph (*Callorhinchus capensis*)	None that we are aware of

Table 1 continued

Hake inshore trawl	DSWG	• Skates & rays • Sharks (*Galeorhinus* & *Mustelus* in particular) • Linefish (silver kob, carpenter, panga, white stumpnose, etc.)	Precautionary Upper Catch Limits (PUCLs) Experimental Threshold Project Responsible Fisheries Alliance (RFA) training Limited observations by SADSTIA at-sea observer programme to come
Hake offshore trawl	DSWG	• Skates & rays • Sharks • Teleosts (ribbonfish, jacopever, monkfish, kingklip, snoek)	PUCLs RFA training SADSTIA at-sea observer programme
Hake longline	DSWG	• Sharks • Kingklip • Small percentage (<5% of total catch) of other linefish species combined	FCP Kingklip PUCL Limited, industry-funded at-sea observer programme RFA training
Large Pelagics (swordfish & tuna)	LPSWG	• Blue sharks (*Prionace glauca*) • Mako sharks (*Isurus oxyrinchus*) • Thresher sharks (Alopias spp.) • Carcharhinid sharks	Shark PUCL NPOA sharks activities?
Linefishery	LSWG	• Prohibited species (red steenbras, 74, etc.) • Undersized target species • Shark species	None that we are aware of
Midwater Trawl	DSWG	• Sharks • Mammals • Sunfish • Small pelagics, hake & other fish	Analysis of observer-data by Jodie Reed; publication(s) forthcoming. Thesis completed At-sea observer programme
Netfish: Beach seine (harders, linefish, sharks)	LSWG	• Sharks • Juvenile linefish (False Bay: kob, elf)	None that we are aware of
Netfish: Gillnets (st. joseph & harders)	LSWG	• Sharks (*Mustelus*) • Linefish (regional specific – e.g. white stumpnose in Langebaan)	None that we are aware of

Table 1 continued

Oysters (KZN, South Coast)	Small invertebrates WG (Lutz Auerswald)	• red bait and mussels, among others	None that we are aware of
Prawns (KZN prawn trawl). *Note: shallow-water fishery nearly closed but deep-water is active.*	Rock Lobster WG	• Linefish (juvenile & square tail kob) • Sharks, rays, skates • Langoustines, crabs, lobster	None that we are aware of
Small pelagics (sardine, anchovy & round herring)	SPSWG	• Juvenile horse mackerel, sardines and round herring. • Lanternfish and lightfish	PUCLs, TAB quota for sardine in the anchovy-directed small pelagics fishery

The group identified twelve clusters of concern around fish bycatch in South African fisheries:

1. Data challenges/monitoring, particularly primary level collection and analysis
2. The lack of an at-sea observer programme
3. Sharks NPOA – implementation difficulties
4. Recreational fishery – data collection & fishing effort limitations
5. Poor coordination of data within DAFF across sectors
6. Ineffective coordination between DAFF Scientific Working Groups regarding bycatch issues in particular
7. The need for formal Fishery management plans
8. The lack of strategic objectives per fishery
9. Scientific working groups not capable of dealing with all EAF issues
10. Socio-economic issues -- fishers economically dependent on some vulnerable bycatch species
11. High levels of estuarine bycatch (particularly juvenile linefish)
12. Lack of clarity on categories of bycatch – managed vs. unmanaged

The group then ranked these concerns into the two most important priorities and then developed practical actions to address these in the short term. The following two priorities were identified:

1. Data challenges/monitoring (lack of species-specific data and analysis)
2. The need for fishery management plans

Other notable issues identified were the following:

- Resuming the DAFF at-sea observer programme
- Identifying and agreeing on strategic EAF objectives for each fishery
- Full implementation of a National Plan of Action (NPOA) for Sharks.

Table 2. Actions to address issues relating to fisheries bycatch and an EAF

Issue	Summary	Action to be taken
Data challenges & monitoring	A five-year vision of success was discussed, which would include the following: • Integrated data system (not necessarily at DAFF) • Reliable CPUE indices • Reliable estimates of total catch across sectors • Targeted at-sea observer coverage when needed	A recommendation was to request that the Director of Research ask all SWGs to undertake the following exercise: • Compile a worksheet that • identifies: (i) "Primary" non-target species - high volume catches, typically retained and important economic component. (ii) Species of conservation concern. These may not necessarily be "primary" but are species of concern. • For each category (i) and (ii), • identify data requirements to appropriately monitor/analyse stocks.
Fishery-specific management plan	The key problems that prevented development of these plans in the past are as follows: • Complexity of the plans • Few internal resources • Legal framework challenges • Frequently changing conditions render process burdensome	Actions to move towards a solution that avoid the pitfalls of prior approaches: • Rather than focusing on a large, complex and comprehensive plan, the group suggested the opposite: a simple template with high-level principal objectives for each fishing sector. • This could be undertaken by the SWG and/or fishing industry sector groups depending on what is best suited for the given fishery. • These high-level principles would then be proposed to DAFF management for incorporation into the sector-specific policies.

3.2 Top predator- fisheries interactions

Co-chairs: Dr Ross Wanless, Ms Christina Hagen (Birdlife SA); Rapporteur: Dr Florian Weller (UCT)

Top Predators were commonly understood by the group to include sharks, seabirds, cetaceans, turtles and seals, despite the fact that not all of these taxa occupy the highest trophic levels in the ecosystem. Top predators are affected by fisheries in three ways (1) bycatch (2) removal of fish (both direct and indirect effects) and (3) changes to their behaviour. Bycatch affects mostly seabirds, sharks and turtles, although entanglement in fishing gear was also discussed as a form of bycatch. Sharks were not discussed fully as these species were covered in the session on Fisheries bycatch reported above (section 2.1). Direct effects of fish removal are thought to mainly impact top predators that feed on small pelagic fish and result from direct competition for the same prey species. Indirect effects of fish removal include the disruption of foraging associations that occur, for example between tuna and seabirds (whereby the tuna force the fish to the surface, within reach of the seabirds). Changes to top predator behaviour occur as a result of fishing activities changing foraging opportunities (e.g. seals and seabirds following trawlers) or habitat (e.g. Fish Aggregating Devices) for top predators. The following issues were identified by the group:

Table 3: The key issues pertaining to top predator-fisheries interactions, along with a summary of the issue and the actions to be taken in the short and medium term.

Issue	Summary	Action to be taken
Top predator bycatch	Bycatch mitigation is not linked to fishing effort (e.g. impact of 0.05 birds/1000 hooks when only 1 million hooks vs 100 million hooks) Very sectoral approach with no measure of cumulative impacts of all fisheries on individual species Bycatch/entanglement of threatened or protected species (TOPS species (e.g. whales) for which levels of mortality are not high are not considered seriously enough	Review of top predator bycatch rates across all fisheries including the areas of high levels of bycatch and what mitigation measures are commonly in place Bycatch rates should be measured in relation to fishing effort and limits be imposed accordingly
Removal of fish (direct effects)	Integrating top predator requirements into models is very complicated but needs to happen, although in many cases the necessary modelling tools are lacking There are limits to how many ecosystem considerations can be integrated with management equations There is a lack of knowledge to enable the use of top predators as indicators of ecosystem health	Research (especially on seabirds) should include better survival estimates than are currently available for some species Explore the use of top predators as indicators of fishing impacts on the ecosystem (a suite of indicator species is likely needed) Identify the most important top predators from a

Table 3 continued

		volume/consumption point of view A feedback management system should be implemented (e.g. What are the signals? What is causing them? What do they tell us about the future? What can we do about it?)
More general bycatch issues	The issue of top predator interactions with fisheries is often one of multiple differing objectives (i.e. minimising the impacts of fisheries on predators while maximising the economic gain to the fishing industry). Better interdepartmental collaboration is required between DAFF and DEA to resolve these issues	Decision analysis methods need to be developed to provide trade-off solutions to these sometimes conflicting objectives Formation of a group with representation from all sectors to coordinate EAF implementation
	EAF is trying to move management away from single sector/problem approaches so EAF implementation needs to be coordinated and systematic. Low trophic level fisheries especially affect multiple fisheries, yet there is little collaboration in the management of SA's different fisheries. Fisheries management is very data intensive but certain fisheries are missing key data because of a lack of fisheries observers	Reinstate at-sea observer programmes
	New or experimental fisheries are not always subject to sufficient investigation before being allowed to proceed e.g. there have been issues with a new octopus fishery and whale entanglements	To evaluate the impact of fishery gear on top predators, a framework e.g. risk assessment) should be developed for the process to be followed when a new fishery/gear is suggested

3.3 Small scale fisheries

Co-Chairs: Dr Merle Sowman, Dr Serge Raemaekers (UCT), Rapporteur: Mr Sven Ragaller (UCT)

The South African Small Scale Fisheries (SSF) sector is being formalised through the Small Scale Fisheries Policy. The SSF Policy has been promulgated in 2012 and the draft SSF regulations were published in 2015.

The SSF sector is not yet fully operational and current discussions are at a high level and are focused on how the SSF Policy will be implemented. The SSF Policy embraces an EAF approach, and this concept is built

into the policy principles and approach. Emphasis has been placed on the human dimensions right from the start, which is quite different from the process in all the other sector policies. Since rights still need to be allocated, a scientific and management working group with all the right stakeholders has not yet been formalized. While DAFF is setting up catch monitoring and socio-economic baselines, there has been no discussion yet as to how to best use this data to track the implementation of EAF. However, being at the start of implementation for the SSF sector offers an opportunity to set EAF objectives, and to design implementation and monitoring to meet these. A successfully implemented SSF sector should be well aligned with the principles of ecosystem-based management. The SSF sector also offers an opportunity to actively address objectives for the human well-being dimension of EAF in South Africa. There is scope for this sector to learn from other fisheries experience both in South Africa and internationally.

A number of issues relating to EAF implementation and the SSF were identified by the group:

- No clear understanding of an Ecosystem Approach to Fisheries in a small scale fisheries context (definition, objectives, implementation)
- Lack of leadership and formal organisation in the SSF sector
- Design of a monitoring framework
- Gender equity and representation
- User-rights for SSF
- (Economic) viability. This includes, understanding food security, livelihoods and; exploring value chains and value-adding; Links with numbers of livelihoods, and coordination and integration of fishery sectors and links between commercial and SSF sectors
- Training, capacity building and skills training
- Poaching and lack of compliance

Noting that on a policy level the SSF embraces an EAF approach, the SSF is still in the early stages of implementation and therefore clear actions to support EAF implementation could not be developed. However, the following recommendations were raised by the group to support the effective implementation of the Small Scale Fisheries policy:

1. Improved communication among stakeholders and DAFF
    - Encourage DAFF to improve communication on developments
    - Improve mechanisms of communication (e.g. Facebook, apps)
    - Engage stakeholders effectively to move from debate to dialogue
2. Expand EAF representation within the SSF forum
3. Develop a roadmap of how SSF will be implemented. E.g. DAFF booklet to demystify process of implementation targeting media and stakeholders
4. Create ways to support the government and the sector to achieve goals

Despite increased efforts from the Department, there was evidence of miscommunication and a lack of accurate information around the SSF policy and progress towards implementation between the stakeholders, both in the session and within the wider group. Quite a few members from the group had

not been informed of the latest SSF Policy implementation process, from the policy, to the Marine Living Resources Act (MLRA) amendments, the regulations and all the activities that DAFF is putting in place.

As the focus of the session ultimately focused on foundational issues for rolling out the SSF sector, it was difficult to find clear actions for EAF implementation. The nature of the sector and the continued confusion around how this policy will be interpreted in implementation has left little space for developing practical actions and it seems difficult for stakeholders to disentangle EAF issues from the wider policy and implementation concerns. Since the SSF in this current formulation has not had the extensive discussion around EAF that many of the other fishing sectors have experienced through the Ecological Risk Assessment processes and subsequent research and discussion, creating a forum where EAF objectives could be developed should be considered.

3.4 Spatial management

Co-chairs: Dr Carl van der Lingen (DAFF/UCT), Dr Lynne Shannon (UCT); Rapporteur Dr Kate Watermeyer (UCT)

The need for consideration of spatial management in fisheries is tripartite:

1. Resource perspective (e.g. spatial considerations in management procedures given the occurrence of multiple stocks; protection of spawning areas)
2. Ecosystem perspective (e.g. identification of Ecologically or Biologically Significant Areas (EBSAs) that resulted in 21 MPAs being proposed covering inshore, shelf and offshore waters (Sink et al. 2013)
3. Other considerations (e.g. marine spatial planning (MSP) as a process of informing ecosystem-based management regarding the allocation and siting of multiple ocean uses)

The group identified five key issues of relevance to spatial management of fisheries and ecosystems in South Africa:

1. Bulk marine sediment mining
2. Balancing conflicts (both within/between fisheries and between fisheries and other groups, including other mining)
3. Management for extraction (population structure, by-catch, community structure)
4. Management for conservation (e.g. MPAs for baseline data/ habitat protection / vulnerable species/ community conservation)
5. Ecosystem needs

For each issue identified, the short and medium-term (2-5 years) actions needed or underway and the responsible bodies in South Africa were developed. These are summarised in Table 4, below.

Table 4. Marine spatial management key issues, short- and medium-term actions needed or underway and the responsible bodies.

Issue	Action to be taken *(& responsibility)*
Bulk marine sediment mining	Moratorium, via: **Lead by the Centre for Environmental Rights (CER)** a. Engagement with decision makers *DEA, DAFF, DMR, BCC, ISA, FAO* b. Communication strategy c. Research into: • Socio-economic implications (underway) • Update of impacts & dispersal studies (underway) • Legal: identify a framework, if not how, identify how it can proceed • Phosphate assessment: is it as important as suggested? d. Need to identify no-go areas, extend mining and biodiversity guidelines to include marine ecosystems *CER, SANBI*
Balancing conflicts between fisheries	Define sector-specific objectives *DAFF & fishery stakeholders*
	Zone areas for specific fisheries sectors *DAFF & fishery stakeholders*
	Develop decision support tools to guide point (a) above *DAFF & academic groups*
Balancing conflicts between fisheries & other groups	Define sector-specific objectives *DAFF & other stakeholder groups including DEA, DMR, tourism*
	Zone areas for specific sectors *DAFF & other stakeholder groups including DEA, DMR, tourism*
	Develop decision support tools to guide point (a) above Academic groups in collaboration with above groups
Spatial management For exploitation	Assess population structure using multiple methods; determine productivity characteristics of individual stocks *DAFF & tertiary education institutions, SANBI and through bursary funding*
	Ensure spatial completeness of surveys *DAFF & tertiary education institutions*
	Community structure (including by-catch): research, ecological indicators etc. *DAFF & tertiary education institutions*
Spatial management For conservation/protection	Implement MPAs Operation Phakisa, spatial planning *Underway through OMPA & SANBI*

Table4 continued

	Need for baseline/'before' data before MPAs are implemented (urgent) *SANBI, DAFF* (e.g. invertebrate sampling on surveys), *DEA, SAEON & others* e.g. citizen science is possible inshore (ISPOT, ICATCH, FISHtory already going) but inshore MPAs are not being extended and these approaches are not feasible for offshore MPAs.
	Improvement of management structure of MPAs MPA forum
Ecosystem needs **For ecosystem function/ healthy ecosystem**	Long term goal: Currently no legal basis for minimum ecosystem services (as FOR FRESHWATER systems e.g. minimum flow requirement). (Oceans Bill – in development?) *CER*
	Identify thresholds (e.g. *E. coli?*) *DAFF, DEA & tertiary education institutions*
Ecosystem needs **For dependent predators**	Account for prey requirements of top predators (fished e.g. snoek, and unfished e.g. birds) – needs some ecological research to better understand feeding, trophic flow etc. *DAFF, DEA & tertiary education institutions*

In addition, monitoring and enforcement were topics that were highlighted as falling under all groups, but which were seen as part of the solution not the issues.

The group also noted that phosphate/bulk sediment extraction needs to be dealt with differently from oil and gas extraction. Mining and its ecosystem impacts (often unquantified) and management should be given high priority. Conflicts between mining and fisheries objectives and the respective tradeoffs will need to be addressed explicitly, and managed accordingly.

4. Social learning to support an EAF in South Africa

Based on her recently completed PhD research, Dr Emily McGregor shared insights on social learning in EAF implementation with the participants and through conversations with the chairpersons of the breakaway groups. These thoughts are new to the process of implementing EAF in South Africa, and are summarized in this section.

Stakeholder participation in decision making is fast becoming the norm. In South Africa, fisheries management at all levels calls for participation of wide groups of stakeholders (e.g. Marine Living Resources Act, No. 18 of 1998). An EAF in particular requires effective participation by stakeholders to ensure that multiple objectives and perspectives are identified and trade-offs effectively addressed in decision-making for EAF implementation. As such, participatory processes are regularly initiated to support EAF in South Africa (e.g. the Ecological Risk Assessment processes, the International Stock Assessment review processes, scientific and management working groups within DAFF). These processes hope to achieve sustained and positive interactions that allow the groups to reach successful outcomes that can be taken up by relevant decision makers and that participants LEARN together and as individuals within a group. This important element of learning caught the attention of the first author of this report (EM), and drew her into the literature around social learning theory as applied in the context of environmental management (see Cundill and Rondela (2012) for a good overview on the application of social learning in this context).

Social learning is defined as the "*collective action and reflection that occurs among individuals and groups as they work to improve the management of human and environmental interrelations*" (Keen et al., 2005:4). Social learning can occur both during interactions of people within a group and through interaction with one another. It is during interaction that stakeholders can learn to work together for joint action to develop new and innovative solutions and perspectives on a shared problem. Therefore, the deliberative interactions among stakeholders from different backgrounds and with different perspectives provide opportunities for social learning.

This workshop offered an opportunity to focus on social learning through interaction on a shared goal. The aim of the workshop was to highlight both the positive strides made in EAF implementation as well as the outstanding challenges in South Africa through the presentations by key players and groups driving EAF. This provided a baseline for all participants to enter into the afternoon sessions with a shared understanding and perspective. Placing participants into groups to work on a shared task of identifying issues to address in the short term to help advance the EAF principles across various themes. The session chairs were provided guidelines to encourage open and equal opportunity for participants to engage with one another and with the topic they were addressing.

The aim of the workshop was to ensure that not only were clear and achievable short-term actions developed to progress an EAF in South Africa but that participants felt their time was valued and their

participation in the process was meaningful. This can be supported through effective facilitation and an eye on the social interaction that can be met through social learning. Ways to measure this include:

- Diverse participation
- Perceived successful interactions
- Innovative facilitation with social learning in focus (e.g. more emphasis on group interaction, alternative meeting structures and the better application of multiple-stakeholder process methodologies. For an excellent free resource see the MSP guide developed by the Center for Development Innovation at Wageningen University http://www.mspguide.org/.
- Sustained communication
- Perceived changes in understanding, knowledge gained, attitudes towards each other

While the workshop was a short and once-off event, feedback from the session chairs, speakers and participants was generally positive. Younger participants who had not been through previous EAF processes fed back that they found the workshop a valuable exercise in both placing EAF into the South African context as well as seeing what actions they can support as they move forward in their current positions. Effective communication was highlighted by a number of the sessions as important to support EAF in South Africa. More emphasis on this element in future participatory processes is encouraged.

Diverse participation is always hard to achieve, and while the workshop was successful in reaching many stakeholders in different groups and with different perspectives, there is always more work to be done in garnering more diverse participation. An important element in this is making sure participants will feel they will get something out of joining. Providing all stakeholders with the opportunity to air their concerns without the fear of them being dismissed off hand can make a difference in effective participation.

The longer-term outcome of these processes is the change in understanding, knowledge-gained and positive changes in attitudes towards one another. A highlight of this workshop was to observe how long-term engagement on some topics has resulted in effective participation and clear actions being developed. The spatial management and bycatch groups in particular benefitted from the on-going engagement and cohesion among stakeholders that has been facilitated throughout the Ecological Risk Assessment process ten years ago. In contrast, the SSF group struggled to find a clear perspective around EAF implementation and positive interaction among stakeholders. This is a new topic in the small-scale South African fisheries context, and the balance and diverse participation required to effectively engage is still lacking. However, if the workshop outcomes are followed through, further support and more effective stakeholder engagement can be developed. If successfully achieved, this will have huge benefits to broadening EAF implementation in South African fisheries

5. Panel discussion summary

A panel discussion was chaired by John Duncan and included Drs Lynne Shannon (UCT), Johann Augustyn (SADSTIA), Serge Raemakers (UCT) and Mr Craig Smith (DAFF) as panelists. Four specific questions were asked to which each panelist shared their views, and the panel then responded to questions from the other participants. The specific questions were:

- Do we have a shared understanding of what an EAF is?
- Are we making progress in implementing an EAF?
- How are we doing in comparison with other countries, particularly those with whom we like to compare ourselves?
- What should we do to generate EAF capacity?

5.1 Panel responses to the initial questions

The panelists agreed that the EAF is a very wide and all-encompassing field and as such, probably quite daunting in its all-encompassing properties. Discussion between the panelists and members of the audience highlighted that while there is an FAO definition of this term, there is not a shared understanding of how this definition is to be implemented in practice. In particular, there is no agreement on approaches to be used to balance conflicting objectives, e.g. long-term versus short-term objectives, competition between different fisheries sectors, and/or conservation objectives versus objectives linked to exploitation of marine resources.

Although there was agreement that South Africa is making progress in the implementation of an EAF, the lack of a coordinating body for this work was re-emphasised. Although it is desirable that government assume a stronger role in coordinating an overarching EAF strategy, it was accepted that this would possibly not materialise given the known capacity problems.

The panelists thought that from the natural science research side, South Africa is making progress in terms of improving our understanding of ecosystem functioning and related EAF issues. However, it is not doing that well in terms of implementation of management responses. Success stories include the mitigation of seabird by-catch, where work undertaken in South Africa even influenced the regional fisheries management authorities.

A key challenge noted was that due to the bias of the EAF research to date towards the natural sciences, our understanding around the social and economic aspects of an EAF is considerably less well-developed. A lack of transdisciplinarity in research has resulted in a situation in which natural science is seen as the primary source of information on which to base management actions and, as a result, the legitimacy of the outcomes and recommendations of these processes is increasingly being challenged. Understanding the 'human dimensions' needs considerably more attention, both in terms of clarifying what they are and how

they can be more effectively incorporated in research and management. There was some support expressed for suggestions to create a human dimensions working group at DAFF.

The lack of capacity is known to be a general problem in South African state departments. The panel agreed that bureaucracy hinders progress with regard to the implementation of an EAF and that there is currently not a dedicated focus on this issue within the management authority. State support of an EAF would require more money allocated to this endeavor, paired with appropriate human capacity and improved administration. In the current situation, much of the progress has achieved through partnerships and externally funded studies. The panel emphasised the need to ensure that (i) these studies are interlinked and (ii) there is a careful focus on how their results feed into management. Importantly, the EAF needs to make its way into day-to-day management, but it was understood that this can only be done with a full, and adequately capacitated management team. It was pointed out that a critical question remains as to how DAFF: Fisheries Management can coordinate its approach such that it actually reaches the fisheries stakeholders.

During the past decade, government focused on Ecological Risk Assessments, which were regarded as pre-requisites to implementing an EAF. While this process has undoubtedly increased awareness among the participating stakeholders of the multitude of management objectives that need to be balanced, in hindsight the ERA-process to date appeared gridlocked as an exercise that ran too fast for all sides to feel included. In order to emphasise inclusiveness and relevance, it was further thought helpful to formulate research questions in collaboration with stakeholders, similar to what had been a positive result from the first round of ERAs and what is being aimed for in the process of SASSI listing of key species .

There was general agreement (also from many participants after this discussion session) that this workshop was exceptionally useful. A workshop like this could be an annual event of communication and coordination, although it was understood that a workshop cannot delve in depth into particular technical issues. These would need to be integrated into fisheries management plans, which would hold management accountable.

5.2 Additional discussion

Questions from the floor prompted further discussion on:

- How to deal with the lack of continuity in stakeholder fora, where it was highlighted that it is impossible to achieve progress in these mandated fora if a constant trickle of new participants in the process require starting the discussions back from square one time and time again.
- The need for adequate mechanisms for monitoring and compliance in the implementation of the SSF policy, acknowledging the weak monitoring, control and surveillance (MCS) system in general.
- The need to address the social and economic consequences of the different policies governing fisheries, opening knowledge of the human dimension beyond economic efficiency. It was highlighted that, in evaluating case studies, careful consideration has to be given to the particular context in which that case study took place. It was also emphasised that while policy evaluations along several human dimensions will have to be carried out on specific case studies first, a further step involves their

combined evaluation beyond those case studies to find possible commonalities which could in t urn serve further policy development.

- The continued need for DAFF: Fisheries Management to engage with a wider group of researchers than those invited to management working group meetings.

5.3 A two-pronged way forward

In summary, the panelists' responses pointed to a two-pronged way forward. While a focus on building EAF-related capacity in the government departments needs to continue, researchers and fisherfolk (in the widest sense) also need to learn to collaborate more closely in order to implement this integrated approach in the real world with all its context-specific complexities.

The need for continued integration and coordination of the complex EAF implementation process was highlighted, and it was suggested that an annual review meeting after the present workshop would be useful.

6. Conclusion

Opportunities for strategic research and development

Prof Astrid Jarre concluded the workshop by reflecting on strategic research needs for progress in the implementation of an ecosystem approach to fisheries (EAF) in South Africa. This section provides a summary of her presentation.

One step back, one step sideways and one step forward

Going back a good decade, and concurrently with the publication of FAO's Technical Guidelines for the implementation of EAF (FAO 2003), a global scientific working group was preparing for a major science conference at the UNESCO Headquarters in Paris in 2004. The closing remarks of the IOC - SCOR Conference on "Quantitative Ecosystem Indicators for Fisheries Management" highlighted steps into three EAF dimensions as "*one step back, one step sideways and one step forward*" (see Figure 1). Firstly, the scientists in the room were reminded that predictions were only as good as the underlying, evidence-based understanding of processes. To step back and continuing to know one's system, hence, was the first piece of advice. Secondly, as the step sideways, the natural and social scientists in the room were encouraged to establish links, in order to integrate social and economic considerations more explicitly into fisheries governance and management. The third point maintained that the legal basis and scientific framework for an EAF were largely available, so the challenge ahead, as the step forward, would be to get started. These steps provide a useful guide as we continue to progress EAF in South Africa.

To date, a systems approach to management of human activities in the ocean, of which EAF is a part, continues to be the best framework available to work towards sustainable development. There was general consensus that important progress has been made, jointly through the Ecological Risk Assessments (Nel et al. 2007, Petersen et al. 2010, Petersen et al. 2015), and related research. The following section highlights opportunities for research and development. Since the "ability to achieve" dimension continues to pose important challenges, a few overarching points pertaining to this dimension are given first, and then more specific "ability to achieve" aspects are linked to continued challenges in the ecological and human dimensions.

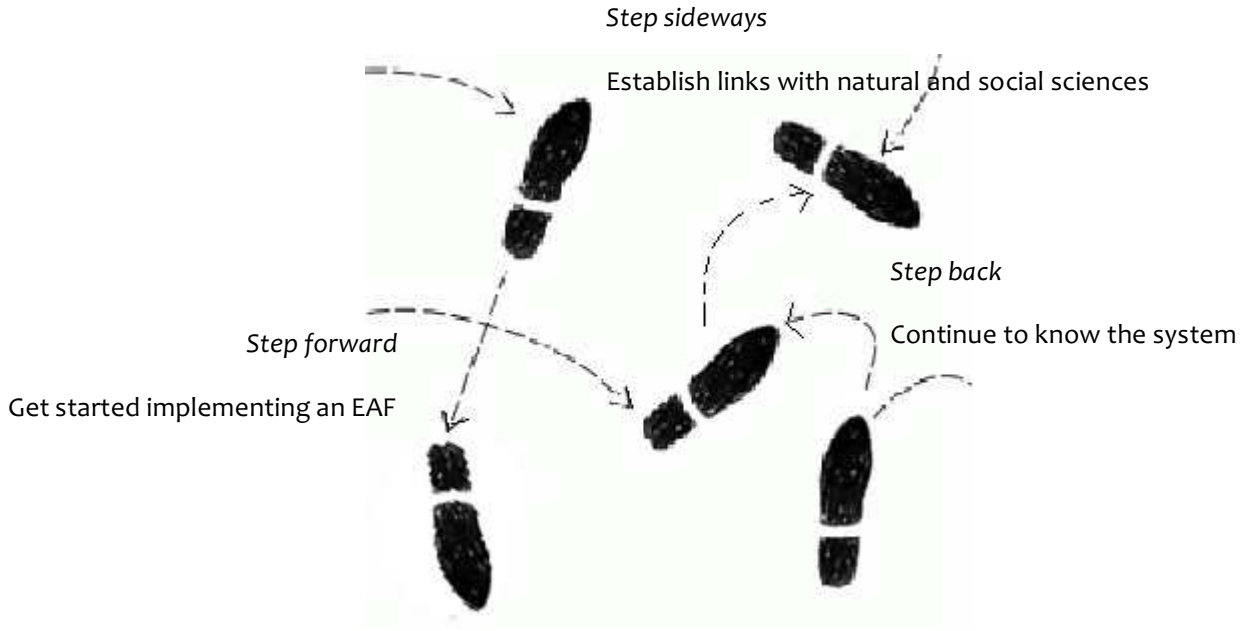


Figure 1. One step back, one step sideways and one step forward: Steps into the three dimensions of an EAF.

Preparing to step forward: General needs for improving on the "ability to achieve" dimension

The "Ability to Achieve" dimension is broken down into two sub-dimensions, "Governance" and "External drivers". Major drivers of the dynamics in the Benguela Large Marine Ecosystem have been identified (see, e.g., Jarre *et al*. 2015 for an overview), and in addition to fishing and long-term, large scale climate variability and change, marine mining has emerged as a potential, major external driver of ecosystem dynamics.

With regard to governance, the lack of political and economic stability has delayed the implementation of an EAF in South Africa, particularly since 2009 which saw both the onset of the world economic crisis and President Zuma's cabinet reshuffle which split DEAT into DAFF: Fisheries and DEA: Oceans and Coasts. Major governance-related stumbling blocks which require interdisciplinary research, include the development of a methodology to overcome the very high levels of conflict which preclude communication and collaboration amongst diverse stakeholders, and to increase legitimacy of management institutions. Related to this is the question of how to incorporate different bodies of knowledge into a general framework underlying management decision-making. The continuing capacity problems in government have highlighted the need to develop complementary management institutions that lack the bureaucracy (see presentation by Tim Reddell on Day 1, Appendix 1), but include the knowledge residing in the relevant government departments where possible.

Backwards and forwards: "Ability to achieve" needs linked to the ecological dimension

For the ecological dimension, and in addition to the specific feedback from the breakaway groups, which is presented in Section 3 there is a continued need to develop integrative indicators and ways to combine them, apply the concept of ecosystem services, and, last not least, conduct an integrated (cross-sectoral) ecosystem assessment in line with international best practice. Linked challenges in the 'ability to achieve' dimension include the need to better understand the impact of external drivers on the dynamics of the Benguela social-ecological system, and the need to improve integrated decision-making under uncertainty, including the (transdisciplinary) development and analysis of long-term adaptation scenarios.

Sideways and forwards: "Ability to achieve" needs linked to the human dimension

For the human dimensions, and in addition to the specific feedback from the breakaway groups the first day (Section3, Tables 2-4), there is a need to further develop specific social objectives, both on local and regional scales. The lack of data/knowledge that is linked to progress towards these objectives, likewise, needs to be addressed with urgency. In view of the high levels of conf lict, social science research needs to address ways to increase humanity and decrease violence in our marine communities. In the implementation of the new SSF policy in particular, ways of co-existence of formal and informal economies need to be understood and their peaceful co-existence improved. Opportunities for research and development in the 'ability to achieve' dimension, which are directly linked to the human dimension, include the creation of functional multi-stakeholder fora at various scales (local, regional, national), the building of legitimate management institutions at levels above the local that can, e.g., engage with already established fora/groups such as the RFA. The concept of compliance needs to be redesigned and then implemented. Vulnerability and adaptability in our marine communities need to be understood in order to enhance their resilience. This will require coordinated communication and collaboration among various sectors (and possibly government departments) and, last but by no mean s least, education at various levels.

Integrating good data with good processes: - , Learning to dance - backwards, sideways and forwards

What has emerged during the past ten years of South Africa's pathway towards the implementation of an EAF, and is supported internationally, is the understanding that we need both good data/knowledge and good processes. There is plenty of scope for transdisciplinary research for solution pathways into the particularly wicked problem of fisheries management (Khan & Neis 2010), and, more generally, into management of human activities in our marine social-ecological systems.

There was general consensus that further progress could best be supported through review workshops such as this one, and that an annual event would be suitable spacing in time. The workshop would then fulfil an overarching coordinating role in the implementation of an EAF in South Africa. Specific breakaway groups for each review workshop could be selected based on proposals made by the marine community (in the wider sense) for review by the workshop core team, which would ensure that specific, topical issues are addressed when needed, and in this way fast-track focused, collaborative research and action and support good communication.

7. Acknowledgements

The core team gratefully acknowledges funding by WWF-SA, the Responsible Fisheries Alliance and the South African Research Chair Initiative, funded by DST and administered by NRF, through the Research Chair for Marine Ecology and Fisheries. We would like to extend our sincere gratitude to all speakers for sharing their expertise and continued enthusiasm, as well as to the chairpersons of the breakaway groups and to the rapporteurs for each session. We express our sincere thanks to all discussants for their input and to all participants for their interest. Last but not least, the staff of the Park Inn hotel in Newlands, as well as UCT's technical support and VIVA catering provided technical assistance and/or catering for a smooth running of the sessions and enjoyable breaks on both days.

8. References

Cooper, R. (2015). *Systems modeling with emphasis on hake (Merluccius capensis and M. paradoxus) fisheries in South Africa*. PhD thesis, University of Cape Town, South Africa.

Cundill, G., & Rodela, R. (2012). A review of assertions about the processes and outcomes of social learning in natural resource management. *Journal of Environmental Management*, 113, 7-14.

FAO (2003). *Fisheries management. The ecosystem approach to fisheries*. FAO Technical Guidelines for Responsible Fisheries Supplement 2. 112 pp.

Jarre, A., Hutchings, L., Kirkman, S. P., Kreiner, A., Tchipalanga, P., Kainge, P., Uanivi, U., van der Plas, A.K., Blamey, L.K., Coetzee, J.C., Lamont, T., Samaai, T., Verheye, H.M., Yemane, D.G., 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(S1), 122-149.

Keen, M., Brown, V. A. & Dyball, R. (2005). *Social learning in environmental management: towards a sustainable future*. Earthscan, New York, USA.

Khan, A. S. & Neis, B. (2010). The rebuilding imperative in fisheries: Clumsy solutions for a wicked problem? Progress in *Oceanography*, 87(1), 347-356.

McGregor, E.S. (2015). *Evaluating the implementation efficacy of an Ecosystems Approach to Fisheries management in the South African sardine fishery* . PhD thesis, University of Cape Town, South Africa.

Nel, D. C., Cochrane, K., Petersen, S. L., Shannon, L. J., van Zyl, B. & Honig, M. B. (2007). *Ecological Risk Assessment: A Tool for Implementing an Ecosystem Approach for South African Fisheries* . WWF South Africa Report Series – 2007/Marine/002.

Paterson, B. & Petersen, S.L. (2010) EAF implementation in Southern Africa: Lessons learnt. Marine Policy 34: 276-292.

Petersen, S., Paterson, B., Basson, J., Moroff, N., Roux, J.-P., Augustin, J. & G. D'Almeida (2010). *Tracking the implementation of an ecosystem approach to fisheries in southern Africa*. WWF-South Africa Report Series 2010/Marine/001.

Peterson, S., Duncan, J.A., Omardien, A., Betts, M. & Johnson, A. (2015). *A decade fo implementing an ecosystem approach to fisheries for southern African fisheries.* WWF South Africa Report Series - 2015/Marine/001.

Shannon, L.J., Cury, P.M. Nel, D., van der Lingen, C.D., Leslie, R.W., Brouwer, S.L., Cockcroft, A.C. & Hutchings, L. (2006). How can science contribute to an ecosystem approach to pelagic, demersal and rock lobster fisheries in South Africa? *African Journal of Marine Science* 28, no. 1 (2006): 115-157.

Shannon, L.J., Jarre, A., & Petersen, S.L. (2010). Developing a science base for an ecosystem approach to fisheries in the Benguela. *Progress in Oceanography* 87: 289-303.

Sink, K., Attwood, C.G., Lombard, A.T., Grantham, H., Leslie, R. Samaai, T. et al. (2013) Spatial planning to identify focus areas for offshore biodiversity protection in South Africa. Final report for the Offshore Marine Protected Area Project. South African National Biodiversity Institute, Cape Town.

Smith, A.D.M., Brown, C.J., Bulman, C.M., Fulton, E.A., Johnson, P., Kaplan, I.C., Lozano -Montes, H., Mackinson, S., Marzloff, M., Shannon, L.J., Shin, Y. -J. & Tam, J. (2011) Impacts of fishing low-trophic level species on marine ecosystems. . 333: 1147-1150

Watermeyer, K.E.(2015). *Ecosystem implications of the recent southward shift of key components in the southern Benguela*. PhD thesis, University of Cape Town.

Weller, F.G., Sherley, R.B., Waller, L.J., Ludynia, K., Geldenhuys, D., Shannon, L.J. & Jarre , A. (2016). System dynamics modelling of the Endangered African penguin populations on Dyer and Robben islands, South Africa. *Ecological Modelling* 327: 44-56 + TRACE Appendix.

Appendix 1 – Agendas for Days 1 and 2

Day 1 Agenda

Workshop: Tracking Implementation of an Ecosystem Approach to Fisheries (EAF) in South Africa

25 August 2015, Park Inn Hotel Newlands, Cape Town Time	**Presentationtopic**	**Speaker**
PART 1: Welcome and overview of key areas of EAF implementation in South African fisheries		
8.30-9.00	Tea and snack	
9.00-9.05	Welcome	Astrid Jarre (UCT)
9.05-9.35	An overview of progress in the EAF Scientific Working Group	Carl van der Lingen (DAFF)
9.35-10.05	WWF and sustainable fisheries	Samantha Petersen (WWF)
10.05-10.20	Responsible Fisheries Alliance and an EAF	Tim Reddell (RFA)
10.20-10.50	**TEA**	
11.00-11.20	Social learning to support an Ecosystem Approach to Fisheries in South Africa	Emily McGregor (UCT)
PART 2: Speakers will provide a short overview of past and current progress in implementing an Ecosystem Approach to Fisheries within highlighted themes/areas These talks will act as an introduction to the afternoon sessions		
11.20-11.30	**Bycatch** An overview of bycatch issues and projects currently inplace in various fisheries.	Colin Attwood (UCT); Jessica Greenstone (WWF)
11.30-11.40	**Top predator interactions** An overview of issues and work done towards understanding top predator and fishery interactions.	Ross Wanless (BirdLife); Christina Hagen (BirdLife)
11.40-11.50	**Spatial management** An overview of various themes, issues and projects around spatial management and South African fisheries management.	Carl van der Lingen (DAFF); Lynne Shannon (UCT)
11.50-12.05	**Benthic habitats and marine mining** Two short feedback presentations on (I) the benthic trawl experiment and (ii) phosphate mining in South Africa.	Lara Atkinson (SAEON) Saul Roux (CER)

12.05-12.15		**Small scale fisheries** An overview of the issues and progress made in EAF within small scale fisheries in South Africa.		Merle Sowman (UCT); Surge Raemaekers (UCT)
12.15-12.45			Discussion	
12.45-13.00		Guidance on afternoon sessions		Emily McGregor
13.00-14.00			**LUNCH**	
PART 3: The afternoon will involve four parallel sessions (participants will need to choose one Session to attend). These sessions will provide an interactive, participatory platform to identify the Most pressing issues and to formulate key actions for theSe issues in order to support EAF Implementation within the next 5 years 14.00-17.00 with tea available from 15.00-15.30				
Themed session	***Bycatch***	***Top predator interactions***	***Spatial management (ecosystem, climate)***	***Smallscale fisheries***
Chair	Jessica, John D	Ross, Christina	Carl, Lynne	Merle, Serge

Copies of the presentations are available from the authors of this report.

Day 2 Agenda

Seminar

Tracking Implementation of an Ecosystem Approach to Fisheries (EAF) in South Africa

26 August 2015, Kramer Lecture Theatre 3, University of Cape Town **Time**	**Presentation topic**	**Speaker**
9.00-9.15	Welcome	JohnDuncan
Feedback presentations from a collaborate EAF Workshop held with key stake holders on 25 August 2015.Outlining the key issues and primary actions for EAF invarious themes		
9.15-9.45	Bycatch	Jessica Greenstone (WWF)
9.45-10.15	Top predator interactions	Ross Wanless & ChristinaHagen (BirdLife)
10.15-10.45	Smal lscale fisheries	Merle Sowman & Serge Raemaekers (UCT)
10.45-11.15	Spatial management (Ecosystem, climate)	Lynne Shannon (UCT) & Carl van derLingen (DAFF)
11.15-11.40	**Tea**	
Panel discussion and summary		
11.50-12.45	Panel session **Participants TBC**	Chair: John Duncan (WWF)
12.45-1.00	Closing	Astrid Jarre (UCT)
Lunch		

Appendix 2

List of stakeholders invited to participate in Day 1 of the workshop

	Organisation	*Name*
CoreGroup		
1	**UCT**	Astrid Jarre
2		Lynne Shannon
3		Emily McGregor
4	**WWF**	John Duncan
5		Jessica Greenstone
6		Chris Kastern
7	**RFA**	Junaid Francis
Participants		
8	**UCT**	Colin Attwood
9		Merle Sowman
10		Serge Raemaekers
11		James Howard
12		Tony Leiman
13	**DAFF**	Carl van der Lingen
14	Directors	Siphokazi Ndudane
15		Craig Smith
16		Dennis Fredericks
17		Saasa Pheeha
18	SWGS	Janet Coetzee
19		Andy Cockroft
20		Rob Tarr
21		Sven Kerwath
22		Deon Durholtz
23		Rob Anderson
24	**DEA**	Herman Oosthuizen
25		Steve Kirkman
26	**RU**	Kevern Cochrane
27	**UWC**	Mafa Hara
28		Moeniba Isaacs
29	**SAIAB**	Angus Patterson
30	**ORI**	Larry Oellerman
31	**SANBI**	Kerry Sink
32	**SAEON**	Lara Atkinson
33	**CapeNature**	Lauren Waller
34	**WWF**	Samantha Petersen
35		Mkhululi Silandela
36	**Birdlife**	Ross Wanless
37		Christina Hagen
38	**RFA Projects Working Group**	Bronwyn Maree
39		Charlene Coetzee
40		Claudia Bowers
41		Karen Koen
42		Madoda Khumalo
43		Trevor Wilson
44	**Centrefor Environmental Rights**	Saul Roux
	Industry Associations	
45	SAPFIA	Mike Copeland
46	SADSTIA	Johan Augustyn
47	WCPFA	Llwellyn Strydom
48	ECPFA	Redah de Main
49	SAHALLA	Clyde Bodenham
50	WCRLA	Suleiman Salie
51	**I&J**	Rob Landman
52	**Oceana**	Titania Stefanus Zincke
53		Rui Ventura
54	**Masifundise**	Naseegh Jaffer
55		Christiaan Adams
56	**MARAM**	Doug Butterworth
57	**FishSA**	Jeremy Maurilla

Attendance at Day 2 of the workshop was opened to a wider audience and invitation was widely distributed through the mailing lists of UCT's Marine Research Institute and the South African Network for Coastal and Oceanic Research, SANCOR.