

WORKING Paper 5

STRATEGY FOR FISHERIES SOCIO- ECONOMIC RESEARCH

March 2008

by Terence Jayiya, Mafa Hara, Martin de Wit and Doug Crookes

Terence P Jayiya
email: <mailto:tjayiya@jaymat.co.za>
tel: +27 (0)21 919 9015
fax: 086 513 5736

Martin de Wit
Associate Professor Extraordinary
Faculty Economics and Management Sciences, School of Public Management and Planning
Stellenbosch University

Mafaniso Hara
Senior Researcher
Institute for Poverty Land and Agrarian Studies (PLAAS)
School of Government
University of the Western Cape
Private Bag X17, Bellville 7535, South Africa
<http://www.plaas.org.za>

Doug Crookes
Independent Research Economist



Contents

Acknowledgements	3
Executive Summary	3
Governance and processes	4
Fisheries production	4
Social benefits	4
Introduction	6
Background	6
Scope and Purpose	7
Report Structure	7
Fisheries socio-economics overview	8
General	8
Legislative	8
Economic	10
Commercial	11
Recreational	11
Subsistence	12
Social	12
Project approach (methods)	14
Fisheries socio-economic research themes	15
Governance and Processes	16
Fisheries Production	18
Social Benefits	19
Institutional framework	20
Present Present Present	20
Proposed Functions	21
Staff Staff Staff	22
Conclusions	23
APPENDIX 1: List of consultees	25
APPENDIX 2: Survey questionnaire sample	27
APPENDIX 3: Interviews outcome	29
APPENDIX 4: email survey outcomes	36
APPENDIX 5: LITERATURE SURVEY	43

Acknowledgements

The authors would like to thank the programme for marine fisheries cooperation between Norway and South Africa (NORSA) for funding this project. We would also like to thank all those fisheries experts who willingly gave their time to respond to interviews and questionnaires. Also, Marine and Coastal Management for being generous with the time needed to complete such a project.

Executive Summary

This document sets broad strategic directions for a period of five years and provides a framework on which fisheries socio-economic research priorities can be determined on a more frequent basis. This is seen as more effective than investing in socio-economic research as and when the need arises. Development of the strategy should be seen as a process, not an endpoint, hence, it is quite likely that the strategy itself will require refinement during the next five years.

An overview of fisheries socio-economic issues has to start with a clear meaning and understanding of what is meant by 'socio-economics' and, more importantly, what relevance this has to fisheries management. The term socio-economics therefore needs to be handled with some care. It does not really indicate a particular disciplinary focus and, in most cases, the work carried out by 'socio-economists' would be better divided between sociologists and economists carrying out their respective analyses though clearly working closely together (FAO, 2003). In this overview, the focus is on the work carried out by sociologists and economists, although the many important areas of overlap, where the disciplines may need to closely cooperate, are also discussed.

This project has identified three fisheries socio-economic research themes for implementation by Marine and Coastal Management. These themes span the spectrum of fisheries management information needs, and often correspond to specific disciplines within the socio-economic sciences. Proposed themes are:

Governance and processes

This topic will evaluate policies, regulatory frameworks, legal authorities and processes that are required for planning, management and regulation of coastal and marine resources. The topic will also look at formal and informal institutions (State, provincial, local, traditional/use-based and NGOs) responsible for managing and regulating coastal and marine resources. Three topics are envisaged under this theme, namely Policy Instruments, Rights Structures, and Conventions and Treaties.

Fisheries production

Fisheries production involves combining an input of resources or 'factors of production' to produce an output of goods and services. Producers may use any combination of resources of different types in the production process. This theme will investigate the area of fisheries production which is located at the point where resources are taken from the marine environment into the economy. Below are three possible research topics for investment.

Social benefits

This theme will deal with investigating the benefits that fishing communities, rights holders and society at large derives from coastal and marine resources. An important aspect will be to develop an inventory of social and economic data of various sectors (commercial, small-scale, subsistence, recreational and existence value). A second aspect will be studying socio-economic characteristics of fishing communities and use patterns of coastal and marine resources with the view of developing evidence-based development and management interventions. Three topics could be: employment, users value, and existence value.

Further, in Chapter 4, we propose research topics under each theme.

In Chapter 5 we discuss specific actions the organisation should undertake if it is to create the ability to *actually conduct this research and act on its findings* in the long-term stewardship of the nation's most valued living marine resources. To that end, this section discusses the (a) present status, (b) the proposed functions to be undertaken, and (c) the issue of building the capacity within and outside the organisation.

In terms of the capacity required, the project has proposed the employment of:

- Principal Resource Economist (7–10 years' experience)
- Principal Sociologist (7–10 years' experience)
- Economist (2–4 years' experience)
- Sociologist (2–4 years' experience)

Introduction

Background

After decades in which fishing has contributed to the development of the economy of many countries and to the welfare of consumers, fishery resources in some areas of the world have been seriously reduced and even jeopardised. Significant environmental, economic, social and cultural costs are involved, and states individually and collectively must assume the responsibility for mitigating the consequences of fisheries degradation, preventing further degradation, and, wherever possible, fostering recovery from conditions of degradation. From a biological and ecological perspective, the duty of governments is to control the stocks of living resources that need to be maintained at a certain point in time. Because of this, the management of fishery resources has traditionally relied heavily on natural science information about the biology and ecology of specific marine resources and ecosystems. It has, however, become increasingly clear that while there is adequate information about stocks, their biology and the environment, there has been a lack of socio-economic information to counter-balance this (Augustyn, pers. comm.).

Today, managing industry, recreational fisher, environmental and seafood consumer expectations, and developing appropriate political responses, will require carefully planned social, economic and policy research as well as the more traditional biological and ecological research. To ignore or marginalise the *socio-economics* of fisheries risks prolonged and counterproductive user conflicts, legal challenges, procedural delays, and ineffective outcomes for both the ecosystems and the human users they support.

Fisheries management is about managing people's social and economic behaviour as regards exploitation of fisheries. As a result, socio-economic aspects of fisheries have been identified as key to fisheries management worldwide. Experience shows that fisheries management cannot be successful if it is not

based on an understanding of the socio-economics of fishing and on proper governance institutions (which requires socio-economic research). Thus while fisheries natural science defines the bio-ecological limits, socio-economics define the rules of the game. Therefore fishers' behaviours and motivations should be more clearly understood, as they play a critical role in ensuring sustainability of the resource. Thus strategic and meaningful research on fisheries socio-economics is a requirement which must be fulfilled.

Scope and Purpose

Recognising the above, Marine and Coastal Management have commissioned this project on the development of a strategy for fisheries socio-economic research ('the research strategy'). The resulting strategy is intended to improve the incorporation of socio-economic research, in all of its disciplines, into the planning, management and evaluation of marine resources, and to enhance and target the allocation of scarce resources toward high priority information needs by managers. The final end product of the project will be a research strategy document with priority fisheries socio-economic research themes, as well as how Marine and Coastal Management should implement the strategy from 2008 to 2012. Thus the scope and purpose of this document is to:

- Highlight priority socio-economic research themes for Marine and Coastal Management.
- Propose an institutional framework for conducting socio-economic research and for integrating this research into fisheries management. That is to advise on how to put the research in operation over the next five years.

Report Structure

This document is divided into six chapters:

Chapter 1: Provides a background to the project, scope and purpose of the document.

Chapter 2: Is an overview of fisheries socio-economic issues in South Africa, based largely on the literature review conducted during the project.

the economic and social factors is clearly highlighted in a number of environmental legislation and international conventions relevant to South African fisheries.

The Marine Living Resources Act (Republic of South Africa -RSA, 1998a) states that the Minister and state officials should exercise their powers with due reference to:

'the need to utilise marine living resources to achieve economic growth, human resource development, capacity building within fisheries and mariculture branches, employment creation and a sound ecological balance consistent with the development objectives of the national government' (Section 2(d), line 33–36).

The White Paper on coastal development (RSA, 2000) states that:

'Coastal economic development opportunities must be optimised to meet society's needs and to promote the well-being of coastal communities ... Coastal management efforts must ensure that all people, including future generations, enjoy the rights of human dignity, equality and freedom ... The diversity, health and productivity of coastal ecosystems must be maintained and, where appropriate, rehabilitated.'

One of the principles enshrined in the National Environmental Management Act (RSA, 1998b) is that:

'The social, economic and environmental impacts of activities, including disadvantages and benefits, must be considered, assessed and evaluated and decisions must be appropriate in light of such consideration and assessment' (Section 2(4), i).

The Bruntland Commission defines sustainable development as:

'development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (WCED, 1987). This comprises ecological and ecosystem sustainability, economic growth and stability and social equity.'

The 2002 World Summit on Sustainable Development held in Johannesburg highlighted the fact that:

'resources managers are faced with the challenge of reconciling equity, economic efficiency and sustainability' (Kleinschmidt et al., 2002).

These legislations and international conventions taken together, highlight the need to adopt a holistic (and people centred) approach to fisheries and coastal management and development, which is also consistent with the ecosystem approach (Shannon *et al.*, 2006). In general, all of these mandates refer to the need for interdisciplinary assessment in support of policy and management decisions, including both formal social-scientific data and the inclusion of public and stakeholder input.

Economic

In reviewing the socio-economic context of fisheries, it is important to realise that markets do not provide the full picture with regards to economic sustainability. There is a growing environmental and resource economics (ERE) literature that strives to include ecological considerations into traditional economic markets. While some of these studies are discussed here, no comprehensive framework currently exists for assessing all the impacts of the environment on development, and vice versa.

Annual revenue from coastal resources in South Africa is estimated at more than R179 billion (DEAT, 1998). While not all of these components are relevant to Marine and Coastal Management, this is a sizeable contribution to economy, estimated at approximately 37 per cent of Gross Domestic Product (GDP). Some of the components include subsistence and commercial fishing, recreation, coastal tourism, waste assimilation and aesthetic and intrinsic values. The recreational use value of selected beaches in the Cape Peninsula alone has been estimated at 8.6 million (Ballance *et al.*, 2000).

Major macroeconomic threats to the marine and coastal resources include ecologically insensitive onshore development, competitive overfishing and pollution (WCED, 1987). For example, discharges into the ocean are a major

cause of pollution. There are approximately 63 of these outfalls releasing 800 000 m³ of sewage and industrial effluent into the sea every day (UNEP, 2002). Contact with or consumption of contaminated fish or seafood products poses a human health risk. Pollution also degrades the marine environment, resulting in lower economic returns from fish products and tourism. Further socio-economic threats to ecosystems include population growth and the threat of illegal, unregulated and unsustainable fishing.

Commercial

In the mid-1990s, the annual wholesale value of South Africa's commercial fisheries was R1.7 billion per annum, or 0.5 per cent of Gross Domestic Product (McQuaid and Payne, 1998). By 2003 the fishing industry's estimated contribution to GDP was approximately R2.63 billion (or 1 per cent of GDP) (FAO, 2005). In spite of transformation, the sector has still managed to grow. Almost 90 per cent of these marine catches (by value as well as tonnage) come from the Western Cape, with most of the balance coming from the Eastern Cape (McQuaid and Payne, 1998). Approximately 26 000 people are employed by the sector (Tapscott, 1999). Assuming an average household size of five, this amounts to 120 000 people dependent on the fishing industry for their livelihoods. Fish products contribute 1.5 per cent of Gross Geographic Product (GGP) for the Western Cape (Tapscott, 1999). The trawl fishery is the most important, with hake contributing 70 per cent of catch and 80 per cent of value (Tapscott, 1999). A recent Economic and Sectoral Study (Rhodes University, 2003) found that directly employed fishers accounted for 16 854 people, with indirect employment a further 10 876.

Recreational

Approximately 750 000 people participate in the recreational angling sector in South Africa each year, and spend at least R750 million per year (1995) in the process (RSA, 1997). The multiplier effect in terms of investment in equipment and boats, employment in shops selling fishing gear and in the tourist industry is significant. Annual catch of high value species is 17 000 tons (RSA, 1997).

Recreational fisheries generate many additional socio-economic benefits (Van der Elst *et al.*, 2005). There are approximately a third of a million recreational anglers in the Western Indian Ocean of South Africa.

Subsistence

Very little is known about the economic contribution of subsistence fishing. A nationwide study in 20 localities by Branch *et al.* (2002) has documented the socio-economic characteristics and lifestyles of informal and subsistence fishers. The study contains a description of earnings, fishing-related income and composition of harvest. Measures of poverty were also derived. A number of other case studies of individual fisheries are also available, some of which are discussed in Chapter 5.

Social

Among the many problems facing non-social scientists attempting to come to terms with social issues is the difficulty often encountered in understanding what it is that sociologists, or whoever is brought in to look at 'social issues', are really dealing with. In this review, the 'social' sphere is concerned with all forms of relations between individuals and groups. This means understanding the ways 'society', as a grouping of individuals, has developed, the way it is organised, how the various groups within a society interact, the norms of behaviour which they observe, and how groups and group behaviour affect the individuals which make up those groups.

What the above analysis means for fisheries is that fishers behaviours and motivations should be more clearly understood, as they play a critical role in ensuring the sustainability of resources. This is particularly the case for countries such as South Africa, where small-scale fisheries are an important livelihood strategy for fishers along the coast. Additionally, the role of social science is especially important in South African fisheries because of the country's complex,

diverse ethnicities and historical background. The broadened understanding of an ecosystem approach as outlined by the FAO (FAO, 2003; Garcia *et al.*, 2003) and subsequently adopted by South Africa (Shannon *et al.*, 2006) recognises the necessity of understanding and integrating socio-economic dynamics into fisheries management and governance. This means that the social context of fisher households and coastal communities are critical to the development of appropriate management strategies and livelihood opportunities. Furthermore, this context will be different in different regions, requiring an adaptive management approach that responds to specific circumstances. This is even more important when it comes to dealing with poor people with a short time horizon in terms of their basic needs. For example, while reducing pressure on severely depleted stocks such as abalone is vital, this is only going to work if one understands what drives current exploitation patterns and what competitive alternatives exist outside fishing. Social data and information will improve and strengthen both operational and strategic management decisions that DEAT:MCM has to make by making them evidence-based. By having the capacity for investigation and validation in socio-economics, this will strengthen the department's ability to fulfil its mandate.

Many fishers from traditional fishing towns and fishing communities (Van Sittert, 2003) solely dependent on fishing for economic sustenance, such as Doringbaai, Port Nolloth, Paternoster and Elandsbaai, failed to get long-term rights because they could not prove that they were bona fide fishers (Van Schalkwyk, 2006) or because of the onerous application procedures (Chandler, 2006), despite the fact that addressing unemployment and stimulating job creation are two crucial goals of government (Van Schalkwyk, 2006). If resources should be allocated according to some kind of distributional logic other than use of markets, it is important to know, not only who are the potential recipients of rights and quotas, but also what their socio-economic situation is and therefore what criteria should be applied in the allocation of rights.

Involving fishers and rights holders in policy and management decision-making, sometimes referred to as 'co-management', and integration of their views into policy and management is likely to result in better understanding and greater acceptance of the regulatory framework by the fishers, and therefore improved voluntary compliance (Hauck and Sowman, 2003; Hara, 2003; Hutton, 2003; Hutton, Raakjær, Nielsen and Mayekiso, 1999). How best to involve stakeholders is best achieved through the skills of fisheries social scientists.

Project approach (methods)

Three techniques were used to solicit data and information:

- Direct in-person interviews. These were stakeholders available to meet the project team. The list of names of those who were interviewed is in Appendix 1.
- An e-mail based questionnaire survey. This was intended for people the project could not meet on a one-to-one basis. See Appendix 1 for names and Appendix 2 for the survey questionnaire.
- A literature survey on the relevant issues to this research. See Appendix 5 for the literature survey.

A structured questionnaire was developed as a guide for issues on which views were being sort. Even then the interviewees had the freedom to provide any other inputs that they thought might not have been covered under the questions guiding them.

The people for the survey were purposefully selected on the basis of their stakeholderhip in the South African fishing industry and their knowledge of the fishing industry. The categories of people whose views had been sort were: researchers (both natural scientists and social science) at academic institutions

within South Africa, industry working groups, MCM managers, selected individual international fisheries social scientists (from Canada, Norway and Denmark) with a knowledge of South African fisheries, FAO, and a sample of rights holders.

This report combines the views obtained from the surveys and interviews, the literature survey and the consultants' own intuition based on their experience of working in the fishing industry and scholarship.

Fisheries socio-economic research themes

This project has identified three fisheries socio-economic research themes for implementation by Marine and Coastal Management. These themes span the spectrum of fisheries management information needs, and often correspond to specific disciplines within the socio-economic sciences. Further, the project illustrates (Figure 3.1) the utility and relevance of each research theme. The purpose of this is to show that the research themes are not just stand alone, nice to do, but will assist Marine and Coastal Management in the production of information required to fulfil the socio-economic objectives and principles of the Marine Living Resources Act (Act No. 18 of 1998).

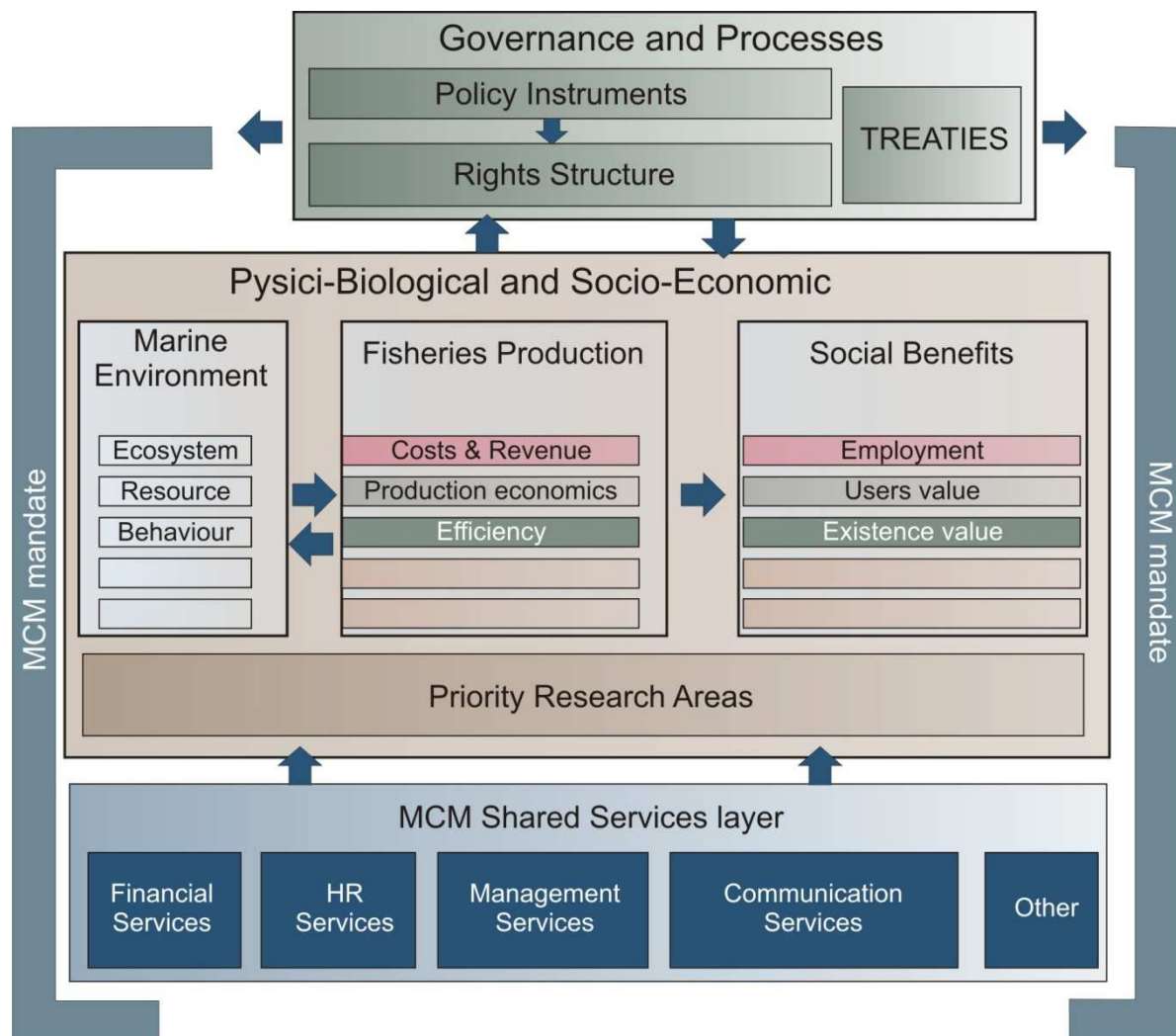


Figure 1 : Total fisheries system in the South African context. Fisheries socio-economic themes are (a) governance and processes, (b) fisheries production, and (c) social benefits

Governance and Processes

This topic will evaluate policies, regulatory frameworks, legal authorities and processes that are required for planning, management and regulation of coastal and marine resources. The topic will also look at formal and informal institutions (State, provincial, local, traditional/use-based and NGOs) responsible for managing and regulating coastal and marine resources. Three topics are envisaged under this theme, namely Policy Instruments, Rights Structures, and Conventions and Treaties.

Policy and Regulatory Instruments:

This will examine the various policy instruments that govern coastal and marine resources, the nature of intra-agency, inter-agency, and inter-governmental interactions in relation to coastal and marine resources planning, and management and development in order to design optimal structures and avoid inter-jurisdictional incompatibilities and conflict. This may include an analysis of the existing and required regulatory frameworks.

The topic will also deal with the development of methods for monitoring and evaluating transformation in the industry. For commercial fisheries, these could be based on the score sheets that outline conditions for fishing rights in each sector (DEAT, 2005). Some of these are: redistribution of access rights, job creation, ownership structure of companies, gender transformation, employee equity ownership, etc.

A third aspect will be studies on the capacity building for new entrants and female rights holders in the industry. This should include the skills transfer, access to capital, investment in the industry, survival rates of new entrants, etc.

Rights and Management Systems:

This will investigate the appropriate fishing rights structures and management systems for the various fishing sectors based on fishery or regional characteristics and incentives structures for sustainable utilisation (e.g. ITQs, Community Based Fisheries Management, Co-management, Territorial Use Rights, etc.).

This will also examine models for the meaningful integration of the public into coastal and marine resources management decision-making.

Treaties and Conventions:

South Africa is signatory to various international treaties and conventions. How effective are these for coastal and marine fisheries management? Do they have positive or negative effects on coastal community economies?

Fisheries Production

Fisheries production involves combining an input of resources or 'factors of production' to produce an output of goods and services. Producers may use any combination of resources of different types in the production process. This theme will investigate the area of fisheries production which is located at the point where resources are taken from the marine environment into the economy. Below are three possible research topics for investment.

Costs and Revenue

This topic is a collection of the baseline data needed for more in-depth economic analysis. Research work is needed on the cost of harvest/production and the associated revenue. This is needed in order to try and understand how to increase the value of the product and improve the economic viability of the fishing sectors. Revenues and costs mainly determine the economics of fishing operations. Revenues depend on species and quantities caught and prices obtained, which again depend on marketing channels and markets, seasonal fluctuations and other factors. The main cost factors are capital investment and operation costs, which can be divided in labour costs, running costs and vessel costs (<http://www.fao.org/fishery/topic/12309>).

Production Economics

A key topic under fisheries production is the understanding of production economics. This is where a link is made between the fishing stock models and economic yields. Also, some of the data will come from the above theme dealing with fishing costs. The topic will help study various ways to represent production and technological progress in mathematical models. We emphasise using methods that make it possible to provide realistic images of the complexity of real productions. Fisheries productions typically include multiple input, multiple output and uncertain conditions of production, and corresponding complex

correlations. It will consider all the production factors required for economic analysis. In the end it will allow for the bio-economic analysis fishing.

Efficiency

Assessment of economic performance is important to ensure that state-owned resources are efficiently utilised and that information is available to facilitate resource and business management decisions. It could assist in the decision-making process during allocations. Allocation is a complex issue which requires a greater understanding of the resource, environment, and economic status of fisheries. Useful and meaningful research in such issues is urgently required to provide an objective basis for decision-making.

Social Benefits

This theme will deal with investigating the benefits that fishing communities, rights holders and society at large derive from coastal and marine resources. An important aspect will be to develop an inventory of social and economic data of various sectors (commercial, small-scale, subsistence, recreational, and existence value). A second aspect will be studying socio-economic characteristics of fishing communities and use patterns of coastal and marine resources with the view of developing evidence-based development and management interventions. Three topics could be: employment, users value, and existence value.

Employment

Some of the issues under this topic are: employment figures in the industry, forms of employment, wage and benefits structures, labour issues, etc.

Users Value

What are values (e.g. net profit) that rights holders in the various sectors get from coastal and marine resources? This will also investigate the importance of coastal and marine resources for local fishing and coastal communities in terms of tradition, livelihoods and subsistence. In addition such studies will define the limits of coastal and marine resources for meeting all the social and economic needs of coastal and fishing communities. The studies on importance and limits

should form a basis for evidence-based interventions for development and poverty alleviation programmes (e.g. small-scale fishing rights, subsistence fishing rights, alternative/supplementary economic activities, infrastructure provision, external social support systems/programmes, etc.).

Existence Value

Develop methods for estimating existence or non-consumptive values of coastal and marine resources in order to include these in the total economic value. For example what are the values of cage shark-diving, whale-watching and cultural use of coastal and marine resources?

Institutional framework

This strategy addresses the need for Marine and Coastal Management to invest in the development and implementation of fisheries socio-economic research. The previous section presents two distinct research themes that should together constitute a fisheries socio-economic research agenda for Marine and Coastal Management. However, this information alone, while interesting, is not sufficient to meet the needs of the organisation. This section discusses specific actions the organisation should undertake if it is to create the ability to *actually conduct this research and act on its findings* in the long-term stewardship of the nation's most valued living marine resources. To that end, this section discusses (a) the present status, (b) the proposed functions to be undertaken, and (c) the issue of building the capacity within and outside the organisation.

Present Present Present

Currently Marine and Coastal Management have no fisheries socio-economic core research programmes. In the absence of specialised core research themes/programmes, as well as lack of fisheries socio-economist, MCM contribution in fisheries-related socio-economic research or socio-economic impact studies and review of policies/programmes/projects in the fisheries sector has been very marginal, if at all. The main function of Marine and Coastal

Management in the area of fisheries socio-economics is currently confined to ad hoc rudimentary assignments which are carried out by other institutions. In turn, these institutions are often supervised by MCM staff with no qualifications or adequate training in fisheries socio-economics.

In terms of capacity, Marine and Coastal Management have four staff members working in the area of fisheries socio-economics. Three economists are employed in the Resource Management Chief Directorate. These are at Deputy Director level and below. There is also a person employed for socio-economic development in the Coastal Management Chief Directorate. During our interviews, it became clear that this capacity was involved in some other aspects of management support and very little research activity. In fact, it was difficult to ascertain what kind of information they are currently providing the managers. ***Nevertheless, those interviewed suggested that capacity ought to be built inside the Research Chief Directorate.*** They strongly advised that a small number of people dedicated to fisheries socio-economics be established within the Research Chief Directorate.

Outside the organisation are a number of institutions that conduct some fisheries socio-economic work. The ones identified during the project are the UCT, Stellenbosch, UWC and Rhodes universities. ***All agreed that in order for this kind of work to be taken as important as the biological one, capacity ought to be built inside the organisation and some investment outside the organisation through SANCOR and the NRF.***

Proposed Functions

In line with the recommendations made in Chapter 4 above, it is proposed that the Marine and Coastal Management socio-economic group (within the Research Chief Directorate) should be established and have the following functions, to be divided according to the specialised domain of each theme, namely Fisheries Governance, and Fisheries Production.

1. Prepare and implement the annual work plan according to the proposed fisheries socio-economics research themes, and *in consultation with biological and management working groups already existing*.
2. Design and formulate future research projects as required, in line with the core research themes.
3. Establish and maintain an efficient Documentation and Data Bank for all fisheries-related projects and programmes, a database of reliable and comprehensive information on the sector ensuring that the recommendations are based on sound and comprehensive data on fisheries, fisheries resources.
4. Conduct socio-economic surveys.
5. Conduct studies on economic and socio-economic aspects of marine fisheries, and make policy recommendations on sustainable improvement of small-scale fishing communities, managing the resource to maximize its productivity and also to allocate the limited marine fisheries between small-scale fishing communities and industrial fisheries to avoid the conflict between them.
6. Conduct socio-economic impact studies of marine fisheries-related policies and projects.
7. Provide leadership in the review and discussions on the fishery development policy proposals.
8. Cooperate and liaise with national and international fishery research institutes and bodies all over the world on matters of fishery socio-economic research and fishing community development.
9. Participate in the relevant fisheries research working groups already established at MCM.
10. Management of fisheries socio-economic research contracts.

Staff Staff Staff

The proposed socio-economic research themes and recommendations in Chapter 4 of this report would demand a highly professional and very intensive series of outputs from the socio-economist to be employed at Marine and Coastal Management. In order to carry out the fisheries socio-economic core research

themes, MCM needs to start the recruitment of appropriately qualified and well experienced professional staff to fill all the posts (still to be created) at the Research Chief Directorate as illustrated in Table 1.

Table 1 : Staff requirements for the fisheries socio-economics capacity required at MCM

SPECIALIST & EXPERIENCE	GOVERNANCE THEME	PRODUCTION THEME	SOCIAL BENEFITS	TOTAL
Principal Resource Economist (7–10 years' experience)	0	1		1
Principal Sociologist (7–10 years' experience)	0	0	1	1
Resource Economist [add: (2–4 years' experience)?]		1		1
Sociologist [add: (2–4 years' experience)?]	1			1

Conclusions

Along with the recognition that fisheries socio-economic factors are relevant for improved understanding of fisheries, and therefore implementing appropriate policies and management plans, has come the realisation that the collection of data and the conduct of fisheries research need to incorporate these concerns (Charles, 1998). This project has evaluated the needs for fisheries socio-economic research by interviewing fisheries managers, reviewing the existing research literature, and consulting external experts.

The project sets forth a plan to conduct the research of the highest priority and payoff for the Marine and Coastal Management. The document also allocates responsibilities for accomplishing this strategy. Some of the activities to be carried out are immediate and clear, whereas others are less certain and therefore require more information and flexibility. When this strategy is implemented, fisheries socio-economics researchers should be able to provide the Marine and Coastal Management and its clients with socio-economic suggestions and information required for improving the management of South African fisheries.

The Marine Living Resources Act (1998) emphasises the importance of harvesting the natural resource base sustainably. It should therefore be recognised that the need to preserve fish stocks for future generations should receive paramount attention. While it is important to understand the socio-economic impacts of fish on fishers and associated communities, these issues do not supersede the need to conserve the resource base. Perhaps the major research effort needs to lie in setting out the theoretical groundwork for an integrated 'Bio-Socio-Economic' fishery analysis in order to provide fisheries managers with a complete set of management recommendations. This will surely be the challenge to fisheries research into the future.

APPENDIX I: List of consultees

Table 2 : List of people interviewed by the project team. The list includes fisheries managers and researchers that are knowledgeable about South African fisheries

NAME AND SURNAME	ORGANISATION	POSITION
Dr Monde Mayekiso	Marine and Coastal Management	Deputy Director General
Dr Johan Augustyn	Marine and Coastal Management	Chief Director: Research
Mr Ashley Naidoo	Marine and Coastal Management	Director: Research Support
Mr Ntobeko Bacela	Marine and Coastal Management	Director: Inshore Fisheries Management
Miss Theresa Franz	Marine and Coastal Management	Director: Offshore Fisheries Management
Mr Jacobus de Swart	Marine and Coastal Management	Deputy Director: Offshore Fisheries Management
Dr Mohammad Karan	University of Stellenbosch	Lecturer in Resource Economics
Dr Moenieba Isaacs	University of the Western Cape	Senior Researcher: Fisheries Socio-Economics
Prof Doug Butterworth	University of Cape Town	Professor at the Mathematics Department (Fisheries Assessments)
Prof Tony Lieman	University of Cape Town	Professor at the Economics Department (Fisheries Economics)

Table 3 : List of people who were surveyed by e-mail as part of the project. These people were given a questionnaire to complete and return to the project team

NAME AND SURNAME	ORGANISATION	POSITION
Prof Rudy van der Elst	Oceanographic Research Institute	Director of Fisheries Research
Serge Raemaekers	Rhodes University	Ph.D. Student
Prof Jesper Raakjær	Institute for Fisheries Management, Aalborg University	Professor of Research
Prof Bjorn Hersoug	Norwegian College of Fishery Science, University of Tromso	Professor of Fisheries Economics

Strategy for fisheries socio-economic research

Prof Poul Degenbol	European Commission	Fisheries Scientific Advisor
Prof Rashid Sumaila	University of British Columbia	Professor of Fisheries Economics

APPENDIX 2: Survey questionnaire sample

*Please return your answers and contributions to Mafaniso Hara at:
mhara@uwc.ac.za*

Socio-economics is the study of the relationship between economic activity and social life. The field is often considered multidisciplinary, using theories and methods from sociology, economics, history, psychology, and many others. Socio-economics analyse both the social impacts of economic activity and the economic impacts of social activity.

Objectives of survey: Investigate socio-economic data and information requirements for fisheries policy and management. This will guide the Department of Environmental Affairs and Tourism (DEAT): branch, Marine and Coastal Management (MCM) with regard to priority areas for socio-economic research.

DETAILS OF INTERVIEWEE

Name

Organisation and title

E-mail address

Telephone

(Please use extra pages if you cannot fill in your answer within the allotted space. Remember to show which question the extended or additional answer refers to by including the question number.)

Strategy for fisheries socio-economic research

QUESTIONNAIRE STATEMENTS

1. *Why is socio-economic research important for South African fisheries?*

.....
.....
.....
.....

2. *What socio-economic data and information is required for policy and management of South African fisheries?*

.....
.....
.....
.....

3. *How can this data and information be collected and collated? (e.g. from existing secondary data or through primary research?)*

.....
.....
.....
.....

4. *Can the data and information needs be grouped into research themes/programmes? If yes, what programmes should these be?*

.....
.....
.....
.....

5. *How can DEAT: MCM operationalise this research?*

.....
.....
.....
.....

6. *Any other suggestions you would like put forward for formulation of DEAT: MCM's strategy for socio-economic research?*

.....
.....

Thank you for your contribution(s)

APPENDIX 3: Interviews outcome

Background

One of the main sources of information for this report was a series of semi-structured interviews with knowledgeable individuals who have worked on issues related to fisheries management. A general list of questions – rather than a formal questionnaire – was prepared as the basis for the interviews. Each interview followed a slightly different course, according to the experience and interests of the interviewee, as well as the time available. Interviewees were speaking in their personal capacity and their views may not be the official policy of the organisations for which they work. The authors have made their best efforts to ensure the accuracy of the information contained in this report and apologise for any inadvertent errors.

Views on fisheries socio-economics

The key issues are highlighted and discussed under the four broad questions, which were asked during the interview sessions. An attempt was made to make the interviews different to the e-mail-based survey. A link for and between answers is then created in order to discuss the results of the questionnaire survey. For each broad question, key issues emanating from the survey are highlighted.

Understanding of fisheries socio-economics:

Conversations with our interviewees revealed a range of opinions and interpretations on the meaning of fisheries socio-economics, but the large

Strategy for fisheries socio-economic research

majority of the interviewees voiced an opinion that, in the appropriate context, this includes studies on the social impacts brought about by some change in fisheries economic activity. The changes in economic activity in fishing might be the closing down of a fish processing facility, which in turn will affect the social life of a small fishing community or region. The changes in economic activity may affect patterns of consumption, the distribution of incomes and wealth, the way in which people behave (both in terms of purchase decisions and the way in which they choose to spend their time), and the overall quality of life. These can further have indirect effects on social attitudes and norms.

Based on the above understanding of fisheries socio-economics, the interviewees suggested that it is now inescapably clear that the successful design, establishment and stewardship of any fisheries management is also an intensely human endeavour that is profoundly influenced by how society values the oceans and how we perceive our role in marine ecosystems, now and in future generations. To ignore or marginalise the socio-economics of fisheries (as has been the case in South Africa) risks prolonged and counterproductive user conflicts, legal challenges, procedural delays, and ineffective outcomes for both the protected ecosystems and the human users they support.

Suggested fisheries socio-economic research:

For this section, interviewees were asked to provide or suggest areas of potential research and investment by Marine and Coastal Management. Prior to asking this question, interviewees were informed that the South African Marine Living Resources Act, 1998 (Act No. 18 of 1998) is the legal instrument by which South African fisheries are managed and regulated and that chapter one of the Act sets out 10 objectives and principles that ought to be considered when exercising the powers under the Act. Among its

Strategy for fisheries socio-economic research

objectives in section 2(d), the Act deals with the need to achieve economic growth, human resource development, capacity building within the fisheries and mariculture branches, employment creation and a sound ecological balance consistent with the development objectives of the national government. Interviewees were then supposed to answer the question in such a way that Marine and Coastal Management would be able to address the socio-economic objectives of the act.

Our interviewees identified the following broad themes as priorities for fisheries socio-economic research coordination and action. These will form the basis of further, more detailed consideration by the project consultants, for the development of a fisheries socio-economic research strategy:

- Develop the socio-economic dimensions of the ecosystem approach
- Understand people/community value of fisheries
- Test the role of fisheries in sustainable development
- Test economic viability of fishing rights
- Understand the relationship between fishing rights and human rights
- Equity aspects of fisheries (gender and race)
- Understand the spatial dimension of interactions between human activities and fisheries change
- Understand the relationship between multiple complementary processes (tourism, fisheries, and economic development)
- Conduct social assessment of fishing communities
- Conduct Fisheries Economic valuations (e.g. catch costs)
- Social and economic databases
- Monitoring (policy objectives)
- Fisheries transformation
- Developing socio-economic indicators to complement biological indicators

Strategy for fisheries socio-economic research

- Predictive tools for economic impacts
Values of fishing rights versus other livelihoods
Link socio-economics to stock assessment
Adherence to permit conditions (monitoring)
Understand the dynamics between fishers or rights holders

The above list is as received from the ten people interviewed. Clearly the above list is exhaustive and needs further refinement and scaling down. This is done in the main body of this report after considering the e-mail-based survey and the literature review.

The potential use of fisheries socio-economic information:

The preceding section discussed the meaning, understanding and interpretation of fisheries socio-economics as presented to us by the interviewees. In this section we tried to get an understanding from the list as to what they perceived would be the potential use of fisheries socio-economic research or information.

The overwhelming response was that socio-economic information could help make clear assessments of and comparison between fisheries through time. Socio-economic information should allow the description in simple terms of the extent to which the objectives set for sustainable development are being achieved. Their basic function, in other words, is to facilitate the process of fisheries policy and management performance assessment. Together with other information (especially biological information), they should be useful as objective guides for the analysis of management proposals made or measures taken for South African fisheries.

Strategy for fisheries socio-economic research

They should furthermore provide a basis for developing systemic knowledge of the socio-economic realities of the fishing sector in every region concerned. This knowledge can be used mainly for analysing the impact of ongoing fisheries changes in fleets, and areas, including changes in production, prices, costs, economic yields, employment, technology, and the state of resources.

A leading research economist put it well when he said 'Economic and social assessments are clearly important to inform governments regarding policy decisions on resource management and to provide industry with information vital to investment decisions.'

Interviewees also stressed that the socio-economic information collected over time could eventually enable the development of a simulation methodology. In fact, the information that could be gathered would make it possible to perform simulations on the basis of alternative scenarios (for instance, on the productivity of capital or of manpower). Hence, the next step following the identification of needed information would be to develop simulation systems that make it possible to anticipate how different management alternatives may help communities to adjust their fishing capacity so that fisheries become sustainable both in economic and in biological terms.

Associated risks:

Despite the potential advantages of conducting fisheries socio-economic research, identified by many of our interviewees, this report would like to suggest that they offer no panacea or simple solution for the many problem issues associated with fisheries management and development. Indeed, this type of research is only likely to succeed in a conducive policy atmosphere,

Strategy for fisheries socio-economic research

and if supported by all of the key stakeholders who should be involved in their design. Designing socio-economic research often requires the resolution of a number of complex challenges against a background of incomplete information.

Even when properly designed, fisheries socio-economic research projects are likely to be controversial and the subject of disagreement. For instance, some conservation organisations oppose the entire concept, preferring to lobby for an outright fishing ban with no consideration of socio-economic consequences. Others are less critical of the concept of fisheries socio-economic research in theory, but feel that the way they are being put into practice leaves much to be desired. Community organisations may want to use socio-economic information to argue for more fishing rights.

Institutional strengthening:

Currently, Marine and Coastal Management have no fisheries socio-economic research programmes. There are, however, two or three people within the organisation who conduct economics research in the more commercial fisheries. Besides this, there is some work done on fisheries economics on an ad-hoc basis by outside consultants, mainly from academia.

To build on the above and to strengthen the institution, our interviewees have all suggested that the capacity to conduct such research would have to be built both inside and outside the organisation. This is because Marine and Coastal Management would have to initially conduct some of the more basic work (data collection, constructing of databases, monitoring and evaluation) while at the same time building an internal unit to conduct the complex work later. In the meantime, the more complex and urgent work will have to be outsourced to the more experienced people at Universities and

Strategy for fisheries socio-economic research

consultancies. Built into this would be the requirement that these experts assist with internal capacity building at MCM (training of students who could be absorbed into MCM).

APPENDIX 4: email survey outcomes

Objectives of survey

Investigate socio-economic data and information requirements for fisheries policy and management. This will guide the Department of Environmental Affairs and Tourism (DEAT): branch, Marine and Coastal Management (MCM) with regard to priority areas for socio-economic research.

Methodology

Technique used: E-mail-based questionnaire (see [Appendix 2](#)).

Analysis of information from survey

- 1. Importance of socio-economic research for South African fisheries**
 - Fisheries management is essentially about managing people, thus socio-economics is an important driver of human behaviour.
 - South Africa's fisheries policy and management decisions have too often been made primarily based on the biological considerations of the target species. Often complicated resource models have been created, and decisions on input and output controls based on these. Despite the fact that those models have been accepted to be too complicated and perhaps not reflecting reality, it has created an 'understanding' gap between the managers (and their scientists) and the fishers themselves. It is believed that fisher's behaviours and motivations should be more clearly understood, as they play an even more important role in the sustainable management of our

Strategy for fisheries socio-economic research

resources. (If you leave the fish alone, they'll be fine, it's the people you need to manage). Secondly, an effort from MCM to understand fisher's characteristics in more depth, and the integration of results into fisheries policy decision-making, might well stimulate greater acceptance and understanding of the regulatory framework by the fishers, and therefore improve voluntary compliance.

- Two main reason can be put forward:
 - Fisheries management is about people and all experience shows that fisheries management cannot be successful if it is not based on understanding the socio-economic dimension of the fisheries and on proper governance institutions (which require socio-economic research to develop); and
 - Fisheries development is obviously about the social and economic dimensions of fisheries.
- Socio-economic research could improve understanding of the linkages between Ecological Services (ES). For example, a man can harvest a mussel to eat, or he can use the mussel as bait, or sell the mussel to a recreational fisher as bait or he can act as a guide to take a tourist fishing with the bait, or he can provide other facilitations for the tourist fisher, or he can build the road to allow the tourist to reach the fishing spot, etc. Each is fishery dependent, but each has different types of benefits and each of these are additional benefits. We need to understand such linkages better for development of the fisheries, management decisions, etc.

Strategy for fisheries socio-economic research

- The following can be stated as justification for socio-economic research:
 - If resources should be allocated according to some distribution logic other than the market, it is important to know not only who are the potential recipients of rights and quotas, but also what are their socio-economic situation.
 - In order to have a more inclusive management system, South Africa needs to know more about the actual situation of the fishers around the country.
 - Socio-economic data may be relevant for preparing policy interventions
- Socio-economic research has been identified as key to fisheries management worldwide. This is particularly the case for countries such as South Africa, where small-scale fisheries are an important livelihood strategy for thousands of fishers along the coast. The broadened understanding of an ecosystem approach (as outlined by the FAO) recognises the necessity of understanding and integrating socio-economic dynamics into fisheries management and governance. This means that the social and economic context of fisher households and coastal communities are critical to the development of appropriate management strategies and livelihood opportunities. Furthermore, this context will be different in different regions, requiring an adaptive management approach that responds to diverse circumstances. Thus, a socio-economic research strategy is key to developing a fisheries governance system that sustains marine resources at the same time as responding to the social and economic needs of fishers and their communities.

Strategy for fisheries socio-economic research

2. Socio-economic data and information required for fisheries policy and management in South Africa

- Socio-economic data is diverse, and needs to begin with fishers themselves and extend to macro issues such as national and international policy and market forces. At a micro level, research should focus on developing an understanding of current fishing/harvesting practices (what is considered both formal and informal), in order to identify the number of fishers, level of dependency on the resource, historical practice, other livelihood strategies, etc. Management practices, ideally, should respond to current practice on the ground and adapt accordingly. At present, there is too much of a top-down approach that dictates fishing practice over historical/traditional knowledge/activities. In addition, research is required on market and trade dynamics, which influence pressure on the resource, economic benefits and compliance. A focus on small-scale fisheries is critical, as this has been historically neglected in South Africa. In addition, however, research is required in the area of fisher and community involvement, impact, support and benefits from commercial fisheries and how the needs of these stakeholders can be met. Finally, there is a need to monitor and evaluate current management practices and approaches from a socio-economic perspective. It is important to assess what is working, and what is not working, and why. This is the case in the area of fisheries compliance, for example, where strategies are developed in isolation of the socio-economic and political drivers. It is necessary, therefore, to assess these interventions in order to develop more appropriate strategies that are effective in a particular context.

Strategy for fisheries socio-economic research

- MCM should limit itself to socio-economic research alone. Social research includes cultural, institutional and socio-economic research. There is a lot of data that could be potentially collected. To name just a few potential ideas:
 - Socio-economic indicators/data of:
 - All the relevant fishing communities (small-scale fisheries):
 - Census data (age, sex, ID, household livelihoods, grants, etc.)
 - Resources harvested, and gear
 - Permit/no-permit
 - And fishing companies (commercial fishing industry)
 - See Economic and Sectoral Study of South African Fishing Industry: this needs updating and continuation
- Indigenous / traditional / local fisheries management aspects
- Institutions / organizations / stakeholders analysis: what are their strengths, what are their weaknesses, where do they require training
- The type of data that should be collected should include catches, prices, cost of fishing, employment alternative livelihood/economic opportunities, etc.
- The following type of data/information would be important to collect:
 - How many fishers do you have in various categories?

Strategy for fisheries socio-economic research

- What is their labour/economic situation? (terms of employment and income)
 - What is the family situation of these fishers and fish workers? (number of dependents)
 - What is the poverty and health situation of these people?
 - What is the level of literacy and organisation among these people?
-
- Data and information must be sufficient to sufficiently understand impacts of management measures, to make good decisions on governance institutions and to understand potentials for development
 - Coastal and marine Ecological Services (ES) need to be understood and evaluated in their broader sense; these need to be related/matched to societal needs and expectations; differences in such needs (per region or community) should be understood; the implications of limited resources should be understood, etc.
 - Fisher community economic and social needs

3. Method for collection and collation of socio-economic data

- First, there is a need to establish a database of current and historical socio-economic research, including publications, reports and grey literature that can be accessed and circulated. In addition, names and contacts of researchers and institutions should be identified in order to establish a network of socio-economic expertise. Second, a workshop should be held to brainstorm gaps in information,

Strategy for fisheries socio-economic research

prioritise information and highlight current data that exists and/or needs to be analysed. Interaction between researchers from different areas is important for sharing information and building research knowledge. Third, through this process clarity will be provided on: existing data that can be collated, sharing of published and unpublished documentation and the identification of gaps, and possible funding opportunities, to conduct research programmes

- The Economic and Sectoral Study of South African Fishing Industry needs updating and continuation
- There is a need for both ongoing data collection of basic data as well as specific projects to collect specific data and study specific features of the fishery
- A number of methods should be used, combining secondary data, primary data, statistical methods, etc., depending on what the data is for, availability and existing gaps
- MCM has already got a good amount of the information that can be used to develop a baseline database on the fishery. This is the information provided by applicants in their rights application forms. What would be required would be to develop methods of validating this information
- In principle, routinely collected information is important for operational and short-term decisions while information from specially commissioned studies and databases should be used for strategic decisions. It must be emphasised, however, that in the end routine information should provide a good database for strategic

Strategy for fisheries socio-economic research

decisions as it would provide *trends* in the fishery that would be vital for informed evidence-based decisions

- Through specially commissioned studies to look at specific issues/problems
- Through routine data collection programmes especially for data and information required for planning, monitoring and evaluation purposes, e.g. catch value, BEE progress achieved, transformation progress achieved
- The industry working groups should be used to discuss with industry the importance of this information, how it can be provided without endangering company business secrets, methods of validation and how it would benefit the companies
- Some of the information on specific aspects can be collected indirectly from other departments and organisations. For example SARS, department of customs and excise (import and export information), department of labour? SA statistics?, etc
- Import and export information could also be collected from receiving or exporting countries
- FAO, INFOFISH, INFOPERCHE, etc. provide export and import figures by: country, species, product, year, etc. Although these are global, they would provide a starting point for comparison with other countries, validation of figures provided by industry, etc.

APPENDIX 5: LITERATURE SURVEY

A literature survey on the socio-economic aspects relevant to fisheries management in South Africa

Prepared by:

De Wit Sustainable Options (Pty) Ltd

PO Box 546

Brackenfell

7561

Prepared for:

Terence Jayiya, consultant to Marine Coastal Management

This report should be cited as:

Crookes, D.J. & De Wit, M.P. 2008. *A literature survey on the socio-economic aspects relevant to fisheries management in South Africa*. Report prepared for Marine and Coastal Management. Report Number SO 8002, De Wit Sustainable Options (Pty) Ltd, Brackenfell, February.

© All rights reserved.

Disclaimer: The information, opinions and analysis contained herein are based on sources believed to be reliable but no representation, expressed or implied, is made as to its accuracy, completeness or correctness. The opinions contained herein reflect our current judgment and are subject to change. Neither De Wit Sustainable Options (Pty) Ltd nor any agency thereof, nor any of their employees, nor any of their contractors, subcontractors or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or any third party's use or the results of such use of any information, apparatus, product, or process disclosed in this report.

Strategy for fisheries socio-economic research

CONTENTS

1. INTRODUCTION
2. THE SOCIO-ECONOMIC CONTEXT WITHIN WHICH FISHERIES OPERATE IN SOUTH AFRICA
3. DIFFERING PARADIGMS OF FISHERIES MANAGEMENT AND THEIR SOCIO-ECONOMIC IMPLICATIONS
4. THEORY OF REGULATORY COMPLIANCE
5. CASE STUDIES
6. MANAGEMENT STRATEGIES CONSISTENT WITH THE SOCIO-ECONOMIC APPROACH
7. CONCLUSION AND RECOMMENDATIONS
8. BIBLIOGRAPHY
9. APPENDIX 1: A SELECTION OF SOUTH AFRICAN AND REGIONAL STUDIES ON THE BIOECONOMICS AND SOCIOECONOMICS OF FISHERIES
10. APPENDIX 2: POSSIBLE RESEARCH THEMES FOR MARINE AND COASTAL MANAGEMENT

1. Introduction

1.1 Overview

Internationally many fisheries are in a crisis, with global landings falling since the late 1980s, the average size of fish caught decreasing and the practise of 'fishing down the food web', or consuming marine organisms previously used as bait, increasing (Pauly *et al.* 1998, 2005, Pauly 2003). Many fisheries in South Africa are also experiencing difficulties. For example, more than 20 line fish species are considered 'collapsed' with many more over-exploited (EnviroFish Africa 2006). By this it is meant that most of the line fish are depleted to 5-15 percent of pristine levels (Gerwin 2004). Catches of South coast and West coast lobsters have been in decline for a number of years and have only recently began to recover (van Sittert *et al* 2006). Illegal harvesting by one of the major rights holders was one of the major causes for the decline (Hauck and Kroese 2006). Abalone stocks have also been in decline, as a result of a combination of illegal fishing, syndicated large scale operations driven by Far East markets, and a migration of the West coast rock lobster into the abalone fishery resulting in a destruction of essential habitat for the juvenile abalone (Van Sittert *et al* 2006).

The biological environment is not the only system to undergo stress (Kaplan 2007). Social and economic systems face fluctuations, not only from the resource base but also from changes in policy and regulatory frameworks. Furthermore, policy and regulatory changes may also benefit one social group while disadvantaging another social group. The Bruntland Commission defines sustainable development as "development that meets the needs of the present without compromising the ability of future generations

Strategy for fisheries socio-economic research

to meet their own needs." (WCED 1987). This comprises ecological and ecosystem sustainability, economic growth and stability and social equity. These factors, taken together, highlight the need to adopt a holistic approach to fisheries management, which is also consistent with the ecosystem approach.

1.2 South African legislative environment

The important instruments of environmental legislation contain strong sustainability rhetoric. One of the principles enshrined in the National Environmental Management Act (RSA, 1998a) is that:

"The social, economic and environmental impacts of activities, including disadvantages and benefits must be considered, assessed and evaluated and decisions must be appropriate in the light of such consideration and assessment" (Section 2(4), i)

At the same time, the Marine Living Resources Act [RSA, 1998b] states that the Minister and state officials should exercise their powers with due reference to:

"the need to utilise marine living resources to achieve economic growth, human resource development, capacity building within fisheries and mariculture branches, employment creation and a sound ecological balance consistent with the development objectives of the national government" (Section 2(d), line 33-36).

The White Paper on Coastal development (RSA, 2000) states that:

"Coastal economic development opportunities must be optimised to meet society's needs and to promote the wellbeing of coastal communities...Coastal management efforts must ensure that all people, including future generations, enjoy the rights of human dignity, equality and freedom...The diversity, health and productivity of coastal ecosystems must be maintained and, where appropriate, rehabilitated."

Strategy for fisheries socio-economic research

Much has been done on the issues of redressing past imbalances in the distribution of resources over the past decade or so. In addition, fisheries management has historically taken place with strong reference to biological sustainability criteria. It is the socio-economic context that is the primary focus of this review.

2. The socio-economic context within which fisheries operate in South Africa

In reviewing the socio-economic context of fisheries, it is important to realise that markets do not provide the full picture with regards to economic sustainability. There is a growing environmental and resource economics (ERE) literature that strives to include ecological considerations into traditional economic markets. While some of these studies are discussed here, no comprehensive framework currently exists for assessing all the impacts of the environment on development, and vice versa.

2.1 Economic

Annual revenue from coastal resources in South Africa is estimated at more than R179 billion (DEAT 1998). While not all of these components are relevant to Marine and Coastal Management, this is a sizeable contribution to economy, estimated at approximately 37 percent of Gross Domestic Product (GDP). Some of the components include subsistence and commercial fishing, recreation, coastal tourism, waste assimilation and aesthetic and intrinsic values. The recreational use value of selected beaches in the Cape Peninsula alone has been estimated at 8.6 million (Ballance *et al* 2000).

Strategy for fisheries socio-economic research

Major macroeconomic threats to the marine and coastal resources include ecologically insensitive onshore development, competitive over fishing and pollution (WCED 1987). For example, discharges into the ocean are a major cause of pollution. There are approximately 63 of these outfalls releasing 800 000 m³ of sewage and industrial effluent into the sea every day (UNEP 2002). Contact with or consumption of contaminated fish or seafood products poses a human health risk. Pollution also degrades the marine environment resulting in lower economic returns from fish products and tourism. Further socioeconomic threats to ecosystems include population growth and the threat of illegal, unregulated and unsustainable fishing.

Commercial

In the mid-1990s, the annual wholesale value of South Africa's commercial fisheries was R1.7 billion per annum, or 0.5% of Gross Domestic Product McQuaid and Payne (1998). By 2003 the fishing industry estimated contribution to GDP was approximately R 2.63 billion (or one percent of GDP) (FAO 2005). In spite of transformation, the sector has still managed to grow. Almost 90 percent of these marine catches (by value as well as tonnage) comes from the Western Cape, most of the balance coming from the Eastern Cape McQuaid and Payne (1998). Approximately 26 000 people are employed by the sector (Tapscott 1999). Assuming an average household size of 5 this amounts to 120 000 people dependent on the fishing industry for their livelihoods. Fish products contribute 1.5 percent of GGP for the Western Cape (Tapscott 1999). The trawl fishery is the most important, with hake contributing 70 percent of catch and 80 percent of value (Tapscott 1999). A recent Economic and Sectoral Study (Rhodes University

Strategy for fisheries socio-economic research

2003) found that directly employed fishers accounted for 16 854 people, with indirect employment a further 10 876.

Recreational

Approximately 750,000 participate in the recreational angling sector in South Africa each year, and spend at least R750 million per year (1995) in the process (RSA, 1997). The multiplier effect in terms of investment in equipment and boats, employment in shops selling fishing gear and in the tourist industry is significant. Annual catch of high value species is 17,000 tons (RSA, 1997). Recreational fisheries generate many additional socioeconomic benefits (Van der Elst *et al* 2005).

Subsistence

Very little is known about the economic contribution of subsistence fishing. A nationwide study in 20 localities by Branch *et al.* (2002) has documented the socioeconomic characteristics and lifestyles of informal and subsistence fishers. The study contains a description of earnings, fishing related income and composition of harvest. Measures of poverty were also derived. A number of other case studies of individual fisheries are also available, some of which are discussed in Section 5.

Mariculture

Mariculture production has increased dramatically over the past few years. All the major mariculture species have increase production by tonnage between the year 2000 and 2003 (Table 1). In terms of value, however, only *Abalone* and *Gracillaria* have increased. *Abalone* is a significant growth area, having more than trebled in value in three years. Most abalone production centres around the Hermanus area on the Cape South Coast (FAO 2005).

Strategy for fisheries socio-economic research

Table 1: Mariculture production by quantity and value for 2000 and 2003

Species	Production				Annual Growth
	2000		2003		
	Quantity (Tons)	Value (R)	Quantity (Tons)	Value (R)	Value (%)
Abalone	180	36	515	134	55.0
Oysters	170	5.1	250	1.6	-32.1
Mussels	790	5.1	900	5.1	0.0
Prawns	120	54.3	130	11.8	-39.9
<i>Gracillaria</i>	40	0.17	48	0.26	15.2
Total	1,300	100.67	1,843	152.76	14.9

Source: *Envirofish Africa (2005)*

2.2 Socio-institutional

From a social perspective, the fishing industry is one of the most transformed in South Africa (Envirofish Africa 2006). 60 percent of rights holders are black persons or from black controlled companies. At the same time, increases in rights issues, especially to previously disadvantaged communities has increased the number of fleets operating on the ocean. This has increased capitalization of the fisheries fleet. These two consequences (capitalisation and increase in the number of vessels), taken together, increase the risks of overexploitation of the resource base. Unfortunately, current data are not available to indicate the effect of most recent rights issues. Other threats include natural causes such as climate change and environmental conditions within oceans can also have an impact on marine resources.

From an institutional perspective the fish and coastal systems are public goods, and there are strong arguments that state that Government, as custodians of the natural resource base, should ensure the ecological sustainability of these resources. However,

Strategy for fisheries socio-economic research

recent staff losses at Marine and Coastal Management have put pressure on the capacity of these organs to manage the resource. Some promising trends are the increases in monitoring and enforcement activities in certain fisheries, leading to some successful arrests. In other fisheries such as the abalone fishery, funding cuts led to reduced moral amongst enforcement staff and allegations of corruption (Sauer *et al*, 2003).

Historically, the transformation process within the industry has benefited from good macroeconomic aggregates, in particular a devaluation of the currency leading to strong export earnings. As a result the fishing industry has managed to remain competitive. The exchange rate remains an important variable in the sustainability of the industry as it moves to a more inclusive society.

3. Differing paradigms of fisheries management and their socio-economic implications

The type of management system is crucial in determining the socio-economic impact of policies, plans and procedures. A review of the literature on current trends in management systems as they relate to the socio-economic environment is therefore important.

There are two major branches of contemporary fisheries management from a biological perspective. The first relates to ecosystem approaches, and the second to rights based management. These will now be considering in more detail as they relate to the socio-economics of the coastal sector.

3.1 Rights-based approaches

Rights based approaches have asked, who does the resource base truly belong to? For example, a policy of individual transferable

Strategy for fisheries socio-economic research

quotas does not imply that quota holders become owners of the resource base. It is in fact access rights that are privatised; the fish itself remains a public resource (Copes and Charles 2004). This is the same concept subscribed to by the Marine Living Resources Act (1998). Although a right is not defined by the Act, frequent reference is made to 'a right of access' being defined.

In the literature the assignment of a right sometimes refers to an individual transferable quota (ITQ). However, we adopt a broader definition of a right consistent with Charles (2002), Copes & Charles (2004) and Pomeroy (2003). Following from this, there are essentially two kinds of rights: Use rights determine who has the right to harvest the fish resource, how access is restricted and what effort is allowed. Management rights determine who has the right to manage the resource, including who has the right to determine what types of harvesting policies are allowed.

Use rights

Firstly it should be noted that use rights are independent of the management regime. A centrally based management regime or a community based management regime can still impose different forms of use rights. Figure 1 summarises the different type of use rights that may be allowed. These essentially fall into two categories. Command and control policies, and market based policies.

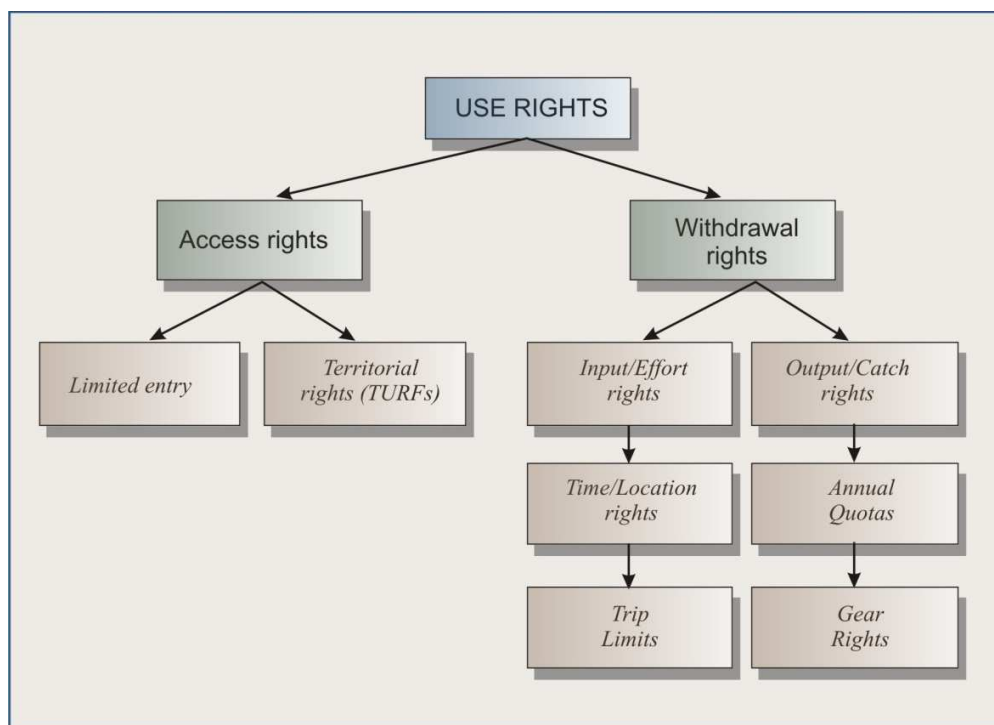
a. Command and control measures

A review of the history of fisheries management policy in South Africa (Saville and Lumby 2001) suggests that this was the dominant policy for fisheries management from the 1970s onwards. Regulations introduced included a 200 mile Exclusive Economic

Strategy for fisheries socio-economic research

Zone (EEZ), licenses, quotas, closed seasons and minimum mesh sizes. These policies did achieve some measure of success from a biological perspective. However, from an economic perspective the policies failed dismally (Saville and Lumby), resulting in large concentrations of ownership in the fishing industry. These policies also promoted poaching and other illegal activity such as bribery.

Figure 1: A topology of use rights



Source: Charles (2002, 2003); Pomeroy (2003)

From an economic perspective, these policies are also inefficient as they do not promote optimal utilisation of resources. Closed seasons and other policies also promote overcapitalisation of the fisheries, and encourage a race for fish. A case in point is the Pacific Halibut and Sablefish in the Alaska Region, where the fishing season was open for less than one week in certain areas. This resulted in low catch per unit effort (CPUE), low ex-vessel prices for

Strategy for fisheries socio-economic research

fishers, poor product quality and a scarcity of fresh fish on the market (dissatisfied consumers) (Crookes 2001).

b. Market based instruments

Economic instruments incorporate monetary values for the use of natural resources, by for example, applying taxes, prices or tradable rights. The advantage of these pricing mechanisms is that they provide clear signals to consumers about the cost of producing a product, and to producers about the relative valuations (WTP) that consumers place on the resource (Davis and Gartside 2001). An advantage of EIs is that they allow for decentralised decision-making by those whose behaviour is modified. Economic instruments work well in partnership with biological objectives of reducing harvests to sustainable levels. The strength of the approach is that efficiency is achieved. From an economic perspective, transferable quotas in a deterministic environment are regarded as formally equivalent to an optimal tax on landings (see Clark 1985). However, ITQs are preferable to taxes from the perspective of the resource harvester, in that resource rents are not transferred to the authorities but accrue to the resource user (Milner-Gulland and Crookes 2001). In this regard, quotas may be more acceptable from a societal perspective.

Empirical evidence supports this approach. Studies in the Gulf of Mexico red snapper fishery (Weninger and Waters 2003) indicates that dockside revenue increased by \$3.2 million as a result of switching to a rights based approach. This represents a 48.6 percent increase in revenues for the fishery. Similar results were achieved for the Gulf of Mexico grouper fishery (Weninger 2007). Cost saving of \$2.92-\$7.07 million are achieved, 12-30% less than the

Strategy for fisheries socio-economic research

case under controlled access management. A limitation of quotas is that they do not expressly deal with equity issues. Guyader and Thebaud (2001) try to address this by developing an empirical model to look at distributional issues between firms which own a number of fishing vessels. Variables such as firm profits, vessel owner profits and wage rates are included, the latter being dependent on the value of the catch. Another limitation of quotas is the issue of bycatch (Bureau *et al* undated). In Chile, ITQs have been touted as the best available fisheries management option, particularly for the industrial sector (Peña-Torres 2002). In South Africa, individual quotas have been assigned to some fisheries from as early as the late seventies (van Sittert *et al* 2006), and the results have been positive both from an efficiency perspective while at the same time taking into account the need to redress past imbalances and promote equity. As Van Sittert *et al* (2006) states:

“In 1994, access rights were in the hands of about 300 almost exclusively white-owned companies, but by 2004 had been reallocated to 5837 individuals and fishing companies, with Small, Medium and Micro-Enterprises (SMMEs) owning the majority of the rights.”

Other countries utilising Individual Transferable Quotas (ITQs) include Iceland (an ITQ system in nearly all fisheries since 1990) and New Zealand (the primary mechanism for managing commercial fisheries) (Schmidt 2003).

Management rights

Management approaches are either top-down, community based, or a combination of the two (co-management). The current Act does not allow for a complete devolution of all fishing rights to

Strategy for fisheries socio-economic research

communities. However, there has been much discussion in the literature on the other two management approaches.

a. Top down approaches

Like many other successful economies around the world, South Africa has at its core a free market democratic system. In such a system, the conventional view of government is that it sets the rules and enforces them, it recognizes and protects property rights, and guards against market imperfections. From a natural resource perspective, there are at least five main roles for government: 1] Guarding against monopolies, cartels and other forms of anti-competitive behaviour. Monopolies and cartels can abnormally inflate prices, which have welfare implications for consumers. Mitigating the effects of adverse impacts on the environment as a result of market transactions. These are known in the economics literature as 'externalities'. Examples include effluent and other forms of pollution. 3] Finally, provision and protection of public goods. Public goods are those goods whose benefits are shared. Examples include education and defence. Many natural resources are also regarded as public goods, since the market fails to provide sufficient quantities or maintain them. 4] Governments also intervene in markets when there is imperfect information on market transactions. 5] Government also provides stability for markets, stimulates growth and creates employment. In its protective role, government maintains security by enforcing a set of rules within which society operates. A distinguishing characteristic of government is its monopoly on the legitimate use of coercive force to control the behaviour of individuals and groups (Olsen *et al* 2006).

Strategy for fisheries socio-economic research

In allocating resources, government needs to balance considerations based on efficiency and equity. The primary objectives of rules and regulations are to influence individuals and firm's behaviour. These have positive and negative socioeconomic impacts. Some policies, for example, create an environment for economic growth and human capital development. Other policies are aimed at discouraging undesired behaviour. Education is also an important tool for encouraging environmental awareness that can encourage behavioural patterns supportive of ecosystem sustainability (Olsen *et al* 2006).

b. Co-mangement discussions

There are two approaches to co-management (Copes and Charles 2004). The first is that of seeing co-management as a tool for planning to meet the needs of fishers and their communities both now and in the future. The second are those that seek market based approaches to fisheries management. This approach argues that rights holders such as those who hold Individual Transferrable Quotas (ITQs) are the legitimate stakeholders in the industry, for whom the fishery resource should be managed. The literature on co-management is exhaustive and it is not possible to review it all here. Hauck and Munshi (1999) provide a useful bibliography.

Some of the key issues associated with the success of community based natural resource management programmes is provided in Table 2. Not all these issues can be resolved at a community based level, and requires involvement from Government, NGOs and other role players.

Strategy for fisheries socio-economic research

Community based systems have been touted in the developed world as offering real benefits in terms of improved compliance, lower management costs, particularly in relation to monitoring and enforcement activities (Copes and Charles 2004). It has also been argued that the role of government should be oversight rather than operational decision-making. As Olsen *et al* (2006) state:

“Appropriately done, such reform would greatly weaken the shortsightedness among resource users, giving them the incentive to be willing to make the short-term sacrifices needed to rebuild depleted stocks and avoid overfishing.”

Table 2: Key issues influencing community-based management of natural resources

	Issue	Components
1.	Identification of relevant community	
2.	Contested resources	Security of tenure
3.	Establishment of ownership rights	
4.	Sense of community	
5.	Affinity with natural resource base	
6.	Dependence on natural resource base	
7.	Time horizon of exploitation	
8.	Financial ability to maintain resource	Income
9.	Ability to abstain from exploitation	Alternative livelihood opportunities
		Sustainable uses of the resource (e.g. tourism)
		Economic climate (stability, jobs)
10.	Legislative frameworks	Enabling environment for community participation
11.	Local government and community based institutions	Existence Capacity to enforce regulations
12.	Donor agencies	Partnerships
		Resources
		Expertise
		Priorities

Source: Crookes (2001)

There does appear to be some empirical evidence of the benefits of co-management. For example, Arias and Eglesias (2008) model the effects of the implementation of co-management for the Chilean artisanal fishery. Simulation results indicate that, after an initial fall in catch and profits, stocks recover to levels exceeding those that would have occurred under the old centralised management

Strategy for fisheries socio-economic research

regime. However, it should be noted that these results are preliminary and by no means indicative.

c. The South African situation

Responsibility to manage marine resource has been devolved to the Environmental Affairs Minister and the Department. In terms of Section 14.(1-2) it is the Minister's responsibility to determine total allowable catch and/or the total applied effort, to be allocated in any year to local commercial, subsistence, recreational and foreign (page 22, line 36-40). Furthermore, Section 18. (1) of the Act states:

"No person shall undertake commercial fishing or subsistence fishing, engage in mariculture or operate a fish processing establishment unless a right to undertake or engage in such an activity or to operate such an establishment has been granted to such a person by the Minister."

The White paper on Marine Fisheries Policy (RSA, 1997) determines that "local communities, labour, scientists and resource users will play an active role in the management of marine resources" (Section 3.8). The White Paper (Section 5.11) further recommends that:

"the principle of national coordination and control over the use of South Africa's living marine resources and related research activities be entrenched, but on a basis of involving other authorities in cases of non-mobile marine resources which occur relatively nearshore and which do not overlap boundaries. When this is practicable, it may be necessary to involve networks of scientific institutions to assist in the process. The inherent potential of introducing co-management structures shall be given special attention in this respect"

The White Paper on Coastal development (RSA, 2000) furthermore stresses the importance of co-operative governance:

Strategy for fisheries socio-economic research

“Partnerships between government, the private sector and civil society must be built in order to ensure co-responsibility for coastal management and to empower stakeholders to participate effectively”

There is no reference to co-management in the current Marine Living Resources Act, although Marine Policy is currently under review in South Africa (FAO, 2005).

MCM appointed a task team to advise them on management issues related to the subsistence sector. One of the recommendations was to involve resource users in co-management (Harris *et al.* 2002). Co-management projects have subsequently been initiated in several coastal rural subsistence communities throughout South Africa, particularly in KwaZulu-Natal on the east coast (Napier *et al.* 2005). Not all co-management efforts have been successful. In a study of seven subsistence communities along the KwaZulu-Natal coastline (Napier *et al.* 2005), it was mostly the longer term projects that appeared to have more correlates with success.

d. Which management regime?

Not all management systems are likely to be appropriate in all instances. A number of considerations arise in examining which institutional choice is most appropriate in a given context (Charles 2004). One aspect in evaluating the management model is the nature of the resource users that trade the rights. For example, is it the efficient agents who buy out the more efficient ones (in other words, is it a welfare increase) or is it those that have better access to financial capital who buy out others (thereby raising concerns over equity issues)? The reaction of markets to management structure and policy changes is also important. Issues such as the structure and effect of customs and traditions on management outcomes in a community, and the extent to which the

Strategy for fisheries socio-economic research

participation of resource users are incorporated in the management process are also factors that need to be taken into consideration. The key is to determine to what extent decentralised management structures are able to achieve the objects of resource sustainability and economic efficiency, and whether this would be done to a greater extent than was possible under centralised management.

Charles *et al* (2004) propose the following guidelines for determining which management approach is more appropriate (see also Table 3). A co-management structure is relevant when there is a need to balance multiple objectives within a relatively small-scale system, and/or in situations with a coherent social structure in which users have clear ties with the community. Market based management, on the other hand is suitable when the resource sector has a predominantly industrial orientation, and where the profit motive dominates over community and socioeconomic goals. However, it should be noted that this measure is by no means indicative for all contexts.

Table 3: Comparisons between community based and market based approaches

Community-based Rights if:	Market-based Rights if:
structure is small-scale/artisanal with clear fisher-community ties	the fishery has a predominantly industrial capital-intensive orientation
history and tradition play a major role in fishing activity and fishery management	the fishery does not play a major role in supporting coastal communities
multiple fishery and non-fishery goals are pursued; fishery management requires the balancing of these objectives	profitability dominates over community and socioeconomic goals (e.g. equity employment health of local economy)

Source: Charles (2002)

Although results are preliminary, co-management approaches do seem to have some socioeconomic benefits, as well as promote equity. Furthermore, a variety of issues are relevant in the South

Strategy for fisheries socio-economic research

African context that relate to whether such management approaches are sustainable from a biological perspective.

3.2 Ecosystem approaches

The Ecosystem approach to fisheries (EAF) has achieved much attention in the fisheries management literature lately (Beddington and Kirkwood 2005; Corkeron 2006; McShane *et al* 2007; Harwood 2007; Shannon *et al* 2006). This report does not attempt to provide a comprehensive review of such an approach. The EAF as a paradigm shifts from management focus away from individual species to ecosystems as a whole (Table 4). This definition of ecosystems includes man-made systems.

Table 4: ecosystem based approaches to management as a paradigm shift

From	To
• Individual species	• Ecosystems
• Small spatial scale	• Multiple scales
• Short-term perspective	• Long-term perspective
• Humans independent of ecosystems	• Humans as integral parts of ecosystems
• Management divorced from research	• Adaptive management
• Managing commodities	• Sustained production potential for ecosystem goods and services

Source: Lubchenco (1994) in Olsen *et al.* (2006)

Including humans as an integral part of ecosystems suggests that traditional environmental economic evaluations are important, such as understanding of the value of the ecosystem intrinsically, as well as for leisure and consumption (Sutinen 2000). Furthermore, an ecosystem approach to management underscores the need for intersectoral, stakeholder, and intergovernmental coordination and cooperation (Olsen *et al* 2006). A shift from short term policymaking to a long term perspective is also important. Economic theory terms this approach social discounting, which

Strategy for fisheries socio-economic research

regards the future as less important than the present. Politicians facing re-election frequently have a short term perspective. There is a need to move beyond this and consider the impact of decisions on future generations. Short-sightedness also appears in fishing behaviour, with certain policies such as closed seasons resulting in a 'race for fish' and overcapitalisation in the sector. Such policies do not protect the underlying ecosystem, or limit by catches and result in 'hi-grading', and have prompted research into the so-called 'essential fish habitat'. A list of possible socioeconomic indicators compatible with an ecosystems approach, are listed in Table 5.

Table 5: Possible socioeconomic indicators for inclusion in an ecosystem approach for fisheries management

Objective	Indicator
Supply availability	Total output of fish products by region
	Consumption of fish products per capita
	Consumption of individual fish products as a % of total fish consumption
	Consumer prices for fish products
Livelihood security	Total employment in fisheries by region
	Regional dependency ratios
	Income per capita in fishing sector
	Multiplier indicators of dependency
Economic efficiency	Productivity ratios
	Foreign exchange earnings
	Degree of openness of sector
	Profit per unit
	Environmental damage costs per unit
Social acceptability	Environmental protection costs per unit
	Producer prices for fish products
	Public attitudes towards fishing
	Qualitative indicators of user conflict
	Compliance with regulations

Source: Adapted from ECASA (undated)

Strategy for fisheries socio-economic research

3.3 Marine protected areas

Marine protected areas (MPAs) provide a means of integrating traditional management approaches with the new ecosystem approach to management (Roberts *et al* 2005, Stefansson and Rosenberg 2007). MPAs are particularly useful where mortality of undersized fish is indicated (Le Quesne *et al* 2007). MPAs are suitable for conservation of species as well as essential habitat.

A review of bioeconomic models for reserves indicates that stock densities will increase under MPAs compared with an open access situation, but rents will be lower compared with the profit maximising outcome. The success of reserves is also dependent on initial stock densities. Pezzey *et al* (2000) found that for densities greater than half the carrying capacity, a reserve policy actually decreases overall catches. On the other hand, for stock densities less than 0.5K, a reserve raises overall equilibrium catches. Furthermore, the dispersal rate is key to the success of reserves. Low or zero dispersal reduces profits compared with no reserve policies (Sanchirico and Wilen 2000). Medium dispersal increases the likelihood of 'win-win' situations (increased profitability at higher effort levels) however for high dispersal rates results are the same as open access harvesting thereby negating the benefits of reserve establishment (Hannesson 1998).

The Millennium Ecosystem Assessment (2005) states that an optimum of 30-50% of the world's oceans needs to be protected from fishing to prevent the loss of some species now threatened with extinction. Several scientific studies also suggest that, for heavily depleted populations, a large reserve is required (Sladek Nowlis and Roberts 1999, Guenette *et al.* 2000, Hannesson 1998).

Strategy for fisheries socio-economic research

Reserves that are too large, on the other hand, lead to the non-viability of harvesting activities (Conrad 1999).

What is evident from the review is that management policies (size of reserve) and also biological characteristics (dispersal rate, stock density and size) play an important role in the socioeconomic impact of such a policy. The total of South Africa's coastline falling within protected areas is just less than 20% (MCM website). However, the Marine Living Resources Act distinguishes between an MPA (where no fishing is allowed except by the permission of the Minister) and closed areas (where fishing is prohibited entirely). This means that quite a large proportion of these protected areas may theoretically be accessible to fishing. It is unclear how many fishing rights have actually been granted in MPAs.

4. Theory of regulatory compliance

The issue of regulatory compliance is important in sustaining fish stocks and ensuring a sustainable harvest. Enforcing regulatory compliance can theoretically be done at a community level or from a centralised position, although, as was indicated earlier, government has a monopoly on the use of coercive force to ensure compliance. However, other means of coercion may be used at a community level. The economics of enforcement is important since socioeconomic conditions influence compliance with regulations. In addition, the degree of compliance affects the socioeconomic status of harvesters and communities dependent on the income or food security that the resource base provides. For example, in the Abalone fishery of South Africa (Hauck and Kroese 2006), the following socioeconomic impacts of poaching were found: 1]

Strategy for fisheries socio-economic research

increased involvement of youth leading to high school drop outs; 2] an increase in gangs and related criminal activity; 3] ongoing violence related to the trade; 4] a decline in tourism and economic investment in areas where poaching was prevalent; and 5] a general erosion of quality of life as a result of fear within communities. In Namibia more effective enforcement measures for fisheries and the nationalization of the fishery sector contributed to better socioeconomic conditions for many coastal communities (Millenium Ecosystem Assessment 2005).

4.1 Economics of enforcement

There is a growing body of literature dealing with the enforcement as it pertains to fisheries management (e.g. Mazany *et al* (1989); Charles *et al* (1999); Sutinen and Andersen (1985)). Most of the economic theory of enforcement derives from the basic deterrence model first postulated by Becker (1968), with further development by Stigler (1970). In any model, assumptions are required. The delimiting assumption in this model is that the supply of offences is based on the perceived benefits from committing the crime exceeds the perceived costs. In reality the decision to commit a crime is complex and depends on a number of factors (Hauck in press). Some attempts have been made in the economics literature to take into consideration these factors (e.g. Sutinen and Kuperan 1999).

The basic model predicts that, for a risk averse resource user, the cost minimising decision by the enforcement authority is to minimise the probability of detection and maximise the perceived fine. However, it has been shown (Milner-Gulland and Crookes 2002) that, in a situation of risk embracing individual, increasing the probability of detection has a greater effect on reducing the supply of offences than an increase in the penalty. For a risk neutral

Strategy for fisheries socio-economic research

individual, increasing the probability of detection or the fine is equivalent. Impoverished individuals are more likely to take risky decisions than well-off people (Milner-Gulland 2001), and as a result monitoring and enforcement activities become more important in those areas.

We found few documented cases that deal with the economics of crime for the fishing industry in South Africa. Hutton *et al.* (2001) use game theoretic approaches to determine management strategies for line fish stocks, to assess whether fishers will co-operate with fisheries management or not co-operate, for various different management regimes. In terms of the policies of size limits on catches, and also effort reduction strategies, it was found that co-operation results in a greater sustainable yield and a greater present value of revenue after 70 years. However, in the short term (5 years) revenues are higher under non-cooperation.

4.2 Methods for promoting compliance

Olsen *et al* (2006) discuss two methods for promoting voluntary compliance: 1] greater user participation in the design and implementation of policy; 2] moral suasion.

User participation in the design and implementation of policy can create conditions for compliance with policy. A large body of research indicates that compliance is greater and less costly when users are involved with the development and implementation of fisheries management programmes. This also improves the fairness and appropriateness of the programme. Keeping regulations simple, and with a clear connection to conservation objectives, and the equitable application of regulations and policies of enforcement is also important in achieving support (Olsen *et al*

Strategy for fisheries socio-economic research

2006). Including user participation creates a stake in the outcome and reduces uncertainty about process goals. Also, this approach can ensure increased stewardship of the resource by creating an assurance of control over outcomes.

There are at least seven key tasks that can be shared between government and resource users in the development and implementation of a fishery management program (Olsen *et al* 2006). These are: 1] an assessment of the state of the fishery; 2] setting management objectives; 3] selecting management measures; 4] allocation of catches (or other benefits) among resource users; 5] allocation of catches over time; 6] enforcing regulations, and 7] learning about changing conditions in the fishery.

Another method for promoting voluntary compliance of fisheries regulations is moral suasion. One approach to moral suasion is what is known in the literature as 'social marketing techniques' (Mahanty and Stacey 2004). This involves using commercial (business) techniques to 'sell' ideas, attitudes and behaviours in order to promote behavioural change. An important aspect of this approach is providing people with information which, if successful, shapes their attitudes and values and induces socially desirable behaviour (Olsen *et al* 2006).

4.3 Implications for policy

The first implication is, where possible, to promote voluntary compliance. This is achieved primarily through education and user participation. In a fisheries context, increasing the probability of detection is important, although the penalty must also be such that it promotes compliance. Practical issues in this regard include targeting repeat offenders, and adopting enforceable regulations.

Strategy for fisheries socio-economic research

A long term perspective is also required by resource users and management.

5. Case studies

The literature on the socio-economics of fishing is growing (useful reviews are given in Charles (1988), and Charles *et al* (1995), the latter which focuses explicitly on the developing world). However, there are very few if any cases studies in these reviews that deal with the South African context. On the other hand there is a growing body of case studies, particularly since democratisation, which has looked into the socioeconomic and bioeconomic context of fisheries management. [Appendix 1](#) summarises some of those case studies, with specific reference to South Africa and, in a few cases, Namibia. Most of the fisheries dealt with in this review relate to coastal resources.

Namibia's fisheries policy is an interesting case in point, since that country has been on the road to democratisation for longer than South Africa. Also, many of the fisheries are similar and it forms part of the Benguela Current Large Marine Ecosystem, along with South Africa and Angola. Box 1 indicates some of the policies that Namibia has implemented, along with associated socio-economic impacts.

Strategy for fisheries socio-economic research

Box 1: Namibia's fisheries policy

An apparent recent regional success story is the "Namibianisation" policy (Erastus 2002), aimed at promoting preservation of the natural resource base and improved socio-economic benefits. The key policies under the strategy are as follows:

- 1] The allocation of rights and quotas to Namibian companies;
- 2] Preference in granting rights and quotas to companies controlled by Namibians;
- 3] Reduced quota fees for Namibian owned vessels;
- 4] Long terms rights (10 years) for 90% Namibian owned companies compared to joint ventures with (7 years);
- 5] Requirement for fish to be processed on-shore, creating employment and investment; and
- 6] Training and transfer of skills for Namibians.

Employment in the fishing industry increased by 5,5 percent per annum between 1991 and 1998. Furthermore, employment in the processing industry increased by 13,0 percent per annum between 1990 and 1998. GDP as a share of national GDP increased from 8,7 percent in 1995 to 10,0 percent in 1998, although this hides the fact that fishing GDP grew by over 15 percent per annum over the same period.

Strategy for fisheries socio-economic research

6. Management strategies consistent with socio-economic approach

Socio-economic approaches require one to move beyond the conventional economic view of labour as one input into the production process, to focus instead on interactions between markets, costs and investment considerations, and the human side of those working in the fishery (Charles *et al* 1995).

Diversifying livelihoods

Charles (2004) distinguishes between two types of livelihood diversity. The first is occupational pluralism where resource users hold other jobs when the resource is unavailable. The second there is a need to create sustainable economic activity outside the natural resource base. Increasing the opportunity cost of harvesting lure individuals away from depleting the natural resource base, and also discourages other users from entering into the resource sector. A livelihood approach is imperative to take into consideration the broader vulnerability context of people lives (Andrew *et al* 2007).

Strengthening institutions

From a centralised perspective this includes working between and across different government departments. It also includes strengthening local community institutions where co-management options are considered. Central to this is an appropriate set of use rights to the resource (Charles 2004). Community based institutions may be appropriate in creating appropriate incentives for responsible behaviour in resource use, and also provide a suitable set of rights that clarify roles and responsibilities.

Strategy for fisheries socio-economic research

Territorial Use Rights for Fisheries (TURFs)

Ensuring a form of regulated open access, so that those that do not live in the area do not have a right to harvest the resource base. This has already been done to an extent in the commercial fisheries sector in South Africa by the establishment of Exclusive Economic Zones (EEZs). A limitation of these rights is the case where fish stocks migrate away from a particular area. This can affect socioeconomic stability.

Monitoring sustainability

This means not only evaluating sustainability from a biological perspective, but also monitoring from a socio-economic and institutional perspective. Integral to this is developing a set of criteria and indicators against which each of the components of sustainability may be measured.

7. Conclusion and recommendations

The number of people employed in the fisheries sector is, on the whole, modest. Even if dependents are included, this is still only a small proportion of total employment in South Africa. Potential for growth in the wild-caught sector is limited, and at the same time and even if this was the case it is unlikely to be a significant contributor in terms of alleviating the unemployment situation. At the same time, earnings for those in the fishing sector are higher than national averages of those in the primary sector. Furthermore, many communities are depending on coastal fishing to supplement incomes. A careful balance therefore needs to be achieved between ecological sustainability, and social and economic stability.

Strategy for fisheries socio-economic research

The Marine Living Resources Act (1998) emphasises the importance of harvesting the natural resource base sustainably. It should therefore be recognised that the need to preserve fish stocks for future generations should receive paramount attention. While it is important to understand the socio-economic impacts of fish on fishers and associated communities, these issues do not supersede the need to conserve the resource base. As the availability of wild-caught fish stocks declines internationally, attention is increasingly shifting towards aquaculture and mariculture development. Already in South Africa there has been significant growth in mariculture. For example, between 1989 and 1994 the farming of molluscs grew from 200t to 3000t (FAO 1997), which equates to an annual growth of almost 72 percent. The socio-economic impact of aquaculture and mariculture and potential for development is an important growth area that requires further study.

8. Bibliography

AFMA (2007) Economics in Commonwealth fisheries management – workshop. Final report, 2 March 2007. Canberra, Australia.

Andrew N.L., C. Be´ne´, S.J Hall, E.H Allison, S. Heck & B.D Ratner (2007) Diagnosis and management of small-scale fisheries in developing countries. *Fish and Fisheries*, 8: 227–240

Andrew T.G., Rouhani Q.A and Seti S.J. (2000). Can small-scale fisheries contribute to poverty alleviation in traditionally non-fishing communities in South Africa. *African Journal of Aquatic Science*, 25: 49-55

Strategy for fisheries socio-economic research

Arias, Mauro and Iglesias, Eva. 2008. Modelling the Bioeconomics Impacts of Co-Management. Paper prepared for presentation at the 107th EAAE Seminar "Modelling of Agricultural and Rural Development Policies". Sevilla, Spain, January 29th-February 1st, 2008.

Ballance, A., Ryan, P.G., & Turpie, J.K. (2000). How Much Is A Clean Beach Worth? The Impact Of Litter On Beach Users In The Cape Peninsula, South Africa. *South African Journal Of Science* 96(5): 210-213

Becker G., (1968). Crime and Punishment: An Economic Approach. *Journal of Political Economy*, (76), 2, pp.169-217.

Beddington, J., and G. Kirkwood. (2005). Introduction: fisheries, past, present and future. *Philosophical Transactions of the Royal Society of London Series B* 360:3-4.

Branch, G.M., May, J., Roberts, B., Russell, E., Clark, B.M. (2002). Case studies on the socio-economic characteristics and lifestyles of subsistence and informal fishers in South Africa. *African Journal of Marine Science*, 24(1): 439-462.

Bureau, J., Lefaudeaux F., and Rotillon G., (undated) Rights based fishing vs effort control in the presence of by-catches. *Journal of Environmental Economics and Management*. Submitted.

Charles, A.T. (1989) Bio-Socio-Economic Fishery Models: Labour Dynamics and Multiobjective Management, *Canadian Journal of Fisheries and Aquatic Sciences* 46:1313-1322.

Strategy for fisheries socio-economic research

Charles, A.T. (1991) "Bio-socio-economic dynamics and multidisciplinary models in small-scale fisheries research", p.603-608 in: J.R. Durand, J. Lemoalle and J. Weber (Eds), *Research and Small-Scale Fisheries*, ORSTOM, Paris France.

Charles A.T., R.L. Mazany and M.L. Cross, (1999) The Economics of Illegal fishing: A Behavioral Model, *Marine Resource Economics* 14:95-110.

Charles, A.T. (2002) "Use Rights and Responsible Fisheries: Limiting Access and Harvesting through Rights-based Management" in: Cochrane, K., (Ed) *A Fishery Manager's Guidebook. Management Measures and their Application*. FAO Fisheries Technical Paper, No. 424, Food and Agriculture Organization of the United Nations, Rome Italy, 231p.

Charles, A.T. (2003) "Rights-Based Fishery Management: A Focus on Use Rights", Presented at the U.S. Sea Grant Workshop "Who Gets the Fish?-Rights Based Management Approaches" Maine, New Hampshire, Connecticut, Rhode Island.

Charles A.T., T.R. Brainerd, A.Bermudez, H.M. Montalvo, R.S. Pomeroy (1995) *Fisheries Socioeconomics In The Developing World Regional Assessments And An Annotated Bibliography*. IDRC: Ottawa, Ontario, Canada.

Charles, A.T. (1988) "Fishery Socioeconomics: A Survey", *Land Economics* 64:276-295

Strategy for fisheries socio-economic research

Charles A.T., (2004) "Sustainability and Resilience in Natural Resource Systems: Policy Directions and Management Institutions" In: Encyclopaedia of Life Support Systems (EOLSS), Developed under the Auspices of the UNESCO, EOLSS Publishers: Oxford, UK.

Clark C.W. (1985). Bioeconomic Modelling and Fisheries Management. John Wiley & Sons, New York. 291 pp.

Conrad J., (1999). The bioeconomics of marine sanctuaries. *Journal of Bioeconomics*, (1), pp. 205-217.

Copes, P. and Charles, A. (2004). Socioeconomics of Individual Transferable Quotas and Community-Based Fishery Management. *Agricultural and Resource Economics Review*, 171-181

Corkeron, P.J., (2006). Opposing Views of the "Ecosystem Approach" to Fisheries Management. *Conservation Biology* Volume 20, No. 3, 617-619

Crookes, D.J., (2001). The effects of policy tools on hunter incentives with specific reference to the Upper Guinean Forest Ecosystem, West Africa: Review of policy tools and evidence for effectiveness. Imperial College London, Unpublished report.

Davis D., and Gartside D.F. (2001) Challenges for economic policy in sustainable management of marine natural resources. *Ecological Economics* 36:223-236.

DEAT (1998). Green Paper for a Coastal Policy for South Africa. Department Of Environmental Affairs And Tourism, Pretoria

Strategy for fisheries socio-economic research

ECASA (undated). Ecosystem Approach for Sustainable Aquaculture. EU projects on Sustainable Environment. WAS. Florence.

Envirofish Africa (2005) A Review of Aquaculture Policy and Institutional Capacity in the BCLME Region, with recommended regional policy options. BCLME Project LMR/MC/03/01.

Envirofish Africa (2006) Report on the biological, social and economic impact of rights allocations in the BCLME region. Report LMR/SE/03/03.

Erastus, A.N., 2002: The Development of the Namibianisation Policy in the Hake Subsector, 1994–1999. NEPRU Working Paper No. 82, The Namibian Economic Policy Research Unit (NEPRU), Windhoek, Namibia

FAO (1997) Aquaculture Economics In Developing Countries: Regional Assessments and an Annotated Bibliography. FAO Fisheries Circular No. 932 FIRI/C932. FAO: Rome.

FAO (2005). Fishery country profile: South Africa. FAO: Rome.

Gewin V. (2004) Troubled Waters: The Future of Global Fisheries, PloS Biology, 2(4): 422-427

Guenette S., Pitcher T., and Walters C., (2000). The potential of marine reserves for the management of northern cod in Newfoundland. *Bulletin of Marine Science*, (66), 3, pp. 831-852.

Strategy for fisheries socio-economic research

Hannesson R., (1998). Marine reserves: what would they accomplish? *Marine resource economics*, (13), pp.159-170.

Harwood, J. (2007) Is there a role for ecologists in an ecosystem approach to the management of marine resources? *Aquatic Conservation: Marine and Freshwater Ecosystems*, 17: 1–4

Harris J. M., G. M. Branch, B. M. Clark, A. C. Cockcroft, C. Coetzee, A. H. Dye, M. Hauck, A. Johnson, L. Kati-Kati, Z. Maseko, K. Salo, W. H. H. Sauer, N. Siqwana-Ndulo And M. Sowman (2002) Recommendations For The Management Of Subsistence Fisheries In South Africa. *South African Journal of Marine Science* 24: 503–523

Hauck, M. and Munshi, A. (1999). Coastal and Fisheries Co-Management: A Bibliography. (Occasional Paper Series). Cape Town: Institute of Criminology, University of Cape Town

Hauck, M. and M. Kroese, (2006). Fisheries Compliance in South Africa: A Decade of Challenges and Reform 1994-2004, *Marine Policy* 30: 74-83.

Hauck M., (in press). Rethinking small-scale fisheries compliance. *Marine Policy*.

Hutchings, K.; Lamberth, S.J.; Turpie, J.K. (2002) Socio-economic characteristics of gillnet and beach-seine fishers in the Western Cape, South Africa. *African Journal of Marine Science*, 24(1): 243-262

Strategy for fisheries socio-economic research

Hutton T., M.H. Griffiths, U.R. Sumaila, T.J. Pitcher (2001) Cooperative versus non-cooperative management of shared linefish stocks in South Africa: an assessment of alternative management strategies for geelbek (*Atractoscion aequidens*) *Fisheries Research* 51: 53-68

Hutton T., and U.R. Sumaila (2002) Natural Resource Accounting and South African Fisheries: A Bio-Economic Assessment of the West Coast Deep-Sea Hake Fishery With Reference to the Optimal Utilisation and Management of the Resource. CEEPA Discussion Paper Series.

Kaplan, I. (2007). The importance of industrial and socio-economic considerations for maritime management and newly developed ecosystem based management plans. *Maritime Policy & Management*, 34(1): 81-84

Le Quesne W.J.F, S.J. Hawkins and J.G. Shepherd (2007) A comparison of no-take zones and traditional fishery management tools for managing site-attached species with a mixed larval pool. *Fish and Fisheries*, 8:181-195

Lubchenco, J. 1994. The scientific basis of ecosystem management: framing the context, language, and goals. In *Ecosystem Management: Status and Potential*. 103rd Congress, 2nd Session, Committee Print. Zinn, J. and M. L. Corn, editors. U.S. Government Printing Office, Superintendent of Documents. ISBN 0-16-046423-4. p. 33-39

Mahanty, S. and N. Stacey, (2004). Collaborating for Sustainability: A Resource Kit for Facilitators of Participatory Natural Resource

Strategy for fisheries socio-economic research

Management in the Pacific. South Pacific Regional Environment Programme. Available online at: http://www.sprep.org/iwp/Resources_Handbook.htm (accessed 08/02/2008)

Mather D., P. Britz, and W. Sauer (2000) Redistribution and Transformation in the South African Fishing Industry: The Case of the Squid Fishery. Paper present at the IIFET conference, Oregon State University

Mann, B.Q., James, N.C., Beckley, L.E. (2002). An assessment of the recreational fishery in the St Lucia estuarine system, KwaZulu-Natal, South Africa. *African Journal of Marine Science* 24(1): 263-279(17)

Mazany, R. L., A. T. Charles, and M. L. Cross. (1989). Fisheries regulation and the incentives to overfish. Paper at Canadian Economic Association Meeting, June 2-4, 1989. Quebec, Canada: Laval University.

McQuaid C.D. and Payne A.I.L. (1998) Regionalism in marine biology: the convergence of ecology, economics and politics in South Africa. *South African Journal of Science*, Vol.94: 433-436. {on paper}

McShane P.E., Broadhurst M.K. & A. Williams (2007). Keeping watch on the unwatchable: technological solutions for the problems generated by ecosystem-based management. *Fish and Fisheries*, 8: 1-9

Strategy for fisheries socio-economic research

Millenium Ecosystem Assessment (2005), *Ecosystems And Human Well-Being: Current State And Trends: Findings of the Condition and Trends Working Group*. Island Press.

Milner-Gulland E.J. and D.J. Crookes, (2001). The effects of policy tools on hunter incentives Six month report submitted to Conservation International, covering the period April-September 2001. Imperial College London.

Milner-Gulland E.J., and D.J. Crookes, (2002) The effects of policy tools on hunter incentives: Six month report submitted to Conservation International, covering the period October 2001 - March 2002. Imperial College London.

Moorson, R. 1987. Perspectives on Fisheries Development in Independent Namibia. *Cultural Survival Quarterly* Vol. 11, No.2: 33-34. [Transcript Printing Company, Peterborough, New Hampshire, USA.]

Olsen S.B., J.G. Sutinen, L. Juda, T.M. Hennessey, T.A. Grigalunas (2006) *A Handbook on Governance and Socioeconomics of Large Marine Ecosystems*. Coastal Resources Centre. University of Rhode Island.

Pauly D., (2003). Jellyfish for dinner? Conservation alert. *Science in Africa*. July-August 2003.

Pauly, D., V. Christensen, J. Dalsgaard, R. Froese and F.C. Torres Jr. (1998). Fishing down marine food webs. *Science* 279: 860-863

Strategy for fisheries socio-economic research

Pauly D., R. Watson and J. Alder (2005) Global trends in world fisheries: impacts on marine ecosystems and food security. *Phil. Trans. R. Soc. B* (2005) 360, 5–12

Peña-Torres J. (2002) Individual Transferable Fishing Quotas in Chile: Recent History and Current Debates. Universidad Alberto Hurtado Economics Working paper Series I-139. Chile.

Pezzey J., Roberts C., and Urdal B., (2000). A simple model of a marine reserve. *Ecological economics*, (33), pp. 77-91.

Pomeroy, R. (2003) "Traditional Fishery Management Measures vs. Rights-Based Approaches Why Rights-Based Management Is Being Considered", Presented at the U.S. Sea Grant Workshop "Who Gets the Fish?-Rights Based Management Approaches" Maine, New Hampshire, Connecticut, Rhode Island (2003)

Pradervand, P., Beckley, L.E., Mann, B.Q., Radebe, P.V. (2003) Assessment of the Linefishery in Two Urban Estuarine Systems In Kwazulu-natal, South Africa. *African Journal of Marine Science*, 25(1): 111-130

Republic of South Africa (1997) A marine fisheries policy for South Africa: White paper. Government Printer: Pretoria.

Republic of South Africa (1998a). National Environmental Management Act No. 107: Government Printer: Pretoria.

Republic of South Africa (1998b). Marine Living Resources Act No. 18: Government Printer: Pretoria.

Strategy for fisheries socio-economic research

Republic of South Africa (2000). White Paper for Sustainable Coastal Development in South Africa. Government Printer: Pretoria

Roberts C.M., J.P. Hawkins and F.R. Gelly (2005) The role of marine reserves in achieving sustainable fisheries. *Phil. Trans. R. Soc. B*, 360:123–132

Sanchirico J., and Wilen J., (2000). Dynamics of Spatial Exploitation: A Metapopulation Approach. Discussion Paper 00–25-REV. Resources for the Future: Washington, D.C.

Sauer, W.H.H., Hecht, T. Britz, P.J. & Mather, D. (2003). An Economic and Sectoral Study of the South African Fishing Industry. Volume 2: Fishery profiles. Report prepared for Marine and Coastal Management by Rhodes University.

Saville, A.D. (1997). A Computable Dynamic Bioeconomic model of the Optimal Utilisation and Management of South Africa's Renewable Marine Resources: a case Study of the Hake Fishery. Unpublished thesis, Doctor of Philosophy in the Department of Economics, University of Natal, Durban (December 1997).

Schmidt C. (2003) Fisheries and Japan: A case of multiple roles? Paper prepared for the International Symposium on Multiple Roles and Functions of Fisheries and Fishing Communities, 13 February 2003, Aomori, Japan.

Strategy for fisheries socio-economic research

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(1): 115-157

Sladek Nowlis, J., and Roberts, C. M. (1999). Predicted Fisheries Benefits and Optimal Marine Fishery Reserves Design. *Fish. Bull.* 97: 604 - 616.

Sowman M, Beaumont J and M Rankin. (1999). Obstacles to Implementation of a Co-management System in the Olifants River Harder Fishery, South Africa: An Update. International Workshop on Fisheries Co-Management. 22-28 August 1999. Penang, Malaysia.

Stage J. and C.H. Kirchner (2005) An economic comparison of the commercial and recreational linefisheries in Namibia. *African Journal of Marine Science*, 27(3): 577-584

Stefansson G. and A.A. Rosenberg (2005) Combining control measures for more effective management of fisheries under uncertainty: quotas, effort limitation and protected areas. *Phil. Trans. R. Soc. B*, 360: 133-146

Stigler G., (1970). The optimum enforcement of policies. *Journal of political economy*, (78), pp.526-536.

Sutinen J., and Andersen P., (1985). The Economics of Fisheries Law Enforcement. *Land Economics*, (61), 4, pp.387-397.

Strategy for fisheries socio-economic research

Sutinen J.G, (Ed) (2000). A Framework for Monitoring and Assessing Socioeconomics and Governance of Large Marine Ecosystems. US Dep Commer, NOAA Tech Memo NMFS NE 158; 32 p.

Sutinen and Kuperan (1999). A socioeconomic theory of regulatory compliance in fisheries. *International Journal of Social Economics*. Vol.26:174-193.

Tapscott, C. (1999). An Overview of the socio-economics of some key maritime industries in the Benguela Current Region. A report prepared on behalf of the Benguela Current Large Marine Ecosystem Project. <http://www.bclme.org/factfig/socio-economic.asp>

UNEP (2002). Africa Environment Outlook: Past, Present and Future Perspectives. Available online at: <http://www.unep.org/dewa/Africa/publications/AEO-1/index.htm> (accessed 5/2/2008)

Van der Elst R., B. Everett, N. Jiddawi, G. Mwatha, P. Santana Afonso and D. Boulle (2005). Fish, fishers and fisheries of the Western Indian Ocean: their diversity and status. A preliminary assessment. *Phil. Trans. R. Soc. A* 363, 263–284

Van Sittert L., G.M. Branch, M. Hauck and M. Sowman (2006), Benchmarking the first decade of post-apartheid fisheries reform in South Africa. *Marine Policy*, 30(1), 2006: 96-110

Weninger, Q. and J. R. Waters (2003), 'Economic Benefits of Management Reform in the Northern Gulf of Mexico Reef Fish

Strategy for fisheries socio-economic research

Fishery' , *Journal of Environmental Economics and Management*,
46, 207-30

Weninger Q. (2007) Economic benefits of management reform in the Gulf of Mexico grouper fishery: A semi-parametric analysis. Unpublished article, December 2007.

World Commission on Environment and Development, (1987). Our Common Future, Report of the World Commission on Environment and Development. Published as Annex to General Assembly document A/42/427, Development and International Co-operation: Environment

9. Appendix 1: A selection of South African and regional studies on the bioeconomics and socioeconomics of fisheries

Reference	Fishery	Location	Description
Hutton <i>et al</i> (2001)	Line fishery	South African	Compliance results in greater returns over 70 years. However, in the short term (<5 years) non-compliance produces the greater returns
Hutton and Sumaila (2002)	West Coast Hake fishery	South Africa	Computes the economic benefits accruing to trawl and new longline sector. An amount of R1 357 accrues to the trawl sector if it co-operates, and R50 million to the longline sector if it employs a non-cooperative strategy.
Mather <i>et al</i> (2000)	Squid Fishery	South Africa	Command and control attempts at transformation in the fishery did not achieve desired outcomes. The paper proposes a market based incentive approach
Saville (1997)	West coast and south coast hake	South Africa	Shifts away from a biological to a bioeconomic basis of management improves social welfare considerably
Pradervand <i>et al</i> (2003)	Recreational linefishery	Durban harbour and Mgeni Estuary, Kwazulu-Natal	432 shore anglers were interviewed using a socioeconomic questionnaire in 2000. Economic investment in terms of angling equipment cost R10 million, and bait, travel and tackle costs amounts to R9 million per year.
Moorson (1987)	Various	Namibia	Looks at the prospects for developing the fisheries of Namibia, outlining some socioeconomic factors that should be considered in the development process (cited in Charles 1995)
Hutchings <i>et al</i> (2002)	Gillnet and beach seine	Western Cape	Majority claimed to make less than 5% of income from netfishing. Fishing gear maintenance, fuel and equipment purchases, and sale of fish contribute R15 million to the regional economy annually.
Mann <i>et al</i> (2002)	Recreational linefishery	St Lucia, Kwazulu-Natal	The value of the fishery in terms of accommodation and direct expenditure amounted to R9 million in 1992.
Branch <i>et al</i> (2002)	Subsistence and informal fishers	South Africa	20 localities surveyed on socioeconomic conditions of fishers, including income, employment status, migratory patterns and food security
Shannon <i>et al</i> (2006)	Pelagic, demersal and rock lobster	South Africa	Highlights the need for socioeconomic studies to assess the forces motivating poachers, as well as market research highlighting the economic forces driving illegal behaviour in the rock lobster fishery
Stage and Kirchner (2005)	Silver kob recreational and commercial	Namibia	N\$23.9 million contribution to GDP from the recreational fishing, followed by commercial fishing in large vessels (\$12.8 million) and lastly in commercial skiboat fishing (N\$1.2 million)

Reference	Fishery	Location	Description
Napier <i>et al</i> (2005)	Subsistence	KwaZulu-Natal	The perceptions of 11 subsistence fisheries in 7 rural communities were assessed. There were three strongly significant ($p < 0.01$) correlates of perceived success: 1) Benefits exceed the costs of participation ($p < 0.0001$), 2) Training and empowerment provided ($p = 0.001$), 3) Availability of a long term champion ($p = 0.008$)
Andrew <i>et al</i> (2000)	Freshwater subsistence	Eastern Cape	A cost benefit analysis of the viability of the fishery indicates a positive cash flow to the community. This suggests that small scale fisheries are a viable alternative to more common forms of food procurement in these traditionally farming communities
Sowman <i>et al</i> (1999)	Olifants river harder fishery	Western Cape	Surveys conducted in 1996 and 1999 indicated an increased dependence on the harder fishery. Forty percent of survey respondents indicated that their highest source of income was from fishing. Crops and livestock are also farmed for subsistence purposes.

Strategy for fisheries socio-economic research

10. Appendix 2: Possible research themes for marine and coastal management

Research themes	Research gaps	Key needs in fisheries economics	Research areas/priority activities
Economic data	Economic data collection	Maximising net economic returns to SA community from the management of fisheries and increased industry profit	<ul style="list-style-type: none"> Methodological framework reporting framework (incl. indicators) Methods for data poor fisheries
Economic indicators	Economic indicators		
Bio-economic models	Economic analysis	<ul style="list-style-type: none"> informing harvest strategy policy and rebuilding stocks relative to target and limit reference points 	<ul style="list-style-type: none"> consistent framework to estimate Maximum Economic Yield (MEY) rebuilding strategies
Economic analysis of fisheries		<ul style="list-style-type: none"> create economic incentives to reduce discard and improve compliance 	<ul style="list-style-type: none"> economic studies on discard and compliance issues
		<ul style="list-style-type: none"> understanding economic impacts of management alternatives 	<ul style="list-style-type: none"> commercial fisheries recreational, and subsistence
		<ul style="list-style-type: none"> understanding economic impacts of marine conservation 	<ul style="list-style-type: none"> Bio-socio-economic evaluation of marine reserves policy instruments for marine conservation valuation of non-market benefits
Valuation and Allocation		<ul style="list-style-type: none"> allocating across time, space, borders and species 	<ul style="list-style-type: none"> Commercial vs. recreational fishing Socioeconomic impact of quotas
Socioeconomics		Understanding the economic impacts of management on communities	<ul style="list-style-type: none"> studies of social component of sustainable development
Other issues	Governance	Ensuring effective governance	<ul style="list-style-type: none"> benchmarking to improve effectiveness and consider alternatives Assessing jurisdictional compatibilities
	Capacity building/ engagement and interactions	Communicating and capacity building to facilitate uptake in decision making	<ul style="list-style-type: none"> courses and development fisheries economists on staff understanding of fisheries economics by fisheries managers, industry, etc.
		Informing investment decisions	<ul style="list-style-type: none"> Systems dynamic and scenario analysis of key drivers economic sensitivity analysis fisheries outlook
		Evaluating alternative economic futures	