

HOW PARTNERSHIPS AND ADAPTIVE MANAGEMENT CAN INFLUENCE ECOSYSTEM APPROACHES TO FISHERIES: THE CASE OF THE RED SEA STATE IN SUDAN

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Introduction

The paper discusses how an ecosystem approach to fisheries (EAF) has been applied to the Red Sea (RS) fishery in Sudan with the support of the European Union (*EU Technical Assistance to the Fisheries Sector in Red Sea State: EU Ref. No. SDC 2009-282/204256/1*). EAF embraces both the human and ecological elements of a fishery and is an approach that favours the active participation and sharing of fishery management responsibilities between the state, private sector and fishing community (Staples et al, 2010). EAF implemented in Sudan has been applied through a co-management framework and has adopted various adaptive management measures. Adaptive management uses experimentation to better understand an ecosystem (fishery) and its users (Holling, 1978). In Sudan it has been used as an integrated and iterative process of learning by doing. This has resulted in the sharing of data and management responsibilities between stakeholders, which is contributing to stock assessment through the testing different fishing systems. It is also building trust through greater collaboration and transparency in decision-making, and allowing different harvesting regimes to be agreed by all participants.

The active participation of stakeholders in EAF is creating mutually beneficial relations and ties between the state, private sector and fishing community. These relationships influence the behaviour of a partnership and can be assessed using social capital (SC) analysis. SC refers to the networks, norms and sanctions that connect different people and institutions, and can have a positive and negative impact on people's behaviour. SC examined in the Sudanese case reveals different relationships of power and self interest between the government and stakeholders and the importance of engaging actors such as the security agencies to enable collaboration and permit the positive impacts of partnership management to be felt.

Sudanese marine environment

The least known and arguably least understood of Sudan's diverse ecosystems is the marine tropical ecosystem represented by the Red Sea. The RS is shared by ten coastal states including Sudan and is recognised as a Global 200 eco-region. It contains geographically distinct assemblages of natural communities and species, which provide important livelihood opportunities for coastal populations from fishery resources, tourism, transportation and petroleum.

Sudan has jurisdiction over 750 km of the coastline from Egypt in the north to Eritrea in the south and has an Exclusive Economic Zone (EEZ) that covers an area of 91,600 Km²

including a shelf area of 22,300 Km². Its pristine coastline shows high diversity in habitat and complexity that is characterised in its lagoons several of which are fringed by mangroves and enclose seagrass beds. Its coral reefs are regarded as the most diverse in the RS and include fringing and outer barrier reefs as well as atolls. In addition to these habitats, the Sudanese RS coast is shaped by small tidal variations (0.5m), weak currents, low nutrient upwellings, high water temperatures (20-33°C), high salinity (39-56 percent) and no permanent freshwater runoff. Although such factors can limit fish and organic production the Sudanese RS supports high biodiversity including an estimated 200 species of soft and hard coral, 300 bony fish species, over 50 species of sharks and rays and 1,000 species of invertebrate. The coast also functions as an important feeding and breeding ground for the endangered dugong and sea turtle as well as for migratory and residential birdlife.

The coastal plain, which is bordered by the RS Hills is home to a complex blend of indigenous people known collectively as the Beja. The Beja are considered an ancient nomadic tribe of Hamitic descent that have occupied the eastern desert region of Sudan, Eritrea and Egypt for over four thousand years. Fishing does not have a long tradition in the Beja culture, which is seen as a seasonal subsistence activity, contributing to a livelihood based on pastoral and agricultural activities.

Fishing operations are conducted mainly in the near shore inlets and inshore fringing reef using traditional gear, craft and fishing methods. The main gears are handlines and gill nets that target reef associated fish species that account for 80 percent of the 1,500 tonne annual catch. The locally constructed wooden and fibreglass open boats are powered by sail or outboard motor with the majority of the approximate 600 vessels 5-7m in length and used by an estimated 2,000 fishers.

The domestic demand for fish products is weak and the market small, which constrains the growth of fishery business. Sudan has one of the lowest annual per capita consumptions in the region at 1.4 kg per person compared to 14.2 kg in Israel, 9.9 kg in Saudi Arabia and 25.1 kg in Yemen. Despite fishing being an important livelihood to coastal communities its contribution to GNP is small estimated at less than 3% with the main RSS economy coming from marine transport and petroleum.

Challenges and opportunities

The RS fishery sector has experienced limited investment over the last 20 years, which has resulted in a contracted public service and budget, loss of experienced staff, poor physical infrastructure and weak institutional capacity. Fishing is conducted by artisanal fishers whose level of income, production, fishing range, political influence, market outlets, employment and financial dependence keeps them subservient to the economic decisions and operating constraints placed upon them by those who buy their production.

The EAF and adaptive management approaches and techniques that have been introduced to the RS fishery have aimed to address a number of interrelated challenges and opportunities. These relate to: (1) Policy and governance; (2) Stock assessment and management; (3) Capacity building and institutional development; and (4) Marketing and consumption. This paper only discusses policy and governance.

Policy and governance

The policy framework is established under the 2002 Comprehensive Peace Agreement (CPA) and Interim National Constitution (INC) which adopts a system of federalisation.

Responsibility for fishery policy and governance lies principally with the RS State although there are several national institutions with jurisdiction over marine resources such as the Federal Ministry of Agriculture as well as national policy frameworks such as the National Agriculture Revival Programme. As a consequence there are tensions between Federal and State institutions and programmes leading to ad hoc policy arrangements. In addition, the legal framework is weak, established under the 1937 national fishery law (amended 1975), which does not reflect modern management principles such as those outlined in the Code of Conduct for Responsible Fishing or recognises Sudan's commitment to international agreements.

To help develop fishery policy and improve governance the EU intervention has focussed on building a consensus on the key management objectives for fisheries and created an advisory forum representing government institutions responsible for fishery resources. The RS Fishery Coordination Group (RSFCG) has been established under the State Ministry of Agriculture with representation from the RS University, Fishery Administration (FA), Fishery Research Institute, Ministry of Planning and Finance, Humanitarian Aid Coordination (HAC) and security agencies. The RSFCG has identified fishery management areas, agreed on the key fisheries and management objectives and set up several co-management groups. These groups have broadened consultation requiring the state, private sector and fishing community to share responsibility for fishery management and identifying management measures for the seacucumber and finfish fisheries.

The co-management arrangement for the seacucumber fishery is currently providing the model for the development of management systems for the other fisheries. Commercial fishing for seacucumber was closed in 2009 based on evidence provided to all RS coastal States from the regional conservation organisation PERSGA. The decision to close the fishery created tensions with fishing communities and traders benefiting from seacucumber and led to a workshop where broad management objectives were identified and a 'Roadmap' that set out how to improve seacucumber management tabled. The roadmap presented a 10-point plan in which the ban on harvesting seacucumber would be lifted if there was an agreement between traders, fishers and the state to set fishing effort limits, reduce the harvesting period and areas, and to share data collected during an experimental one-year harvest.

The seacucumber fishery is the first co-management arrangement in the Sudanese fisheries and uses adaptive management through experimental harvesting that requires fishers and traders to provide data on their harvesting activities. The first step involved legalising the fishery so that the boats involved in harvesting were registered and marked accordingly, and all fishers were licensed. Traders are supporting the initiative by funding the costs of government observers to remain in each of the camps to gather data. This is helping to monitor the fishery and has led to improvements in processing such as a ban on the use of mangrove wood and limiting the size of species harvested. The state is now collecting catch data as well as gaining a better understanding of the operational costs and benefits of the fishery. This is helping to develop management measures that address marketing, production and equity concerns. Where infractions have occurred particularly in the supply of poor quality SCUBA diving equipment these traders are required to cover inspection costs as an

initial penalty. This arrangement currently means that the management costs and benefits are shared by the partnership and is not reliant on licensing or state revenues.

Applying SC analysis provides a better understanding of the partnership and how they are supporting the fishery management process. This can be analysed using proxy indicators (See Table 1 below), which assess the interactions between key participations that facilitate cooperation, compliance, bargaining, benefit distribution and compensation and can help fishery managers understand the extent of participation in the fishery management process (Johnstone, 2009). Currently the partnership arrangements are helping to build cooperation through the formal contact arrangements of the co-management groups. The partnerships are also improving the negotiating capacity of fishers with the support of the FA and have negotiated guarantees for local employment in compensation for local fishery use by seacucumber traders.

Table 1: Social capital indicators of participation in the fishery management process

Behavioural characteristic	Social Capital Indicators of participation in the fishery management process
<i>Cooperation</i>	<ul style="list-style-type: none"> • Formal contact arrangements exist between all resource users and the state • Fishery management groups represent all resource users and relevant NGOs, private sector and state governing institutions
<i>Compliance</i>	<ul style="list-style-type: none"> • Fishery management rules incorporate traditional knowledge / rules • Fishery management rules are adopted by fishers through traditional institutions • Fishery management regulatory mechanisms include all stakeholders
<i>Bargaining</i>	<ul style="list-style-type: none"> • Fishing management rights are secured with political support and maintained through ongoing positive political alliances with the state • Fishing communities recognise fishing management rights of other users
<i>Benefits Distributions</i>	<ul style="list-style-type: none"> • Competition between different resource users leads to collaborative actions/ activities with benefits shared • Fishing management benefits are agreed and shared amongst different resource users
<i>Compensation</i>	<ul style="list-style-type: none"> • Negotiations on fishing compensation involve the state and all resource users with fishing management rights including migratory fishers

Importantly and despite initial reluctance the security agencies are now also engaged in the partnership process. The security agencies are federally managed and controlled and monitor all movement and activities in the RSS. This includes a requirement by all fishers to obtain maritime access licences before going to sea. The partnership approach has engaged the security agencies and encouraged them to share some management responsibility with other stakeholders including fishing communities. The initial meetings held at the FA were first cancelled by the security agency until the Director General of the Ministry of Agriculture convened a meeting in which the security agreed to be involved in the process. The case illustrates both the positively and negatively influence of the security agencies on the co-management process in Sudan, and how they can be moderated by political and institutional interventions. The engagement of the security agencies in the partnership is currently contributing positively to improving compliance to the plan particularly as all the stakeholders are involved in the management and regulatory framework including participation in joint surveillance operations.

Discussion / conclusions

The EU intervention has applied a highly participatory EAF approach to fishery management in Sudan that has broadened consultation and demanded transparency in decision-making through co-management. Building fishery management capacity around EAF has helped the government work collaboratively with its fishing communities and traders and is contributing to sustainable development by finding a balance between ecological and human well-being.

EAF is particularly effective in the fishery management process when combined with adaptive management as it helps to structure management priorities so that human, ecological and governance issues are addressed, which can be tested. These are now providing the guiding principles for Sudan's fishery management system and helping to define fishery policy.

The experience of the seacucumber fishery is an important example why adaptive management works. Closure of this fishery in 2009 was based on evidence that was not specific to Sudan and encouraged a precautionary approach to management. The decision to close the fishery disenfranchised fishers and traders from benefiting from the fishery. However, negotiating a limited experimental harvest and applying adaptive management principles has meant that the knowledge, risks and responsibility for managing seacucumbers is shared and all stakeholders are partners in its management.

Using SC to assess the extent of participation in the fishery management process is a useful tool for fishery managers. The participation and active engagement of the state and resource-users in the fishery management process are important components of rights-based management. Therefore the ability for participants to cooperate, comply, bargain, distribute benefits and compensate in the fishery management process are essential behavioural characteristics for a sustainable EAF management system.

An important challenge in Sudan is to continue to engage the security agencies as they can undermine the participatory management approaches. The security agencies reluctance to be engaged in the process suggests two issues: first the difficulty of sharing decision-making responsibilities with other stakeholder; and second it indicates the extent of illegal, unregulated and unreported (IUU) fishing facilitated by these agencies. This issue is the most challenging to address as the benefits of IUU fishing often outweigh the costs of compliance.

In conclusion, this paper has discussed the importance of EAF, partnerships and adaptive management in developing policy and governance structures for fishery management in Sudan. The approach is also contributing to stock assessment, strengthening the institutional capacity of the sector and integrating market issues into the fishery management process. Bringing together traders, fishers and the state to form partnerships for fishery management is now ensuring a more comprehensive policy vision for the long-term environmental and economic sustainability of the Sudanese fishery.

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