REPORT

Rehabilitating mussel beds in Coffee Bay, South Africa: Towards fostering cooperative small-scale fisheries governance and enabling community upliftment

Gurutze Calvo-Ugarteburu, Serge Raemaekers,
Christina Halling

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Abstract Along the coast of South Africa, marine resources play a significant role in supporting livelihoods and contributing to food security in impoverished rural communities. Post-apartheid fisheries laws and policies have begun to address traditional fishing rights and development needs, and new management arrangements are being implemented. One such initiative has been the Mussel Rehabilitation Project in Coffee Bay, which piloted a resource rehabilitation technique at several over-exploited fishing sites. Mussel stocks in these exploited areas had dropped to under 1 % mussel cover, and during the project period, stocks increased to >80 % cover, supporting a sustainable harvest well above national daily bag limits. This stock enhancement was achieved only after the project had started to address social challenges such as the lack of local management institutions and the need to enhance food security. The project embarked on training and institution-building; it formed a robust community mussel management committee; and developed a local resource management plan, facilitating increased community participation in the day-to-day management of the resource. The project also saw the initiation of various ancillary projects aimed at improving food security and stimulating the local economy and hence alleviating pressure on the marine resources. Here we review this 10-year project's outcomes, and present lessons for small-scale fisheries governance in South Africa and internationally. We show, through empirical experience, that balancing stock rebuilding needs in a context of widespread poverty and dependency on natural resources by a local fisher community can only be addressed through an integrated approach to development. Participation of resource users and a thorough understanding of the local context are imperative to negotiating appropriate small-scale fisheries governance approaches. We recommend that

the implementation of South Africa's newly minted Small-Scale Fisheries Policy should begin with bottom-up, demonstrative resource management measures such as mussel rehabilitation. This type of initiative can deliver short-term food security benefits and foster social learning towards sustainable and cooperative fisheries governance.

Keywords Community upliftment · Fisheries governance · Mussel rehabilitation · *Perna perna* · Small-scale fisheries

INTRODUCTION

Globally, governments are increasingly faced with the challenge of managing the small-scale, inshore fisheries, whose characteristics and needs are not suited to top-down and other conventional management approaches used in many commercial fisheries (Béné 2006). Over the last 20 years, co-management has been established as an alternative to improve small-scale fisheries management, with many working examples in existence today, also sharing key conditions for successful fisheries co-management (Jentoft 1989; Pomeroy and Berkes 1997; Pomeroy et al. 2001; Pomeroy and Rivera-Guieb 2006).

In the case of South Africa, some of the poorest villages are located in the Eastern Cape Province (Fig. 1) (Stats SA 2000), where many coastal villages have a subsistence economy, and people depend on natural resources for food and income. Small-scale fisheries, such as those involving the harvesting of marine invertebrates, are of significant importance as food supply for many of the poorest households (Sowman 2011). Nevertheless, traditional fishers in these rural areas were either fishing informally or under the regulations governing recreational fisheries (Sowman 2006) and were only recognized as 'subsistence' fishers with the

Fig. 1 Map of the study area showing the Coffee Bay tourism node, the ten villages included in the project and the Nqutheni ridge

enactment of the Marine Living Resources Act (MLRA) in 1998 (Act No. 18 of 1998; Republic of South Africa 1998) (Branch et al. 2002) in terms of South Africa's rights-based Constitution.

In 1999, the government appointed a Subsistence Fisheries Task Group (SFTG) to recommend management arrangements for the country's subsistence fisheries based on their needs and the imperatives of South Africa's Constitutional legislation. The SFTG recommendations, accepted in 2001, have subsequently guided the implementation of a nationwide subsistence fisheries programme by the national fisheries authority—formerly Marine and Coastal Management (MCM), now the Department of Agriculture, Forestry and Fisheries.

A key recommendation of the SFTG was the need to adopt a co-management process, which meant that fishers and the fisheries authority needed to collaborate in fisheries governance, from generating knowledge in this data-limited sector to structuring local governance structures and regulations. The SFTG had found that in many communities dedicated local fisheries management structures did not

exist, and thus it was necessary to establish local institutional structures that would facilitate co-management (Raemaekers 2009).

Following the SFTG recommendations, the fisheries authority embarked on a process of identifying and issuing individual subsistence fishers in the Eastern Cape Province with annual exemption permits—a requirement under the MLRA—until such time that a dedicated subsistence policy was formulated to guide the allocation of long-term user rights.

The implementation of the subsistence fisheries programme in the Eastern Cape presented the fisheries authority with a daunting challenge given: (i) the extent of the province, and the associated geographical and logistical constraints in reaching the large number of traditional coastal communities; (ii) that the fisheries authority had only allocated limited capital (budget and personnel) to the implementation of the programme in this province and (iii) that the fisheries authority was historically geared towards managing commercial fisheries, and had very little experience in dealing with the needs of impoverished fishers.

Together, these factors did not leave much room for capacity-building and development support—elements essential to achieving a successful co-management arrangement (Raemaekers 2009).

In 2000, the South African government launched a White Paper for Sustainable Coastal Development, and made a call for the involvement of non-state actors to provide support to fisheries and coastal management. Researchers at the then University of the Transkei (now Walter Sisulu University) successfully obtained funding to start a Mussel Rehabilitation Project (MRP) in the coastal communities near Coffee Bay, a holiday resort located in the central part of the Wild Coast¹ (Fig. 1), where the local population lives scattered in traditional, round, thatched huts grouped in homesteads and villages.

In accordance with the MLRA, invertebrate harvesters were permitted to collect a maximum of 30 mussels per person per day, and to do so, they needed to have a valid individual subsistence or recreational permit. The permitting system, however, held very little legitimacy, and most fishers harvested without a permit and well over the daily bag limit. Due to heavy fishing pressure, most intertidal fringes were depleted of mussels, and harvesters were forced to collect in the infratidal zone. The Mussel Rehabilitation Project (MRP) aimed to pilot a resource rehabilitation technique at several over-exploited ridges, draft a community-based management plan for the sustainable utilization of the newly rehabilitated resources and undertake training and institution-building among resource users and the community at large. A local committee was formed and community catch monitors were trained to collect information to develop a local resource management plan. The project also saw the initiation of various ancillary projects aimed at improving the local economy and possibly alleviating the subsistence harvesting pressure on marine resources.

Here we evaluate aspects of the work of the MRP between 2000 and 2009, with particular focus on one rehabilitated site, Nqutheni. The aim is to demonstrate that successful co-management of resources use is dependent on addressing both the technical aspects of resource rebuilding and the social challenges faced by the resource users in a participative, bottom-up, demonstrative approach.

¹ The Wild Coast is situated along the former Transkei coastline: With the coming to power of the National party in 1948 the development of homelands began in South Africa, and over the following years, eight black homelands were established in the country. These were independent territories, with their own government and administrations, established mainly in underdeveloped areas with very little infrastructure. The Republic of the Transkei was established as one of such homelands on 26 October 1976; it remained independent until its incorporation back into the Republic of South Africa in 1994, after South Africa's first democratic elections.

BACKGROUND: THE FISHERIES CONTEXT

The utilization of marine resources along the Wild Coast

The harvesting of marine invertebrates has a long tradition in coastal South Africa. The historical importance of shellfish along the Wild Coast is revealed by archaeological middens, made up of invertebrate shells, mainly from the brown mussel *Perna perna* (Lasiak and Dye 1989; Lasiak 1992). *P. perna* is still the preferred targeted invertebrate today, followed by limpets, oysters and sea squirt (red bait).

In recent decades, the increased exploitation pressure, due to population growth and uncertain income conditions, has had a significant negative impact on invertebrate intertidal stocks such as the brown mussel. In unexploited areas, mussels dominate the intertidal rocky shores with over 80 % cover at densities of hundreds of individuals per m² (Van Erkom Schurink and Griffiths 1990; Lasiak 1991). In the 1980s, the annual mussel yield along the Wild Coast was estimated at 5.5 tons per km of rocky shore (Hockey et al. 1988); however, a 2005 study indicated that the stocks of brown mussels together with other invertebrates commonly targeted by subsistence harvesters (e.g. abalone, limpets and oysters) were over-exploited (Fielding 2005). Later studies on the abundance of *P. perna* in the Dwesa-Cwebe Nature Reserve (approximately 50 km south of Coffee Bay) elucidated the role of human exploitation on the mussel beds along the Wild Coast, as the biomass was over 22 times higher inside the protected area than outside (Pelc et al. 2009).

The brown mussel *Perna perna* in Coffee Bay

Perna perna is found attached to the rocks on the lower zone of surf-beaten intertidal reefs and in subtidal reefs. The intertidal ridges are harvested during spring low tide dislodging mussel clamps using flat iron bars. Harvesters collect mussels indiscriminately, dislodging not only big mussels, but also the small ones that are attached to them, clearing entire sections of rock. Since the settlement of new mussels is strongly positively related to the presence of established adult populations (McQuaid et al. 2000; Erlandsson and McQuaid 2004; Pelc et al. 2009; Reaugh-Flower et al. 2011), this technique of harvesting has severe consequences for recruitment, and natural recovery of over-exploited areas is extremely slow (Dye and Dyantyi 2002; Erlandsson and McQuaid 2004; Erlandsson et al. 2011). Stock assessments from intertidal ridges in the Coffee Bay area between 2001 and 2003 confirmed that the mussel beds were denuded with very low intertidal densities (less than 1 %) (Calvo-Ugarteburu, unpubl.). Since the

natural recovery of mussel beds is so slow and there is no documented evidence yet of spill-over effects of mussel recruits and larvae from nearby Marine Protected Areas (MPAs) to exploited areas in the studied region (Ludford et al. 2012), rehabilitating mussel beds along the coast became even more important in order for this biological resource to recover and the fishery to be rebuilt.

Catch-monitoring data from mussel harvesting in Coffee Bay

Catch-monitoring took place from August 2005 to October 2008. The monitored coastline was divided into two sections, and a monitor was assigned to each section. Each monitor walked the assigned section for 16 days each month (4 days before spring low tide and 4 days thereafter) starting 3 h before low tide until 3 h thereafter. They walked the area from east to west 1 day and from west to east the following day.

Community monitors recorded a total of 5923 harvesting events, with a total catch of 32 071 kg of mussels during this period, spread along 18 ridges along a roughly 12 km stretch of coast. Both the number of harvesters and the catch per unit effort (CPUE as average catch per fisher per day) varied between seasons. The majority of harvesters collected an average of 4.2 and 5.4 kg per harvester per day in winter and summer, respectively (Fig. 2). Although the summer yields were higher, this does not imply that more mussels were harvested at this time, since mussels have higher flesh content and weigh more in summer due to spawning seasonality.

The CPUE did vary between the years with a significant increasing trend ($p < 0.01$). This is clearly shown in Fig. 2 showing the daily averages per fisher for each month. Harvesters collected an average of 5.1 kg of mussels per person per day for the entire period, although CPUE increased from an average of 3.9 kg of mussels per person per day in 1 year monitored (August 2005–July 2006) to an average of 7.6 kg per person per day in the end of the monitored period (August 2008 and October 2008) (Fig. 3). Variable annual total recorded catches and total number of active fishers make it hard to interpret the increasing CPUE trends, although it was not necessarily paired with an increase in total catch, but most likely, directly linked to a decrease in the number of harvesters over the years. This could possibly be a result of limited permit allocations coupled with more regular visits by the law enforcement arm of the fisheries authority, where harvesters were told that if caught without a permit, they would face a fine and even a period in jail in addition to having their catch confiscated. It is interesting to note, however, that average daily catches per harvester remained well above the daily bag limit of 30 mussels.

RESULTS

The coffee bay mussel rehabilitation project

Phase one: Mussel rehabilitation and establishing relationships

The objectives of the Mussel Rehabilitation Project (MRP) were to re-stock mussels on heavily denuded ridges, and to develop a management system for their sustainable utilization in partnership with the local community. The project involved establishing a pilot project that would do the following: (i) refine the mussel rehabilitation technique developed by Dye and Dyantyi (2002); (ii) train community members in its application; (iii) develop a re-seeding and cropping system and (iv) develop a management plan to be implemented by local communities.

A resource-centred approach was adopted from the onset of the project, with focus on physical rehabilitation of mussels on the rocks and environmental education and training. The project attempted to be as inclusive as possible, involving not only resource users, but the community at large. A representative committee was elected by the community to liaise with project staff and assist in decision-making. Community members were employed as monitors, given training on sustainable natural resource management, and set to work collecting information on mussel use, assisting with re-seeding and communicating with harvesters about the project to gain their co-operation. This approach proved to be beneficial to the project; although community members were initially unsure of the project intentions, they saw a direct benefit in the form of employment.

Other activities included relationship-building with the broader community through meetings and open days, environmental education at local schools, socio-economic surveys and fishery-independent mussel stock assessments. Project staff also participated in community activities, assisted community members with challenges that they faced, such as applying for identity documents and helping with health issues. Although not directly related to management, this contributed to building trust and to the success of the project. The establishment of the pilot project, refining of techniques and community training was successfully done during the 1st year of the project, and some artificially planted mussel clumps could soon be seen in the area. However, due to the high dependency on mussels for food and income, substantial harvesting did take place on the rehabilitated mussels, when the sea was too rough to reach to the infratidal beds. Even though the community had on principle agreed to respect the newly rehabilitated mussels and give them a chance to grow, food or money were desperately needed.

Fig. 2 Average monthly CPUE (kg of mussels per harvester per day) between August 2005 and October 2008 as recorded by the community catch monitors. Error bars represent standard error

Fig. 3 Average annual CPUE (kg of mussels per harvester per day) between August 2005 and October 2008 as recorded by the community catch monitors. Error bars represent standard error

Phase two: Participatory household livelihoods security assessments

In a second phase of the Mussel Rehabilitation Project (commencing December 2001), it was decided important to explore supplementary sources of food and income to possibly alleviate pressure on the natural resources. Firstly, a comprehensive needs assessment of the community was undertaken with the involvement of community members.

The participatory household livelihood security (HLS) approach was adopted to assess the challenges faced by the different groupings in the community. The household livelihoods security assessment (HLSA) provides a framework to collect information on rural livelihoods (Carney et al. 1999). Relevant stakeholders (including government departments, non-governmental organizations (NGOs) working in the area, community-based organizations (CBOs) and community members) were invited to participate. Information was gathered on what activities people were involved in, what resources/assets they had available and their skills/capabilities.

Thus, in 2002, the MRP embarked on the collection of socio-economic data from ten villages in the vicinity of Coffee Bay. The smallest village had 21 households and the largest over 250 households. Data were collected using social maps and semi-structured household questionnaires. Of approximately 980 households present in the ten villages, 480 were represented in the social maps. In addition, a total of 216 questionnaires were conducted across all ten villages to verify the information collected using social maps. The number of questionnaires per village was selected based on the information from the social maps, and the households to be interviewed were randomly selected.

The average household size in the survey population was 6.7 members (median 7; range 1–16). It was common

to find several generations living in the same household. For 68 % of the households, grants from the Department of Social Development (DSD) constituted the main source of income. The average monthly income received from grants was 104 US\$. Formal employment provided a source of income for just over 41 % of the households in the study population. Although 36 % of the interviewees reported to have migrant workers in their household, only 13 % received remittances from household members working outside of Coffee Bay. Just 3.2 % of households had some members who were self-employed, mostly running a small business such as making and selling handcrafts, selling local tobacco or beers, with an average of 46.2 US\$ per month, and a median value of 20 US\$.

The number of mussel harvesters and east coast rock lobster fishers was only surveyed in five of the ten villages (238 households). Of these, 142 households (60 %) reported to have some mussel harvesters and 62 households (26 %) had lobster fishers.

Based on the information provided on the social maps, the households were categorized into 5 ‘vulnerability’ categories:

Category 1: Most vulnerable—no income and no resources

Category 2: No income and some resources including child grants

Category 3: One source of income only, either a pension or disability grant or a temporary project

Category 4: Only one source of income, either migrant, own business or working locally

Category 5: More than one source of income.

This information was highly relevant, since the lower the category the higher the direct dependency on natural resources, i.e. households in categories 1 and 2 (27 %) are highly dependent mainly on marine resources, and therefore should be targeted with the MRP’s activities. Figure 4 shows a graphical representation of these ‘vulnerability’ categories across all ten villages, visually highlighting that more than 50 % of the population do not have formal jobs and sources of income.

The HLSA confirmed that the lack of a local economy was one of the key issues threatening community livelihoods in Coffee Bay, resulting in a high level of direct dependency on natural resources. It became evident that the project’s objectives would not be met without adopting a broader livelihoods approach. This had not been considered during the first phase. In phase 2, the project followed a more integrated approach, based on the range of livelihood options available to the local community. It applied for further funding, and widened its scope to become a ‘Mussel Rehabilitation Programme’.

Fig. 4 Vulnerability categories based on the results of the 2003 social maps (Category (Cat) 1 No income and no resources; Category 2 no income and some resources including child grants; Category 3 one source of income only and it is either a pension or disability grant or income from a project; Category 4 only one source of income either migrant or own business or working locally; Category 5 more than one source of income

A vision map completed with distinct community groups (men, women and youth) revealed that all participants identified the possibility of starting agricultural projects as a means to improve their livelihoods. In September 2002, an assessment of the agricultural potential of the area revealed good potential: fertile soil, abundance of water throughout the year and abundance of local markets (i.e. hotels, backpackers, cottages and local shops). However, in previous decades, most household heads had spent years working further inland in the mining sector, which created a culture of ‘dependency on remittances’, and many households had stopped cultivating their fields.

Phase three: Supplementary food security and income-generating activities

Based on results of the assessment, funds from the Sustainable Coastal Livelihoods Programme (funded through the UK-DfID) were secured to start a new phase aimed at integrating the physical rehabilitation of over-exploited mussel stocks with other food security and income-generating activities, in order to relieve pressure on the natural coastal resources and develop sustainable harvesting practices. The project was approved and started in June 2003, funded for 1 year.

During this phase, six community gardens were fenced and provided with drip irrigation materials and foot pumps. A total area of 6400 m² was cultivated, and approximately 110 people (age range 22–73 years) were trained in agricultural production. Yields varied, some affected by soil type and water logging, and others by external factors such as disease, but were close to 500 kg per garden per month. Produce was sold in local villages surrounding the gardens

and in Coffee Bay and Hole in the Wall (Fig. 1). Linkages with tourism were also sought during this phase, and three community youngsters were trained as tourist guides. In addition, the project team established partnerships with the local municipality and other organizations implementing development initiatives in the area.

With clear benefits from the project in terms of food production, the community decided to close the areas where the fieldworkers were re-seeding mussels. Subsequently, with funds obtained from WWF South Africa, in 2005, the development of a local co-management plan for the sustainable utilization of mussels in the Coffee Bay area was initiated.

Phase four: Consolidation

Finally, in 2006, a new phase was commenced with funds from the Department of Environmental Affairs and Tourism–Social Responsibility Policy and Projects (DEAT–SRPP). Activities engaged in during this phase included the following: (i) the establishment of an enhanced and effective mussel rehabilitation and management programme, including the training of environmental mentors, community catch monitors, a management committee and a community awareness programme consisting of workshops with harvesters and linkages with other programmes; (ii) the establishment of community gardens, with participants being trained in organic agriculture, marketing and basic business skills; (iii) the establishment of homestead gardens including training and provision of vegetable seedlings and trees and (iv) the establishment of a community nursery to provide seedlings to community and household gardens. The emphasis of this three-year phase was on training and short-term employment. Fifty community members were trained in either environmental education and resource management or agricultural practices, and they were employed as (i) environmental trainers, to teach harvesters how to rehabilitate mussel beds and the principles of sustainable utilization; (ii) drillers, to facilitate the rehabilitation process; (iii) monitors, to record information on intertidal resource use in the area; (iv) agricultural trainers, to deliver fruit trees and seedlings to the household gardens and conduct training workshops; (v) agricultural monitors, to inspect the household gardens periodically and provide further assistance and intervention where necessary and (vi) field managers, to help co-ordinate all project activities and liaise with the committee and project staff.

To ensure sustainability of the community and homestead gardens, the project also created a vegetable seedling nursery, which facilitated access to garden seedlings. Nursery participants were taught to build the nursery and to manage the nursery as an independent business. They were

provided with training on seedling production and small business operations, including introductory computer skills. The nursery was registered as a cooperative in 2007.

During this time, fieldworkers and harvesters continued re-seeding mussels at five selected sites. Harvesters were encouraged to engage in the rehabilitation by getting seedlings and helping to establish a small vegetable garden in their household. Once all involved harvesters were provided with seedlings, other community members also received training and seedlings. Over 1000 household gardens were established during this phase and were provided with vegetable seedlings and fruit trees.

A Project Advisory Committee (PAC) was formed with representatives from the local community, the Local Municipality, the District Municipality, local businesses, several provincial government departments, DEAT and the implementers. By 2007, numerous mussel beds had been successfully rehabilitated, the most successful one at Nqutheni.

Figure 5 summarises the different phases and funders of the MRP during its existence between 2000 and 2010.

The Nqutheni success

Mussel rehabilitation at Nqutheni ridge started in 2003. A stock assessment in June 2004 showed that mussel cover had increased from 0 % in non-rehabilitated areas to 64 % in rehabilitated areas (Calvo-Ugarteburu, unpubl.). However, by January 2005, all the rehabilitated mussels had been harvested illegally.

Nevertheless, rehabilitation recommenced at the end of 2006. By November 2007, the rehabilitation showed results with a mussel cover of 80–100 % (Calvo-Ugarteburu, unpubl.). According to the MLRA (1998), harvesters needed a permit to harvest rehabilitated mussels. Considering that the size of the rehabilitated mussels was sufficient, and that they, in time, would naturally be pushed out by new recruits, the mussel committee decided to apply for an exemption to the MLRA to start harvesting the rehabilitated area with experimental bag limits.

Various harvesting events took place before a permit was finally granted in June 2008 to the Mussel Committee, allowing 60 harvesters who had been involved in the rehabilitation of Nqutheni to harvest 5 l of mussels each per day, provided stocks did not go under 40 % mussel cover. Committee members and project workers met with the harvesters, and in addition it was also agreed:

- Only harvesters who had participated in replanting the mussels were to be allowed to harvest;
- Harvesting would take place every 2nd day;
- Only big mussels would be harvested, and a narrow blade tool would be used;

Fig. 5 Summary of the different phases and funders of the MRP during its existence between 2000 and 2010 (*MRP* Mussel Rehabilitation Project; *MCM* Marine and Coastal Management; *SCLP* Sustainable Coastal Livelihoods Programme; *DFID* Department for International Development (UK); *WWF* World Wildlife Fund; *DEAT* Department of Environmental Affairs and Tourism; *SRPP* Social Responsibility, Policy and Programmes)

- Harvesting would take place under strict monitoring to ensure that the rehabilitated stock did not decline to less than 40 % cover.

Controlled harvesting took place from July 2008 to September 2009. All mussels collected were weighed and counted by the community monitors employed by the project. The monitors weighed and counted the mussels collected and also ensured that the permit conditions were adhered to.

In Nqutheni, there were 685 harvesting events and over 3000 kg of mussels harvested between June 2008 and September 2009 (Fig. 6). The average catch of 4.5 kg per harvester per day (Fig. 7) reflects the legal limit of a 5 l bucket per person per day, agreed upon by the fisheries authority. Although lower than what harvesters were harvesting in the natural infratidal ridges at the time (an average of >7 kg per person per day), this was still significantly higher than the 30 mussel bag limit of the MLRA (5 l of large mussels can amount to 90–100 mussels). It is worth noting that harvesters were harvesting these mussels legally and in easily accessible areas of the intertidal zone, without taking any risks collecting the high wave energy infratidal fringe.

To ensure that the stocks did not decline below the agreed cover, stock assessments were performed every

spring low tide (twice a month), with the exception of December 2008–January 2009, over the Christmas period, and the first low tide in June 2009, when some big storms made the ridge inaccessible. During the stock assessments in February 2009, it was observed that the mussel beds showed signs of under-utilization, in that the cover was 90 % with recruitment cohorts forming multi-layered beds, resulting in the biggest mussels on top being pushed out by the newly settled juveniles. In order to avoid this, it was desirable to increase the harvesting rate. However, due to the permit conditions, it was not possible to allow more than 5 l per person per day. It was then agreed to allow harvesting any day of the month, instead of every second day as originally agreed. This accounts for the increase in catches after February 2009 shown in Fig. 6. Despite this increase in harvesting effort, stocks remained over 80 % mussel cover. In fact, stocks only declined to 60 % cover in June 2009, after a big storm, when whole clumps of mussels were uprooted by the waves and winds (Fig. 8). The monitoring and the stock assessment data show that the mussel beds at Nqutheni were harvested in a sustainable manner, even possibly underutilised due to the precautionary process taken by the project team.

Since the permit had been granted for 1 year, in July 2009, an application was made to continue harvesting the

Fig. 6 Total kilograms of mussels harvested at the rehabilitated site in Nqutheni ridge between July 2008 and September 2009

Fig. 7 Average monthly CPUE (kg of mussels per harvester per day) for Nqutheni ridge between July 2008 and September 2009. Error bars represent standard error

rehabilitated ridge. Unfortunately, no response was received from the fisheries authority until late 2010, by which time the project and the monitoring effort had ended. Stock assessments in 2012 showed cover to be less than 5 % in the ridge indicating that the harvesting agreement had failed without the monitors and a functioning co-management structure (Calvo-Ugarteburu, unpubl.).

DISCUSSION

The lessons from the MRP illustrate that stock rebuilding can be achieved through fisheries co-management. They also demonstrate that for co-management to be successful, an integrated approach that addresses the social challenges, such as the lack of local management institutions and the

Fig. 8 Mussel cover at the rehabilitated site in Nqutheni ridge between July 2008 and September 2009. *Error bars represent standard error*

need to enhance food security, in a participative, bottom-up, demonstrative approach is necessary (Kooiman et al. 2005; De Young et al. 2008; García et al. 2008; Mahon et al. 2008).

At the outset of the Coffee Bay MRP, the Eastern Cape did not possess provincial structures capacitated to undertake fisheries management, and thus the project experience serves as a practical example of how straightforward, simple and effective techniques such as mussel rehabilitation can be used to initiate fisheries co-management processes.

The mussel rehabilitation technique has also been used in other areas of South Africa, such as in the case of the Sokhulu Intertidal Mussel Harvesting Project, which has been used as an example to roll out a regional fishery co-management programme in the KwaZulu-Natal Province (Harris et al. 2003). However, this is a province with a long-established, strong and autonomous conservation agency (EKZN Wildlife), which committed itself and undertook the implementation of the fisheries programme in the province, with devolvement of decision-making power by the fisheries authority. The Coffee Bay MRP project further demonstrates that in those cases where no such management capacity or institutional support exists, a more integrated, participatory bottom-up approach that takes into consideration the livelihoods of the resource users and the community at large is needed.

The Coffee Bay projects lasted 9 years, during which it expanded from a single focus on increasing the mussel stocks, towards a multi-pronged approach and a larger programme that aimed to address sustainable resource use, while at the same time have an impact on pressing community needs such as food security and jobs. The MRP provided an empirically documented setting for the project team, the local community

members who participated in the project, and the vast range of stakeholders who were exposed to the project through workshops, launches, media, etc., to experience first-hand how crucial it was to address the human dimensions from the outset of the initiative. Only when various human dimensions were addressed, fishers did begin to buy into the mussel rehabilitation time-frames, objectives and harvesting experiments. A key lesson to sustainable fisheries governance in a setting where people employ a range of livelihood opportunities is the need to embed any fisheries management intervention into the local institutional structures and an integrated development framework and approach.

The MRP achieved tangible benefits in a short space of time from rehabilitated mussel beds, by allowing those harvesters involved in the rehabilitation to harvest the rehabilitated ridges. Very often, co-management processes focus largely on institutional setup, developing catch-monitoring programmes, electing committees, and spending effort on administrative processes such as membership, rules and sanctions. Catch restrictions are set by resource scientists with limited flexibility due to fear of overfishing. Little attention is actually given to providing fishers with direct benefits in a short-term period that can secure their interest in the whole initiative. The MRP, showcased by the Nqutheni example, allowed the co-management committee to experiment with different catch limits based on the stock assessments, and for fishers to experience first-hand how fisheries management arrangements such as size limits and bag limits may well be applicable and needed for the sustainable management of natural resources. This learn-through-doing approach facilitated the evolution of an integrated approach addressing both ecological and social objectives.

At the origin, the project manager, a marine biologist, approached the project and the work with communities from her disciplinary background. Soon, however, it became clear that although ecological objectives were relatively easily achieved, they were only going to have long-term success if social objectives were addressed simultaneously. Prominent human dimensions that needed attention were, firstly, making sure the community at large and the fisher group specifically were fully informed of, and involved in the project, the process, and its intended outcomes. This required discussion workshops, training and awareness raising. More so, the affected group became actively involved in the decision-making processes and co-owning the project through meaningful and effective participation. Secondly, attention needed to be shifted towards developing or at least facilitating complementary livelihoods in the form of jobs such as drillers and monitors, or through the setup of household gardens and community gardens, and ultimately the nursery as a sustainable and community owned business venture. Only when other livelihood needs were being addressed through boosting of agricultural output for example, people became more supportive of the MRP and what it could offer to them. Stock rebuilding and sustainable harvests were key objectives for the project manager and funding agencies; however, local realities of large-scale unemployment and food insecurity impeded this ambition. This is certainly a topical dilemma for the management of many small-scale fisheries across the globe (Allison et al. 2011; Sowman 2011). In Coffee Bay, the beginnings of a co-management process had catalysed a change in setting fisheries objectives and nesting these within more integrated livelihood development approaches. The Nqutheni case provided the opportunity to measure this paradigm shift in both quantitative and qualitative ways.

Sadly, despite almost 10 years of mussel rehabilitation, the programme came to an end in 2010, highlighting the complexities associated with sustaining externally funded development interventions in the absence of a functional government fisheries management organizational structure.

Despite its successes, the project still heavily relied on outside expertise and funds, and had not been integrated into government's proposed small-scale fisheries management programmes. Thus, the long-term sustainability of the programme through dedicated government personnel that could work with the local co-management committee was not achieved. The fisheries authority showed interest in, and expressed support for the initiative; however, larger socio-political processes were at play. The long awaited subsistence fisheries policy had still not been finalized by 2010, and fishers in the Western Cape had taken the fisheries authority to the Equality Court, arguing that fisheries reforms post-apartheid had failed to recognise them

(Sowman et al. 2014). The Equality Court settled in favour of the fishers in 2010 and ordered the government to develop a new policy that would better cater for the needs of small-scale fishers and fisheries.

The highly contested policy making process took several years, delaying decision-making and the roll out of a small-scale fisheries implementation programme. While the Small-Scale Fisheries Policy (SSFP) which was officially gazetted in June 2012 certainly serves the context and needs of the Coffee Bay small-scale fishers, the project and its institutional structures had for years operated in a policy and management vacuum which ultimately undermined its momentum.

Interviews and field work undertaken by the authors of this paper during 2012 have indicated that community members are still hopeful that the project will be re-instated; however, it has become clear that any future for mussel rehabilitation will need to be integrated into the implementation strategy for the new SSFP.

Nevertheless, despite termination of the project and the mussel rehabilitation, certain social impacts have been longer lasting. An evaluation and skills audit done with project participants has shown how the work done so far had built the confidence of the local people to the extent that individuals were now taking other livelihood development initiatives forward with external partners and within their own community structures. This self-determination was recognized by the committee and community monitors. In essence, the project has helped to empower people. This was achieved mainly through the training provided to any community member who was willing to participate in the programme. It is also important to mention that, for example, 70 % of the people who participated in the community gardens had no schooling at all. In many government-driven training programmes, training must be accredited, which often means that potential trainees must have a degree of prior education. In Coffee Bay, like in most rural coastal communities, this is problematic due to the high number of people with very low levels of education. The MRP project opened its training programme to people who would have otherwise been excluded. So despite the project coming to an end, people have been empowered through the process, and capacity was built at the local level. This is not to be underestimated, and it could greatly improve any new programme linked to the SSFP implementation.

CONCLUSION

The MRP showed that a new approach to small-scale fisheries governance through co-management is possible, and should take into account the community development.

One of the major challenges to mussel management at present is the impoverished nature and dependency of the community; this should be addressed by integrating any management intervention with other development initiatives aimed at improving the local economy and providing complementary livelihoods. To ensure the sustainability of these new livelihood opportunities, community involvement at the identification and planning stage is crucial. In addition, integration of any local management intervention within the wider national policy and institutional framework is necessary to sustain a long-term engagement. The new SSFP offers this enabling governance framework.

The MRP has often been referred to as a success story. Even though it failed to become integrated in a wider supportive government programme, the project clearly showed that participatory mussel rehabilitation and local management are a possible mean to community upliftment and that it has had some ever-lasting social effects on the community.

We reiterate that, with the need to implement the newly minted SSFP in rural fisher communities along the Eastern Cape coastline, the fishers, government and affected stakeholders should consider using mussel rehabilitation as a practical starting point, i.e. a demonstration approach towards developing a bottom-up management model that fits the local needs and realities and an approach that can guide the structuring of local management institutions. The mussel rehabilitation process can deliver food security in the short-term, while at the same time become a social learning tool to collaborate and work towards resource sustainability and community development in the longer term. Mussels are also widely harvested along the Eastern Cape coastline, and are often regarded as the dominant source of marine protein for many impoverished communities and households. If communities targeted for the implementation of the SSFP do identify low mussel abundance and heavy harvesting pressure as a key challenge, lessons from the MRP can be transferred within a wider regional mussel rehabilitation and development programme.

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AUTHOR BIOGRAPHIES

Gurutze Calvo-Ugarteburu (✉) started the Coffee Bay Mussel Rehabilitation project. Her main interest is environmental management, mainly CBNRM and co-management. She is interested in integrating biological and socio-economic aspects into co-management, and focusses on gender issues and the role of children and other vulnerable groups in resource use.

Address: Department of Zoology, Walter Sisulu University, Private Bag X1, Mthatha 5110, South Africa.

e-mail: gugucalvo@yahoo.com

Serge Raemaekers (✉) is a lecturer and researcher at the University of Cape Town. His work engages with systems thinking and fisheries governance practice with the aim to recommend governance models and management approaches that are more applicable to small-scale fishers 'realities'. Most of his work is centred on social learning processes with local small-scale fishers, with the aim to ensure the communities' knowledge; needs and vision are adequately captured and incorporated in any planning and decision-making processes.

Address: Department of Environmental and Geographical Sciences, University of Cape Town, Private Bag X3, Rondebosch, Cape Town 7701, South Africa.

e-mail: serge.raemaekers@uct.ac.za

Christina Halling is a senior scientist working mainly with ecological aspects of coastal resource use, especially aquaculture. Her major research interest is to develop management and system solutions that are both ecological and economically sustainable.

Address: Department of Ecology, Environment and Plant Sciences, Stockholm University, 106 91 Stockholm, Sweden.