

Possible Paths to Co-managing the Sea Egg Fishery of Barbados

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ABSTRACT

From the latter half of the 1980s and throughout the 1990s, consistently low stock sizes had effectively collapsed the fishery for the white sea urchin *Tripneustes ventricosus* (locally known as the sea egg) in Barbados. In 2001, the sea egg stock recovered to a level that had not been observed during the preceding two decades. Government authorities and scientists all agree that sustainability of the fishery can only be achieved through co-management arrangements that include fishers. The resource's wide distribution around the island and ease of accessibility negates the possibility of adopting the small-scale community management model that has proved successful in the St. Lucia sea egg fishery. From the latter half of the 1990s, a number of governmental and non-governmental agencies have investigated the potential and means to co-manage this fishery. The outputs of projects, conducted during the last five years, which facilitated fisher participation in resource assessment and analysis and examined ways of establishing formal co-management arrangements for the Barbados sea egg fishery, are examined in this paper. The multi-phase Coastal Co-management Project (CORECOMP) commenced in 2001, implemented first by the Caribbean Conservation Association (CCA) and then the Centre for Resources Management and Environmental Studies (CERMES) of the University of the West Indies (UWI). As a result of these and other efforts, fisher participation in monitoring the status of the resource and in influencing management decisions to some degree has increased over the last five years. However, a formal co-management arrangement for this fishery remains elusive for reasons that are biophysical, socio-economic and institutional.

KEY WORDS: Sea egg fishery, CORECOMP, co-management

Posibles vías para el Co-manejo de la Pesca de Erizo de Mar en Barbados

A partir de finales de los años 1980s y a lo largo de los 1990s la consistente baja en tamaños, ha logrado colapsar de manera efectiva la pesca de erizo de mar blanco *Tripneustes ventricosus* (conocidos localmente como huevos marinos) en Barbados. En el 2001 la reserva de erizo de mar logró recuperarse

a un nivel que no se había observado durante las dos décadas pasadas. Las autoridades de gobierno y los científicos coincidieron que la sostenibilidad de la pesca solo puede lograrse a través de acuerdos para el co-manejo que incluya a los pescadores. La amplia distribución del recurso alrededor de la isla y su fácil acceso niegan la posibilidad de adoptar un modelo de manejo comunitario a pequeña escala que ha probado ser exitoso en la pesca de huevos marinos en Sta. Lucía. A partir de finales de los años 1990s un sinnúmero de agencias gubernamentales y no gubernamentales han investigado el potencial y los medios para el co-manejo de esta pesquería. Los resultados de proyectos, conducidos durante los pasados cinco años, que facilitaron la participación de pescadores en evaluación y análisis del recurso y examinado las formas para establecer arreglos para un co-manejo formal para a pesca de huevos marinos en Babados, son examinados en esta ponencia. El multifase proyecto de Co-manejo Costero (CORECOMP) inició en el año 2001, implementado inicialmente por la Asociación para la Conservación de Caribe (CCA) y posteriormente por el Centro de Manejo de Recursos y Estudios Ambientales (CERMES) de la Universidad de West Indies (UWI)). Como resultado de estos y otros esfuerzos, la participación de pescadores en el monitoreo del estatus del recurso y en influenciar decisiones para el manejo, hasta cierto grado, ha aumentado a lo largo de estos cinco años. Sin embargo, un arreglo formal de co-manejo para esta pesca aún no se consolida por razones biofísicas, socio-económicas e institucionales.

PALABRAS CLAVES: Pesca de erizo de mar, CORECOMP, co-manejo

INTRODUCTION

The Barbados sea egg (*Tripnustes ventricosus*) fishery has been under legislative control since 1879. Closed seasons, coinciding with the presumed peak reproductive period of the animals, have hitherto been the main regulatory mechanism employed for managing this fishery. Historical records indicate that during this long period of management, the sea egg fishery has declined sufficiently on a number of occasions to become of concern for management authorities. However, it was not until the mid-1980s that it was deemed that the local stock had collapsed. Apart from a few years during which some moderate increases in stock sizes were noted, the stock remained in a depleted state for most years between the mid-1980s and throughout the 1990s (Parker 2002, Mahon et al. 2003, McConney et al. 2003, Parker In prep).

The collapse of the stock triggered a flurry of interest in the sea egg fishery from government, scientists, the general public, and of course, the fishers and called for investigations aimed at identifying the causes of the collapse and ways to rehabilitate the stock and subsequently manage the sea egg fishery in a sustainable manner. From the early 1990s the consensus of researchers and management authorities was that management regulations requiring government enforcement would be unsuccessful. Co-management arrangements involving fishers and government were recommended. The Fisheries Division advocated co-management of the sea egg fishery in its first Fisheries Management Plan (FMP) for the period 1997 - 2000 (Fisheries

Division 1997). All three subsequent FMPs have continued to promote co-management of the fishery.

The 1997 - 2000 FMP promoted fisher participation in the management of local fisheries in general not just for the sea egg fishery. Indeed the FMP itself had been developed through a process that involved the participation of fishing industry stakeholders. The organisation of fisherfolk into coherent bodies that could provide a collective representative voice for the fishing community was the first step in developing co-management. However, up to the late 1990s, Barbadian fisherfolk organisations had deservedly earned the reputation of being ephemeral as they were usually only formed and active during times of perceived crises or as a means to lobby government to redress situations specific to their members. The few longer-lasting organisations eventually came to rely heavily on government assistance to maintain them. With this history, it was clear that efforts on the part of government and other relevant non-governmental agencies were needed to forge viable and sustainable fisherfolk organisations (McConney et al. 1998).

While a formal co-management arrangement is not yet in effect for the Barbados sea egg fishery, several strides have been made in facilitating the participation of fishers in the decision-making process. A number of agencies, both governmental and non-governmental have been integral in the fostering of co-management of the fishery through specific projects. Detailed reports of these projects have been produced with some remaining in the domain of "grey literature" and others published in mainstream journals. However, it is important that these projects not to be viewed as isolated but rather as stepping-stones defining a path to the final goal of co-management. To this end an overview of the significant outcomes, both successes and failures, of these projects in addition to other relevant issues such as the ecology of the resource and the framework of fisheries legislation, is needed to guide policy-makers and stakeholders. The main objective of this paper is to provide such a guiding overview.

LEGISLATIVE FRAMEWORK

The first laws governing the sea egg fishery were embodied in the Sea Egg Preservation Act of 1879. The main regulatory mechanism in the Sea Egg Preservation Act was the establishment of an annual fishing closed season presumably planned to encompass the animals' peak spawning season. Although the period between 1st April and 31st August, inclusive, was stipulated as the closed fishing season in the Act, a clause was also included giving the authorities the legal right to change the harvest period via an announcement in the Official Gazette. Fines, terms of imprisonment and confiscation of fishing gear and boats were the punitive measures recommended for breaking the laws embodied in the Act. In 1904 the articles of the Sea Egg Preservation Act were retained in the Fisheries Regulation Act, which consolidated a number of pieces of fisheries legislation in existence at the time. Apart from occasional periodic increases in fines, it was the ending dates of the annual closed season and thus the start of the fishing season that was most often altered during the life of the Act. Adjustments to the dates of the closed

season notably only took place during the first half of the century until 1987 when the closed season was extended to two-years to facilitate a harvest moratorium (Parker 2002, Parker In prep).

The Fisheries Regulation Act was finally repealed and replaced with the Fisheries Act of 1993. The new Act mandated the appointment of a Chief Fisheries Officer (CFO) and charged him with the responsibility of managing and developing local fisheries. In 1997 the first Fisheries Management Plan was produced in accordance with this edict. The plan espoused co-management of the sea egg fishery.

In the Fisheries Act, stakeholder input into management decisions is facilitated through the appointment of a Fisheries Advisory Committee composed of representatives of government agencies and representatives of key sectors of the fishing industry. The CFO is also given the option of consulting with stakeholders when preparing or reviewing a management scheme. However a very important facet of the Fisheries Act is that the Minister responsible for fisheries ultimately must make all management regulations.

The Fisheries Act does, in itself, not include any management regulations for the sea egg fishery but mandates the Minister to dictate appropriate regulations for the fishery. It also provides the Minister with a range of management tools other than only closed seasons. It was not until five years later, in 1998, that the first suite of fisheries regulations was enacted. For sea eggs the tried and tested imposition of an annual closed season was retained, however fixed dates were not included up front, thus permitting dates to be set on an annual basis. The option for restrictions on the use of fishing gear was exercised by banning the use of SCUBA for fishing sea eggs. This also effectively set a depth range restriction aimed at protecting those sea eggs living at depths beyond the reach of free divers.

Co-management encompasses several possible arrangements that are often depicted as a scale constructed from the relative sharing of responsibility and authority between government and stakeholders (Pomeroy and Berkes 1997, Berkes et al. 2001). McConney et al. (2003) suggest the following labels for three different degrees of co-management:

- i) *Consultative co-management* — Government interacts often but makes all the decisions
- ii) *Collaborative co-management* — Government and the stakeholders work closely and share decisions
- iii) *Delegated co-management* — Government lets formally organised users/stakeholders make decisions

In its present form, the Fisheries Act does not allow for the divestment of the governance of any fishery to user groups. It *de facto* restricts power sharing through co-management to the level of collaborative co-management as defined above. The potential exists for government both at the level of the CFO and the Minister to derail any management decisions or policies derived by any stakeholder group. From a pragmatic perspective, verification that policy recommendations have originated from consultation with as many

stakeholders as possible will be the best defence against possible top-down governmental interventions. A recognised representative stakeholder group with which government can interact is needed.

THE STEPPING STONES TO CO-MANAGEMENT

Although, since 1879, management of the sea egg fishery was through state legislation, and thus “top-down” in nature; it appears that fishers were at least occasionally consulted in governance decisions for the fishery. For example, no record has been found to suggest that any scientific study was used to fix the period for the fishing closed season first prescribed in 1879. It can only be assumed that local knowledge, presumably mainly from fishers, was used to determine the timing of the animals’ peak reproductive season and thus the period for the closed season. It was not until 1958 that a comprehensive scientific study of the animals’ biology was published (Lewis 1958). The study confirmed that the animals’ peak spawning period fell within the range of the closed season as had been prescribed by law since 1879.

In 1899, fears of an imminent collapse of the sea egg fishery prompted the tabling of a bill in parliament calling for the imposition of a two-year harvesting ban to protect the stocks. A parliamentary committee mandated to investigate the issue consulted fishers before suggesting changes in the legislation that were duly enacted. Correspondence between the Director of Agriculture and the Fisheries Officer in charge of the Fisheries Division suggest that in 1946 the Director wanted to open the fishery before the customary 1st September opening date. While the Fisheries Officer conducted the logical science-based step of testing the readiness of the roe, he also obviously consulted fishers as he duly reported the divergent views of fishers from different communities on allowing an early start to the season. No records of government-fisher consultations have been found for the next forty years and since the periods of the fishing season were not altered until 1987, it would appear that if there were any such consultations during that period, they did not result in altering the legislated *status quo*.

In 1994, Vermeer et al (In press), conducted a questionnaire-based survey of 35 fishers on the potential for co-management of sea eggs in Barbados. About half of the fishers interviewed reportedly thought that community-based management groups could be formed or that community action could result in greater cooperation of fishers with management efforts. The wide distribution of sea egg fishers around the island, and the fact that fishers traditionally freely operated from any site, indicated that the small community-based structure that was in place in St. Lucia to manage its sea egg fishery was not suitable for Barbados. Instead, it was suggested that a flexible closed season be introduced and that fishers should be encouraged to conduct annual assessments of the stock and the timing and duration of fishing seasons, should be based on the results of these surveys following consultation with the Fisheries Division. Given the inherent unpredictability of the stock this was a very astute recommendation. Vermeer et al. also felt that fishers would be more likely to respect regulations that they had participated in developing. While this approach would include volunteer fishers in the decision making process, it did not

suggest a mechanism to organise the fishers into a formal group that could be recognised as a representative decision making entity.

In 1998 an ambitious project of the Coastal Zone Management Unit (CZMU) attempted to foster co-management of the fishery as was being advocated in the 1997-2000 FMP. The goal of the project was to establish a co-management mechanism operated by the fishers themselves with technical and advisory support from the Fisheries Division (Mahon et al. 2003). The first phase of the project involved identifying groups of fishers and contact persons in recognised fishing communities. Dialogue with individuals and small groups was initiated and attempts were made to draw these persons into successively larger group meetings organised by key persons in the communities to reach consensus on management approaches. The Technology of Participation (ToP) was used to develop a shared vision for the fishery and to develop a strategic plan for achieving the vision.

One of the strategic directions identified at the end of the process was cooperating for the betterment of the industry. In response to this call, attempts were made to establish a fisherfolk organisation. The decision was made that the organisation should not be restricted to sea egg fishers but to all persons involved in dive fishing. Fortunately, the project was underway when Dr. Anton Atapattu, a Fisherfolk Organisation Development Adviser (FODA) was on assignment in Barbados with the express mandate to develop fisherfolk organisations. The first meeting of the Barbados Fisherfolk Divers Association (BFDA) was held at the Fisheries Division in February 1999. A constitution based along the same lines as for the other fisherfolk organisations and developed by the FODA was agreed to and the fishers present elected the seven-member executive (Mahon et al. 2003).

However, attendance at the meeting was very poor. This was attributed to the meeting coinciding with the peak of the pelagic fishing season when many fishers would be at sea. It was decided that an interim executive committee could still be formed by those present and another general meeting be called when the pelagic fishing season was over. The next meeting was held in August 1999 but turnout was even poorer and a meaningful electoral process could not go forward. No further meetings were called, and attempts to form the fisherfolk organisation had failed.

As Mahon et al. (2003), pointed out, the BFDA was unique to Barbados in that it focused on resource management rather than development and improvement of conditions for fishers. As a result great efforts on the part of government would be needed to maintain its structure, especially when addressing contentious issues. A more immediate problem was that its members were widely dispersed throughout the island. As a result, members from different communities did not know each other well enough for the electoral process to be meaningful. Due to a lack of human resources at the Fisheries Division, a familiarisation process could not be undertaken and was probably a major cause of the collapse of the organisation. Despite the failure of the BFDA, the project demonstrated a willingness of fishers to participate in-group processes aimed at managing the fishery (McConney et al. 2003).

In 2001, the Coastal Resources Co-management Project (CORECOMP), a 3-year project of the Caribbean Conservation Association commenced.

CORECOMP offered assistance to the Fisheries Division and the Barbados Union of Fisherfolk Organisations (the umbrella organisation for local fisherfolk organisations) as the co-management partners to establish a pilot project on co-management of the sea egg fishery. The project was especially timely and welcomed, since in 2001 the Barbados sea egg stock underwent what can only be deemed a dramatic recovery reaching abundances that had not been observed for over thirty years. The stock recovery coincided with the expiration of a three-year harvest moratorium that was due to be lifted at the end of July. With the lifting of the ban, the fishery would be opened with no co-management in place. It was even more important that the stock be protected from another collapse due to over-harvesting.

The first order of business was to assess the true status of the stock to advise the best policy to allow a sustainable harvest. A proper scientific stock survey was therefore needed to determine appropriate start times for the harvest and duration of the fishing season to prevent over-fishing. The time had come to establish the flexible harvest seasons and draw the fishers themselves into the scientific aspect of fisheries management and thus make them real participants in the management process, as was suggested by Vermeer et al. in 1994.

The survey programme was designed by the Fisheries Division's fisheries biologist and involved organising 16 volunteer fishers into four groups. Twenty-six index sites located around the island were chosen and the survey teams were assigned to survey a number of the sites with which they were most familiar. A simple quadrat method was used to estimate population densities and the diameters of samples of the animals at each site were measured and recorded. The sampling protocol and the rationales for collecting the information were explained to fishers in both a classroom and field sessions by the biologist and an assistant. The field surveys were conducted in July and August. The results of the surveys were collated and analysed by the biologist, and the results explained to the fishers. The fishers were also invited to actually input and manipulate the data themselves to further familiarise them with the scientific process of resource assessment. The information generated by this collaborative research was used to prepare a policy paper to government advocating a two-month fishing season starting from 1st October. Despite the delay in the start and the substantially reduced duration of the season, government accepted the recommendations and passed them into law. Long-standing traditions for managing the fishery had been altered through a collaborative effort of the Fisheries Division and fishers in a scientifically sound assessment.

Similar surveys have been conducted in each successive year and the results used to determine the duration and timing of the annual seasons. However, funding of the successive surveys have been undertaken out of the Fisheries Division's budget and have been constrained to fewer index sites. In 2002 and 2003 fisher involvement after submitting the survey data was much reduced and the final management decisions were largely made through consultations between BARNUFO and the Fisheries Division based on the survey results. Due to a perceived reduction in the standing stock at several sites in 2002 compared with 2001, a one-month harvest season was recom-

which was made somewhat shorter by days of inclement weather, proved very unpopular with a number of fishers who, with the assistance of some of their parliamentary representatives, successfully lobbied government to extend the season by one month against the public outcry of the president of BARNUFO. This event provided an example of how co-management decisions can be overturned under the present governance structure if not firmly supported by a large and representative body of stakeholders.

In August 2004, the Fisheries Division held a meeting with the fishers involved in the stock surveys along with a number of other sea egg fishers and representatives of BARNUFO to facilitate consensus on the timing and duration of the upcoming fishing season. Even one self-confessed sea egg poacher was deliberately invited to the meeting to benefit from his perspective. The results of the survey were discussed along with anecdotal information offered by the fishers present who were not involved in the survey. The outcome of the meeting was truly that of compromise. For example the durations of the seasons proposed by the fishers ranged from none at all to one month, the final recommendation being two weeks and the proposed start dates ranged from 1st September to 1st October, with 15th September being finally decided upon. The outcome of this meeting clearly demonstrated that, for the sake of conserving the stock, well-informed fishers were quite willing to take tough stances that would be unpopular with many of their peers. Such fishers had the makings of true managers. It is noteworthy that, in spite of protests from some fishers, this extremely short fishing season, which was also much affected by inclement weather, was not extended.

In 2002, the Caribbean Conservation Association (CCA), in association with the Marine Resources Assessment Group Ltd. (MRAG) and Natural Resources Management Program of the University of the West Indies (NRM-UWI), implemented the Caribbean Coastal Co-management Guidelines Project. The objective of the project was “to ensure that integrated coastal management in the Caribbean is done in a way that involves and benefits those who depend on the resources of coastal areas, especially where there is poverty” (McConney et al. 2003). The Barbados sea egg fishery was chosen as a case study under this project. The project comprehensively reviewed issues related to developing co-management of the Barbados sea egg fishery through use of document analysis, key informants, semi-structured interviews, questionnaire surveys, and workshops with all stakeholders.

In May 2002, a multi-stakeholder project inception workshop was held involving persons involved in the sea egg fishery, fisheries authority, researchers, enforcement agencies, environmental NGOs and others to decide what the project should address. The responses from the group included issues that had been cited on numerous previous occasions such as improved enforcement of the regulations including prosecutorial success, improved public education, and the formation of local area management to improve compliance. During the fishing season, a questionnaire-based survey was conducted amongst sea egg fishers at three major harvesting sites to obtain their views on what was needed for the fishery. Again, much of the same sentiments expressed by stakeholders reported in previous reports were reiterated. However, of particular interest was that the majority of persons interviewed (60%) suggested that government

mended and subsequently passed into law. However, the shortened season, and fishers should equally share control of the fishery, and 70% also thought that fisherfolk organisations could help in management, although 75% of the respondents were not members of fisherfolk organisations. One interpretation of these results is that many fishers want to have a say in management but don't want to participate in the processes involved, such as becoming members of organisations themselves. This suggests that they are more willing to have their opinions voiced through an emissary.

THE STUMBLING BLOCKS

Historical records clearly indicate that out of season poaching has been a feature of the sea egg fishery since the concept of a closed season was introduced. There are numerous negative impacts of poaching on the management of the fishery. The activity directly undermines the benefits of the closed season (i.e. removal of the animals before they have spawned) and the need to take more animals during the spawning season to satisfy catch demands since the roe is not in a fit state for harvest (e.g. runny when spawning and very small after spawning). As the level of poaching is unknown then accurate assessments of fishing effort cannot be made to advise management measures that involve controlling fishing effort.

Effective ongoing monitoring supported by active enforcement along with punishments that adequately deter poaching are essential for converting legislation into real control. Earlier works have already discussed in detail the possible contribution of fines that are small when compared with the potential financial gains from poaching sea eggs to the collapse of the stock during the 1970s and 1980s (Parker 2002, Parker In prep.). This weakness in the legislation was removed by the 1998 fisheries regulations that set maximum fines of \$50,000 and/or two years imprisonment as punishment for sea egg poaching. Despite these sterner potential penalties, anecdotal information tends to indicate that the incidence of sea egg poaching may actually have increased following the recovery of the sea egg stocks observed from 2001.

A number of important contributing factors for this apparent increase in poaching incidents may be identified. The first is that the overall increased number of sea eggs can support increased fishing effort whether legal or illegal. The bitter irony here is that the animals left on the grounds by fishers who only harvested the animals within the substantially shortened fishing season then become the prey of the poachers. The positive impacts made by the sacrifices of these many law-abiding fishers for the conservation and even increase of the stock in the first place thus increases the profitability of poaching. This cannot engender cooperation in management.

The second contributing factor is the existence of a lucrative black-market for the poached sea eggs reportedly largely fuelled by some of the wealthier and powerful residents of the island. Fishers must surely view this situation as one of laws being only applicable to the poor.

The third contributing factor to poaching is that although the courts have started imposing stiffer penalties for sea egg poaching, (maximum recorded was Bds. \$2,500 in 2003), the fines still fall well below the maximum allow-

able under law and are still effectively below the level at which the fisher would perceive that the cost of his capture exceeds the potential financial gains from poaching.

Authorities have found the capture and subsequent conviction of sea egg poachers to be challenging exercises. The rugged terrain of the coastline which fronts much of the more productive sea egg grounds in the north and southeast of the island is replete with small bays and beaches that are difficult or impossible to access by vehicles on land or by boats at sea. These secluded areas are havens for poachers who use them as a landing site for their catches and if challenged by authorities can use the poor accessibility features to make good their escape when necessary. In addition poachers often use lookouts to warn of the approach of enforcement officers and have developed clever strategies to quickly dump their catches and thus the evidence of their crime. The high incidence of successful poaching due to failures in enforcement has a snowballing effect, as more fishers perceive that the risk of punishment is low and capitalize on this weakness, while law-abiding fishers poach when they become anxious that few sea eggs will be left for them during the legal fishing season.

An important aspect of successful management of the sea egg fishery is sensitisation of the general public to the rationales behind management measures. The general public must be made aware of their role as stakeholders in the fishery. Historically, sea egg poaching has been viewed as a very trivial offence, but as pointed out by McConney et al. (2003), this perception must be changed to one of outrage if management is to be successful. Each of the major projects outlined in the previous sections have recognised this need for public education. In response, an informational booklet on the sea egg fishery was produced out of the 1998 CZMU project (Mahon and Parker 1999) and an informational brochure was produced by the Fisheries Division in collaboration with BARNUFO with funds supplied out of the CORECOMP project and the Oak Foundation. In 2004 the Barbados Government Information Service produced a short (30 second) programme featuring the Fisheries Division's Fisheries Biologist advising the general public against poaching sea eggs or purchasing poached sea eggs. The clip was screened on numerous occasions prior to the opening of the season. Indications are that the clip was very successful at getting the simple message across to a very wide audience and this seems to be a useful format for public education.

THE FINAL STEPS

In November 2003, the Fisheries Division hosted a Sea Egg Fishery Management Small Group Meeting at the Fisheries Division as part of the post evaluation of the 2003 sea egg fishing season (McConney and Pena 2004). Participants included fishers that had participated in sea egg stock assessment surveys and other fishers who were known to be interested in participating in management. The meeting also served as a forum to generate recommendations for inclusion in the Fisheries Management Plan for 2004 - 2006. The fisheries biologist delivered a Powerpoint presentation outlining his recommendations for managing the fishery and the rationales for them. From the

beginning of the meeting the fishers were advised that they were free to interject at any time to ask questions or offer comments (positive or negative) or offer suggestions. Consensus agreement was sought on all relevant issues. Following discussions, the participants agreed among other things that:

- i) Closed seasons were the most appropriate management tool for the fishery.
- ii) The timing and duration of fishing seasons should be agreed on an annual basis following stock surveys, and the length of the season should be used as the means of controlling allowable catches.
- iii) Allowable catches should ensure that a reserve adult stock be retained at the end of each season.
- iv) More index sites should be surveyed necessitating the inclusion of more fishers in the programme.
- v) Licensing should not be introduced as a means of limiting the numbers of fishers involved; however, all fishers should be registered so that fishing effort can be determined.
- vi) The issue of the ban on the use of SCUBA gear in the fishery should be reviewed.
- vii) Poaching must be eliminated.
- viii) Public education on proper traditional harvesting techniques, such as testing roe quality before picking and leaving unripe animals, should be undertaken.

An important aspect of the meeting was the introduction of a proposal for establishing a Sea egg Management Council (SMC) as a means of facilitating co-management. The proposed council would comprise representatives of relevant government agencies including enforcement agencies, BARNUFO, an independent fisheries biologist and representatives of major sea egg fishing communities. More than half the council's membership would be fishers. Community representatives would be responsible for advising members of their communities on relevant issues and reporting the concerns and opinions of whom they represent to the council meetings. The council would coordinate stock assessments, formulate management policies, and develop ways of enforcing any management regulations. The fishers accepted the proposal in principle, and as a result, the recommendation was included in the 2004 - 2006 FMP.

A number of hurdles must necessarily be first overcome in developing the council. For example, mechanisms will have to be put in place to allow communities to elect their representatives. However, given the need to kick-start the formation of the council, it is proposed that the representatives be appointed initially. Financing of the council will also become an issue, as it is unlikely that participants will be willing to devote their time and effort to make the council work in the longer term for free. While donor agencies and government would be willing to finance the initial set up stages, the council will have to eventually find ways to at least partially finance its work.

DISCUSSION

Several features of the sea egg fishery, including the very nature of the animal and its market worth, make the resource vulnerable to overexploitation which can lead to fishery collapse. For example, the animals are broadcast spawners, which makes spawning success highly dependent on the numbers of spawning animals and their proximity to each other. The several factors that impact on the survival and transport of the animals through the long planktonic phase of their life cycle through settlement to the benthos, all make recruitment success highly unpredictable. The animals live in shallow-water and are sedentary, making them easy to collect with minimal capital investment. Finally, there remains a ready local market, both legal and illegal, for this high-priced commodity. Based on these features alone, no management measures are likely to succeed without the cooperation of harvesters and the buying public. To facilitate this, there is little doubt that the sea egg fishery would be best managed through a co-management arrangement.

However, developing co-management of this fishery has proven to be a daunting task. McConney et al. (2003) aptly describes co-management of the Barbados sea egg fishery as being only in the pre-implementation stage. While industry representatives and enforcement agencies continue to demonstrate interest in co-management, patience may be wearing thin as the same issues are discussed at successive meetings without any apparent resolution (McConney and Pena, 2004). Tangible successes are needed urgently.

At some level there have been notable improvements in the level of fisher participation in governance. So far, the only sustained fisher-government collaborative success has been in the annual resource assessments. This has led to the now generally accepted norms of shorter fishing seasons with the possibility of variation from the traditional start date of 1st September. It is now also accepted in principle by most involved in the fishery that the state of the stock should dictate the length and timing of the fishing season. The level of impact that these changes on how the stock is exploited have had on its sustainability cannot be accurately measured. However, certainly the fact that annual harvests following the 2001 stock recovery have been either fair or good must send the message to the public that the fishery is being managed with some success.

However, many fishers not involved in the stock surveys customarily cast suspicion on the validity of the assessments and consider that longer fishing seasons would not endanger the stock. It is understandable that there would be fears of coercion on the part of government when the same small group of fishers are repeatedly used to conduct the stock surveys on which the information that advises this principal management measure. To avoid this misperception the assessments should be expanded to include more index sites on a regular basis. This would not only improve the soundness of the survey programme from a scientific perspective, but also will draw new fishers into the programme. In addition, anecdotal information on stock status and other relevant information should be systematically collected from a wider group of fishers for the same reasons. The policy of inclusion in the area of information

gathering must be improved.

Finally, formal fisher participation in the decision making process must be extended beyond the information gathering stage. Again, at this level a mechanism must be put in place to draw the opinions of all stakeholders together. Stakeholders in this context include government agencies as well as fishers. This is the only way that critical management measures can be dealt with in a frank, transparent manner. The proposed Sea Egg Management Council will be one such mechanism.

It is however, unlikely that sea egg fishers on their own have the will or capacity to organise themselves to facilitate self-representation. To this end the Fisheries Division must take the lead in nurturing this process. Limitations on human resources at the Division are unlikely to change in the near future. However, one hitherto unmentioned intangible benefit of the long years of this co-management process is the creation of a number of personal alliances between Fisheries Division staff, BARNUFO and the sea egg fishing community. A number of people who would make meaningful contributions to the development and success of the council are thus known to the Fisheries Division. These persons should be brought together in an effort to kick-start the development of the council. However processes whereby fishers can select their own representatives should be developed as soon as possible.

It seems unlikely that Government will be inclined in the near future to release its primary control on managing this fishery, which is of such economic, social and cultural importance to the island. However it is more probable that the recommendations of the council would be sufficiently weighty to effectively advise government policy once it demonstrates that it truly represents the majority of stakeholders.

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LITERATURE CITED

- Barbados Fisheries Division. 1997. Barbados fisheries management plan 1997-2000. Ministry of Agriculture and Rural Development. 69 pp.
- Berkes, F., R. Mahon, P. McConney, R. Pollnac, and R. Pomeroy. 2001. *Managing Small-scale Fisheries: Alternative Directions and Methods*. International Development Research Centre, Canada. 320 pp.
- Mahon, R. and C. Parker. 1999. Barbados sea eggs, past, present and future. Fisheries Division. Ministry of Agriculture and Rural Development, Barbados Fisheries Management Plan, Public Information Document No. 1. 16 pp.

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- Mahon, R., S. Almerigi, P. McConney, C. Parker, and L. Brewster. 2003. Participatory methodology used for sea urchin co-management in Barbados. *Ocean and Coastal Management* **46**:1-25.
- McConney, P.A., A. Atapattu, and D. Leslie. 1998. Organizing fisherfolk in Barbados. *Proceedings of the Gulf and Caribbean Fisheries Institute* **51**:299-308.
- McConney, P., R. Mahon, and C. Parker. 2003. Barbados case study: the sea egg fishery. Caribbean Coastal Co-management Guidelines Project. Caribbean Conservation Association, Barbados. 74 pp.
- McConney, P. and M. Pena. 2004. Events and institutional arrangements in the management of the 2003 Barbados sea egg fishing season (15 September – 15 October). Coastal Resources Co-management Project (CORECOMP). Centre for Resource Management and Environmental Studies, University of the West Indies, Cave Hill Campus, Barbados. 38 pp.
- Parker, C. 2002. The contribution of inadequate fines to the collapse of the sea egg fishery of Barbados. *Proceedings of the Gulf and Caribbean Fisheries Institute* **53**:203-217.
- Parker, C. [In prep.]. UWI doctoral dissertation on the sea urchin fishery. Department of Biology. Faculty of Pure and Applied Sciences. Cave Hill, Barbados.
- Pomeroy, R. and F. Berkes. 1997. Two to tango: the role of government in fisheries co-management. *Marine Policy* **21**:465-480.
- Vermeer, L.A., W. Hunte, and H.A. Oxenford. 2005. An assessment of the potential for community level management of the sea urchin fishery in Barbados. *Proceedings of the Gulf and Caribbean Fisheries Institute* **47**:70-103.