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Participatory Mapping for the Grenadines Marine Resource Space-use Information System

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ABSTRACT

Marine resources provide the foundation for livelihoods in the transboundary Grenadine island chain. A better understanding of the abundance and distribution of key marine resources and space-use patterns is critical for planning and management for sustainable use of the marine resources of the Grenada Bank. Stakeholder involvement in participatory mapping exercises is thought to be pivotal in the documentation of local spatial knowledge and the development of an integrated multi-knowledge marine resource space-use information system. This paper summarizes participatory methods used and lessons learned during the creation of Grenadine marine resource users' space-use profiles. Further mapping will be conducted with marine resource users' in order to highlight areas for management such as: critical habitats; areas of high aesthetic/cultural importance; areas important for livelihoods including fishing, shipping and tourism; as well as areas of space-use conflict. It is anticipated that participatory GIS will enable more holistic and integrated transboundary planning and management between government, NGOs and communities of the Grenadine Islands and will also contribute to stakeholder education and capacity.

KEY WORDS: marine resource space-use, mapping exercises, participatory GIS

INTRODUCTION

The transboundary Grenadine island chain lies on the Grenada Bank stretching some 120 km between two countries, Grenada and St. Vincent and the Grenadines (Figure 1). There are over 30 islands, islets and cays of which nine have permanent settlements (CCA 1991a, b). Of these nine, two (Palm Island and Petit St. Vincent) are private resort islands. The other seven islands have towns and communities with public and private supporting infrastructure.

The Grenadine Islands are one of the few areas within the Lesser Antilles with an extensive bank. The Grenada Bank has an area of approximately 3,000 km^2 exposed to the influence of oceanic water (CRFM 1994). Three quarters of the Grenada Bank is shallower than 50 m and supports the most extensive coral reefs and related habitats in the south-eastern Caribbean (CCA 1991a, b). In the Grenadine Islands all reef-related

habitats are represented: seagrass and lagoon, areas of mangrove and a variety of patch, fringing and bank barrier reefs (ECLAC 2004).

Figure 1. Geographic location and detail of the transboundary Grenadine Islands of the Grenada Bank (Adapted from Sustainable Grenadines Project 2005).

Marine resource use (including marine-based tourism, fishing and transport) is of vital importance to the people of the Grenadines (Sustainable Grenadines Project 2005; Baldwin *et al.* 2006). Tourism is a key sector for employment and revenue, and tourism development is proceeding apace with the number of visitors to the Grenadines increasing steadily in recent years (ECLAC 2004). The marine-based tourism sector includes onshore accommodation and restaurants (resorts, hotels, guesthouses, rental villas), cruise-ships and charter yachts, and recreation/entertainment (water-sports including SCUBA and snorkel trips, sport-fishing, day boat charters). Fishing is another main source of employment and livelihood and it is reported some 85-95% of adult males in the Grenadines are fishers or active in related sectors (CCA 1991a; b). Fisheries resources consist of shallow-shelf reef fishes, lobsters, conchs, deep-water (slope and bank) demersal fishes, coastal pelagics, sea turtles and sea urchins (Mahon 1990). Most fisheries in the Grenadines are small-scale artisanal, with fishers typically operating independently at a subsistence level with little or no organisation (Chakalall *et al.* 1994; Gill and McConney 2007; Staskiewicz and Mahon 2007). Grenadine marine transport

operations including ships and ferries are essential to passenger and cargo movement between the islands (Baldwin *et al.* 2006).

Current Status of Management

Both Governments perceive their Grenadine islands as having high potential for tourism and associated development, whilst also recognising their current value and long tradition of supporting coastal communities through fishing. They are also well aware of the high vulnerability of the marine resource systems of the area to environmental degradation and the dependency of sustainable development on conservation of the resources (Sustainable Grenadines Project 2005). Both countries are party to a large body of international and regional environmental agreements and possess national legislation and regulations to promote sustainable development and protect and conserve marine resources and biodiversity (Mattai and Mahon 2007).

Despite this awareness, unplanned development and the unregulated use of the coastal and marine resources of the Grenadines have already led to significant degradation in many areas. Increasingly serious infrastructural, socio-cultural and ecological problems have contributed to the declining quality of the natural resources of the Grenadines in recent years. Overfishing, coastal habitat destruction and degradation, sedimentation, solid waste and sewage disposal from land-based and boat sources as well as the recreational abuse of coral reefs have been cited as causative factors for this deterioration (CCA 1991a, b; FAO 2000; FAO 2002; ECLAC 2004; Sustainable Grenadines Project 2005; Williams *et al.* (in prep) 2007).

Historically, marine management of the Grenada Bank has primarily been top-down fashion and lacking national integration between relevant government agencies, transboundary multi-sectoral collaboration and formal stakeholder participation. This may be, in part, due to centralisation of both governments on their respective mainland and the physical constraints of access to the dispersed chain of transboundary Grenadine islands. This is no doubt exacerbated by a lack of formal fisheries and marine tourism management plans, limited enforcement capacity and nonexistent formal stakeholder participation mechanisms in planning and management initiatives both within and among the countries.

Participatory GIS

Participatory GIS (PGIS) is an emerging interdisciplinary community development and environmental stewardship tool based on participatory research principles. PGIS incorporates local knowledge, stakeholders' perspectives and socio-economic data in the GIS database and merges it with conventional biophysical information for a more ethical, functional and holistic framework to promote social justice and ecological sustainability (Aberly and Sieber 2002; Corbett *et al.* 2006). PGIS practice has developed from the merger of participatory learning and action and participatory rural appraisal methods with geographic information technologies (Aberly and Sieber 2006; Chambers 2006; Corbett *et al.* 2006; Rambaldi *et al.* 2006). PGIS can allow for a more comprehensive understanding of the social characteristics of natural resource use and its' users by

promoting the interactive participation of stakeholders in the development of a technical representation of local spatial knowledge (Quan *et al*. 2003). Furthermore, the PGIS process includes participatory validation, control and access of information generated by stakeholders (Aberly and Sieber 2002). It is argued that the process of PGIS not only results in more comprehensive understanding of functional natural resource information, but that planning priorities can be better focused resulting in more effective coastal resource management, including the sustainability of livelihoods. Furthermore, it is believed that PGIS can strengthen civil-society education, build capacity and increase acceptance of management initiatives (IIRR 1998; Walters *et al*. 1998; Calamia 1999; Aberly and Sieber 2006; Chambers 2006; Corbett *et al.* 2006; Rambaldi *et al*. 2006; Smith 2006). Moreover, it is purported that PGIS can produce unique spatial information and demonstrate the relevance of information provided by stakeholders and support the utilisation of local knowledge together with conventional scientific knowledge and facilitate participatory decision-making processes, community support, empowerment and social change (Calamia 1999; Corbett *et al.* 2006; Chambers 2006). This cannot be achieved using conventional GIS approaches.

Objective of the Research

With a heavy reliance on marine resources and increasing numbers of marine resource users in the transboundary Grenadine islands, there is a clear need for integrated marine resource use management. For such management to be effective it is proposed that the resource users themselves must be a part of the data gathering and management planning process and that their local ecological knowledge and resource use patterns must be clearly understood (Walters *et al.* 1998; Bunce *et al.* 2000; Bunce and Pomeroy 2003; Chuenpagdee *et al.* 2004; Rambaldi *et al*. 2005; Corbett *et al*. 2006). Towards this end, a collaborative spatial approach derived from the fullest possible information base is proposed to effectively understand, plan and manage the multifaceted nature of the marine resources of the Grenada Bank. This research will investigate the utilization of participatory research (PR) methods to document the local knowledge systems of marine resource users. This information will be amalgamated with conventional biophysical information on the resources, biodiversity and ecosystems of the Grenada Bank including social, economic and space-use information within a GIS framework. This research will therefore develop a collaborative marine space-use information system (MarSIS) for the Grenadine Islands as a tool for planning sustainable resource management of the Grenada Bank.

This paper summarizes some of the PR methods utilized in a variety of participatory mapping exercises and will discuss lessons learned thus far during the research.

METHODS

Geodatabase Structure

The geographical scope of the study is the marine environment of the Grenada Bank, which spans the jurisdiction of two countries: Grenada and St. Vincent and the

Grenadines, including the coastal areas of the Grenadine islands extending to the 200 meter depth contour. The Grenadines MarSIS geodatabase will be created using ESRI's ArcGIS version 9.2 software. All spatial database files will be accompanied by corresponding attribute tables and ESRI FGDC compliant metadata. Furthermore, a variety of Participatory Monitoring and Evaluation techniques (Maine *et al.* 1996; McAllister and Vernooy 1999) will be utilized to validate information collected, provide for quality assurance of data produced and better guide participatory adaptive research.

The MarSIS will incorporate key spatial information on biophysical resources such as critical habitats (essential fish habitats, spawning aggregation sites, and areas used by endangered species), areas of high biodiversity and representative marine ecosystems (mangroves, seagrass beds and coral reefs). Socially and economically important areas (i.e. space-use patterns) will be identified based on high aesthetic and recreational value, historical and cultural importance, important fishing grounds (including types of fishing, pressure and gear used) and areas important for marine-based tourism and transport. Areas for livelihood development opportunities as well as areas of highest human pressure (space-use overlap) and perceived threat (including locations of land-based sources of marine pollution) will also be identified. As a result, the MarSIS will be interactively utilized to spatially identify areas within the Grenadine islands of spatial importance for marine conservation and marine-based livelihoods as well as areas which space-use conflict is currently or potentially high (see Table 1).

Table 1. Spatial categories to be included in the MarSIS geodatabase.

Spatial Category	Type	Description
Biophysical Resources	Marine Benthic Habitats*	Including reef classifications, associated fish species and organisms, spawning and nursery areas, marine monitoring survey sites
	Coastal Resources*	Including key areas of use, seasonal patterns, intensity
	Marine Biophysical Data	Bathymetry, currents, salinity, temperature
Marine Resource Users & Space-use Patterns	Fishing Villages/Communities	Including demographics, activity profiles, socio-economic information
	Important Fishing Grounds*	Including key resources (fish species, conch, lobster), fishing intensity/pressure, gear used
	Fish Landing Sites	Including demographics, landing records
	Other Marine Resource Users	Including demographics, activity profiles, socio-economic information
	Areas Important for Marine-based Tourism*	Including dive sites, snorkelling areas, sailing passages, anchorages, intenisty
	Safe Anchorages, Marinas, Ports	Capacity, depth, infrastructure, intensity
	Shipping (Commercial Use) Areas*	Inter-transit shipping routes, intensity
	Areas of High Aesthetic, Historical, Cultural & Recreational Value*	
Legislative & Identified Areas	Conservation/Protected Areas	Proposed and legislated marine protected areas
	Land-based Sources of Marine Pollution*	
	Perceived Environmental Threats*	
	Areas of Livelihood or Development Opportunities*	

* Indicates spatial categories in which the information base will include local knowledge obtained through the use of participatory research mechanisms

Stakeholder Involvement

This research is will investigate the premise that in order to obtain an accurate understanding of the abundance and diversity of marine resources and their use patterns as well as gain stakeholder acceptance in management initiatives; a variety of stakeholders and knowledge systems must be included in management. It is envisioned

that by utilizing a range of PR techniques throughout the research, the MarSIS geodatabase will not only incorporate popular knowledge on marine resources but transparently bring a variety of stakeholders into a common space of understanding.

A three month data-scoping exercise was undertaken in each of the inhabited Grenadine islands and each respective mainland in order to initially understand the institutional organization of each country, identify the general abundance and distribution of marine resource users, and appreciate the current uses of marine resources in each island. Information was obtained primarily through direct observation and key informant interview techniques (IIRR 1998; Walters *et al.* 1998; Bunce *et al.* 2000). A minimum of three key informants from each marine resource user group was interviewed in each island for a total of 87 key informant interviews. Information gathered during this activity was also employed to identify subsequent socio-economic survey variables and appropriate spatial data collection tools.

Primary stakeholders identified include key government agencies (Fisheries Division, Physical Planning and Tourism) of each country and direct marine resource users (including the private sector). Direct marine resource users have been grouped by type of use and by island and include: dive shops, day tour operators (general, sailing and sport-fishing), water-taxi operators, fishers, yacht charter companies, ferry operators and ship owners. Fishers are further grouped by landing site and will be analysed by fishery type (*i.e.:* baitfish, conch, lobster, reef fish, bottom fish and inshore/offshore pelagics). Secondary stakeholders include civil society organisations and local NGOs, other relevant government agencies (Forestry, Ministry of the Environment, Coast Guard, Port Authority, Statistics, Harbour Master, Customs and Maritime Administration) and the communities of the nine inhabited Grenadine islands.

The objectives, the role of stakeholder involvement, and the progress of the development of the MarSIS research, including issues encountered and possible solutions, are communicated to stakeholders through both one-way and two-way channels. One-way channels utilized include regular newsletters, emails and flyers. Two-way channels include a yahoo e-group/website (www.GrenadinesMarSIS.yahoogroups.com) which currently has more than 160 members and is used not only to increase the accessibility of information gathered but to promote transparent communication between all stakeholders. Furthermore, periodic governmental and community stakeholder meetings are used to introduce the project, review the objectives, validate and share information collected by stakeholders allowing for feedback and evaluation of the research. Moreover, all stakeholder meetings and field research activities are documented in summary reports and shared through both the e-group and website as well as in hard copy format in collaboration with the locally established NGOs and the Sustainable Grenadines Project (Sustainable Grenadines Project 2005).

Coastal and Marine Habitat Classification

A science-based classification system will be developed through the use of secondary scientific sources, satellite imagery and conventional GIS techniques (*i.e.* ArcGIS Habitat

Digitizer extension). The system for benthic marine habitats will be at a broad-scale that is useful for planning and management purposes, with categories such as: sand, seagrass, coral-dominated reefs, algal reefs (low-relief) and rocky reefs (high-relief).

Local knowledge classification systems for both marine resources and habitats will be determined in collaboration with the direct marine resource users. Interactive learning exercises will be carried out with each type of the marine resource user to identify and classify each group's key areas of usage, important resources and habitats as well as areas unsuitable for use. Further classification will be through the use of coastal profile transects, seasonal calendars, and participant observation techniques (Maine *et al.* 1996; IIRR 1998; Walters *et al.* 1998). Additionally, interactive learning exercises allow the researcher to develop stronger relationships with marine resource user stakeholders, gain invaluable insights into each of the marine resource users livelihood and resource space-use patterns as well as aid in the identification of key informants for subsequent participatory mapping exercises.

Data Collection

An extensive review of global, regional and national secondary (i.e. existing) data on marine-related legislation, policies, management plans as well as relevant research conducted on the marine environment, fisheries, tourism, civil-society and private sector organisations was conducted over a two-year period. All existing secondary information on marine resources of the Grenada Bank and it uses will be translated spatially into GIS data files where possible. Furthermore, site visits were made to all government stakeholders' to source additional information and identify information gaps. This also aided institutional strengthening by building working relationships while sharing and reviewing all secondary data collected.

Basemap Production

A basemap of the Grenada Bank consisting of coastlines, bathymetry, high-resolution satellite imagery and territorial boundaries has been created in ArcMap for subsequent spatial data collection.

In order to aid stakeholder understanding of this simple basemap for use in subsequent mapping exercises, community stakeholder mapping exercises were undertaken to determine the 'topogy' (i.e. locally-used names) for the beaches, bays and cays of the Grenada Bank. Standard government 1:10,000 Lands and Surveys maps were used in this mapping exercise due to their easy availability and community members' familiarity with landmarks. Community members from each island were asked to provide the local names for all the beaches, bays and cays with which they were familiar with and all names were written directly on each map. Each map was carried around to the various communities within each island until all named coastal features were identified and general consensus gained. At least three key informants verified and agreed on each name provided, before each island's 'topogy' map was considered complete. Information collected was spatially referenced in ArcGIS and used to supplement the basemap with the local names of

coastal features for use in subsequent mapping exercises (Figure 2). Secondarily, the processes of validation and distribution of these "local" maps in each island aided with community acceptance and knowledge of the research.

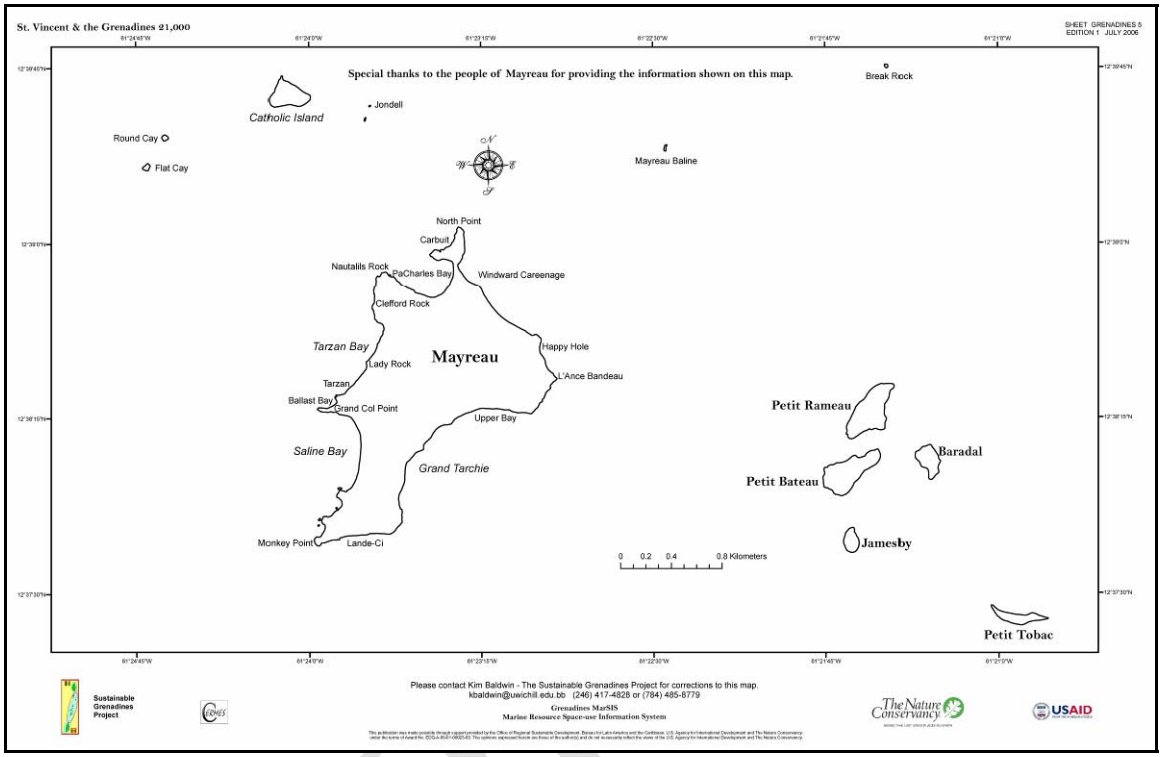

Figure 2. Topogy map of the island of Mayreau; developed using a standard government land & survey map and georeferenced in ArcGIS 9.2. These "local name" maps were also distributed in each of the respective islands to assist in gaining support for the research.

Socio-Economic and Activity Profiles. An inventory of each marine resource user group and preliminary socio-economic survey instruments (Bunce *et al.* 2000) were administered over a two month period with four assistants. Baseline marine space-use information was collected to create spatial activity profiles for each marine resource user group. All survey instruments were posted on the MarSIS e-group for feedback from stakeholders before being utilized. A total of 826 direct marine resource users (including fishers, dive shop operators, yachting companies, water-taxi operators, day tour operators, ferry operators and ship owners) including 519 boats were identified as currently operating in the Grenadine islands (Baldwin *et. al* 2006). Three quarters of all marine resource users were Vincentian, and 90% were male. Fishers made up the largest marine resource user group overall (Baldwin *et. al* 2006). Furthermore, a series of validation meetings (Maine *et al.* 1996; McAllister and Vernooy 1999) was used to present marine resource user activity profiles and associated socio-economic findings to stakeholders in order to obtain feedback before being spatially translated into GIS data files accompanied by a technical report.

Mapping Exercises. Participatory mapping will be conducted in the form of small semi-structured focus group interviews and individual interviews (Walters *et al.* 1998; Bunce

et al. 2000). Focus group interviews will be used to map coastal habitats and resources as well as identify current or potential issues/conflicts and opportunities. Focus groups will consist of a diverse group of direct marine resource users (comprising four to six participants), a facilitator and a record keeper/computer assistant. During each series of mapping exercises at least one focus group interview will be held in each of the inhabited Grenadine islands, although in larger islands, such as Bequia and Carriacou, with multiple discrete communities two to three focus group interviews will be conducted for each mapping exercise. Duration of each mapping exercise is limited to two hours to minimize fatigue of participants.

At the start of each mapping exercise, stakeholders were first orientated with the basemap of the Grenada Bank annotated with the local names of beaches, bays and cays (Walters *et al.* 1998). To better orientate stakeholders with the basemap and the areas to be mapped; all mapping exercises were visually supplemented using Google Earth Web-based satellite imagery of the equivalent area (Figure 3). Each mapping exercise was concluded with a review of major points to ensure all topics have been fully addressed and allowed time for initial validation and correction of spatial information collected. Furthermore, after each mapping exercise data was digitized into the GIS and validated before proceeding to the next phase of mapping.

Figure 3. Example of KML files created for the island of Mayreau and the Tobago Cays that were converted from the simple basemap ArcView shapefiles. Therefore, the simple basemap was superimposed on Google Earth satellite imagery and used in mapping exercises to supplement to the basemap provided for increased map recognition.

Coastal / Marine Habitats. Participants in each Grenadine island will be asked to identify the locations of critical coastal and marine habitats. Anticipated categories[1] to be mapped will include: mangroves, seagrass beds, beaches, coral reefs, algal reefs, hard

[1] Coastal and marine habitats and resources will ultimately be classified by the direct resource users.

substrate/rocky reefs and salt marshes/swamps. Participants will be asked to draw polygons around the boundaries of each marine habitat using the provided basemap and a simple colour-coded marine habitat legend provided (Walters *et al.* 1998). Local names will be used wherever given.

Coastal / Marine Resources. Participants will then be asked to identify locations of coastal and marine resources that provide goods or materials of tangible value for local communities. Anticipated categories to be mapped include: fishes (sub-categorised as: coastal pelagics, shallow shelf/reef fishes, deep-slope fishes, turtles and offshore pelagics), invertebrates (lobsters, conch, wilks, oysters, crabs, sea urchins) and algae (sea moss). Locations of marine resources will be mapped by drawing polygons around each resource area and coded using an Arabic numeral (Walters *et al.* 1998).

Other Coastal Space-use Activities. Using the basemap annotated with habitats and resources, participants will be asked to identify the current uses and areas for livelihoods. These sites will include areas for: use of particular fishing gears (sub-categorised as: handlines, spears, SCUBA, gill nets, trolling, beach seines, trammel nets, palang {floating or sinking}, commercial long-lines); coastal resource gleaning activities; sand-mining; mangrove cutting; recreational or cultural/historical activities; shoreline protection; conservation areas; nursery and spawning grounds. Areas identified will be mapped using polygons and a letter coding system (Walters *et al.* 1998).

Marine Space-use Conflicts, Issues and Opportunities. The final integrated mapping exercise will interactively utilize spatial datasets created from the previous coastal and marine habitats, resource and space-use mapping exercises to identify marine space-use conflicts, issues and opportunities. Initially this mapping exercise will conduct a comprehensive participatory validation and feedback exercise of all previously created datasets (Maine *et al.* 1996; McAllister and Vernooy 1999). Furthermore during this mapping exercise, GIS spatial datasets will be presented to stakeholders to highlight areas of overlap and identify existing or potential space-use conflicts/issues as well as ascertain areas in which marine resources may provide opportunities or benefits to the Grenadine communities.

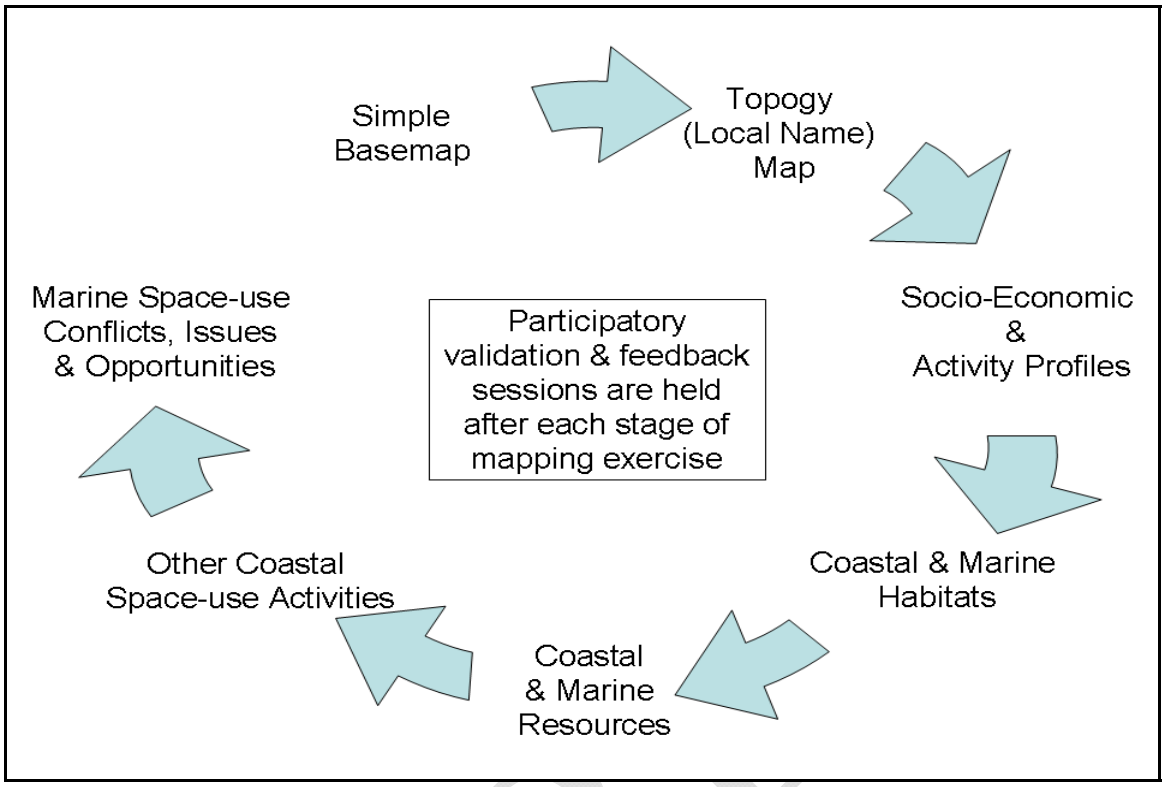

Figure 4. Flow chart of participatory mapping exercises utilized in the development of the MarSIS geodatabase.

Evaluation of Geodatabase Utilization

On completion of the development of the MarSIS geodatabase, a series of stakeholder utilization workshops will be conducted to examine the practical application and overall usefulness of the information system. A range of participants will be invited including government, direct marine resource users and civil society stakeholders. During MarSIS utilization workshops, participants will be guided through a series of structured computer exercises to test the application and information generated from the geodatabase. Additionally, the legitimacy of local knowledge in comparison to conventional scientific knowledge will be investigated through the evaluation of spatial datasets. During this workshop, participants will be administered surveys to critique the overall functional usefulness of the MarSIS and evaluate the utilization of PR methods. This final evaluation process will aim to aid inter-stakeholder understanding and support for the integrated multi-knowledge MarSIS geodatabase although this will not be thoroughly tested.

LESSONS LEARNED

Numerous lessons have been learned and existing knowledge re-affirmed from the utilization of PR.

Geographic Scale and PR

The issue of geographical scale in relation to the appropriateness of using PR in the development of a transboundary PGIS will be critically analyzed. Further investigation on the ultimate success of utilizing PR across such a large-scale; encompassing two countries, including nine inhabited islands, thirteen communities and close to a thousand direct marine resource users must be carefully appraised at the conclusion of the research. Thus far, the research has taken a substantially longer time period than anticipated. The importance of transparency and taking time to allow stakeholders to understand the research objectives and gain confidence in the researchers both within each community and amongst the various stakeholders must not be rushed. The research reaffirms that taking the time to identify the stakeholders and each of the groups' issues as well as accommodating the interests of the stakeholders' into the objectives of the research has been essential in gaining participation and support for the research. Moreover, the importance of continual stakeholder validation and evaluation meetings must not be underestimated. Although time-consuming, the processes of holding government and communities meetings after each stage of the research, including the distribution of periodic summary and technical reports as well as utilizing the MarSIS e-group has provided for increased understanding and communication both between and among the various stakeholders. Support and respect for the researcher and research has also been gained by allowing for periodic and easily accessible reporting of information through the range of communication mechanisms described. Furthermore, much time has been taken to personally revisit with stakeholders and distribute summary reports. Again, allowing the stakeholders to validate and give feedback after each stage of the research has given a sense of control and ownership in the research and has been well received. Therefore, the processes of using PR must be highlighted, and may be as important as the production of the geodatabase itself, in a participatory project of this scale.

Adaptive Research

Allowing for an adaptive research framework has been important to the success of the research. By allowing the researcher and stakeholders to evaluate and learn from previous methodology utilized, stakeholders have guided subsequent PR initiatives. Again considerable human resources are needed including: personal visits, phone calls, website surveys, informal and formal meetings in order to find the most appropriate methods for use with each stakeholder group. Moreover, reviewing PR methods to be used with stakeholders and seeking advice from key informants from the outset has been essential in choosing appropriate and feasible PR strategies.

Community Immersion

In order to better understand the use and importance of marine resources as well as gain trust and build working relationships in each of the communities included in the PR, it was found that this is best accomplished by the researcher intermittently living within each of the communities' for a period of time. By participating in community activities and conducting interactive learning exercises with each of the various marine resource

groups in each of the islands, a tremendous amount of insight into the key issues and struggles of the livelihoods of the Grenadine people has been gained as well as respect for the research earned amongst stakeholders. Furthermore, taking the time to 'get to know' each island and its people has provided several insights on the communities' structure, leaders and resource use patterns which could not have been gained through surveys or short field visits. Again, this process was time intensive but allowed for the researcher to gain credibility and provide for mutual learning and understanding between the research and communities allowing for more appropriate PR techniques.

CONCLUSION

This research explores the premise that by utilizing PR a range of interdisciplinary and multi-knowledge information on the marine resources of the Grenada Bank can be integrated into a geodatabase thus providing a basis for a holistic approach to transboundary marine resource management. Secondarily, it is anticipated that through the utilization of an adaptive process of PGIS development, a range of stakeholders' capacities will be strengthened fostering their ongoing engagement in sustainable marine resource planning, development and management. Ultimately, this research aims to provide an easily accessible integrated information base to support further participatory resource management and decision-making processes in the Grenadines as well as strengthen multi-stakeholder communication, education and advocacy.

ABOUT THE SENIOR AUTHOR

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