Participatory Monitoring and Evaluation of a Mexico City Wetland Restoration Effort

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ABSTRACT

The Xochimilco wetland in Mexico City is threatened by reductions to the aquatic system area, overexploitation of water resources, and widespread pollution. The introduced carp (*Cyprinus carpio*) and Nile tilapia (*Oreochromis niloticus*) compete with endemic species such as the axolotl (*Ambystoma mexicanum*). The Restoration Ecology Laboratory of the Institute of Biology, Universidad Nacional Autónoma de Mexico together with local fisher groups, with funding from local government, implemented a project to reduce non-native fish by drawing on local fishing expertise. To improve project management, project coordinators established a participatory monitoring and evaluation scheme, which provides a basis for understanding local livelihood strategies and stakeholder priorities. Recognizing that there are differences among stakeholders and establishing institutional arrangements that account for these differences can result in more inclusive projects based on mutual understanding and cooperation. This, in turn, yields better results. However, group dynamics, local political alliances, and powerful actors turn participation into an intricate social process. Restoration practitioners who are serious about participation should bear in mind that a participatory approach may add complexity to project implementation, but the outcome may be more sustainable restoration projects.

RESUMEN

El humedal de Xochimilco en la Ciudad de México está amenazado debido a la reducción del sistema acuático, la sobreexplotación y contaminación de las fuentes de agua. Las especies introducidas, carpas (*Cyprinus carpio*) y tilapia del Nilo (*Oreochromis niloticus*), compiten con las especies endémicas, como el ajolote (*Ambystoma mexicanum*). El Laboratorio de Restauración Ecológica del Instituto de Biología, Universidad Nacional Autónoma de México junto con grupos locales de pescadores y con financiamiento del gobierno local, la Delegación de Xochimilco, han implementado un proyecto de pesca intensiva para reducir las poblaciones de peces exóticos con base en la experiencia pesquera local. Los ejecutores del proyecto establecieron un esquema de monitoreo y evaluación participativos que brinda una base para comprender los medios de vida locales y las prioridades de los actores interesados a la vez que coadyuva en el mejoramiento de la gestión de proyectos. El reconocimiento de que existen diferencias entre los diversos actores y el consecuente establecimiento de arreglos institucionales que ayuden a tomarlas en consideración pueden dar como resultado un proyecto más incluyente con base en el entendimiento común y la cooperación. A su vez, esto genera mejores resultados. Sin embargo, la dinámica grupal, las alianzas políticas locales y los actores relativamente más poderosos pueden tornar a la participación en un proceso social intricado. Los expertos en restauración que deseen adoptar un enfoque participativo con seriedad deben tomar en cuenta que éste puede añadir complejidad en la implementación de proyectos, pero el resultado bien puede ser una mayor sustentabilidad.

Keywords: axolotl (*Ambystoma mexicanum*), intensive fishing, participatory monitoring and evaluation, wetland restoration, Xochimilco

Palabras clave: ajolote (*Ambystoma mexicanum*), evaluación y monitoreo participativos, pesca intensiva, restauración de humedales, Xochimilco

Design, implementation, and evaluation of conservation and restoration projects involving both local groups and outside actors (donors, scientists, field technicians, and government officials) are now commonplace worldwide (Jeanrenaud 2002, McNeely 1997, Tyler 2006). In applying their own ecological knowledge, local groups have much to contribute to project implementation (Bunch 1989, Davis and Wagner 2003), and traditionally they have had relatively little influence in project-related decisions (Chambers 1994, 1997, Leach et al. 1999).

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Multistakeholder involvement in natural resource management projects is a challenge. Widely differing perspectives on the environment and resources usually meet in a negotiating arena where power asymmetries are the norm (Fairhead and Leach 2003, Peet and Watts 1996). Participation advocates point out that a participatory approach to project planning and management may be a means to smooth out those differences and generate a level playing field in project design, execution, and evaluation (Brett 2003, Chambers 1997, McDuff 2001). Participation is not only about granting bottom-up access to decisionmaking, it is also about institutional change toward greater transparency and accountability, with the underlying personal and professional transformation for flexibility, ability to listen, and consensus building (Taylor et al. 2006).

Ecological restoration is a pioneering discipline in natural resource management, since its practitioners have understood the need to involve various stakeholders in decisionmaking and project implementation. Not only is it important to understand local social dynamics, resource dependence, and differing visions of nature to make projects successful and fair (Bowcutt 1999, Gobster 2001, Higgs 2005), but ecological restoration offers an opportunity to improve local livelihoods by revaluing cultural practices, improving economic opportunities, restoring resources, and encouraging learning and participation in project design and evaluation (Gann and Lamb 2006).

This article assesses a participatory monitoring and evaluation (PME) program in an aquatic ecosystem restoration project in the Xochimilco wetland in Mexico City. The project, which began in 2004 and continued until mid-2008, had as its main objective the reduction of nonnative aquatic species—carp (*Cyprinus carpio*) and Nile tilapia (*Oreochromis niloticus*)—via intensive fishing. These species compete for resources and habitat with endemic species such as the axolotl (*Ambystoma mexicanum*), an amphibian with important cultural and scientific value. Local fishers worked together with the Restoration Ecology Laboratory of the Institute of Biology, Universidad Nacional Autónoma de Mexico (UNAM) with financing from local government. The Lab established a PME program as a means to improve management and stimulate local involvement in the development of the project.

We argue that PME in ecological restoration projects provides the basis for understanding local livelihood strategies and stakeholders' priorities, and for improving project management. Recognizing that that there are differences among stakeholders and establishing institutional arrangements that account for these differences can result in more inclusive projects based on mutual understanding and cooperation; hence, in more effective ecological restoration projects with better results. However, group dynamics, local political alliances, and traditional powerful actors turn participation into an intricate social process.

Fundamentals of PME

Participatory monitoring and evaluation provides a set of practices and tools that allow the integration of various stakeholders' interests, needs, and priorities in the design of sustainable development interventions—including those related to environmental management—and in measuring and judging performance of projects. There is no single definition or methodology for PME. The main feature is that it is concerned not only with what is measured, like conventional monitoring and evaluation, but on who measures and defines objectives, indicators, and desirable outcomes (Estrella 2000, Estrella and Gaventa 1998, Robson 2000). The complexity of natural resource management projects calls for a holistic approach for design and impact assessment, which includes "the traditional "what" and "where" factors of economic and environmental priorities with newer "who" and "how" aspects of social actors and institutions" (Gottret and White 2001, 1).

Participatory monitoring and evaluation is a flexible method that may combine various research tools from the social sciences, including focus group discussions, participatory research, and action techniques with more traditional survey questionnaires and interviews within a culture of flexibility and horizontality in decisionmaking (Estrella 2000). Indicators to measure project success may be quantitative and qualitative and depend entirely on the PME process and the goals that participants want to achieve (Estrella and Gaventa 1998).

Critics argue that an element of participation can be tagged onto projects only to gain legitimacy or have access to funds without changing project directives or promoting institutional change (Blackburn et al. 2000, Brett 2003, Mosse 2001). Participatory approaches to management are usually applied only at the level of project implementation, which leaves power structures of traditional hierarchies, such as those of bureaucracies and local elites, untouched. This limits the ability of local groups to control how resources are managed (Kothari 2001). In addition, the spaces where participation takes place, such as workshops or forums, are public in nature and as such cannot escape the politics of social relations. Hence, they become arenas where previously agreed positions or the opinions of powerful group representatives become valid for all group members (Kapoor 2001), thus obscuring the rich diversity of perspectives and priorities of heterogeneous groups (Hildyard et al. 2001).

In light of these criticisms, we must draw a distinction between monitoring and evaluation that simply incorporates participatory techniques but may still be controlled and defined by outsiders, and PME, where multistakeholder participation becomes a central feature of the entire project

management cycle, "from defining objectives and information needs to analyzing and using results" (Campilan 2000, 196). The ultimate objective of the latter is to build multistakeholder capacity to solve problems and provide mutual learning opportunities (Fraser et al. 2006). This includes holding institutions responsible for their actions and interventions (Blackburn et al. 2000, Cornwall and Gaventa 2001).

Fish Problems in Xochimilco

The Xochimilco wetland is the last remaining area of the Central Mexico Valley, where Mexico City is located; that features landscape characteristics and farming systems from pre-Columbian times (Ezcurra et al. 2006, Rojas Rabiela 1995). The wetland, located in the southern part of the city, covers an area of approximately 25 km² (one-tenth of its original area). It is an intensively managed system that features a complex network of canals measuring a total of approximately 180 km and so-called chinampas. These are human-made tracts of land built up from lake sediments and a variety of plant and tree species that solidify the structure through their roots. As an agroecosystem, the chinampa is one of the oldest, most diverse, productive, and sustainable in the world, capable of yielding several harvests per year (Jiménez et al. 1995, Wilken 1995). The area features rich biodiversity in both plant and animal species and is on the list of World Heritage Sites (UNESCO 2006). Additionally, Xochimilco is an important national and international tourism destination, visited by thousands of people each year.

The region's aquatic resources have been severely degraded as a result of pollution stemming from poorly planned urban growth, including sewage and semitreated wastewater inflows (Solís et al. 2006), water extraction to cover part of the city's demands (Ezcurra et al. 2006, Mazari-Hiriart et al. 2006), and the introduction of non-native carp and tilapia. It appears that 25 to 30 years ago, several government programs were responsible for these introductions with the idea that these species would provide an alternative income source for fishers. Carp and tilapia have proliferated because of appropriate climatic conditions and a small-scale fishing sector that has not been able to keep fish populations at smaller sizes. Non-natives compete for resources and habitat space with endemic species such as the axolotl (*Ambystoma mexicanum*), an amphibian with cultural and scientific value, currently in the CITES list of endangered species (Contreras et al. 2009, Zambrano et al. 2007). Recent estimates indicate that the fishery in Xochimilco contains approximately 2,200 tons of tilapia (Zambrano and Valiente 2008).

Fishing in the Xochimilco wetland is a rustic, small-scale and subsistence-related livelihood strategy. Several hundred wetland inhabitants fish a few times per month as a subsistence or recreational activity. Another group of approximately 50 to 60 people fish a few times per week, mostly for subsistence purposes. There are only approximately 15 to 20 individuals who fish on a daily basis, with catches ranging from 1 kg to 50 kg per day. Fishing equipment is limited to wooden boats (known locally as canoas and cayucos) and traditional fishing gear made with synthetic materials. Fishers either market their produce locally, selling from house to house in the commonly poor neighborhoods adjacent to the canals or via local middlemen, or some venture out to the central food market of Mexico City where they sell their catch to large-scale intermediaries.

The Intensive Fishing Project

The project started in June 2004 and ended in May 2008. It consisted of three fishing seasons, each with a preparatory period: September 2004 to May 2005, October 2005 to August 2006, and November 2007 to May 2008. The Restoration Ecology Laboratory (henceforth the Lab) led the project and received funding from the local government agency, the Delegación Xochimilco. The project focused on intensive fishing of introduced species by drawing on local fishing expertise. The objective was to generate fisheries data and rehabilitate the habitat of endemic species. As a way to contribute to poverty alleviation, the project provided salaries for participating fishers (US$230/mo). Three groups of direct stakeholders were involved in the project:

Fishers—Two groups, Grupo Independiente and La Santísima were responsible for daily catch. Each group had an average of ten fishers (total number of fishers oscillated from 8 to 12 per group throughout the project's duration). A splinter group from the largest fisher organization in Xochimilco, Michmani, formed Grupo Independiente. The other was from La Santísima neighborhood, traditionally known as the fishers' quarters. Both groups have a lead member. All participants have total family incomes of less than US$400 per month. This level falls within a low-income category for Mexico City (CONEVAL 2010).

The Restoration Ecology Laboratory was the project manager and principal designer. It was responsible for payments, performing fisheries analysis, and providing materials and equipment to fishers, as well as resolving logistical and managerial issues.

The Delegación Xochimilco (henceforth Delegación)—The local government agency funded the project and provided logistical support related to infrastructure and equipment.

By mid-2008 the two groups of fishers had extracted approximately 160 tons of fish at a weekly rate of 0.5–4 T, depending on weather conditions and fishery movement patterns. Fishers worked on a daily basis. Fishing routes in the canal system were established by consensus between the Lab and fishers, according to field data

Table 1. Sessions for the Xochimilco intensive-fishing project involving Grupo Independiente and La Santísima fisher groups, Delegación Xochimilco as the local government agency, and the Restoration Ecology Laboratory (Instituto de Biología, Universidad Nacional Autónoma de México).

Fishing season (Years)	Number	Type	Purpose	Participants
First (2004–2005)	7	Informational, in neighboring barrios	Present on non-native species and ecological problems with visual aids (posters)	*Lab*: head, 2 field technicians, 4–5 students *Delegación*: Director of Environment, 3–4 staff *Neighbors*: 40–50 per session
	5	Planning	1) Establish fishing routes 2) Discuss fishing techniques	*Lab*: head, 2 field technicians, 2 students *Fishers*: 18–22 per session
Second (2005–2006)	2	Planning	1) Present 1st season data 2) Discuss fishers' livelihoods 3) Identify stakeholders' priorities 4) Establish objectives, responsibilities, and indicators	Facilitator *Lab*: 2 field technicians, student, 2 communication specialists *Fishers*: 8–10 per group in separate workshops
	1	Planning	1) Elaborate on environmental problems 2) Discuss interconnectedness of Lab's research projects 3) Assess 1st fishing season 4) Define possible indicators for current season	Facilitator *Lab*: head, 3 field technicians, 2 communication specialists, 5 students
	2	Midterm evaluations	1) Reflect on project developments 2) Review indicators 3) Identify areas of improvement	Facilitator *Lab*: 2 field technicians, student *Fishers*: 8–12 per group in separate sessions
	2	Final evaluations	1) Reflect on 3rd season, including organization and logistics 2) Discuss improvement of fishing techniques	*Lab*: head, field technician *Fishers*: 8–10 per group in separate sessions
Third (2007–2008)	1	Planning	1) Present 2nd season results 2) Discuss ecological problems of the site 3) Fisher-to-fisher exchange to improve fishing techniques	Facilitator *Lab*: 2 field technicians, student *Fishers*: 16 fishers from both groups
	1	Midterm evaluation	1) Assess performance 2) Discuss ways to improve relations between fisher groups	*Lab*: 2 field technicians *Fishers*: 17 fishers from both groups
	1	Final evaluation	1) Reflect on community relations 2) Discuss possible 4th season	*Lab*: 2 field technicians, 2 students *Fishers*: 19 fishers from both groups

and fishers' perceptions on where fish were concentrating. Due to the non-commercial sizes of fish and the perishable nature of the product, project staff shipped most of the fish (around 80%–90%) out of Xochimilco to a flour-processing plant for animal feed. Fishers, their families, and other local inhabitants consumed a small proportion of the daily catch at no cost.

The PME Program

Background

Important management difficulties and persistent discontent on the part of the fishers marked the first fishing season. One key concern was that the unused fish was not shipped out on time. This decreased the local acceptability of the project because fishers and other local inhabitants considered this a health hazard. Another concern was timely payment. According to the fishers, the Lab was not performing well in this respect. As a result, morale among fishers was low, average weekly catches varied substantially, and total catch was less than required. Further, some fishers viewed the intensive fishing project with suspicion, as they interpreted it as a direct threat to fishing resources. The prospect of earning a salary, rather than solving an environmental

problem, was the main reason they joined the project.

As a response to the situation, the Lab invested a substantial amount of human and financial resources to continue the project in hopes of gaining support from local groups. It was recognized that the project required a stronger participatory component for planning and implementation purposes and as a long-term effort to promote environmental awareness and a sense of ownership by local groups. After the first season, the Lab hired personnel with backgrounds in sustainable rural development and participatory methodologies to be responsible for overseeing daily project activities and for long-term PME planning.

Overview

The PME consisted primarily of planning, monitoring, and evaluation workshops and a rigorous schedule of weekly visits by Lab staff (Table 1). The workshops and field visits constituted the pillars of the PME program, since these "spaces and places of participation" (Cornwall 2002, Cornwall and Gaventa 2001) were where fishers and Lab staff interacted, shared ideas, voiced concerns, and planned future actions. During the first season, before the PME was established, informational and planning sessions had been more informative than deliberative.

The Lab designed all monitoring and evaluation workshops according to best practices in participatory methodologies (see for example, Chambers 2002, FAO 2009, Guijt and Gaventa 1998, NEF 1998). Additionally, Lab technical staff and students received training in participatory methodologies, focus group and workshop facilitation. The Delegación decided not to participate in workshops to avoid "confusing lines of command," in the words of the Director of Environmental Programs. Since participation involves the right not to participate (Campilan 2000), project implementers did not press the matter further.

Table 2. Priorities (in descending order of importance) for two stakeholders in the Xochimilco intensive-fishing project: the Restoration Ecology Laboratory (Instituto de Biología, Universidad Nacional Autónoma de México) and two groups of fishers (Grupo Independiente and La Santísima). Perspectives and priority rankings were drawn from results of participatory exercises during workshops (2nd and 3rd fishing seasons), such as card-sorting and ranking, flow diagrams, area sketches/maps, small group discussions, and panel presentations. Fishers were surveyed to identify opinions on environmental problems and project management preferences. A total of 11 Lab staff and 23 fishers participated.

Lab	Fishers
1) Long-term ecological restoration of site	1) Income
2) Obtain fisheries data for research purposes	2) Tactical elements for project implementation (fish disposal, equipment, on-time payments)
3) Environmental education, communication	3) Better coordination and communication with Lab personnel
4) Tactical elements outside of the wetland (relations with government, fish processing, equipment purchases, bureaucratic streamlining)	4) Good relations with the Lab
	5) Improving the environment

Case Study Construction

Authors documented the case through workshop memoirs; field notes; 22 semistructured interviews with Lab personnel (director, field technicians, and students), Delegación representatives, and selected fishers; and participant observations during the project. Additionally, a survey questionnaire was given to all participating fishers during the second fishing season (second quarter of 2006). The purpose of the questionnaire was to develop a socioeconomic profile of fisher groups, identify the project's impact on their livelihoods, and assess with a five-point Likert scale fisher positions on Xochimilco's environmental quality and their project management preferences (data not presented here). Analysis of workshop memoirs, interviews, and field notes focused mainly on identifying the most frequently stated concerns and observations. We reviewed and discussed graphic materials produced during participatory workshops, such as flow diagrams, sketches and oral maps, Venn diagrams, and income seasonality matrices. Key issues were validated using triangulation techniques.

Fishers recorded data by measuring 5%–10% of the day's catch and estimating the remaining portion (using containers with a capacity of 65–70 kg for the first and second seasons and 200 kg for the third season). Data were used to identify total catch weight, fishing effort for various fishing areas (average catch per net throw), and average fish sizes (data not shown).

Findings

One of the key findings of the initial workshops was the differences in stakeholder perspectives and priorities. For Lab personnel, the priority was long-term involvement in Xochimilco to promote a process of ecological rehabilitation. While fishers perceived environmental degradation during the past 30 years, this was not as important as livelihood and management issues: having an additional source of income, receiving payments on time, having appropriate equipment and materials, disposal of the unused fish, and improving communication and coordination with the Lab (Table 2).

Workshops provided a forum to document and examine the seasonality of fishers' income and the diversity of their livelihood activities. For some, fishing is the predominant source of income, but it is by no means the only source. Rickshaw driving, agriculture, gardening and acting as boatmen for tourists feature prominently in their portfolio of livelihood strategies,

Table 3. Objectives, indicators, and responsibilities for Xochimilco intensive-fishing project involving Grupo Independiente and La Santísima fisher groups, the Restoration Ecology Laboratory (Instituto de Biología, Universidad Nacional Autónoma de México), and the local government agency Delegación Xochimilco. Objective fulfillment: √√ fulfilled, √ mostly fulfilled, √– partially fulfilled.

Objective	Indicator	Responsible party	Fulfillment
Fishing itineraries: per fisher observations and fisheries analysis	Weekly route schedules discussed on site	Fisher group heads, Lab	√
Weekly catch: 2nd Season: 1.5 T/group 3rd Season: 2.5 T/group	Measure 5–10% of daily catch; count remaining portion, log-book record	Fisher groups	2nd season: √√ 3rd season: √√
Fish pick-up: Daily	Not applicable	Lab	√√
Equipment oversight	Feedback from information sharing	Fisher group heads	√–
Bureaucratic procedures: Equipment purchases, payment schedules, etc.	Timely payment schedules, equipment stock	Lab	√–
Communication between Lab and fisher groups	Feedback from weekly field visits	Lab, fisher group heads	√

which they combine according to seasonal environmental and market fluctuations. Colder months—from late November to late January—are the times of lowest catch. The low fishing season coincides with December, the month with the highest expenditure levels owing to the many festivities around Christmas. It was important for the fishers to keep the project running during those months, since it provided an additional source of income.

The PME program has been an arena of discussion and reflection regarding environmental problems and participants' perspectives about resources. Despite the fact that all stakeholders recognized the problem of non-native fish overpopulation, fishers were more reluctant to experiment with population sizes via an intensive fishing program, since carp and tilapia constitute part of their livelihood resources. In contrast, the Lab was more willing to induce changes in population sizes. Reducing fish population densities would promote the average size of fish. This could benefit both fishers and ecosystems. At current population densities, a high incidence of dwarfism is not uncommon among fish. It became necessary to discuss the idea that reducing the population of carp and tilapia would be in the fishers' best interest, a discussion that was not devoid of conflicting views.

From Findings to Process

The PME served as the basis to align project activities with stakeholder priorities and to restructure project management accordingly. Payment schedules improved substantially and project personnel performed equipment purchases in line with fisher requirements and shipped out unused fish on a daily basis. Problems beyond the control of the Lab still persisted, related to bureaucratic rigidities, such as those encountered at the Institute's accounting department when making salary disbursements. The fishers, on their part, maintained average weekly catches in line with what was agreed in the initial planning workshops. They also designated responsibilities regarding equipment oversight and care, informed the Lab's field coordinator when new materials or equipment were needed, and delivered fish to a pick-up point. Table 3 includes the list of objectives, indicators of success, and responsibilities that Lab staff and fisher groups formulated. This list served as the basis for project monitoring and performance measurement.

The PME also helped to improve communication among stakeholders. Regular field visits proved to be essential to discuss and resolve daily project issues. These visits were also a means to create trust, by showing that the Lab was serious about its role. During midterm evaluations of the second fishing season, both fisher groups indicated that they were more satisfied with project management and communication.

During several exchanges, fishers suggested ways to reverse local environmental degradation, including the formation of new local groups to tackle environmental problems. While it is too early to show the outcomes of these initiatives, it demonstrates an increased capacity and willingness to discuss problems and arrive at bottom-up solutions.

Fishing performance improved from the first to the second and third seasons. While average weekly catches averaged 902 kg during the first season, the catches averaged a total of 2,046 kg and 2,622 kg for the second and third seasons, respectively (Figure 1). Performance improvements can be attributed to two factors: the gradual improvement of a highly effective fishing technique designed by scientists and fishers and suited to the intricate canal system of Xochimilco (Figure 2), and a greater commitment and sense of responsibility from all project participants. The project's impact on the ecosystem could not be measured fully. Recent data analysis shows that the depletion of non-natives as a consequence of the intensive fishing is related to population increases of the native charal (*Menidia jordani*) (unpub. data). Additionally, there seems to be an improvement in water

quality in particular areas. But the abundance of non-natives is still too high, which has prevented significant improvements in the ecosystem. It is possible that if this program continued over several years more significant results could be achieved.

Challenges to the Participatory Process

We can fully understand participatory approaches to management, including PME, only if we observe them within a wider sociopolitical context (Martin and Sherington 1997). We can assess interventions better if we use a broader lens that also considers contextual aspects, such as different perspectives, political alliances, and power differentials among groups.

The perspectives of powerful actors held precedence over those of other participants of the intensive fishing project. The Lab and the Delegación established the project's ecological restoration–related objectives a priori, with no consultation with local residents who depend on fishing resources. Participatory decisionmaking was not stipulated in project contracts. The participatory approach was an initiative of the Lab after general goals had been established and funds received.

Group dynamics added complexity to the participatory process. Fisher groups include individuals with differences in income, status, and personality. Some group members have family connections, which has created rivalry and conflict within groups. In addition, group leaders feature different management styles. The La Santísima coordinator is a very technically apt fisher, but other group members constantly challenged his authority, as he was not perceived as a local community leader. In contrast, the Grupo Independiente's head is an important grassroots political figure and oftentimes her opinions tended to overshadow those of other fishers during participatory workshops. She constantly interrupted and silenced others during discussions, and her subordinates tended to be more candid when she was not around.

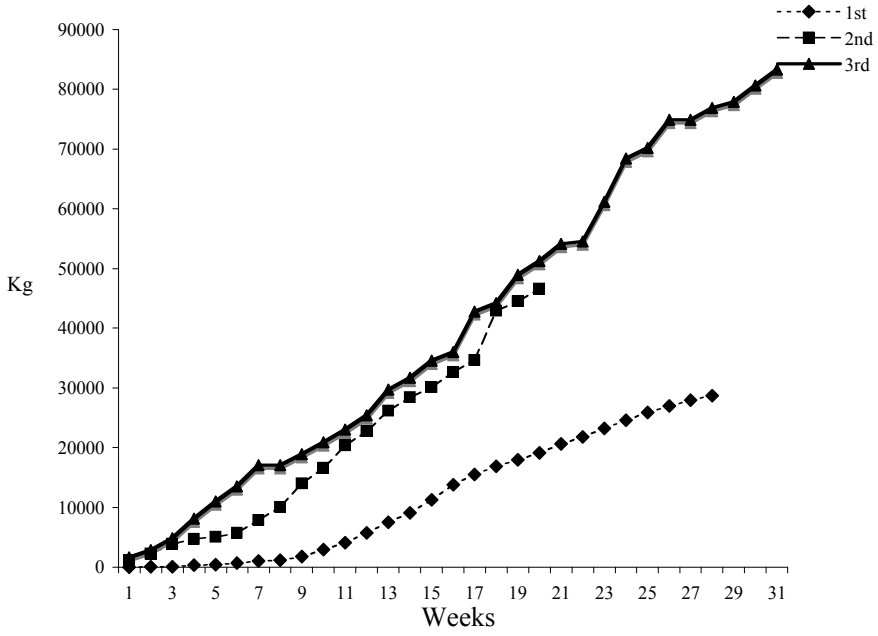

Figure 1. Aggregated weekly catches of non-native aquatic species, carp (*Cyprinus carpio*) and tilapia (*Oreochromis niloticus*) for the three intensive fishing seasons in Xochimilco wetland near México City. The second and third seasons feature similar slopes, suggesting that fishing performance improved after the participatory monitoring and evaluation was initiated.

Group alliances outside of the project arena posed a challenge to project management and to achieving responsibility and accountability on the part of all stakeholders. Local government criteria for initial fisher selection were based more on political ties than personal merit or fishing skills. Both fisher groups have members with ties to the political party currently running the Delegación, and some of them have been active participants in local electoral campaigns. The Lab has been capable of only limited influence within the local context, as it is a latecomer to local community relations.

The Delegación's limited engagement in project activities had mixed results. It simplified management, as negotiations around project objectives have taken place between only the fishers and the Lab. However, its lack of participation limited the participants' political clout to solve problems. Additionally, the Delegación may have forgone an opportunity to learn about the fishing sector, a productive activity that has been traditionally marginalized in local policymaking.

The Delegación's electoral terms resulted in project interruptions, and it has therefore been impossible to keep the project running consistently. This has influenced both fishers' incomes and the program's effectiveness. Carp and tilapia are rapidly growing species, and usually growth peaks when total population levels decrease substantially. Owing to lack of financial support, the project ended after the third season, and to date it has not been possible to restart it. As Mosse (2001) explains, this demonstrates that "choices and program delivery are constrained by organizational systems and procedures" (p. 24).

Opportunities and Constraints of a Participatory Approach

There are different classifications related to the level of participation in project cycles. According to Brett (2003), participation categories refer to the degree of control over project decisions and outcomes between two broad kinds of social actors: those on top, or project planners, and those at the bottom, or project beneficiaries

Figure 2. Fishers lay the net in a narrow canal in Xochimilco, located in México City. Once the net is in place, fishers move to the other end of the canal and begin hitting the water with poles to make fish swim into the net. When the shoal of fish is in the net, fishers pull the net into one boat while pouring the fish into another boat. Photo by Alejandro von Bertrab

and users. Levels of participation move along a spectrum from weak to strong. Weak participation entails consultation and information sharing during project stages, while the strong form relates to building partnerships and ceding control. Additionally, participation can be seen as a means or an ends, or both. Participation as a means is understood as a building block to achieve other goals, such as more efficient projects or improved service delivery. Participation as an ends is related to empowerment, assuming responsibility, and mobilizing resources (Campilan 2000).

Participation is a dynamic process, and different project stages may incorporate varying degrees of participation. In the project analyzed here, participation during the initial informational sessions of the first fishing season tended towards the weak side of the spectrum. The PME generated stronger participation but not fully reaching the level to challenge power differentials. However, the fact that some fishers began discussing the possibility of forming new groups to tackle local environmental problems suggests that the PME may have prompted a sense of empowerment.

Reaching a strong form of participation may remain elusive, as social dynamics, local hierarchies, and technical expertise will not simply give way to a new form of bottom-up project planning and control (Brett 2003). It is more useful to understand participation as a complex social process with inherent limitations (Estrella and Gaventa 1998). In the case presented here, many aspects of community life lie outside the project's scope of action but may shape relations and project outcomes.

But what does participation have to do with ecological restoration? According to some authors, ecological restoration cannot be based solely on normal scientific practice based on "hard methodology" (that is, hypothesis generation, methodical observation, and conclusion generation) but should incorporate land-based trial-and-error testing and long-term involvement with community (Cabin 2007, Higgs 2005). Ecological restoration thus requires an understanding of social dynamics, a commitment to generating new ideas, the integration of diverse knowledge, and an understanding of

the priorities of stakeholders involved in projects. Participatory monitoring and evaluation can be an effective tool for achieving these objectives, since it rests on the recognition that there are always multiple concerns, which "necessarily involves negotiations, consensus building, trade-offs or compromises" (Campilan 2000, 197). Horizontal and flexible decisionmaking may lead to cooperation, while a vertical and externally imposed management structure may provoke an unwillingness to participate in project activities, or worse, foster a desire to sabotage project outcomes or deplete community support for restoration projects.

Restoration of the Xochimilco wetland requires projects with strong community involvement. Xochimilco is an intensely managed system, and the history of the barrios of the central part of Xochimilco, adjacent to the canals, dates back to prehispanic times. Priorities and concerns of local groups must be accounted for, if restoration practitioners wish projects to run smoothly. Ignoring local communities will not only generate resistance or outright hostility to projects, it may also limit the possibility of integrating local ecological knowledge. Longstanding agricultural and fishing traditions underlie a diverse knowledge base, which, when properly combined with scientific knowledge, can produce innovative solutions to solve environmental problems. If restoration practitioners enjoy support from local communities, long-term involvement in a site can be ensured, provided that funding for projects are not interrupted at critical stages. This situation is difficult to avoid, however, if priorities of funding organizations change.

The limits of a participatory approach to management are at the very heart of such interventions. If a number of stakeholders design, monitor, and evaluate projects jointly, implementation may be slower and less predictable, but this may be key to sustainability.

Conclusion

The Xochimilco wetland is an intensely managed system with acute environmental problems. Local communities can trace their history to prehispanic times and possess valuable technical ecological knowledge. Participatory monitoring and evaluation in ecological restoration can provide the means to design and implement projects that take into consideration stakeholders' different interests and priorities. This provides an opportunity to learn and create institutional arrangements for more effective management and, in turn, better results. Failure to recognize differences and to seriously incorporate knowledge and concerns of local groups in restoration activities may limit project effectiveness.

Establishing participatory monitoring and evaluation, however, is a complicated task. Group dynamics, local political alliances, and traditionally powerful actors, such as local elites, scientists, or administrators, can complicate participatory processes. Negotiations and trade-offs are the norm; the achievable levels of participation may be limited, or outcomes may be unpredictable. Restoration practitioners who are serious about participation should bear in mind that a participatory approach may add complexity to project implementation, but the outcome may be more sustainable restoration projects.

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