# Cooperatives in Small Scale-Fisheries: Collective Management for Achieving Ecological, Economic, and Social Goals

# Las cooperativas en las pesquerías de pequeña escala: manejo colectivo para el alcance de objetivos ecológicos, económicos y sociales

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## Abstract

Despite being the focus of directed management for decades, marine fisheries around the world are in decline. We surveyed the literature to evaluate the efficacy of small-scale fishery cooperatives in managing common-pool fishery resources, and to identify the prevailing challenges to cooperative formation and operation, and the critical design elements for successful cooperatives. Collective management of common-pool fishery resources by users organized into cooperatives can result not only in sustainable resource use and enhanced socioeconomic benefits, but also in ecosystem conservation and stewardship. The effectiveness of fishery cooperatives depends on a variety of factors that are discussed in the paper. In addition, there must be measures for aligning the cooperative members' interests with long-term sustainability, including the presence of secure fishing rights.

## Introduction

Small-scale fishermen need to find ways to rebuild depleted fish populations and sustain healthy ones in order to maintain their livelihoods, and fishery cooperatives offer promising solutions. In capture-fishery cooperatives, fishermen can become empowered to influence decision-making on the management of the resources that they rely on. They also benefit from economies of scale when purchasing fishing equipment, and gain power in negotiating fish prices (FAO, 2009). Under some conditions, joint fisheries management between cooperatives and government also facilitates the establishment of measures to protect the sustainability of fishing resources, such as the establishment of marine protected areas (e.g., Pomeroy and Beck, 1999; Ovando et al, 2013).

In a review of small-scale fishery cooperatives worldwide, Pollnac (1988) identified attributes that were important in determining the success or failure of cooperatives in meeting their objectives (Table 1). In a study of 48 fishery cooperatives throughout coastal Ecuador, Poggie et al. (1988) found that the presence of cooperative facilities (running water, sanitation systems, lights, television, and fish storage equipment) and social solidarity (members carrying out obligations, good relations among members) were correlated with the perceived performance of cooperatives among their members.

**Table 1**: Attributes of success or failure of small-scale fishery cooperatives, classified by category (adapted from Pollnac, 1988).

| Category | Attributes |
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| Cooperative origins and background | 1. Local initiative: Organizations formed on the basis of local initiatives are more likely to succeed[1]<br><br>2. Early interest by fishermen: A vested interest by fishermen, in the form of an early investment in capital or labor, provides an incentive to work harder to achieve success.<br><br>3. Foundation in traditional organizations: Fishery organizations that emerge from preexisting organizations are more likely to succeed.<br><br>4. Past experience: Previous negative experiences of fishermen with fishery organizations are predictors of failure.<br><br>5. Organization structure: Using successful local models as templates increases the likelihood of success.<br><br>6. Legislation: Complex regulations can impair cooperative registration and access to loans and tax concessions.<br><br>7. Training needs: Educating government extension agents and cooperative leaders on the potential benefits of cooperatives facilitates increased membership in cooperatives.<br>8. Legislative support: Legislation assigning property rights to fishermen organizations has contributed to their success.<br><br>9. Vested interests: Groups who feel negatively |

[1] However, local initiative has been seen as a necessary but insufficient condition for success. For example, Jentoft and Sandersen (1996) noted the failure of many fishing cooperatives that were formed through local initiatives. In addition, many successful community initiatives have received external support from their inception, including supporting legislation from the government and financial assistance from external organizations (Jentoft et al., 2011).

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| | affected by the establishment of a cooperative can employ methods (including applying political pressure) to undermine the cooperative. |
| Membership | 1. Group size: New cooperatives should be designed to be the size of existing successful organizations. Traditional patterns of social interactions dictate the optimum size of an organization.<br><br>2. Members: Success will ultimately depend on members being willing to perform their duties. One way to maintain member reliability is to recruit only people with close ties to the fishery as members.<br><br>3. Homogeneity of members: Cooperatives whose members have similar goals and values are more likely to succeed. |
| Administration | 1. Management expertise: There are a large number of examples worldwide of fishermen organizations failing due to inadequate management skills. The ability to manage their own organization requires skills that fishermen may not have, and often there is resistance to having "outsiders" managing the organizations.<br><br>2. Complexity: As organizations grow, they tend to assume more tasks and to become more complex and difficult to manage. Managers should take steps to prevent this complexity from threatening success.<br><br>3. Participation: In successful cooperatives, there is strong participation by cooperative members in management decisions. The ability and willingness of fishermen to participate in meetings is essential.<br><br>4. Interagency cooperation: Several government agencies are frequently involved in the development and maintenance of fishermen organizations, and |

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| | excessive bureaucratic procedures can impair organizational performance. Coordination among agencies can reduce the bureaucratic burden. |
| Socioeconomic factors | Availability of capital: The lack of capital has often impeded the establishment of cooperatives, but dependence on government subsidies as a financial source has contributed to failure. The perception of fishermen organizations as opportunities for investment instead as exclusively potential credit sources strengthens organizations. |
| Compliance with rules | Evasion of rules, such as fishing in no-take areas and selling fishery products outside of the cooperative, undermine trust and can lead to failure. |

In this study, we surveyed the literature to identify additional attributes that were identified by authors as leading to the success or failure of small-scale fishery cooperatives. The goal of this study was to address the existing information gap on common factors of success for fisheries cooperation (discussed in Ovando et al., 2013) by incorporating studies conducted after Pollnac (1988), considering the renewed interest on fishery cooperatives as part of the solution in coastal-resource management (Jentoft et al., 2011).

## Methods

We searched the bibliographical database Web of Science (Thomson Reuters) for journal articles that contained information on factors that have contributed to, or have impeded, the success of small-scale fishery cooperatives. We used the truncated search terms Fishery* and Cooperative* in the search field "Topic", and we limited our search from 1989 to the present (to identify articles posterior to Pollnac, 1988). From the number of articles found in the literature search (211), we selected those whose Abstract contained information on the authors' perception on the success or failure of cooperatives in achieving their ecological, social, and/or economic objectives. Given the difficulty in uniquely defining small and large-scale fisheries because of differences in fisheries technology among countries (FAO, 2012), we used the classifications provided by the authors of the different studies. We classified fisheries that were described as "industrial" in the large-scale category. For the different cooperatives, we identified the factors that were perceived by the authors to lead to success or failure, a well as the ecological, social, and economic benefits resulting from cooperation.

## Results

We found 21 studies on 20 fishery cooperatives that met the search parameters discussed (Table 2); 18 of the cooperatives were in small-scale fisheries, as defined above. There was a wide geographical representation: Central and North America (9), Indo-Pacific (7), Caribbean (3), Europe (2), and Asia (1). A broad range of benefits resulted from the establishment of the cooperatives (Table 2), and the presence (or absence) of secure fishing rights was reported to influence success (or failure) in 18 out of the 20 studies. Attributes related to the success or failure of fishery cooperatives, collected from the literature posterior to Pollnac (1988), are listed in Table 2.

**Table 2**: Ecological, social, and economic benefits of small-scale fishery cooperatives, and attributes of success or failure **not included in Table 1**. (N.R.= not reported).

| Cooperative | Benefits/Costs | Attributes |
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| Cooperatives of the Regional Federation of Cooperative Societies of Baja California, Mexico (FEDECOOP) (Pérez Ramírez et al., 2012) | Ecol: Regulations to protect fish recruitment.<br><br>Soc: Community empowerment (autonomy in decision-making).<br><br>Econ: Ability to negotiate prices. | Fishery concessions (exclusive territorial access rights).<br><br>Compliance and self-enforcement of scientifically-based total allowable catch. |
| Abalone fishermen in southeastern Australia (Gilmour et al., 2011) | Ecol: When fishermen perceived declines in stock abundance, they cooperated within their fishermen associations to design rules to protect depleted fishing areas.<br><br>Soc: N.R.<br><br>Econ: N.R. | In addition to secure fishing rights in the form of individual fishing quotas and high levels of trust between fishermen, rules for resource management appeared only when there was a common perception that fishing areas are overexploited. |
| Cooperatives in the Turkish Aegean (Ünal et al., 2011) | Ecol: N.R.<br><br>Soc: Educational opportunities.<br><br>Econ: Credit opportunities, profit sharing, marketing facilities, auctioning services, discounted input prices. | Government assistance was provided to maintain cooperative services, such as credit opportunities, to its members during times of economic hardship. |

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| Commercial divers of Puerto Peñasco, Gulf of California, Mexico (Cudney-Bueno and Basurto, 2009) | Ecol: Increase in local resource abundance.<br><br>Soc: Increase in social ties.<br><br>Econ: Increase in fishermen profits. | Stakeholder participation in monitoring was crucial for the emergence of cooperation.<br><br>Lack of formally-recognized exclusive territorial access rights led to the demise of cooperation. Strong community ties became a negative factor, as it led to resource overexploitation by cooperative members as a means of preventing fishing by outside fishermen. |
| Seri Indian fishing cooperative, Gulf of California, Mexico (Basurto, 2008) | Ecol: Protection of buffer areas (seagrass meadows).<br><br>Soc: Ability to remain in the fishery by negotiating resource prices and collectively harvesting resources commanding high prices.<br><br>Econ: Ability to maintain a regular income from the fishery. | Cooperatives had exclusive territorial access rights.<br><br>Local knowledge on sustainable resource-harvesting practices (minimum sizes, closure of buffer areas) was used to inform management. |
| Tilefish fishermen of Montauk, New York State (Kitts et al., 2007) | Ecol: N.R.<br><br>Soc: Ability of fishermen to participate in fishery management plans. Improved fishing-safety conditions.<br><br>Econ: Higher and steadier income flow. | A quota share was assigned to the cooperative. |
| Lobster and conch cooperatives in Belize (Huitric 2005) | Ecol: Overexploitation of lobster and conch suggested by a decrease in catch per unit effort since the establishment of the cooperatives.<br><br>Soc: Some fishermen have benefited from export markets, and their increased income has allowed them to pay for the | The establishment of fishery cooperatives gave fishermen access to export markets, credit, and new technologies, but resulted in overexploitation because there were inadequate regulations for resource use.<br><br>The open-access nature of the |

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| | schooling of their children. A large number of fishermen became indebted and could not repay their loans.<br><br>Econ: A general decrease in fishermen's income. | fisheries did not create incentives for cooperatives to manage the resources for sustainability. |
| Fishing cooperatives in Capiz Province, The Philippines (Baticados, 2004) | Ecol: Increased resource abundance with community-based management.<br><br>Soc: Tenurial rights were granted to cooperatives. Increased ability to influence government policies on coastal management.<br><br>Econ: Possibility of obtaining credit. Increased fishery catches. | The participation of fishermen in coastal resource management through their cooperative was positively influenced by a perceived likelihood of a threat to their livelihood; an awareness of coastal conservation programs; the support received from the government in controlling illegal fishing; and the number of children that fishermen had. Cooperatives procured exclusive-use rights to fishing grounds. |
| Sockeye salmon fishermen cooperative in Chignik, Alaska (Kitts and Edwards, 2003; Deacon et al., 2008)[2,3] | Ecol: N.R.<br><br>Soc:N.R.<br><br>Econ: Members of the cooperative created a profit sharing agreement that substantially reduces the number of boats and the fishing costs. | The cooperative was assigned a portion of the total catch, which enabled a profit-sharing agreement. |
| Fishermen of Toyama Bay, Japan (Gaspart and Seki, 2003) | Ecol: N.R.<br><br>Soc: Cooperatives have allowed fishermen to gain the right to expand their fishing areas.<br><br>Econ: N.R. | In Japan, coastal communities have exclusive rights over adjacent waters. A successful profit-sharing arrangement occurred even when fishermen had varying degrees of fishing skills because of social norms that engendered pride in being the best fishermen. |
| Fishing communities in | Ecol: Revival of the | A resurgence of community- |

[2] Large-scale fishery, as defined above.

[3] This cooperative ultimately failed due to legal challenges.

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| Vanuatu, Samoa, Cook Islands, Fiji, Palau, Hawaii, and Tuvalu (Johannes, 2002) | application of traditional practices for sustainable resource use.<br><br>Soc: Resurgence of pride in traditional resource management practices.<br><br>Econ: Increased income from marine-related tourism. | based management of fishery resources was attributed to a growing scarcity of resources, the independence of some of the islands from former colonial powers that imposed "Western" management regimes, and a strengthening of the right of communities to control access to their traditional fishing grounds. |
| Fishermen association of Malalison Island, The Philippines (Baticados and Agbayani, 2000) | Ecol: Visual census and fishermen's perceptions suggest an increase in juvenile fish in a fish sanctuary created by the fishermen association.<br><br>Soc: Through membership in the association, fishermen gained power in advocating for changes in fishery management.<br><br>Econ: N.R. | The fishermen association was successful in gaining territorial use rights over a small area.<br><br>The success of the fishermen association depended in part on enforcement assistance provided by the local government. |
| Fishermen in Fijian traditional fishing grounds (Cooke et al., 2000) | Ecol: N.R.<br><br>Soc: N.R.<br><br>Econ: N.R. | The strength of leadership of local rulers was seen as essential for the success of traditional cooperative fishing schemes. Traditional fishing grounds were divided among clans. |
| U.S. Pacific Northwest and Fishing companies in the Alaska groundfish fisheries (Sullivan, 2000)[4] | Ecol: The creation of quota-sharing cooperatives resulted in the elimination of the race to fish and the scattering of fishing to larger areas, reducing the risk of localized depletion of pollock stocks.<br><br>Soc: Increased ability of fishermen to negotiate quota shares.<br><br>Econ: N.R. | When barriers to entry were created and eliminated open access, fishermen recognized the benefits of creating cooperatives that received a share of the quota. |

[4] Large-scale fishery, as defined above.

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| Fishermen of Big Creek Ecological Reserve, California (Pomeroy and Beck, 1999) | Ecol: An informal cooperative agreement by fishermen led to a rotation of fishing grounds to reduce pressure on resources, and the establishment of a no-take zone.<br><br>Soc: Cooperation increased safety, as fishermen helped each other with launching and landing their boats during bad weather. Fishermen also shared fishing data.<br><br>Econ: N.R. | The close personal relationship between the reserve manager and the fishermen was conducive to cooperation. However, increased pressure on fishery resources due to the lack of barriers to entry was a threat to the cooperative arrangement. |
| Lobster fishermen of Caye Caulker, Belize (King, 1997) | Ecol: N.R.<br><br>Soc: N.R.<br><br>Econ: Long-term stable yields of lobster. | The traditional management system allocated territories to fishermen. An absence of a conservation objective is a threat to the lobster stock. |
| Coastal fishermen in Hokkaido, Japan (Barrett and Okudaira, 1995) | Ecol: In Japan, yields of many coastal resources have been maintained in time.<br><br>Soc: N.R.<br><br>Econ: In Japan, the average income of coastal fishermen has grown steadily. | By placing conservation as an explicit goal, Japanese fishing cooperatives have maintained stable yields of coastal resources.<br><br>Coastal communities have exclusive rights over adjacent waters.<br><br>Competition for resources between fishing cooperatives in Hokkaido led to severe emigration of affected fishermen. |
| Users of mangrove resources in St. Lucia (Smith and Berkes, 1993) | Ecol: Density of mangrove shoots increased with cooperative management.<br><br>Soc: Sustainable management of mangrove trees that provide fuelwood to local communities. | Elimination of open-access conditions increased interest in the formation of a cooperative for the extraction of mangrove. |

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| | Econ: N.R. | |
| Fishery cooperatives in socialist Poland (Jentoft and Marciniak, 1991) | Ecol: N.R.<br><br>Soc: N.R.<br><br>Econ: N.R. | The National Union of Fishery Cooperatives (NUFC) was crucial to the success of its member cooperatives. It represented cooperatives in the negotiation of the Polish national quota, and administered the allocation of quota shares among cooperatives. Individual cooperatives had the obligation to allocate their quota internally and to enforce fishing regulations. In one of the co-ops, an annual lottery system was used to allocate fishing areas to individual fishermen.<br><br>On behalf of the cooperatives, the NUFC also negotiated fish prices with the government, imported fishing equipment, and provided endorsements for cooperatives seeking bank credits<br><br>The cooperatives agreed informally to fish only in areas designated to each. |
| Fishery cooperative in socialist Bulgaria (Marciniak and Jentoft, 1992) | Ecol: N.R.<br><br>Soc: N.R.<br><br>Econ: With the establishment of the cooperative, fishermen gained power to set prices and to demand prompt payments. | |

## Discussion

Studies of fishery cooperatives since Pollnac's review (1988) confirm that cooperation in fishing can generate many conservation and socioeconomic benefits, including some that transcend the original goals of cooperating. For example, fishermen can decide to cooperate to reduce costs and maximize revenues, but a fishing cooperative set up for that purpose can bring one or more of the following types of benefits:

(i) Producer benefits (e.g., reduced search time due to information sharing; reduced input costs by buying in bulk; access to financing of infrastructure).

(ii) Market benefits (e.g., reduced costs for market access; increased market power which changes the relationship with buyers; easier access to new markets).

(iii) Management benefits (e.g., reduced transaction costs of agreements and decision making; quick and appropriate sanctions).

(iv) Conservation benefits (e.g., lower by-catch due to information sharing; higher compliance with catch limits and other conservation targets; joint monitoring of protected areas; sustainable yields).

(v) Social benefits (e.g., community empowerment, job retention, maintenance of fishing culture, new educational opportunities, increased safety in fishing activities, increase in social ties).

Fishing cooperatives address problems of resource use in a variety of ways (Ovando et al., 2013), but there appear to be a limited number of factors that predict the success or failure of cooperatives in achieving their goals. Besides the factors that have been known to contribute to success for many years (Table 1), secure fishing rights seem to be an important precursor to the success of actions aimed at increasing sustainability (Ovando et al. 2013). However, for cooperation that is durable and successful over time, secure fishing rights have to be accompanied by skillful management (Jentoft et al., 1998). For their part, good management skills can only be fully utilized when institutional arrangements ensure that the decisions of local managers will be respected at higher levels of administration (Jentoft, 2005).

The emergence of cooperation to achieve common goals in fisheries does not always occur with the purpose of sustaining the resource. As discussed above, when strong social ties that facilitate cooperation are present, but resource use occurs without limited and secure access, cooperation can actually lead to overexploitation. Examples are the cooperative of commercial divers in Puerto Peñasco, Mexico, as well as lobster and conch cooperatives in Belize, where access to new markets, credit, and new technologies, combined with inadequate regulations for resource use, resulted in excessive resource extraction (Table 2). Other challenges to durable cooperation include the imposition of rules from outside agents; difficulties in the formation of capital to sustain the cooperatives; conflicts of interest between cooperative members; the need to address multiple problems faced by a fishery; and the need to count on efficient management from members of the fishing community (Jentoft, 1986). The establishment of secure fishing rights faces challenges of its own (see Bonzon et al., 2010), such as developing a system for

share allocation that receives wide support by fishermen and cooperatives that participate in catch-share programs. Overcoming all of these challenges demands a change in the top-down approach prevalent in many fisheries worldwide, and, although this may not require a complete restructuring of current governance and institutional structures, even modest modifications can take considerable time (Noble, 2000). Given the current state of the world's fisheries and the urgent need for solutions, pursuing strategies to encourage the replication of successful experiences in cooperation warrants particular attention.

## Concluding Remarks

Because the combined list of success attributes from Pollnac (1988) and from the present review is long, we have summarized them into the following cooperative design guidance:

Cooperative origins: Local initiatives, including an early investment by fishermen of labor or capital, should be based wherever possible on traditional institutions. Cooperative research and monitoring can be crucial for the emergence of cooperation. A perceived common threat or common benefit can serve to galvanize cooperation.

Enabling conditions: Local initiatives should be supported by streamlined laws and bureaucracies that facilitate or at least avoid impairing the success of cooperatives. Strong leadership and high levels of social capital also appear to be important for cooperative success. Cooperatives should hold property rights or secure fishing privileges. Support for reducing illegal fishing can enhance cooperative success and overall sustainability.

Membership: Members should be closely tied to the fishery, have similar goals and values, and be willing and able to participate.

Administration: Some members should be trained in management and administration.

Capital: Fishermen should contribute labor and capital, and the cooperative should have access to other sources of capital; however, a financial dependence on subsidies should be avoided.

Compliance: Cooperatives should impose measures such as positive incentives, profit-sharing, and penalties that enhance compliance with rules.

Science-based goals: Cooperatives should hold themselves accountable (or held accountable by other entities) to science-based conservation goals and socioeconomic goals. Local knowledge should be used to enhance scientific understanding of stock status and the articulation of appropriate conservation and management goals.

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