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Predicting Stakeholder Support for Fishery Policies

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Fisheries management has been used to address declining fisheries and threats to livelihood and food security. Past research suggests that public support for fishery policies is a necessary component for sustaining the long-term success of fisheries management. This study predicted public support by examining fishers' perspectives on co-management and fish catch since the establishment of marine protected areas (MPAs), a commonly employed fisheries management tool. Data were obtained from onsite surveys ($n = 505$) with fishers from three municipalities in Cebu, Philippines: Oslob, Santander, and Samboan. Structural path analyses revealed that beliefs about co-management and fish catch predicted support for fishery policies ($R^2 = 59\%$). Separate path analyses for each municipality showed that co-management had greater influence in predicting public support for fishery policies in Oslob and Santander. Fish catch was a better predictor for public support for fishery policies in Samboan. Results can help local governments, non-governmental organizations, and fishery managers to prioritize, plan, and improve fisheries management in municipal waters.

Keywords co-management, fish catch, marine protected areas, public support

Introduction

Fisheries management has been used to address declining fisheries and threats to livelihood and food security, particularly in developing countries (Pomeroy 1995). The literature and managerial experience stress the need to integrate community support for fishery policies designed to protect coastal resources (Christie 2004; Pomeroy, Mascia, and Pollnac 2007). Marine protected areas (MPAs), for example, represent a set of policies used for fisheries management, biodiversity conservation, and habitat restoration (Christie and White 2007). Community compliance with, and consensus for MPA policies are essential for ensuring the sustainability and success of fisheries management initiatives (Charles and Wilson 2009;

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Christie et al. 2003; Walmsley and White 2003). Such initiatives can fail, however, when affected communities do not support the policies (Bunce et al. 2000; Beger et al. 2005).

Public support for MPAs increases when communities believe that they have been involved in decisions that affect their lives (e.g., co-management) and they perceive tangible benefits (e.g., increased fish abundance and catch) from MPAs (Christie et al. 2009a; Pomeroy, Mascia, and Pollnac 2007; White et al. 2006). Co-management and perceived benefits are often interlinked with broader concepts such as governance and stakeholder social well-being (Mascia, Claus, and Naidoo 2010). This article examines the influence of co-management and perceptions of fish catch on engendering public support for fishery policies that extend beyond MPA boundaries in Cebu, Philippines.

Co-Management of MPAs

Co-management is strongly linked with the concept of community-based management and involves joint decision-making among resource users (e.g., fishers) and policymakers. The delegation of management responsibility and authority can occur at local (community), state or national levels (Christie and White 1997, 2007; Pomeroy 1995; Pomeroy and Riviera-Guieb 2006; White et al. 1994). Community-based management is an iterative process that includes problem identification, community organization, education, stakeholder participation, and leadership development when addressing economic or political issues within a community (Alcala 1998; Christie, White, and Deguit 2002; Wells and White 1995; White et al. 1994). Co-management and community-based management integrate traditional ecological knowledge into decision-making through participatory arrangements and partnerships (Eder 2005; Pomeroy 1996). Higher levels of government often provide funding and legislation necessary to sustain and legitimize coastal programs, while local communities integrate their knowledge of specific issues to mobilize management initiatives (Eder 2005; Russell and Alexander 2000).

Community support for policies may be influenced by co-management initiatives. Case studies show the erosion of community support and empowerment due to the weak implementation of co-management initiatives (Christie et al. 2003; Oracion Miller, and Christie 2005; Russ and Alcala 1999). To sustain community support, coastal managers often communicate to stakeholders about the tangible benefits from MPAs and co-management such as increased fish catch.

Perceptions of Fish Catch in the Immediate Area of MPAs

Communities are unlikely to support MPAs and associated policies if they do not perceive tangible fishery benefits such as increased fish catch in the immediate area outside of MPAs (Russ and Alcala 1996). Studies have alluded to the relationship of fishers' perceptions of increased fish catch and abundance with support for MPAs and fisheries management policies (Christie et al. 2009a; Chaigneau et al. 2008). The analysis of fishers' perception of fish catch provides opportunities for understanding social (e.g., attaining public support) and ecological drivers (e.g., increased fish abundance from MPAs) for fisheries management success.

Moving Beyond MPAs

Researchers (Agardy, Giuseppe, and Christie 2011; Christie et al. 2009a; Hansen et al. 2011) and coastal managers stress the necessity of extending fisheries management beyond

the boundaries of MPAs in the Philippines. In the Philippines, fisheries management is part of a municipality's coastal resource management (CRM) program affecting the governance and management ofmunicipal waters (Eisma-Osorio et al. 2009). Despite the inclusion of municipal waters in the CRM plan, much of fisheries management focuses on MPAs that often make up less than 1% of their municipal waters (Department of Agriculture–Bureau of Fisheries and Aquatic Resources [DA-BFAR)] 1998). Consequently, regulating municipal waters outside of MPAs is less approved by fishers as compared to soley regulating MPAs (Allegretti, Thompson, and Cottrell 2011). The challenges of managing fisheries within municipal waters still involve gaining initial public support and showing tangible benefits. Local governments may link lessons learned from MPAs in regulating municipal waters, and eventually apply these lessons for managing a network of municipal waters. Within the context of municipal water jurisdictions, this article examined fishers' perceptions of co-management and fish catch increases since MPA establishment acting as predictors for public support for fishery policies in Oslob, Santander, and Samboan, Philippines (Figure 1).

Site Context

Philippine fishery laws in the 1990s enabled local governments to manage their municipal waters (Christie et al. 2007). The Local Government Code of 1991 provides municipalities the opportunity to co-manage their municipal waters with volunteer fish warden associations and people's organizations (POs) representing fishers and the different communities within the municipality. The 1998 Philippine Fisheries Code and the 1997 Agricultural Fisheries and Modernization Act mold fishery policies and jurisdiction for national institutions such as the Bureau of Fisheries and Aquatic Resources (BFAR) and the Department of Environment and Natural Resources (DENR) (Christie et al. 2007). The institutional structure provided by Philippine Fishery laws lays the groundwork for understanding the responsibilities within the local and national government for managing municipal waters and MPAs.

In the Philippines, many MPAs are small (approximately 12–20 ha) no-take sanctuaries that are community-based and municipality-based. Community-based MPAs are managed at the local level often through the co-management of fisher organizations representing different communities and the municipal local government. The local government controls municipality-based MPAs with collaboration from volunteer fish wardens. While many of the MPAs started as community-based, most have shifted to municipality-based MPAs where the municipal local government takes primary control. This power shift is partly attributed to legal mandates and the capacity of local governments to enact municipal fishery ordinances (Katon et al. 1999).

Although municipal ordinances often apply to MPAs (e.g., no-take rules within MPAs), some ordinances apply to municipal waters and not to MPAs. Local fish gear and method ordinances, for example, can be broad enough to influence resource-use in a municipality's jurisdiction. These broader policies are based on national fishery laws (e.g., Philippine Fisheries Code of 1998) and may facilitate fisheries management to larger ecosystems and jurisdictions.

While municipalities enforce the same set of national fishery laws, local governments use different management styles to adapt to the ecological, geographical, political, and financial limitations of their jurisdiction. Specific implementation regulations differ among the municipalities. For example, municipal governments can make specific ordinances permitting some commercial fishers in their jurisdiction (DA-BFAR 1998); other municipalities can prohibit commercial fishing within their jurisdiction. Samboan, for example, allows some commercial fishers within their jurisdiction; for Oslob and Santander such practices

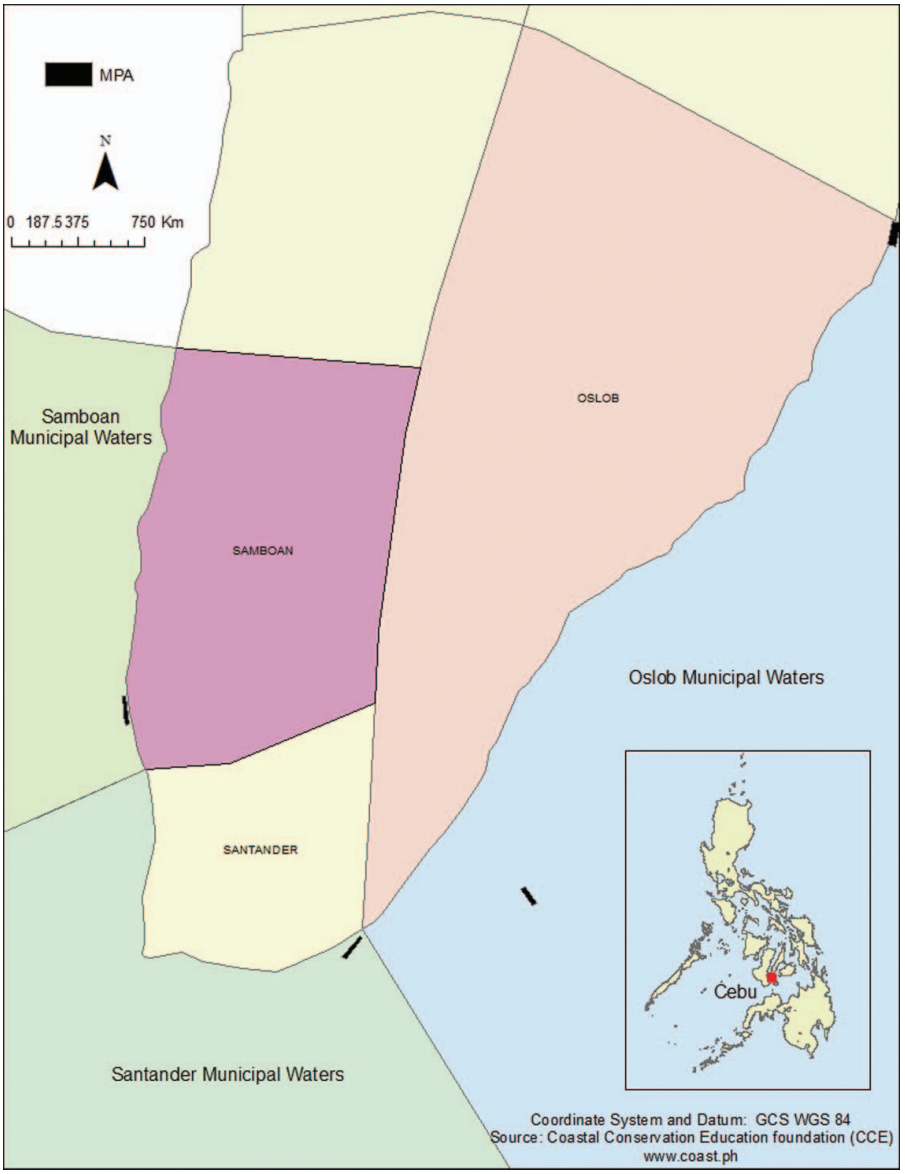

Figure 1. MPAs and municipal water jurisdictions in Cebu, Philippines (color figure available online).

are illegal. Conflict between resident and non-resident commercial fishers in Samboan may occur, given the different regulations that apply to these stakeholders. Samboan's jurisdiction is part of the Tañon straight, a nationally designated protected seascape. The National Integrated Protected Areas System Act requires the DENR to manage protected seascapes (DENR et al. 2001), potentially creating conflict between local municipal and national government decisions about fisheries management. Conflict, unique management styles, and sociopolitical complexities of the municipalities may influence stakeholder support for fishery policies.

Hypotheses

This article examined the influence of fishers' perceptions of co-management and fish catch on public support for fishery policies. Based on past research, the following hypotheses are advanced:

H_1 Perceptions about co-management will predict public support for fishery policies.
H_2 Perceived fish catch will predict public support for fishery policies.
H_3 The relative influence of co-management and fish catch in predicting public support for fishery policies will differ among the municipalities of Oslob, Santander, and Samboan.

Methods

This article was part of a larger study focused on stakeholder acceptability of coastal resource management policies in Cebu, Philippines. The study used structured surveys to reveal common themes on co-management of MPAs, fish catch, and support for fishery policies.

Sampling Design

Onsite surveys were administered to fishers through face-to-face interviews conducted from June to August 2009. The sample ($N = 505$) included the municipalities of Oslob ($n = 279$), Santander ($n = 139$), and Samboan ($n = 87$). These sample sizes corresponded to the municipality size and number of registered fishers, with Oslob having the largest population of fishers ($n = 1{,}012$), followed by Santander ($n = 312$), and Samboan. There was no official list of registered fishers for Samboan. For all three locations, the response rate was 95%.

Surveys

Surveys were translated from English to the local dialect of Cebuano. These surveys were pre-tested with locals and revised in Cebuano. The instruments were then back translated to English to verify that Cebuano questions were the same as the original. Visuals were used to facilitate respondents' understanding of the questions. Thumbs up and thumbs down visuals indicated agreement with a given fisheries management scenario. The visuals were associated with a 5-point scale of strongly agree (+2), agree (+1), unsure (0), disagree (–1), and strongly disagree (–2).

Model Variables

Three concepts were examined: perceptions of co-management, perceptions of fish catch increase since MPA establishment, and support for fishery policies. Co-management and fish catch reflect perceptions of MPA initiatives, while support for fishery policies represents perceptions of management initiatives for municipal waters.

Independent Variables

Co-management perceptions. Respondents' perceptions of co-management were based on three variables reflecting community participation and collaboration with the

municipal government in fisheries management. Respondents indicated their level of agreement with the following statements: (1) Fisher or People Organizations should manage their MPA, (2) MPA regulations and initiatives must be planned by the counselors and vice-mayor of the municipality, and (3) The community's opinions are taken into consideration by the local government during management decisions concerning MPAs. The statements integrate the legislative role of local governments (e.g., vice-mayor) in formulating ordinances and the community's participation for achieving the delicate balance of co-managing coastal resources.

Perceptions of fish catch increase since MPA establishment. Fishers' perceptions of fish catch was measured by their agreement with the following statements: (1) My fish catch has increased since the establishment of our MPA, (2) The MPA is the main reason why my fish catch has increased, and (3) Fish populations have increased since the establishment of our MPA.

Dependent Variable

Support for fishery policies. This construct was measured by fishers' levels of agreement for policies that regulate fish gear and limit access in municipal waters. The following statements measure the construct of support for fishery policies: (1) One must register fishing gear with the municipality, (2) There should be regulations on the type of fish gear used within the municipal waters, and (3) Fishing permits should be given to non-resident fishermen. The policies applied in these statements originate from the Philippine Fisheries Code of 1998 with the main goal of promoting social and ecological sustainability. Fish gear regulations are commonly enforced policies that may be controversial for stakeholders, since these policies influence fishing access outside MPAs and municipal waters reserved for artisanal fishers.

Analysis

A confirmatory factor analysis (CFA) tested whether the constructs of co-management, fish catch, and support for fishery policies provided a good fit to the data. LISREL 8.8 was used for this analysis based on the maximum likelihood estimation procedure and the covariance matrix of the items measuring the three constructs (Jöreskog and Sörbom 2006). Reliability coefficients (Cronbach alpha) were calculated for the items measuring the three constructs. A structural equation path analysis was then used to test the predictive validity of the model. Separate CFAs and path analyses were run for each of the three municipalities. Model fit was assessed using χ^2, χ^2/degrees of freedom, goodness of fit index (GFI), normed fit index (NFI), comparative fit index (CFI), the root-mean-square residual (RMR), and the percent variance explained for all models.

Results

The confirmatory factor analysis demonstrated that the data provided an acceptable fit to the constructs of co-management, fish catch, and support for the fishery policies (Table 1). For co-management, the standardized factor loadings ranged from .54 to .67 with relatively small standard errors ($SE = .05$ in all cases). Similar factor loadings and standard errors were observed for perceived fish catch and support for fishery policies. Further support for merging the specific variables into their respective constructs was shown in the reliability analysis. The Cronbach alpha for fish catch was .92, while the reliability coefficients for

Table 1
Items Measuring Perceptions on co-management, fish catch, and support for fishery policies

Statement[1]	Standardized factor loading	*SE*	*t*-value[2]	Cronbach alpha
Co-management (CO) perceptions				.67
Fisher or People Organizations (POs) should manage their MPA (CO1)	.54	.05	11.54	
MPA regulations and initiatives must be planned by the counselors and vice-mayor of the municipality (CO2)	.74	.05	16.18	
The community's opinions are taken into consideration by the local government during management decisions concerning our MPA (CO3)	.65	.05	14.09	
Support for Fishery Policies (FP)				.69
One must register fishing gear with the municipality (FP1)	.72	.07	13.09	
There should be regulations on the type of fish gear used within the Municipal waters (FP2)	.74	.06	10.47	
Fishing permits should be given to non-resident fishermen (FP3)	.53	.07	10.30	
Perceptions of Increased Fish Catch (FC) since MPA				.92
My fish catch has increased since the establishment of the MPA (FC1)	.83	.04	20.48	
The MPA is the main reason why my fish catch has increased (FC2)	.77	.05	18.62	
Fish populations have increased since the establishment of our MPA(FC3)	.92	.04	23.39	

[1]Responses were recoded that ranged from strongly disagree (–2) to strongly agree (2).
[2]All *t*-values were significant at $p < .001$.

co-management and support for fishery regulations were .67 and .69, respectively. All of these coefficients are in the range of what is normally deemed as acceptable (Vaske 2008).

Having demonstrated the reliability of the constructs, the structural equation model (SEM) was examined. The overall fit of the model was assessed using χ^2, χ^2/df, GFI, NFI, CFI, and RMR. In SEM, a non-significant chi-square indicates no statistical differences between the observed variables (e.g., survey statements) and the latent concepts (e.g., co-management), implying the model fits the data (Kline 1998; Jöreskog and Sörbom 2006). The model's chi-square was not significant ($\chi^2 = 34.74$, $p = .06$), and suggested an acceptable model. The chi-square in relation to the degrees of freedom also indicates a good fit if the ratio (χ^2/df) is between 2:1 and 5:1 (Kline 1998). The χ^2/df for this model equaled 1.48. The GFI, NFI, and CFI should be >.90 to indicate a good fit to the model (Jöreskog and Sörbom 2006). All of these fit indices were in excess of .90. Finally, the

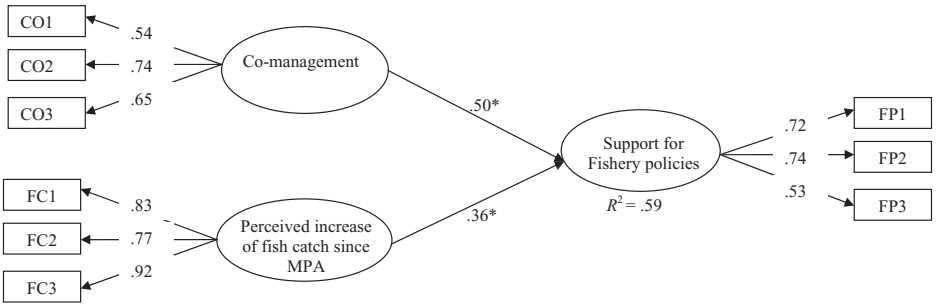

Figure 2. The influence of co-management (CO) and fish catch (FC) on public support for fishery policies (FP) and initiatives. Asterisk indicates significance at $p < .001$.

RMR measuring the mean discrepancies between the model-generated and the observed covariances was .04, demonstrating a good fit of the data (Kline 1998).

Figure 2 displays the path analysis for the fishery management model. Consistent with hypothesis one, a significant relationship between co-management and support for fishery policies was observed ($\beta = .50$, $p < .001$). Similarly, there was a significant relationship between perceptions of increased fish catch since MPA establishment and support for fishery policies supporting the second hypothesis ($\beta = .36$, $p < .001$). The positive coefficients indicate that as perceived catch and beliefs about co-management increase, fishers were more likely to support fishery policies. Taken together, these two concepts explained 59% of the variability in public support for fishery policies.

Municipality Differences

Separate confirmatory analyses and path analyses were run for each municipality. Table 2 compares the fit indicators of these models. All municipalities had a χ^2/df ratio ranging between 1.91 and 2.80. The GFI, NFI, and CFI indices were in excess of .90, and the RMR indices ranged between .05 and .11. All of these findings suggest a relatively good fit of the data (Kline 1998).

Table 2
Municipality differences in overall fit indicators of fishery management model[1]

Indicator	Oslob	Santander	Samboan
χ^2/df	1.91	2.13	2.80
GFI	.965	.927	.855
NFI	.948	.946	.937
CFI	.974	.969	.955
RMR	.049	.074	.119
R^2	50%	60%	77%

[1]The χ^2/df indicates a good fit if the ratio (χ^2/df) is between 2:1 and 5:1 (Kline 1998).
The GFI, NFI, and the CFI indicate an acceptable fit if the indices are in excess of .90 (Jöreskog and Sörbom 2006). An RMR that is within the range of .05 and .10 suggest that data fit the model (Kline 1998).

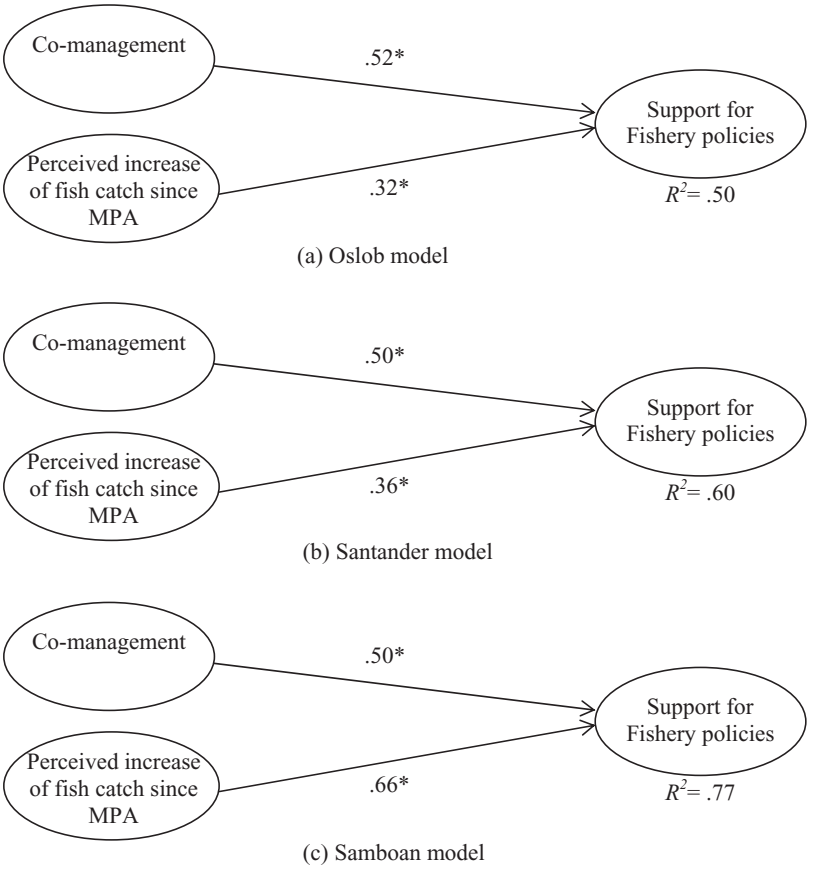

Figure 3. Models predicting public support for fishery policies in Oslob, Santander, and Samboan. Asterisk indicates significance at $p < .001$.

The relative influence of co-management and fish catch on support for fishery policies differed among the three municipalities, supporting the third hypothesis (Figures 3a, 3b, 3c). Significant relationships between predictors and support for the fishery policies were observed for all municipalities. Co-management, however, had a greater influence on support for fishery policies in Oslob ($\beta = .52$, $p < .001$) and Santander ($\beta = .50$, $p < .001$), compared to perceived increase in fish catch. This pattern was reversed for Samboan, where perceived fish catch ($\beta = .66$, $p < .001$) had a greater influence than co-management ($\beta = .26$) on garnering support for fishery policies. Taken together, the municipality models explained between 50% (Oslob) and 77% (Samboan) of the variance of support for fishery policies.

Discussion and Conclusions

Similar to previous research (e.g., Pomeroy, Mascia, and Pollnac 2007; Christie et al. 2009a, 2009b), this study stressed the need to examine perceptions of co-management and fish catch in MPAs for garnering local participation and public support for fishery policies.

Acquiring public support for these policies (e.g., fish gear regulation) may be influential for regulating larger and more diverse jurisdictions such as a network of municipal waters.

Study results showed that perceptions of MPA co-management and fish catch predicted public support for fishery policies (i.e., fish gear regulation). These findings suggest that if managers can acquire and sustain stakeholder support through co-management or perceptions of increased fish catch since MPA establishment, stakeholder support for fishery policies such as fish gear and permit regulations may occur. Such findings are important for local governments and managers that intend to extend their management beyond the borders of small MPAs and sustain support for regulating municipal waters and expansive coastal areas affecting multiple jurisdictions (Christie et al. 2009a; Eisma-Osorio et al. 2009; Hansen et al. 2011).

Current efforts to extend fisheries management to broader jurisdictions are facilitated by institutions such as Coastal Conservation Education (CCE) foundation and the Southeast Cebu Coastal Resource Management Council (SCCRMC) (Eisma-Osorio et al. 2009). The SCCRMC is a socioecological MPA network of local governments that collaboratively govern and manage coastal issues among a network of MPAs crossing seven jurisdictions (Christie et al. 2009a). Current practices of SCCRMC include coastal law enforcement, fisheries and habitat management, and the provision of sustainable livelihood opportunities. These practices are enacted in common local ordinances and national fishery laws supported by municipalities.

Municipality Differences. Differences among the municipalities showed the relative influence of co-management and fish catch in predicting public support for fishery policies. Fish catch was more important for Samboan than Oslob or Santander. Some Samboan fishers' felt that their fish catch had not increased since their MPA was established. These perceptions might reflect: (1) a lack of support for policies limiting public access to potential fishing grounds (e.g., MPAs) that affect fish catch, or (2) a belief that current co-management initiatives are not sufficient. Samboan should not abandon co-management initiatives, but rather strengthen the involvement of the different communities within the municipality. This might be achieved by reviving Samboan's people organizations (POs) formed during the establishment of their MPA.

Informal interviews with the current Samboan PO president and former *barangay* captain indicated the lack of involvement of many members who viewed PO activities as politically driven, instead of community-driven. In 2006, the PO president ran for the *barangay* captain position and was defeated in the election. The election divided the organization and resulted in a substantial decline in membership and support for fisheries management. Existing co-management initiatives between the municipal government and the POs have also eroded causing further conflict among legislative council members who enact the ordinances.

In contrast to Samboan, Oslob and Santander have a unified legislative council of local governments, strong fish warden associations, and consistently enforced policies, which strengthen fisheries management and coastal law enforcement. While policies are similar for all municipalities, the political support among a unified legislative council of local governments establishes the legitimacy and consistency for fish wardens enforcing fishery policies.

Applications. The conceptual model in this article may be useful to policymakers and practitioners in several ways. First, the model provides an intuitive visual of some predictors of public support for fishery policies. Second, the relative influence of co-management and

fish catch in predicting public support helps local governments prioritize fisheries management efforts for specific municipalities. For example, the influence of co-management was greater than fish catch in predicting public support in Oslob and Santander. Because co-management is within the regulatory realm of influence for local governments to promote local participation, prioritizing co-management may facilitate support for policies that could improve fisheries management and potentially sustain fisheries.

Third, the model integrates context-specific co-management scenarios that can guide local governments to effectively target management efforts to specific situations influencing public support for fishery policies. For example, the revival of fisher organizations' participation in MPA management can guide local governments to shape policy proposals that take into account the unique socioecological context of a municipality.

Fourth, fisheries management planning and decision-making processes integrate SEM results to simplify understanding of context-specific scenarios. Cox, Johnstone, and Robinson (2004), for example, used SEM to analyze ecosystem condition changes in influencing social and community relations in Queensland. Path analysis may also be useful for networks of local governments (e.g., SCCRMC) in predicting public support for proposed fishery policies.

Theoretical Implications. Findings have theoretical implications for future research. First, this article examined two predictors (i.e., co-management, perceived fish catch) of public support for fishery management policies. Other potential predictors of support for fishery management could include the strength of local governance and supplemental livelihood programs. These predictors might mediate the relationships between perceptions of co-management, fish catch, and public support.

Second, future research should investigate community support for proposed fishery policies regulating fishing effort. Such studies could benefit collaborative local government networks such as the SCCRMC, which regulate fishing access and fishing power (e.g., gear size, boat size) within a network of municipal waters (Eisma-Osorio et al. 2009).

Third, studies should focus on segmenting the fishers into meaningful sub-groups. Are certain stakeholder segments more likely to support fishery policies that regulate fishing effort and access in municipal waters? Fabinyi, Knudsen, and Shio (2010), for example, showed how local newcomers exhibited less support and trust for fishery policies because of their lack of power and access to participation in co-management initiatives in Cebu, Philippines. Understanding the social complexity and stratification of different stakeholder groups through complementary quantitative and qualitative research methods could increase our understanding for sustaining stakeholder buy-in for fisheries management.

Overall, this study demonstrated that perceptions on co-management and fish catch predict public support for fishery policies. These results suggest managerial and theoretical opportunities to garner public support for fishery management policies and potentially sustain the long-term success of fisheries management.

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