

# Perceptions of Fishermen Households on a Community-based Coastal Resource Management Area: The Case of Asid Gulf, Masbate, Philippines

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## Abstract

This study analyzed the perceptions of fishermen households on fishery resources, the effectiveness of coastal resource management (CRM), and the enforcement of fishery regulations. Face-to-face structured interviews were conducted with 257 sample households within the five municipalities facing the Asid Gulf, Masbate, Philippines. Fishers perceived lower current fish abundance and smaller fish size compared to five years ago. These observations are signs of a lack of effective management of fishing capacity. CRM awareness is lacking in the coastal communities as only a few fishers were engaged in CRM activities. However, there was high perceived effectiveness of CRM for those fishers who were aware of CRM. The enforcement of fishery regulations was also perceived to be strong for those fishers who were aware despite of reported incidence of illegal fishing activities. Increasing the involvement and awareness of the community with the support of local and national government is critical in the sustainability of CRM. Although public awareness is important, it is also imperative to strengthen the enforcement of fishery regulations to increase local compliance. Livelihood interventions should be targeted and acceptable to fishers to be more viable in the long-term. An evaluation of CRM is necessary to document the gains and lessons learned from the implementation for possible replication and modification of future related projects.

**Keywords:** *Asid Gulf, coastal resource management, fishers' perception*

## Introduction

The Asid gulf is one of the major fishing grounds in the Philippines making it the main source of livelihood and employment of small-scale fishers of the nearby coastal communities. The gulf is under the territorial jurisdiction of the province of Masbate in Bicol Region. In 2019, the gulf had a total volume of fisheries production of 23,574 metric tons (Belardo *et al.*, 2019) which comprised 40% of the total volume fisheries production of the province. The fisheries production of the province, however, was observed to be declining in the last five years from 66,061 metric tons in 2014 to 59,371 metric tons in 2019 (Philippine Statistics Authority [PSA], 2019). Although global fish production has been continuing to increase for the past years (Food and Agriculture Organization of the United Nations [FAO], 2018), the trend is different from the cases of the Philippines and the province of Masbate. Between 2010 to 2015, for instance, the Philippine fish production decreased by 9.89%, while in Masbate a negative rate of 5.31% was recorded (Department of

Agriculture Bureau of Agricultural Statistics, 2011; PSA, 2016). At this rate, the trend of fish stock could not be sustainable as the human population growth rate continue to increase (PSA, 2012, 2016).

The decline in production may be attributed to both the demand and supply sides. For the demand side, available literature specify that the downward trend of fisheries production may be caused primarily by human population and economic development. Globally, the per capita food fish consumption has been growing from 9 kg in 1961 to 20.5 kg in 2018 (FAO, 2018). Meanwhile, in the Philippines, Filipinos have been relatively consuming more fish and fishery products at 36.8 kg per year on average (Bureau of Fisheries and Aquatic Resources [BFAR], 2019). This demand for fish and fishery products may put pressure on the natural resources in providing food for the growing number of people (Creel, 2003; FAO, 2001). On the supply side, fisheries production is largely driven by technological improvements and fisheries management (Delgado *et al.*, 2003; Merino *et al.*,

2012; Naiman & Latterell, 2005; Searchinger *et al.*, 2018). The supply side of fisheries production in Asid Gulf, specifically, is largely influenced by fisheries management which includes unsustainable fishing and the use of destructive fishing practices (FAO, 2014; Searchinger *et al.*, 2018). As reported by Miraflor (2021), citing the US Agency for International Development, up to 40% of fish caught and distributed in the Philippines in 2019 came from illegal fishing.

The main challenge of the fisheries sector in the Philippines always relies on its sustainability. If not properly addressed, poverty will still be a serious problem, more resource use conflicts will emerge, and there will be potential loss of fisheries production.

CRM comprises those activities that achieve sustainable use and management of economically and ecologically valuable resources in the coastal areas which consider the interaction among and within resource systems as well as those of humans and their environment (White & Lopez, 1991). It is widely implemented among countries to meet both conservation and fisheries management goals (Maliao *et al.*, 2009). The earliest efforts of CRM were implemented in the 1960s in the United States and Australia (Sorensen, 1993). The procedures for identifying critical problems in the coastal zone, however, can be traced back in the early 1970s in the United States as described in the study of Ketchum (1972).

In the Philippines, CRM, which offers opportunities for poverty alleviation and livelihood, has been practiced for four decades already through various community-based projects and was financed significantly with public and private resources (Alcala, 1998; Courtney & White, 2000; Israel *et al.*, 2004; Maliao *et al.*, 2009; Pomeroy & Carlos, 1996, 1997; White *et al.*, 2002). The information about the success of past efforts and activities of CRM is crucial in achieving effective planning and management (Englander *et al.*, 1977). Thus, it is essential for a CRM assessment as a basis for evaluation.

This study assessed the CRM efforts based only on the perspectives of fishermen households who are the intended primary beneficiaries. The perspectives of other stakeholders are not part of the scope of the study. Furthermore, it does not specify CRM programs, projects, or activities but into a succession of CRM initiatives conducted in Asid Gulf over the years. The study of Israel *et al.* (2004) pointed out that a perception-based study on CRM is important as fishermen households speak a lot about the political acceptability of the approach in the

coastal areas. The literature also specifies different studies in assessing CRM performance through household perceptions (see Debrot & Nagelkerken, 2000; Katon *et al.* 1998; Pomeroy *et al.* 1997, Pomeroy and Carlos 1996; Slater *et al.*, 2013; Webb *et al.*, 2004). This study, however, is unique because it highlights the problems encountered by fishermen households based on their experiences. This analysis provides an initial view on how the fishing households in Asid Gulf perceived the fishery resources for the past five years, including the effectiveness of CRM and the enforcement of fishery regulations. The need to assess the implementation of CRM including the enforcement of fishery regulations has become imperative in providing an accurate understanding of the same (Halliday, 1988; Lowry *et al.*, 2005; Patlis, 2005).

## Materials and Methods

### The Study Area

This study covered the coastal barangays (shaded in yellow) facing and within the Asid Gulf (Figure 1). The Asid Gulf lies south of the narrow coastal plain of Masbate province in the Bicol Region, Philippines. It has a coastal length of 142 km. It is bordered by five coastal towns from Jintotolo Island of Balud (in the southwest) through Milagros, Cawayan, Placer, and Esperanza (in the southeast). It is the eighth largest gulf and one of the major fishing grounds in the Philippines which covers an area of 619 ha (PSA, 2019).



**Figure 1.** Map of Masbate showing the municipalities bordering Asid Gulf.

### Data collection

This research employed both quantitative and qualitative approaches. Specifically, it used the descriptive research method through the conduct of face-to-face interviews among fishermen households using the pre-tested household survey (HHS) instrument patterned after the Participatory Coastal Resource Assessment Training Guide developed by Deguit and colleagues (2004). The study also utilized secondary data from the literature, PSA, and other government agencies.

### Population and Sample

The statistical design employed a three-stage sampling to create a more representative sample of the population. Multi-stage sampling help reduce costs of large-scale survey research by dividing larger clusters into smaller and more targeted groupings for the purposes of surveying. The first stage of the sampling was the selection of the Primary Sampling Unit (PSU) which consisted of all coastal barangays facing the Asid Gulf. From these PSUs, the purok with the greatest number of fishers were identified. The third and final stage was the random selection of the households, which became the ultimate sampling unit.

In each coastal barangay, there was a target of five households who were randomly selected with an interval of one household after each qualified household. The starting point was either the barangay hall, barangay captain's house, school, or chapel. From the sample household, the household head primarily engaged in fishing served as the respondent. In cases when the household head engaged in fishing activities was not available during the day of the visit, other members "directly or personally and physically engaged in taking and/or culturing and processing fishery and/or aquatic resources" (R.A. 8550) served as the respondent. Replacements were made in cases of outright refusal or when there was no member engaged in fishing.

Based on proportionate sampling for unknown population, sample size was 257 fishermen households based on a 95% confidence level ( $Z=1.96$ ), with a margin of error of 0.0611 and a sample proportion of 0.5. This sample size is distributed in 53 coastal barangays across five municipalities along the Asid Gulf (Table 1). They were surveyed between May and August 2019.

### Data Analysis

The data collected were analyzed using descriptive statistics to derive percentage and arithmetic mean. Chi-

**Table 1.** Distribution of coastal barangays and households covered in Asid Gulf, Masbate

Municipality	No. of coastal barangays	No. of Respondents
Placer	13	61
Milagros	12	60
Esperanza	12	56
Balud	11	55
Cawayan	5	25
Total	53	257

squared tests were applied to resource state perceptions to isolate differences in response type frequency by fishers per municipality. A 5-point Likert-type scale was used when the respondents were asked to point out their perceived level of effectiveness of CRM and the enforcement of CRM regulations. This was administered with verbal labels to increase the validity of data in measuring the respondent's perceptions.

## Results and Discussion

### Fishers' demographic profile

There were 223 male and 34 female fishers interviewed. Nine percent of them were 21–30 years old. All others were aged 31 years or older, with the largest group of fishers being 51 years old or older. Four out of five of them had 10 or more years of fishing experience. And, most of the households visited had a size between 6–10 (60%) which was relatively larger compared to the national average of four household members (PSA, 2016) (Table 2).

### Resource state perceptions

The determination of changes in fish abundance and fish size caught from the previous years is important in assessing the local fish population in the fishing ground. Most of the fishers (81%) responded that they perceived lower current fish abundance compared to five years ago (Table 3) – this confirms the findings of similar studies (Hallwass, 2013; Slater *et al.*, 2013). Seventy-seven percent of them also perceived that the body size of fish they caught was relatively smaller now compared to five years ago (Table 3). This finding is also consistent with the results of Pauly and Cheung (2017) and Sheridan and Bickford (2011). Compared to other municipalities, fishers from

**Table 2.** Characteristics of fishers by demographic profile.

Profile	Frequency	Percentage
Sex		
Male	223	87
Female	34	13
Age (years)		
21–30	22	9
31–40	81	32
41–50	67	26
51+	87	34
Fishing experience (years)		
Below 10	41	16
10+	216	84
Household Size		
Below 5	97	38
6–10	155	60
10+	5	2

the Municipality of Placer were significantly more likely to respond that fishes in the sea were more plentiful five years ago compared now and that they perceived smaller current fish size ( $\chi^2 = 10, p < 0.05$  – fish abundance;  $\chi^2 = 12.5, p < 0.05$  – fish size respectively – Table 3). The perceived decline in fish abundance and shrinking of body size of fish are attributed primarily to the warming of sea temperature (Brander, 2007; Pauly & Cheung, 2017; Queirós *et al.*, 2018; Sheridan & Bickford, 2011) and anthropogenic factors which include overfishing and the use of destructive fishing practices (Agnew, 2009; Jackson *et al.*, 2001). Hence, the depleted state of the coastal resources and overfishing are symptoms of the lack of effective management of fishing capacity (Stobutzki *et al.*, 2006).

Understanding the experiences of fishers while they are in the fishing ground is an important key to successful fisheries management. Twenty-four percent of the fishers interviewed identified illegal use of destructive fishing practices as their biggest problem encountered in fishing (Table 4). Destructive fishing is one of the threatening factors that degrade the biological diversity and productivity of coastal ecosystems that could lead to a decline in catch rates and consequently to poverty (Cinner, 2009; Veitayaki *et al.*, 1995). This was only followed by unfavorable weather conditions (21%)

that cause strong waves not suitable for small-scale type boats. The intrusion of commercial fishing (7%) was also identified as a problem by fishers. This observation is valid under the Philippine Fisheries Code (Republic Act [RA] No. 10654) that commercial fishing vessels operating in the municipal water are not allowed. The other problems identified by the fishers were damaged fishing gears (6%), few catches (5%), lack of fishing gears (4%), and improper waste disposal (1%). These problems encountered by fishers, particularly the illegal use of destructive fishing practices, can be considered as contributing factors to low catch rates (Pet-Soede *et al.*, 2001; Veitayaki *et al.*, 1995). Furthermore, low catch rates suggest that the resource base is declining (Tesfamichael *et al.*, 2014).

The likelihood of using destructive fishing methods can be attributed to some aspects of poverty (Bene, 2003; Cinner, 2009; Silva, 2006). In the study of Torres and colleagues (2019), 64% of the households in the coastal communities in Asid Gulf were considered poor. This is a clear picture of the poverty situation in which fishers are forced to use destructive fishing methods to increase their yield and income. In addition, these types of fishing methods can deteriorate marine habitats which is attributed to the decline of yield (Agnew, 2009).

Dynamite or blast fishing (30%) accounted for the most observed destructive fishing method in Asid Gulf (Table 5). Pacini and colleagues (2016) described blast fishing as an unsustainable practice that is often reported in Southeast Asia. It is unsustainable in the sense that it destroys the reef environments (Reef Resilience Network, n. d.; Wilkinson *et al.*, 1994). Aside from the blast fishing, cyanide fishing (13%) and trawl fishing (13%) were also prevalent in the gulf. This is followed by fine mesh net fishing (12%) and purse/Danish seine fishing (4%). Cyanide fishing, in particular, is also a threat to coral reefs and other coastal ecosystems (Barber & Pratt, 1998). This method is used primarily to catch live coral reef fish for aquarium and fish trades and is also widespread practice in Southeast Asia (World Resources Institute, 2008). The observed illegal fishing methods are prohibited under the implementing rules and regulations of RA 10654. These observations indicate a low level of enforcement of fishery laws in the gulf.

### ***Fishers’ awareness of CRM***

In the 1990s, the local governments were given more power to implement CRM activities as part of their basic services (Local Government Code of 1991; Philippine Fisheries Code of 1998). This shifting of responsibility of various CRM programs, projects, and activities from

**Table 3.** Distribution of responses regarding perception of current fish abundance and current fish size over the past five years – responses separated by fisher per municipality.

		Fishers from					All fishers
		Balud	Cawayan	Esperanza	Milagros	Placer	
Abundance of fish in the sea compared to 5 years ago	Less	44 (80%)	17 (68%)	48 (86%)	47 (78%)	57 (93%) <sup>a</sup>	208 (81%)
	More/same	11 (20%)	8 (32%)	8 (14%)	13 (22%)	4 (7%)	49 (19%)
Fish size caught compared to 5 years ago	Smaller	38 (69%)	15 (60%)	45 (80%)	45 (75%)	55 (90%) <sup>a</sup>	198 (77%)
	Bigger/same	17 (31%)	10 (40%)	11 (20%)	15 (25%)	6 (10%)	59 (23%)

<sup>a</sup>Group response distribution differs significantly from all other groups ( $\chi^2 = 10, p < 0.05$  – abundance;  $\chi^2 = 12.5, p < 0.05$  – fish size).

**Table 4.** Distribution of problems encountered by fishers in Asid Gulf.

Problems in fishing	Frequency	Percentage
Illegal use of destructive fishing practices	62	24
Unfavorable weather conditions	54	21
Intrusion of Commercial Fishing Vessels	17	7
Damaged fishing gears	15	6
Few catch	12	5
Lack of fishing gears	10	4
Improper waste disposal	2	1
Others	5	2

**Table 5.** Distribution of respondents by observed destructive fishing methods in Asid Gulf.

Destructive fishing methods	Frequency	Percentage
Dynamite/blast fishing	78	30
Cyanide fishing using compressor	33	13
Trawl fishing	33	13
Fine mesh net fishing	30	12
Purse/Danish seine	11	4

the national government to local governments can pose positive effects in achieving greater public awareness of CRM issues. However, the current study shows a limited number of fishers who were aware of CRM – in

direct contrast with similar studies (Aldon *et al.*, 2011; White *et al.*, 2006). Only 62 or 24% of the fishers were aware of CRM being conducted in their respective local communities. This figure suggests that the information about CRM is not widely disseminated to the fishing communities. Barua and Rahman (2018) claimed that resource users particularly the fishers are still devoted to traditional knowledge and are unaware of the linkages between the various coastal ecosystems. In addition, Pomeroy and co-researchers (1996) suggested that the awareness of fishers about CRM could be a factor of limited information. Thus, public awareness of CRM is imperative to increase community participation among the resource users in achieving sustainable fisheries management.

#### *Fishers' perceived level of effectiveness of CRM*

The sustainability of coastal resources is an important policy goal for the government of countries with coastlines like the Philippines. CRM provides a clear direction to address the challenges in managing the coastal resources. The effectiveness of CRM requires engaged communities and an understanding of livelihood strategies (Allison & Ellis, 2001; Dean *et al.*, 2019; Slater, 2013). Likewise, CRM efforts implemented in the Philippines for the past years are perceived to be effective in empowering local fishing communities (Maliao *et al.*, 2009). In the case of Asid Gulf, in particular, the fishers were asked to rate the CRM activities according to their perceived effectiveness. Although most of the fishermen households were not fully aware of any of the CRM activities in their respective local communities, this analysis focused only on those households who were aware.

The fishermen households interviewed were familiar with the following CRM activities: alternative livelihood assistance (28), enforcement of fishery laws (21), resource

conservation activities (20), the establishment of marine protected areas or marine fishery reserve sanctuary (MFRS) (7), and community organizing activities (4) – Table 6. These limited responses were attributed to a high refusal rate and the non-familiarity of fishers about the different CRM activities. The majority of fishers, who were aware of CRM, stated that these CRM-related activities were either very effective or effective. For instance, the provision of alternative livelihood was rated either very effective or effective by fishers (82%) who were aware of this kind of assistance. It is interesting to note that fishers perceived alternative livelihood as effective, thus, increasing livelihood diversification as a supplementary activity will encourage the fishers to exit the fishery (Martin *et al.*, 2013; Slater *et al.*, 2013). Targeted and acceptable alternative livelihoods for fishers are deemed to be more viable in the long term and consequently reduce the fishing pressure (Slater *et al.*, 2013). Seventy-six percent of the fishers, on the other hand, rated either very effective or effective the enforcement of fishery regulations. The enforcement of fishery regulations was linked by the fishers with the sea guardian or *bantay dagat* volunteers. Indeed, to achieve effective enforcement and high compliance, a co-management approach is ideal that is sharing of responsibility and authority between governments, local communities, and other stakeholders (Crawford *et al.*, 2004; Reef Resilience Network, n. d.). More than half of fishers who were aware of resource conservation activities (75%) and marine fishery reserve sanctuary (MFRS) (57%) also rated these as either very effective or effective. The resource conservation activities and the establishment of marine sanctuaries have already proven to be effective in enhancing fish production (Rivera & Newkirk, 1997). For community organizing, it is surprising that only four fishers were aware of this activity and only one of them perceived it as effective. This implies that fishers refused to engage in

CRM thinking that it would not benefit them or address local concerns. Thus, it is important to engage the fishers in attaining greater involvement and participation in CRM activities (Pollnac & Pomeroy, 2005). In addition, community involvement is critical in the sustainability of CRM even after the project funding and termination of external technical assistance.

### ***Fishers’ perceive level of enforcement of CRM regulations***

Most of the fishers were familiar with the following CRM regulations: implementation of proper waste disposal (70%), banning of the illegal use of destructive fishing practices (69%), protection of rare species (63%), and prohibition of the illegal use of active fishing gear (51%). Except for the execution of closed season fishing in municipal waters (21%), only 21% of the fishers were aware of this regulation – Table 7. With this number of fishers who were familiar with these fishery laws, the majority of them were convinced that the enforcement was either very strong or strong despite the reported incidence of illegal fishing activities. For example, the fishers expressed either very strong or strong enforcement on the banning of the illegal use of destructive fishing practices (61%) and the prohibition of the illegal use of active fishing gears (60%). However, there are still some fishers who perceived that the enforcement is either weak or none at all. As earlier cited, the presence of destructive fishing methods concerns the enforcement of fishery regulations. Furthermore, more than half of fishers also expressed either very strong or strong enforcement for the protection of rare species (73%), proper waste disposal (67%), and the execution of closed season fishing in municipal waters (58%). The execution of closed season fishing, in particular, is effective management of fishing capacity in small-scale fisheries like the Asid Gulf (Salayo

**Table 6.** Distribution of respondents by perceived level of effectiveness of CRM in Asid Gulf

CRM-related activities	Frequency <sup>1/</sup>	Level of Effectiveness					Average
		VE (5)	E (4)	ME (3)	I (2)	VI (1)	
Alternative Livelihood	28	12	11	1	4	-	4.11
Law Enforcement	21	6	10	2	1	2	3.81
Resource Conservation	20	11	4	3	1	1	4.15
MFRS Establishment	7	2	2	3	-	-	3.86
Community Organizing	4	0	1	1	1	1	2.50

<sup>1/</sup> Values may not add to totals due to multiple responses

Note: VE, E, ME, I, and VI mean very effective, effective, moderately effective, ineffective, and very ineffective, respectively.

**Table 7.** Distribution of respondents by perceived level of enforcement of fishery regulations in Asid Gulf

Fishery regulations	Frequency <sup>1/</sup>	Level of Enforcement					Average
		Very strong (5)	Strong (4)	Good (3)	Weak (2)	None (1)	
Proper waste disposal	180	73	48	37	17	5	3.93
Illegal use of destructive fishing practices	178	50	58	39	22	9	3.66
Protection of rare species	163	74	45	31	10	3	4.09
Illegal use of active fishing gear	132	36	43	29	15	9	3.62
Closed season fishing in municipal waters	53	16	15	13	5	4	3.64

<sup>1/</sup>Values may not add to totals due to multiple responses

*et al.*, 2008). Although most of the CRM regulations posted high enforcement levels, there were still some fishers who were unaware of the existing laws. Thus, it is imperative to further strengthen the enforcement, intensify fishers' awareness, and increase the community involvement with local government support to increase local compliance and sustain CRM interventions through time (Catedrilla *et al.*, 2012; Pomeroy *et al.*, 2015; Pomeroy & Carlos, 1997; Wynne *et al.*, 2018).

## Conclusion

The fisheries production in Asid Gulf was largely influenced by fisheries management which included unsustainable fishing and the use of destructive fishing practices. Fishers perceived lower current fish abundance and smaller current fish size compared to five years ago. These observations were primarily attributed to anthropogenic factors which include overfishing and illegal fishing activities. Thus, these observations were signs of a lack of effective management of fishing capacity in the fishing ground. CRM awareness is lacking in the coastal communities. Information about CRM is not yet widely disseminated. The community involvement was also seen to be problematic as few fishers engage in CRM activities. However, there was high perceived effectiveness of CRM for those fishers who were aware of CRM. The enforcement of fishery regulations, meanwhile, was perceived to be strong for those fishers who are aware of CRM regulations despite the reported incidence of illegal fishing activities.

## Recommendations

The CRM in Asid Gulf offers opportunities for marine protection, poverty alleviation, and livelihood. Thus, achieving these objectives of CRM requires effective and sustainable fisheries management. The involvement of the community with the support of the local and national government and other stakeholders is critical in the sustainability of CRM even after the project funding. It is also imperative to further strengthen the enforcement of fishery regulations to increase local compliance and eventually enhance fish stock. Public awareness of CRM is crucial in increasing community participation among resource users. In addition, livelihood interventions should be targeted and acceptable to fishers as it is more viable in the long term. An evaluation of CRM is also necessary to document the gains and lessons learned from the implementation for possible replication and modification of future related projects.

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