RESEARCH JOURNAL OF FISHERIES AND HYDROBIOLOGY

ISSN:1816-9112
Open Access Journal

Coastal and Marine Resource Utilizations in the Dumanquillas Bay, Philippines

Gema U. Alduhisa[1] and Cesar G. Demayo[2]

[1]MSU - Buug College, Buug, Zamboanga Sibugay, Philippines
[2] Department of Biological Sciences, College of Science and Mathematics
[2]Mindanao State University – Iligan Institute of Technology, Iligan City, Philippines

Address For Correspondence:
Cesar G. Demayo, Department of Biological Sciences, College of Science and Mathematics, MSU-Iligan Institute of Technology, Philippines

Received: 3 November 2015
Accepted: 20 December 2015
Available online: 30 December 2015

ABSTRACT

Programs on economic development and human population growth are considered among the few causes of rapid coastal resource deterioration in the Philippines especially marine protected areas like Dumanquillas bay in Western Mindanao. This bay was recognized to have relatively diverse coastal and marine resources for food and livelihood for a majority of the coastal populations living in the area. However, like any other protected bays in the country, coastal and marine resources in the area deteriorated thus this study tried to describe the causes of the continuous decline of resources. The study focused on the people's views on the anthropogenic activities, physical disturbance and effects of climate change. Based on semi structured interviews and focus group discussions on the resident fishers in the area show large portion of mangrove forests that support adjacent ecosystems had already been converted into aquaculture ponds while seagrass beds and coral reefs were already destroyed due to heavy siltation and sedimentation. With regards to fishing activities, 22 types were identified by the respondents of which 11 were considered destructive and illegal. Gleaning of shells was the most common fishing activity in the area with followed by push nets and fish weirs. The respondents' level of knowledge about the existing resources is quite high however, their level of awareness on fishery laws was quite low considering that the bay is a protected area. Low level of awareness had been attributed to the weak implementation of fishery laws and policies and lack of enforcement of the government agency managing the area resulting to proliferation of destructive and illegal fishing activities in the bay. Respondents claimed that there was a decline in their daily fish catch and a few perceived that major coastal resources were in good shape although majority still perceived that the bay was still moderately productive. The government is struggling hard to reverse the deteriorating condition of the aquatic ecosystems in Dumanquillas bay but the protected area management board (PAMB) is not empowered and well-capacitated thus only adopted a management scheme to address the problems of indiscriminate utilization of the resources in the bay. Because of shared responsibility between the national government and the local government units (LGU's), the LGU's deeply relied on the national government for the protection and conversion of the resources since they had been relieved from their full responsibility over the resources because the area has been declared as protected. Likewise, environmental concerns are among the least priorities of the LGUs. It is suggested that to achieve the desired goal of sustainable resource utilization, protection and conservation, management efforts should be simple, clear, non-sectoral and should not be fragmented. Existing laws and policies must be revisited to address the contradictory and overlapping issues that have resulted to a chaotic and ambiguous management of the finite resources of the bay.

KEY WORDS: Resource, focus group discussions, local government units

INTRODUCTION

Coastal and marine resources serve many ecological processes that support life system including human needs for food, employment, energy, transport, recreation and others (UNDIESA-UNEP, 1984; FAO, 2000; Munoz, 2002; Espejo-Hermes, 2004; Luna *et al*, 2004; UNEP, 2006). It was earlier reported that the Philippinesbeing a part of the Indo-West Pacific Region, is endowed with the most productive and biologically diverse ecosystems in the world (White & Trinidad, 1998). It's archipelagic waters outlined by a long stretch of coast line along sandy beaches, shallow waters, coral reefs, deep seas, rocks and boulders (Anoneuvo & Zaragosa, 1986; Floren, 2003) build a mosaic island of habitats that favor existence of diverse species of marine plants and animals. These coastal and marine habitats described as "the Galapagos times ten" (Heany & Regalado, 1998) form a huge reservoir of natural wealth of which the country is largely depends for economic resiliency. Changes were observed when the Philippine government exerted effort to reduce poverty and while it

had gained apparent success, the state of natural resources was often jeopardized (DENR, 2001; Jin *et al*., 2003; CRMP, 2004; Flores, 2014). Coastal areas became focal points for tourism, trade, industrial production and transport thus severely affected the natural state of coastal ecosystems and its local biota (CRMP, 2004; Ganaway & Lacuna, 2013). Aside from physical disturbance brought by combined impacts of anthropogenic activities and natural occurrences, seas and oceans became the ultimate recipient of toxic wastes. Massive and indiscriminate utilization of coastal resources including the use of destructive fishing activities accelerate the depletion of natural stocks. This was further aggravated by other environmental pressures such as global climate change (White & Trinidad, 1998; Jin *et al*, 2003).The rapid coastal resource depletion have greatly affected fishing communities who are dependent on the resources as a source of food and livelihood (Munoz, 2002) thus increasing incidence of poverty. One of these areas in the country is the Dumanquillas bay, earlier reported as one of the richest fishing grounds in Zamboanga del Sur nestled with many valuable and commercially important fishery and marine products. Since it was reported to have exceptional number of biologically and commercially important species, the baywas declared as a marine protected area in 1999 by virtue of Presidential Proclamation No. 158 and is governed with a Protected Area Management Board (PAMB) strictly adhering to the "no take policy" as embodied by the provisions RA 7586 or the National Integrated Protected Area Act of 1992. A decade and a half however, the resources of the bay are continuously deteriorating due to the reported use of destructive and illegal fishing activities. Overexploitation of the resources in the hope to increase fish catch resulted to resource scarcity increasing the incidence of poverty. To understand the issues, how the residents around the bay utilize the different coastal and marine resources that may have contributed to the different degree of disturbance/ stresses on these habitats was therefore investigated in this study. This study was conducted in the coastal villages of Kumalarang, Zamboanga del Sur namely Bualan, Picanan, Poblacion, Diplo, Boyugan West and Gusom. While Kumalarang is a 4th class and second to the smallest municipality of Zamboanga del Sur and is composed of 18 barangays, only (6) of these villages are situated in the coast of Dumanquillas bay. It has an estimated population of 29,832 based on the NSO 2011 to 2015 computed data (MPDO-Kumalarang, 2015).

MATERIALS AND METHODS

This study employed a combination of a semi-structured interview (SII) and focus group discussions (FGD) (McCracken *et al*., 1988; Sajise *et al*., 1990; Pido *et al*., 1996). Results derived from SSI and FGD were further verified through key informants interview (KII) (Bunce *et al*., 2000). An open and close ended survey questionnaire was produced in English and Cebuano where some of questions were adopted from previous studies (Pomeroy & Carlos, 1996; Pido *et al*., 1996; Pomeroy *et al*., 1997; Katon *et al*., 1997; Katon *et al*., 1998; Mulekom & Tria, 1999; Israel *et al*., 2004). The actual interview was conducted between June 4 to 21, 2015 after complying all the technical and ethical considerations of research (Bunce *et al*., 2000; Sajise *et al*., 1990).

RESULTS AND DISCUSSIONS

In this study, of the 140 household respondents, 79.29% were males and 29 or 20.71 % were females. Majority of the respondents were married with age ranging from 18 to 59 years old. The demographic characteristics of the respondents are summarized in Table 1. It can be seen from the results that the ethnic ratio was 2:1 with a majority has reached elementary education. The average monthly income of families is below poverty line. Fishing was the main source of livelihood although some have other sources of income that include farming, buy and sell business of fish pond supplies and other goods, as construction workers, have sari-sari stores and others. There those who are dependent of the Pantawid Pampamilya Pilipino Program (PPPP) of the Department of Social Works Development (DSWD), a poverty alleviation support from the government.

Table 1: Demographic Characteristics of the Fishermen household Respondents

Variable	Frequency	Percent
1. Civil Status		
Single	3	21.14
Married	123	87.86
Separated	7	5
Widow/Widower	7	5
2. Age		
18 years and below	0	0
18-59 years old	128	91.43
60 years old and above	12	8.57
3. Sex		
Male	111	79.29
Female	29	20.71
4. Religious Affiliation		
Catholic	82	58.57

Islam	46	32.86
Born Again Christians	10	7.14
No Response	2	1.43
5. Ethnicity		
Cebuano	85	60.72
Subanen	8	5.71
Muslim	47	33.57
6. Educational Attainment		
Elementary Level	74	52.86
High School Level	55	39.29
College Level	11	7.85
7. Average Monthly Income		
10,000 and below	106	75.71
10,001 to 20,000	34	25.29
20,001 and above	0	
8. House Ownership		
Owned	140	100
Rented	0	0
9. Type of Materials		
Light-weight	100	71.43
Semi-concrete	32	22.86
Concrete	8	5.71
10. Average No. of Family Members		
3 and below	28	20.00
4 to 6	92	65.71
7 and above	20	14.29
11. Average No. of Children in School		
None	10	7.14
3 and below	111	79.29
4 to 6	17	12.14
7 and above	2	1.43
12. Average Years of Residency		
10 years and below	6	4.29
11-20 years	10	7.14
21-30 years	25	17.86
31-40 years	37	26.43
41-50 years	36	25.71
51- 60 years	16	11.43
61-70 years	10	7.14
71 and above	0	
13. Organization Affiliation		
Protected Area Management Board (PAMB)	12	8.57
Barangay Fisherfolk Association	13	9.29
Women's Organization	1	0.71
DSWD (Pantawid Pampamilya Pilipino Program)	18	12.86
Barangay Health Worker	1	0.71
No Affiliation	95	67.86
14. Other Sources of Income		
Farming	22	15.71
Buy and Sell	12	8.57
Sari-sari Store	13	9.29
Construction Worker	1	0.71
Fishpond Supplier	1	0.71
No other source of Income	49	30.01

The municipality of Kumalarang consists of diverse coastal ecosystems. Since fishing requires fishers to exploit natural resources by all means at a given time (Aldon *et al*., 2010), knowledge of daily fishing activities is worthy to know. It was found in this study that a majority of the respondents (84.63%) were knowledgeable on the existence of the different coastal and marine resources in the area indicating their high level of knowledge on coastal and marine resources (Table 2). However of the six coastal barangays, the respondents from the village of Picanan registered the lowest level of knowledge on the existing resources in the bay. A majority of them were engaged into *sud-sod* or push nets operations and gleaning activities considered menial fishery activities but served as main source of livelihood by the respondents. The frequency and volume of shelled mollusks along with some crustaceans extracted by gleaners from the bay everyday was quite huge to quantify (Fig. 1). Worse, greater than 92% of the respondents were unaware on the harmful effects of *sud-sod* or push nets into the seagrass communities of the bay.

Fig. 1: Shows the fishery products that can be derived through gleaning and push nets operations. a) A group of women sorting *Perna modiula* locally known as *"amahong"* b) ready to sell amahong c)

Although hesitant and very cautious to respond to the interviews, many of the respondents in Picanan complained about the proliferation of illegal fishing activities in the area. They reported that most of the illegal fishers were coming from other municipalities. They however, during the FGD were discovered to be unknowingly also engaged in illegal fishing activities because of their low level of awareness on some fishery laws and regulations implemented in the area. The low level of awareness can be attributed to the weak enforcement of the laws by the local government which considered environmental concerns among the least of their priorities. Because of the proclamation of the bay as a protected area, local officials were doubtful if they have the management responsibility of the bay. Likewise, even those who knew that the Bay is a protected area, about 35% of them were either did not know or not sure with the boundaries of the sanctuaries and where exactly in the bay fishing is allowed. Added to the problem is that illegal fishing activities such as *sud-sod* or push nets were considered legal by some village local government units (Barangay Picanan Profile, 2007).

Table 2: Level of knowledge of fishermen on the different coastal and marine resources in the bay as well as the level of awareness on some fishery laws.

Coastal Barangays	Level of Knowledge on the Coastal Resources			Level of Awareness on Coastal Laws and Policies		
	Yes (%)	No (%)	Not Sure (%)	Yes (%)	No (%)	Not Sure (%)
Bualan	87.5	13.13	8	74	14	12
Boyugan West	78.6	4.81	7.69	49.85	22.92	27.23
Gusom	88.75	2.5	8.75	81.86	13.13	5
Picanan	52.92	1.54	45.54	83.81	14.67	1.43
Diplo	100	0	0	49	22.67	28.33
Poblacion	100	0	0	70	30	0
Average Response (%)	84.63	3.66	11.66	68.09	19.58	12.33

While the reliance on coastal resources of the Philippines is readily apparent (UNDIESA-UNEP, 1984; FAO, 2000; Jin *et al*., 2003), a declining trend of the availability of resources was observed and compounded the burgeoning poverty among the coastal dwellers in many parts of the country. Philippine mangroves for example have declined significantly over the past few decades from 500,000 hectares in early1900s (Brown & Fisher, 1920) to nearly 120,000 hectares in 1994(Primavera, 2000) where almost half were found in Western Mindanao (DENR, 1996). Dumanquillas bay was then considered among the richest bays surrounded by vast areas of mangroves composed of big trees and nypa swamps. The bay has an estimated an estimated area of 1,499.05 hectares used as culture ponds. At present, 933.35 hectares were operational and 565.70 hectares were abandoned (DBPLS-GMP, 2015-2019). The municipality of Kumalarang being one of the component municipalities of Dumanquillas, has an estimated remaining mangrove area of 120 hectares and an estimated

total area of 2,859.09 hectares of culture ponds but with only 700 hectares that are operational (DBPLS-GMP, 2015-2019). The disparity in ratio of the area between mangrove and fish ponds jeopardized the mangrove ecosystems and adjacent habitats. The specific protocol recommending a ratio of 4:1(four hectares mangrove and one hectare of fishpond) to maintain the credibility of mangroves in stabilizing the ecological health of the coastal ecosystems (Saenger *et al*., 1983; Primavera & Esteban, 2008) was never followed.

While mangroves were known for its unprecedented uses as it serves as barriers against strong winds and sanctuary for many marine organisms (e.g. fishes, shells, crabs, shrimps and mollusks), these were considered also a good source of timber products (e.g. lumber, firewood and charcoal) and other valuable products (e.g. raw materials for nypa shingles, fisherman's hat, dyes, resins and others). Majority of the respondents (97%) recognized the above usage and claimed that they were benefited with the resources that were derived from these resources. Aside from fishery products such as fishes, shells, crabs and lobsters, they were also dependent on mangroves for domestic fuel utilizing only the barks. However during the actual survey, piles of firewood from mangroves were seen along the road for sale (Figure 5) mainly from huge barks of mangrove trees mechanically cut into smaller sizes. It was revealed during the FGD that there were few residents in the area who relied on mangrove charcoal making. They said charcoal from mangroves was categorized as high-grade and expensively sold to other municipalities and cities since charcoal from mangrove trees were known for its high heating value (Melana *et al*., 2000) and has long been preferred for both domestic cooking fuel and fuel for commercial bakeries (Brown & Fischer, 1918; Wernstedt & Spencer, 1967; Jara, 1987; Walters, 2004) thus depleting the mangrove ecosystems of Dumanquillas.

Fig. 2: Shows other valuable products derived from mangrove *(from left: firewood derived from mangrove piled along the road; a sack of high-grade mangrove charcoal; nipa leaves dried to be made into nipa shingles and ready to sell fisherman's hat).*

It was also revealed during the FGD that most of the mangroves in the villages of Bualan, Picanan and Boyugan were remnants of logging operations undertaken by Philippine Capital Promoters, Inc from 1950s to early 1960s. Along with other forest products from the logging concessions in the upland, mangroves with at least 2 meters in diameter were cut and transported to Japan while some were cleared to pave way the construction of log ponds. Melana *et al*. (2000) reported that in the 1950s, vast tracts of mangroves were awarded to logging concessionaires under Minor Forest Products Lease or MFPL (Walters, 2004) and logged over for firewood and tanbarks. A large volume was transported to Japan which accordingly was a source of rayon (Melana *et al*., 2000).Aside from logging concessionaires, disappearance of large portion of mangrove areas in the country was also attributed to fishpond development (Primavera & Esteban, 2008). Of the six surrounding municipalities of the bay, Kumalarang has the largest reserves for fishpond development (BFAR-Provincial Fisheries Office). The massive mangrove conversion into aquaculture peaked in 1950s and 1960s with 4,000 to 5,000 hectares per year (Primavera, 2000) through the adoption of the Fisheries Decree of 1975 or PD 704. Cash incentives were given to aquaculture entrepreneurs in a form of loans (Villaluz, 1953) while fishpond permits, contracts and leases were extended into 10 years and 25 years respectively by virtue of E.O. 125. Kumalarang was among the municipalities with large mangrove areas declared as reserve for fishpond development during the Marcos Administration. At present, there were an estimated of 150 fishpond operators in the area and is continuously increasing despite the issuance of Presidential Proclamation No. 2146 in 1982 prohibiting the cutting of mangroves and Executive Order No. 23 of President Benigno Aquino III that banned the cutting of naturally grown mangroves (Fig. 3).

Fig. 3: Mangrove trees cut for fishpond development.

In this study, a total of 22 types of fishing methods were identified 11 of which were classified as (Table 3). Majority of the respondents (90%) engaged into two or more fishing activities while others owned two or more fish weirs or push nets. Gleaning of shelled mollusks was considered as the most common fishing activity because these were commonly found in muddy substrates. Gleaning was considered a menial fishery activity which can be done by anybody even schoolchildren since it does not require much effort and time. During the FGD, it was revealed that if only the laws will be strictly followed, all the fishing operations in the area will be considered illegal. Fish weirs or "*bunsod*", for instance, should be established 250-300 meters away from the mouth of the river and 300 meters away from each other as prescribed under the provisions of RA 8550. However, overcrowded fish weirs can be observed everywhere from riverbanks to seagrass beds and even near coral reef areas. These resulted to stiff competition in the utilization of available resources. It was also revealed that most of the coastal areas of Picanan which are composed of river and estuaries, most of their *"sud-sod"* operators were operating outside their area of jurisdiction. This finding was further confirmed by the latest cadastral lot survey conducted by the National Mapping Resource and Information Agency (NAMRIA).

Table 3: Shows the different fishing methods applied by fishers in Dumanquillas Bay.

Fishing Method		Short Descriptions	Frequency n=140	% P=f/n* 100
Local Name	English Name			
"Bunsod"	Fish weirs	• A permanently- established structure with fine nets supported by bamboo poles usually installed 250-300 meters away from the mouth of the river. • It usually caught shallow coral fishes.	55	39.29
"Sud-sod"	Push Nets	• A triangular-shaped nets supported by two bamboo poles usually pushed by a person in the muddy substrate of seagrass beds. • This type of gear usually caught small fishes, shells and other marine organisms.	60	42.86
"*Pasol*"	Fish Hooks	• A typical fish hook with a little bit smaller hook attached in a nylon string.	3	2.14
"Palangre"	Long Line Hooks	• A fishing gear made up of a long nylon with at least 3,000 pieces of larger hooks with 1 ½ meter-distance from each hook. • This type of fishing method is used in deep part of coral reef areas to the deeper part of an open sea.	11	7.86
"Pamana"	Spears	• An improvised bow and arrow where the bow is assembled like a shot gun and an arrow which is made up of small iron stick sharpened at the edge.	5	3.57
"Panginhas"	Gleaning Shells	• It is a merely collection of shells and other edible marine organisms during low tide. Gleaners usually used knives (bolo) and some others used pieces of wires in drawing out shells from the holes (Floren, 2004).	68	48.57
"*Panulo"*		• It is a type of gleaning that were done at night with the use kerosene lamp or high powered chargeable flashlights. Fishers usually bring spears used in catching fishes and small cattle fish or (kobutan).	5	3.57
"Bobo"	Fish pot	• It is a fishing gear made up of woven parts of bamboo formed like a square trap. This type of fishing gear is usually used in catching octopus. • Other species of fish can also be caught through this method.	8	5.71
"Bintol"	Crab pot	• It is a fishing gear also made up of woven parts of bamboo used	8	5.71

		in catching crabs in mangrove areas. This type of fishing gear can also be used in catching fishes in the coral reef areas.		
"Pangurenti"	Electro-fishing	• It is a type of fishing on where fishes hiding on the rocks and boulders were electrified using a stored electricity in a battery.	2	1.42
"Paniro or tiro"	Blasting	• A fishing method where an explosives, usually dynamite will be thrown into a school of fish. • This type of fishing activity is commonly known as 'dynamite fishing".	2	1.42
"Panghilo"		• A fishing method that uses poisons such juice of "*tubli*" or *Derris elitica,* locally known as "*panubli*" and or the use of cyanide, commonly known as cyanide fishing.	3	2.14
"compressor diving"		• It is a fishing activity on where fishers can able to dive to the deepest part of the sea and stay longer in the depths with the use of oxygen supplied by a compressor. The compressor tank is just left at the boat with an attached tube that served as a breathing apparatus of the diver.	2	1.42
Fishing Methods with the Use of Nets				
"Baling"	Fine Fish Nets	• Fish nets with fine mesh intended to catch groupers and anchovies.	7	5
"Paanod"		• A combination of large and fine mesh nets with 50-100 meters long. This is usually installed at the mouth of the river where the water current is fast. The other end of the net will be supported with a fixed bamboo poles while the other end will be carried by water until all the nets will be drowned. The net will stay at the water 15-30 minutes before it will be withdrawn to check the catch.	5	3.57
"Paatang" or "paambit"		• A 1 meter wide with 150-200 meters long black fish nets with finer mesh established near the mangrove strips during high tide to allow fishes to pass through at the top. It will be installed like fence supported with bamboo poles to trap the fishes. During low tide, fishes and other marine organisms will move with the flow of the water and will be trapped on the net.	4	2.86
"Lampornas"	Fish trawling	• A fishing net with 15-20 meters long dragged by a fishing boat.	3	2.14
"Patuloy"		• A fish net with large mesh usually used in catching deep water crabs (*lambay)* and other species of deep coral fish.	9	6.43
"hulbot-hulbot sa Lalom"		• A 10-meter fish net with larger mesh installed in the water usually at the coral reef areas (*kapagangan).* A long rope with big stone or boulder at the end will be thrown into water. The fisher will then draw the rope and smash it hard to the corals to frighten the fishes.	6	4.29
"hulbot-hulbot sa Mabaw"		• A 10-meter fish net with fine mesh installed in seagrass beds.A big stone or boulder tied with a rope will be thrown into water. The fisher will then draw the rope and smash it hard to the seagrass beds to frighten the fishes.	6	4.29
"Laya"		• A typical fish nets with large mesh used to catch bigger fish in seagrass beds.	3	2.14
"Tari-tari"		• A fish net with finer mesh 10-15 meters long established in seagrass areas. While the fisher is on the process of installing the net, the other one will smash the water with bamboo pole going to the direction on where the net was installed to frighten and trap the fishes.	3	2.14

Despite the declining trend on fishery productivity in the Philippines (FAO,2000;BFAR, 2002), majority of the respondents (81.90%) still perceived that the major coastal ecosystems in Dumanquillas Bay such as mangrove, seagrass and coral reefs were still moderately productive (Table 4). For example, the respondents estimated an average of 1-3 kilos of fish in assorted sizes were caught per trip depending on the type of fishing gear they used and where particularly in the bay they go for fishing. The respondents explained that scarcity of fish catch cannot be linked solely to destruction of its natural habitat but also of the increasing number of fishers who went to the sea to fish. They said that if an individual fisherman has an average catch of 1.5 kilo per trip per day that would mean 150 kilos of fish per trip per day for 100 fishers in the municipality. They also cited that if these fishes will be allowed to grow in harvestable size, not that much will be taken by fishers. The fishermen considered January to March as lean season and June to September as peak season. However, due to climate change, during the period of interview, fishers claimed low level of catch with sometimes no catch at all. The respondents were also aware that seagrass beds and coral reefs in the area were dramatically decreasing. In fact, only an estimated of three hectares of remaining seagrass beds can be found in Bualan.It is surprising however that 79.04% of the respondents still rated the seagrass areas as moderately productive because of the presence of malacofaunal species and other valuable species in the area.

Local village officials revealed that heavy siltation along the coastal areas opened livelihood opportunities for people through gleaning. Some of the catch includes *Apogonichthyoides brevicaudatus* or "ibis" and *Aurigequula fasciata* or "sap-sap" which were known to thrive in seagrass and shallow coral reef areas and were always present on the bunch of fish caught every dayusing *sud-sod.* Push nets were regularly used to catch

smaller fishes such as "sap-sap" and "ibis" for the production of salted and dried fish locally known as *"ginamos"* and *"bulad"* (Figure 4).Since the locality lacked post-harvest facilities, adding ample amount of salt to freshly caught fish and drying in the traditional way of preserving their catch were still very common in the area. Salted and or dried fish was far more expensive when sold compared to fresh catch thus the practice. Juvenile shrimps locally known as "*hipon*" caught using sudsod were processed by adding a little salt and dried under the sun for 2-3 days to produce "*hib*i" while the smallest one were mixed with salt and stored for several days to produce a product locally known as *"uyap"* (Figure 4). The respondents also revealed that in Cabug Island there was an abundance offrys of *Chanos chanos* during 1950s to 1980s but together with *Anodontostoma chacunda* or "putian" has now only ranked 6th among the fishes caught by the fishers. It was aslo revealed that collection of natural stock of "bangus fry" was a common livelihood of the people in Barangays of Boyugan West, Bualan and Picanan before but due to overharvesting, habitat destruction characterized by mangrove denudation, chemical pollution, siltation and sedimentation, this natural stock has vanished.

Table 3: Fishers' perception on the status of the major coastal ecosystems in terms of fishery productivity.

Coastal Resources	Productive		Moderately Productive		Not Productive	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Mangrove	6	12.68	117	76.98	17	10.32
Coral Reef	5	0.77	121	91.18	14	7.50
Seagrass	5	0.77	106	79.04	29	19.64
Total	16	3.63	344	81.90	60	14.26

Fig. 4: Products using the traditional way of preserving catch. (*Left to right).* Dried Small Shrimps known as "*hibi"*; Salted Small Shrimps known as *"uyap"* and Dried Fish of Mixed Species locally known as *"sari"* usually of "*sap-sap*" and "*ibis*" species.

Respondents also revealed that juvenile of sardines locally known as *"lopoy"* were also abundantly caught in the area during the months of July to September. Elders narrated that "*lopoy*" first appeared in the place in 1994 with a long stretch of red water encroaching the mouths of the river. Few weeks after, school of juvenile sardines appeared with 200 to 300 boxes trapped at their fish weirs every night. The good catch lasted 2-3 weeks and eventually vanished. Respondents observed that "*lopoy"* appeared seasonally sometimes once in every two years to once a year. Locals shared that the appearance of red water in the sea is their indicator that large volume of "*lopoy*" were coming thus fishing nets and fish weirs will be repaired ready for the big catch. Further, respondents revealed that they were not afraid of red tide because for them that was an indication of good harvests of "*lopoy"* as they have experienced for more than 20 years.

While Dumanquillas bay has relatively diverse coastal resources, a majority of the respondents believed that these resources are already in bad shape (Table 4). The deteriorating condition of these resources was attributed to indiscriminate resource utilization characterized by the use of destructive and illegal fishing methods. Even as a protected area, poor implementation of fishery regulations in the bay was directly linked to lack of logistical and financial support from the national government to carry out conservation and management efforts. The proclamation of the bay as a protected area also deprived the LGUs in exercising their rights over their territorial waters as embodied under the provisions of RA 8550 and the Local Government Code of the Philippines detaching them from the responsibility in the management of the bay. Although the LGUs was involved in the protection and management of bay through the Protected Area Management Board (PAMB) together with the DENR, OGAs, NGOs, academe and various stakeholders, their participation was however

limited since there was shared-responsibility among the members. Moreover, the lack of political will have resulted to weak law enforcement (Aldon *et al*., 2010).

Table 4: The Respondents' perception on the condition of the major coastal resources.

Major Coastal Resources	Respondents' Perception based on Condition					
	Good	Percentage	Bad	Percentage	Not Sure	Percentage
Mangrove Resource	28	20	39	27.86	73	52.14
Fishery Resource	16	11.43	57	40.71	67	47.86
Coral Reefs	4	2.86	52	37.14	84	60
Seagrass Beds	4	2.86	78	55.71	58	41.43
Other marine Resources	3	2.14	30	42	95	67.86
Total	55	7.86	268	38.29	277	53.86

Conclusion:

The coastal resources of Dumanquillas bay is deteriorating and the government is struggling hard to reverse the deteriorating condition but the protected area management board (PAMB) is not empowered and well-capacitated thus only adopted a management scheme to address the problems of indiscriminate utilization of the resources in the bay. It is suggested that to achieve the desired goal of sustainable resource utilization, protection and conservation, management efforts should be simple, clear, non-sectoral and should not be fragmented. Existing laws and policies must be revisited to address the contradictory and overlapping issues that have resulted to a chaotic and ambiguous management of the finite resources of the bay.

Acknowledgements. This piece of work is not possible without the help of the good people of Dumanquillas specifically the respondents from Kumalarang for their hospitability and for sharing their daily experiences in combating the turbulent seas. The Department of Science and Technology is also acknowledged for the study grant.

REFERENCES

Abrogueña, J.B.R., T.U. Bagarinao and L. Chícharo, 2012. Fish habitats in a small, human-impacted Sibunag mangrove creek (Guimaras, Philippines): a basis for mangrove resource enhancement. Ecohydrology & Hydrobiology, 12(4): 311-319.

Anonuevo, M.A.V. and E.E. Zaragoza, 1986. Marketing Practices for Raw Shells, Ornamentals and Shellcraft. In: Proceedings of the Seminar-Workshop on Status of Mollusks Resources and Prospects for Development. Ecotech Center, Cebu City, pp: 83-93.

Barangay Profile of Picanan, 2007. Picanan, Zamboanga del Sur.

Brown, W.H. and A.F. Fischer, 1918. Philippine Mangrove Swamps. Bulletin No. 17, Bureauof Forestry, Department of Agriculture and Natural Resources, Manila.

Brown, W.H. and A.F. Fischer, 1920. Philippine mangrove swamps. In: Brown, W.H. (Ed.), Minor Products of Philippine Forests I, Bureau of Forestry Bull. No.22. Bureau of Printing, Manila, pp: 9-125.

Bunce, L., P. Townsley, R.S. Pomeroy and R.B. Pollnac, 2000. Socioeconomic Manual for coral reef management. Australian Institute of Marine Science, Townsville. CRMP. 2004. Completion Report: The Coastal Resource Management Project-Philippines 1996-2004. Coastal Resource Management Project of the Department of Environment and Natural Resources. Cebu City, Philippines, pp: 179.

Bureau of Fisheries and Aquatic Resources, Zamboanga del Sur-Provincial Fisheries Office. Regional Office 9.

Coastal Resource Management Program (CRMP). 2004. Coastal Resource Assessment of Dumanquillas Bay, Zamboanga del Sur. Department of Environment and Natural Resources, Regional Office 9.

Department of Agriculture-Bureau of Fisheries and Aquatic Resources, 2004. In Turbulent Seas: The Status of Philippine Marine Fisheries.

Department of Environment and Natural Resources. 1996. The Philippine Environmental Quality Report, 1990–1995. Environmental Management Bureau, Department of Environment and Natural Resources, Quezon City.

Department of Environment and Natural Resources. 2001. Philippine Coastal Management Guidebook No. 3: Coastal Resource Management Planning. Coastal Resource Management Project of the Department of Environment and Natural Resources, Cebu City, Philippines.

Dumanaquillas Bay Protected Landscape and Seascape - General Management Plan., 2015-2019.

Espejo-Hermes, J., 2004. Trends and Status of Fish Processing Technology. P. 122-126 in the DA-BFAR (Department of Agriculture-Bureau of Fisheries and Aquatic Resources).2004. In Turbulent Seas: The Status of Philippine Marine Fisheries. Coastal Resource Management Project of the Department of Environment and Natural Resources, Cebu City, Philippines, 378 p.

Food and Agriculture Organization. 2000. Food and Agriculture Organization of the United Nations: A World without Hunger. Fisheries and Aquaculture Department.

Floren, A.S., 2003. The Philippine Shell Industry with Special Focus on Mactan, Cebu. Coastal Resource Management Project of the Department of Environment and Natural Resources supported by the United States Agency for International Development.

Flores, M.J.L., 2014. Abundance and Population Profile of *Helicostyla daphnis* (Stylommtophora: Bradybaenidae), an endemic snail of Cebu, Philippines. Journal of Biodiversity and Environmental

Sciences, 5(1): 477-491.

Ganaway, S.M. and M.L.D.G. Lacuna, 2014. Benthic foraminifera in moderately polluted coasts of Iligan City, Philippines: Diversity and Abundance. ABAH Bioflux, 6(1): 34-49.

Heaney, L.R. and J.C. Regalado, Jr., 1998. Vanishing Treasures of the Philippine Rain Forest. Chicago: The Field Museum, 1-85.

Israel, D.C., E.Y. Adan., N.F. Lopez and J. de Castro, 2004. Perception of Fishermen Households on the Long-term Impact of Coastal Resources Management in Panguil Bay. Philippine Journal Development Vol. XXXI, No.1.

Jara, R.S., 1987. Traditional uses of the mangrove in the Philippines. In Field, C. D., and Dartnall, A. J. (eds.), *Mangrove Ecosystems of Asia and the Pacific: Status, Exploitation andManagement. Proceedings of the Research for Development Seminar held at the AustralianInstitute of Marine Science, Townsville, Australia, May 18–25, 1985*, Australian Development Assistance Bureau and Australian Committee for Mangrove Research, pp: 114-130.

Jin, J., Z. Wang., S. Ran and C. Yun, 2003. Study on Coastal Resource Evaluation Theories and Methods. International Conference on Estuaries and Coasts, Hang Zhou, China.

Katon, B.M., R.S. Pomeroy, M. Ring and L. Garces, 1998. Mangrove rehabilitation and coastal resource management project of Mabini-Candijay: a case study of fisheries co-management arrangements in Cogtong Bay, Philippines. Fisheries Co-Management Research Project Working Paper No. 33. International Center for Living Aquatic Resources Management, Makati City.

Katon, B.M., R.S. Pomeroy and A. Salamanca, 1997. The Marine Conservation Project for San Salvador: a case study of fisheries co-management in the Philippines. Fisheries Co-Management Research Project. Working Paper No. 23. International Center for Living Aquatic Resources Management. Makati City.

Luna, C.Z., C.Z. Silvestre., S.J. Green, M.F. Carreon and A.T. White, 2004. Profiling the Status of Philippine Marine Fisheries: A General Introduction and Overview, p. 3-11 in the DA-BFAR (Department of Agriculture-Bureau of Fisheries and Aquatic Resources).2004. In Turbulent Seas: The Status of Philippine Marine Fisheries. Coastal Resource Management Project of the Department of Environment and Natural Resources, Cebu City, Philippines, p: 378.

McCracken, J., J. Pretty and G. Conway, 1988. An introduction to rapid rural appraisal for agricultural development. Sustainable Agriculture Program, International Institute for Environment and Development, London, UK.

Melana, D.M., J. Atchue III, C.E. Yao, R. Edwards, E.E. Melana and H.I. Gonzales, 2000. Mangrove Management Handbook. Department of Environment and Natural Resources, Manial, Philippines through the Coastal Resource Management Project, Cebu City, Philippines. p. 96.

Mulekom, L. and E.C. Tria, 1999. Community-based coastal resource management in Orion: a case study on the development of a municipal-wide community- based fisheries co-management system. Fisheries Co-Management Research Project Working Paper. International Center for Living Aquatic Resources Management, Makati City.

Municipal Planning Office-Kumalarang Municipal Profile. 2015.

Munoz, J.C., 2002. Fisheries and Coastal Management in the Philippines. Regional Workshop on the Use of Demographic Data in Fisheries and Coastal Development and Management in the Philippines and other Southeast and South Asian Countries, Iloilo, Philippines, March 18-21, 2002.

Pido, M.D., R.S. Pomeroy, M.B. Carlos and L.R. Garces, 1996. A handbook for rapid appraisal of fisheries management systems (version 1). ICLARM Educ. Ser. 16, 85.

Primavera, J.H., 2000. The Values of Wetlands: Landscape and Institutional Perspectives. Development and Conservation of Philippines Mangroves: Institutional Issues. Ecological Economics. 35: 91-106.

Primavera, J.H. and J.M.A. Esteban, 2008. A Review of Mangrove Rehabilitation in the Philippines: successes, failures and future prospects. Wetland Ecology Manage. DOI 10. 1007/s11273-008-9101-y.

Pomeroy, R.S. and M.B. Carlos, 1996. A Review and Evaluation of Community-Based Coastal Resources Management in the Philippines 1984-1994. Fisheries Co-Management Project Research Report No. 6. International Center for Living Aquatic Resources Management. Makati City.

Pomeroy, R.S., R.B. Pollnac., C.D. Predo and M.B. Katon, 1996. Impact evaluation of community-based coastal resource management projects in the Philippines. Fisheries Co Management Research Project Research Report No. 3. International Center for Living Aquatic Resources Management, Makati City.

Saenger, P., E.J. Hegerl and J.D.S. Davie, 1983. Global Status of Mangrove Ecosystems. IUCN Commission on Ecology Papers No. 3.Gland, p: 88.

Saenger, P., and N.A. Siddiqi., 1993. Land from the sea: The mangrove afforestation program in Bangladesh. Ocean and Coastal Management. 20: 23-39.

Sajise, P., M. Espaldon, L. Florece and C. Medina, 1990. Rapid rural systems appraisal (RRSA): diagnostic and design tool for upland development projects. Rainfed Resources Development Project, Department of Environment and Natural Resources, and Institute of Environmental Science and Management, Philippines.

Snedaker, S.C and J.G. Snedaker, 1984. The Mangrove Ecosystem: Research Methods. UNESCO. Bungag, UK. p: 250.

UNDIESA/UNEP., 1984. Environmental Management Problems in Resource Utilization and Survey of Resources in the West and Central African Region.

UNEP., 2006. The State of Marine Environment: A Regional Assessment. Global Programme of Action for the Protection of the Marine Environment from Land-based Activities, United Nations Government Programme, The Hague.

Villaluz, D.K., 1953. Fish Farming in the Philippines. Bookman, Manila.

Walters, B.B., 2004. Local Management of Mangrove Forests in the Philippines: Successful Conservation or Efficient Resource Exploitation? Human Ecology, 32: 2.

Walters, J.S., J. Maragos., S. Siar and A.T. White, 1998. Participatory Coastal Resource Assessment: A Handbook for Community Workers and Coastal Resource Managers. Coastal Resource Management Project and Silliman University, Cebu City, Philippines.

Wernstedt, F.L., and J.E. Spencer., 1967. *The Philippine Island World: A Physical, Cultural,and Regional Geography*, University of California Press, Berkeley

White, A.T., and A. Cruz-Trinidad, 1998. The Values of Philippine Coastal Resource: Why Protection and Management are Critical. Coastal Management Project, Cebu City, Philippines, pp: 96.