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Cultural Beliefs, Practices and Productivity of the Fishery Resource in the Island Municipality of Capul, Northern Samar, Philippines

ABSTRACT

Capul is a small island municipality of Northern Samar situated along the swift flowing San Bernardino Strait. Typhoons often pass through the island especially during the Northeast monsoon season. The inhabitants' livelihood relies mainly on fishing combined with farming. Unstructured focused interview of the elders of the island on their different cultural beliefs and practices related to fishing was conducted. Fish catch was measured in one lunar month each during summer and typhoon seasons. Catch per unit effort (CPUE) was determined for each major type of fishing method. Multiple correlation analysis was used to determine the factors affecting fish productivity.

The islanders still have strong beliefs and respect for deities and fairies supposed to be residing on specific areas of the island. These sacred places remain undisturbed and may have become fish sanctuaries. The inhabitants modified traditional fishing methods to suit their economic needs and condition. People's initiatives and peer pressure have diminished the use of illegal fishing methods in the island such as compressor, dynamite and poisonous plants. The fishery yield was high in comparison with that of other fishery resources of the country. The CPUE for fish net and hook and line methods were high. The inhabitants' cultural beliefs and practices may have led to the conservation of their fishery resource which gave the high yield. There are indications that the yield is sustainable.

Key words: *traditional fishing methods, fishery productivity, deities and fairies, coral condition*

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INTRODUCTION

The Philippines is an archipelago consisting of 7,100 islands. Around 60% of the population lives along the coastal zones (*De Souza 2004*) where the dominant livelihood strategy revolves around fishing and farming. The archipelagic nature of the country coupled with its mountainous terrain has more or less prescribed this condition.

The country's population steady growth of more than 2.0% for a number of decades and the absence of other livelihood opportunities together forced the people to intensify the utilization of natural resources from where the livelihood of the people depend. These two factors have resulted in the environmental degradation of the natural ecosystems such as the tropical forest, fresh water resources and the marine environment. At present, a new environmental threats have emerged as a consequence of global climate change. The predicted consequences of this global phenomenon such as rising sea level and bleaching of corals to name a few, have direct effects on coastal communities. The Philippine government must develop plans to mitigate this impending ecological disaster. A good set of basic information is essential in formulating sound rural development strategies.

Two earlier papers (*Cabili and Cuevas 2010, 2011*) discussed the cultural beliefs and practices related to farming of the inhabitants the island of Capul, a municipality in the province of Northern Samar, in central Philippines. The papers showed that the tropical rainforest cover of the island was destroyed leading to loss of its original flora and fauna. The forest was replaced by a coconut-based farming system. There are indicators that the developed farming system has minimal negative impact to the sea grass community and productivity of the fishery resource of the island.

The island's location, climatic condition and topography dictate and motivate the natives to engage in combined farming and fishing strategy that resulted as a product of shared local knowledge, lived experiences and the in-depth understanding of the biophysical environment and occurrences of natural phenomena. For centuries, the islanders relied on the upland and coastal subsystems to satisfy their basic and other needs. This present paper focuses on the cultural beliefs and practices related to fishing and how these influence the productivity of the

fishery resource of the island. It provides additional base line information on how the people of the island of Capul live, utilize and maintain the island natural resources for half a century after the World War II. All these gathered information can help develop strategists for a sensible, long-term approach to environmental problems of the many similar island municipalities of the country.

MATERIALS AND METHODS

Study Site

The study was conducted in the island municipality of Capul, Northern Samar from January to December 2007. The island lies southwest off the western tip of Northern Samar, situated close to the San Bernardino Strait and is heavily influenced by the western current from the Pacific Ocean and the eastward current from the West Philippine Sea. It appears on the map as an irregular rice grain shaped island at 12°25' 22'' N and 124° 10' 50'' E (**Figure 1**). The nearest landmasses are San Vicente, another island town of Northern Samar on the south, Sorsogon on the north, Samar Island on the east and the island province of Masbate, on the west. It is part of the eastern sea gate of the Philippines to the Pacific Ocean. Historians have attested that ships of the Manila-Mexico Galleon Trade in the 1700s have used the island as a stop-over during typhoons or when there was slack in the ocean current needed to propel their ships. The name Capul is the shortened version of Acapulco. It is in the path of tropical cyclones emanating from the Pacific Ocean during the northeast and southwest monsoons and is often devastated by strong typhoons.

Gathering of nformation on cultural beliefs and practices

Unstructured interviews of key informants to get data and information on cultural beliefs and fishing practices and gears were conducted. The purposive sampling method, a non-probability type of sampling, was used in choosing the key informants who are usually the elders actively

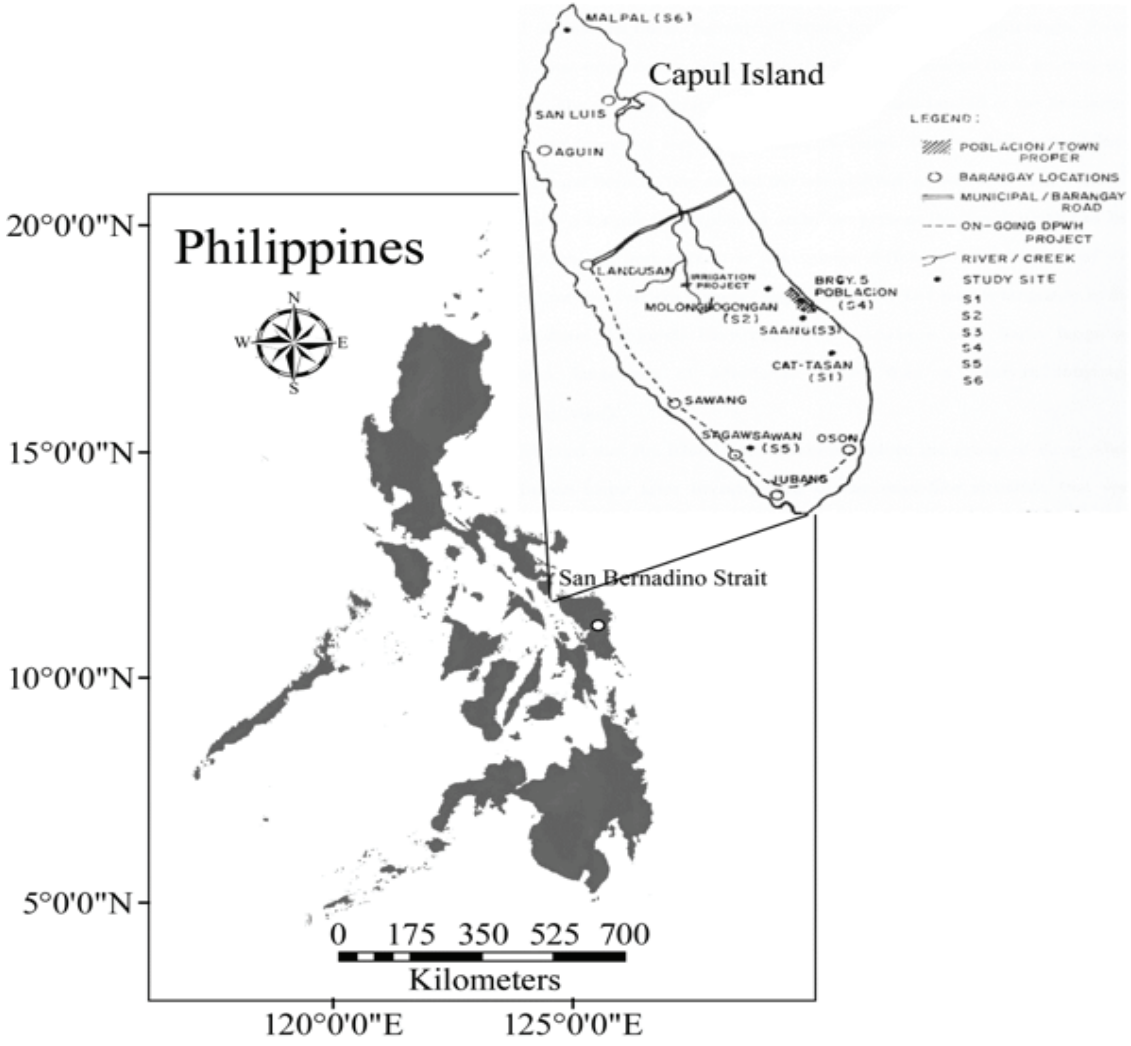

Figure 1. Map of the Philippines locating Northern Samar, San Bernandino Strait and the Island Municipality of Capul and the different barangays of the municipality.

involved in the affairs of the village. The senior author (who is well-versed in speaking the language of the place), a native of the place directly observed the people's way of life and established rapport with the local people, most especially, the farmers cum fisher folks in every barangay. This method was used since some of the old islanders find difficulty reading and writing. A focus group discussion with the group consisting of five to ten farmers cum fisher folks and old villagers was also conducted to validate the data gathered from unstructured interviews of key informants.

Fish Productivity Measurement

Data on fish catch was monitored in ten fish buying stations in the island in the months of April-May for summer months and October- November, 2007, for typhoon months. In the town proper, comprising seven barangays and two big sitios. The daily fish catch for a whole lunar cycle of 28 days was monitored during the summer, when the sea was calm, and during the rainy season, when the sea was rough. Each buying station had an assigned monitor to get the accurate weight of every fish species caught (*Maneja 2003*). Weight of catch was obtained by using a top-loading weighing 100-kg balance provided in each station. Monetary value of the fish catch was computed based on the prevailing price per kg of fish in the buying station.

From the data of fish catch taken from the survey, CPUE (catch for unit effort) was obtained by dividing the total weight of catch over the total fishing effort in terms of man per hour. The effort was expressed in man-hour in order to account for the variation in the number of fishermen per fishing trip (*Maneja 2003*). CPUE of every fishing gear was computed. The average number of fisherfolks and the average number of hours spent for fishing were estimated based on the interviews with the fisher folks and fish buyers who monitored the fish catch. **Table 1** presents the location of the sacred places and the different fishing practices used in the areas surrounding the buying stations.

Correlation Analysis

To determine the degree of influence of different parameters arising from the cultural practices and beliefs on fish productivity, quantitative values were assigned to the parameters. These parameters were deduced from the interview with fisher folks but were qualitative in nature. The values assigned (**Table 2**) were based on the observations of the authors on the biophysical features of the Island of Capul. The data on the status of the coral subsystem assessed by *Mode* (*2004*) were included since massive corals grow very slowly (0.5 cm to 2 cm per year, CORIS Noaas Information system, downloaded 5-1-2012) and therefore condition in 2007 may not have changed significantly. The different factors and their assigned numerical values following the directives given in **Table 2** were correlated (**Table 3**). These assigned values were used for Pearson correlation analysis of each identified factors to fish productivity, and for stepwise correlation to determine hierarchy of influence of the different parameters to fish productivity.

RESULTS AND DISCUSSION

Beliefs and practices related to fishing

Sacred places

The islanders at present 21st century still believe in deities and fairies. There are places along the coastline and islets where people believe are dwelling places of these supernatural beings and are highly revered. In their perspective they are stakeholders of the areas and therefore their rights should be respected. These places are: *timon-timon* rock- a stiff cliff with an erosion resistant rock shaped like a rudder where the word ACAPULCO (the name of the Manila- Mexico Galleon trade of the 1700s) was engraved and from where the name of the town CAPUL was taken; moroporo islet - small islet near the town proper of the island; *makaraha* grassland – mounds shaped like frying pans where grasses are the dominant vegetation, *Madiki Takut* (Rubi Shoal), and *Mahaya Takut* (Diamante Rock). The last two are reef-forming atolls situated 3.2 km and 4.6 km away from the island, respectively. No cultivation or fishing is done in these sacred places, however, rituals are done as a sign of reverence/respect to the deities which are considered stewards of these places, thus these places remain undisturbed. If ever a disturbance is unavoidable, rituals are administered and prayers are said either to ask permission for the work to be done or to appease the spirits dwelling on them for the intrusion to be made. Rituals done before fishing in sacred places are presented in **Table 4**. Respect for these places may unconsciously lead to conservation of the fishery resource. The belief on supernatural beings giving punishment to people who disturb the environment of these sacred places constrained destructive fishing methods. This has made the areas fish sanctuaries where the fishes can take refuge during spawning period and from their natural enemies. The elders of the community relay incidents and stories to the present generation, which strengthened the people's beliefs on deity as guards of the sacred places. This belief has significantly conserved and maintained the ecological balance of the island ecosystem. The two atolls, *Madiki Takut* (Rubi Shoal) and *Mahaya Takut* (Diamante Rock) arethe best fishing venues especially for deep sea hook and line fishing.

Table 1. Buying station, location of sacred places, and fishing methods used in areas surrounding the fish stations.

Buying Station /barangay	Sacred place present	Type of fishing method used	
		Resource conserving - traditional methods	Destructive practices
Poblacion	Small rakit	Non- motorized banca, pamangaraw and fish nets	None
San Luis	Moroporo islet	Motorized banca, Pamagaraw and fish nets	None
Bel-at	None	Non-motorized banca, Pamangaraw and fish nets	None
Aguin	None	Motorized banca, Pamangaraw and fish nets	None
Landusan	Makaraha grassland	Motorized banca; Fish nets/Sea water aquarium	None
Tugsaban	None	Motorized banca, Deep sea fishing nets (pokot, tagata, dala)	None
Sawang	Caves	Motorized banca, Deep sea fishing nets (pokot, tagata, dala)	None
Sagawsawan	None-	Non- motorized banca, kaw- ot or shellfish gathering, fish nets	Shell fish gathering - corals destroyed)
Jubang	Reef-forming atolls	Motorized banca	Use of compressor; dynamite fishing
Oson	Timon-timon rock	Motorized banca, Pamangaraw and other fishing gears, coral gathering prohibited	None

Table 2. Quantitative values assigned to the different parameters arising from the cultural practices and beliefs related to fishing of the inhabitants of Capul and condition of the coral subsystem as assessed by (*Mode 2004*).

Parameters	Numerical values assigned
Presence of sacred places	Scale 1-10
Resource conserving fishing practices	Scale 1-10
Use of non-motorized banca	2
Use of motorized banca	1
Use of traditional small scale fishing method	3
Strict implementation of rules of fishing passed by LGU	4
Prohibition of coral destruction/sale of coral skeleton	8
Use of coral destructive fishing methods	Scale 1-5
Large scale destructive method	(-)5
Small scale destructive method	(-) 2
Condition of the coral reef	Scale - 1-10
Very good	10
Good	8
Fair	4
Poor	1

Table 3. Factors affecting the status of fishery resources around the fish buying stations in the island of Capul for the calendar year 2007.

Buying Station	Coral reef area (ha)	Factors that were correlated							
		% Live coral cover (based on assessment of Mode 2004	Numerical values assigned to the different factors affecting the status of fishery resource				Fish productivity (kg)		
			Condition of corals	Presence of sacred places	Type of fishing method used				
					Resource conserving	Destructive	Dry (calm sea)	Wet (rough sea)	Computed total catch (kg) for one year
Poblacion	43.0	56.0	8	3	5	0	2,262	600	16,572
San Luis	8.0	15.0	1	10	4	0	1,225	382	9,260
Aguin	3.4	14.5	1	0	4	0	655	394	5,168
Landusan	3.0	15.0	1	10	4	0	2361	1291	20,621
Sawang	1.6	15.0	1	5	4	0	673	1,324	10,658
Sagaw-sawan	0.27	6.7	1	0	3	-2	94	444	2,784
Jubang	1.4	15.0	1	10	4	-5	724	387	6,279
Oson	7.5	34.0	4	10	8	0	870	15,303	81,735

Table 4. Rituals done before fishing in places the natives of Capul, Northern Samar considered as sacred.

Rituals Done Before Fishing	Sacred Places		
	Timon-Timon	Madiki Takut	Mahaya Takut
Pag-agon	/	/	/
Paharang	/	/	/
Throwing odd number of coin denomination with prayers	/	/	/

Table 5. Fishing practices done and gears used in fishing grounds close to sacred places.

Fishing Practices Done/ Gear Used	Madiki Takut	Mahaya Takut	Timon-Timon
Pamangaraw (hook and line	/	/	/
Rambo			
Lago'lo	/	/	/
Kitang	/	/	/
Pukot (Net Fishing)	/	/	/
P*ukot si kalaluman* (Deep	/	/	/
sea net fishing)	/	/	/
Tagata (coastal net fishing)	/	/	/
Dala (cast net)	/	/	/
Pamana (Speargun fishing)	/	/	/
Compressor	X	X	X
Tigaw-tigaw	X	X	X
Tubli	X	X	X
Shellfish gathering	/	/	/

The favorable conservation outcomes of the coastal fishery resources are evident in the remaining pristine sea environs and the presence of intact live corals on the sites. These observations are corroborated by the survey done in 2004 by a non-government organization, Management and Organization for Development, Incorporated (MODE). A rapid assessment of coastal and marine resources of the island estimated 289 ha of seabed predominantly covered by coral reefs within the 100 m coastal waters of the municipality. The island has an estimated aggregate live coral cover of 68 ha (25%). The study gave a general assessment of fair condition for the coral subsystem for the whole island.

This condition of the coral reef status of the island is very much better compared to the rest of the country. *Nañola et al.* (*2004*) presented evidences that there is a steady decline of excellent condition from 5% to 3% to > 1% for the whole country. The most recent survey on coral reef status showed that barely one percent of the 25,000 km^2 of coral reef in the Philippines remains pristine (*Lynne Malcolm 'Balancing Nature' on ABC Radio National's Science Show 1-26-2008*). The overall fair condition status of the coral resource of the municipality could also be indicative of the attitude and behavior of the people. Barangay Oson, one of the seven barangays of the municipality, has well-disciplined fisher folks. No harvesting of corals for commercial purposes is observed. Different fishing practices and gear are used in fishing grounds surrounding these sacred places (**Table 5**). The practices show that the people believe that protecting their coastal and marine resources sustains their major livelihood of fishing.

The continuation of the people's cultural fishing practices has been tested by the different local government administrations of the municipality. The past local government under the leadership of Mayor Castillo (1999-2007) had declared the sacred areas as fish sanctuaries, while the next two governments (2007 – present) abandoned this idea. Despite the non-emphasis of the present government on the protection of fishery resources in the sacred places, there was not much disturbance happening on these areas.

Fishing gears, practices, local knowledge, tradition and culture

The fisher folks' fishing activities match the *tuig* (season)- refering to the months of prevailing winds and *landos,* the direction of flow of the current in the region. March to August (dry season) are the months most fit for fishing with May as the best, when fishes undergo pagbiyod (spawning). The months of October to February (typhoon season) are experiences by strong winds and rough seas caused by North East monsoon winds and typhoons, on one hand. On the other hand, the sea current is calm during these months, which offers good opportunities for fishing. To the fisher folks, the two indicators for good fishing conditions are *humugot* (low tide, westward direction) and the direction of the current flowthat is towards the lighthouse or San Bernardino Strait. The good current flow is fit for fishing twice in a day, i.e., more or less five hours in the afternoon and the same number of hours in the evening. Local fishers also consider the phase of the moon as an indicator. The best time is usually few days before the last quarter (*katallo luyo si kawara*) and few days before the full moon (*kaodto si kadayaw*). The information passed on by the elders to young generation includes their knowledge on *tuig* and *landos* which help improve fishing efficiency.

Gears

Interview and observation of the fisher folks' fishing gears reveal their ingenuity and innovativeness. The skills in making traditional fishing gears were handed from the elders, while modern designs are patterned after the fgears used by fishermen of nearby municipalities. Gear use varies with experience, the investment capital of the fishermen and

the motive of having more catch to satisfy the needs of the family. The variation of the fishing gear may range from the traditional and less expensive to the more sophisticated and expensive gears. The fishermen base their choice of fishing gear on their knowledge of the gear, the ease of use, initial cost, and seasonality, which suggest that choice is no longer solely influenced by tradition (*Mangi et al. 2007*). There are different gears used by fisherfolks for different target catch types in various barangays (**Table 6**).

Hook and line gears. The gears are classified as: inexpensive pure hook and hand –held line; hook with the line tied to a curved bamboo stick; *Lago'lo'* type - hook and line but with artificial fish bait called *rapala* accompanied by a stone drop; d) a variation of *Lago'lo'* that uses artificial shrimp called *Rambo* as bait; *Kitang*, a thousand-meter long main line with perpendicular lines attached to it with hooks and fresh fish baits. The *rapala* (**Figure 2**) is a wood carving, tailored and colored just like a real small fish with two hooks on it. This is tied to a stone (about 2-3 kg) as weight and dropped down to a desired depth leaving the *rapala* in the fishing line. The use of stone drop poses threat to the coral reef. Large quantities of stones are dropped in one day which can change the fish habitat structure and make the water shallow. However, the use of *lago'lo* with *rapala* protects the juvenile fishes from being caught as most of the catch are big and mature fishes (I*n-Fisherman 2007*). *Rambo* is an artificial shrimp made of wood artificially carved, and beautifully painted (**Figure 3**) that in a distance it really appears like a real shrimp. It is usually 20 cm X 8 cm in dimension - double the size of the real shrimp. The hooks are placed at the tail and middle-back of the artificial bait.

The use of artificially carved fish and shrimp as bait is noteworthy. Such creative designs lure quality big fishes and ensure more catch, thus more income for fisher folks. Using these baits is not based on luck. It is a display of the people's ingenuity, and mastery of the science of deception (*In-Fisherman 2007*), experience and deeper knowledge on the biology of fishes and other characteristics.

Kitang is an expensive gear with the hooks and the lines costing more than two thousand pesos (PhP 2,000.00) and the fresh fish baits for single-day fishing cost five hundred pesos to a thousand pesos (2007 PhP value). This type of gear is used in deep sea fishing and is tied to a motorized *banca* that enables fishers to catch big sized fishes. The whole assemblage of big main line and smaller lines with hooks and fresh baits (**Figure 4**) is simultaneously dropped into the deep sea. The tautness of the main line indicates the volume of fishes that took the baits and hooked. The taut main line is pulled towards the motorized banca. If big fishes are caught fishermen use *buros*, big spear usually 2 m long (**Figure 5**), to kill the big fish first before putting it in the banca. The initial cost of the fishing gear is easily

Table 6. List of the fishing gears used for the different types of fish resources and the barangays where these gears are used.

Gear	Expected Catch	Place of Fishing	Sustained Reserved of Species	Endangered
Kaw-ot	Shellfish / Mollusks	Barangay. Sagawsawan,	-	/
Pamangaraw		Oson, Sawang, Landusan	/	-
Kitang	Budlis, Turingan,		/	-
	Ahaan, Kugtong &		/	
	other big fish		/	
Rambo/Lagolo	Kanoos (Squid) etc.		/	
Timing – Timing	Small toros, Coral		/	
	fishes	All throughout the Island	/	
Taklob	Gangis, Balawis,		/	
	Coral fishes		/	
Bobo	Coral fishes, shrimps,		/	
	crabs		/	
Pamana/Spearguns	Coral fishes, crabs,		/	
	etc.		/	
Pokot	Big fishes		/	
Tagata	Big fishes		/	
Pamurugkas	Burugkas		-	
Dala	Big fishes		-	
Panilo	Fish, crabs, etc.		-	/
Compressor	Coral fishes, shellfish	Barangay Jubang		/
Tubli	Coral fishes	Barangay Jubang		/
Tigaw-tigaw	Coral fishes	Barangay Jubang		

Figure 2. *Rapala* (wooden baits) of different styles.

Figure 3. *Rambo*, artificial shrimp baits twice the size of actual shrimps.

Figure 4. one meter – segment of *Kitang*; one of the hook and line gears.

recovered with just one big fish catch event. Fishing expedition becomes more profitable with higher frequency of big fish catch episodes. However, only few fisher folks make use of *kitang* due to the expensive initial investment since most of the islanders are subsistence fisher folks. Some folks resort to loaning from middlemen to finance its construction. Such practice allows the fish buyers to control prices of fish catch limiting the fishers' opportunity to get higher profit for themselves. At present, the local fishermen modify *kitang* by shortening the length of the main line and decreasing the number of hooks to reduce the cost of

Figure 5. *Ka'ot* (hook) and *Buros* (spear).

construction. The *kitang,* however, is dropped in a not-so-deep sea level of not more than150 m deep (human arm stretch). Motorized *banca* is substituted by a hand-mechanized *banca*. Such ingenuity allows some low-income fisherfolks to earn more with less financial investments. Modifications of gears like some of the present day *kitang* are the fruits of the fishers' exchange of ideas, day to day experience, and deeper knowledge on the biology of fishes and other characteristics.

Fish trap gears. These are basket-shaped gears of varying sizes. The size of the basket is adapted to the depth of the place of drop and to the kind of fish inhabiting the area. *Timing-timing* (trap for small fishes) is a small round basket gear, usually one foot in diameter made from *mamban*, (*Donax cannaeformis*) trunk. Green algae fastened at the bottom of the gear are used as baits. The gear is used during summer by low-income fisherfolks or by young boys 10-14 years old. This gear is dropped at 1 to 2 m depth. Small toros (siganids) and coral fishes are usually caught. The gear is cheap as the materials are available within the fisher folks cum farmers' farms and they themselves weaved it.

Taklob (**Figure 6**) is another basket-like fish trap about 1 m in diameter that uses *mamban*, *uwag* (rattan),

kawayan (bamboo) or *balukawi* and comes in different sizes. *Taklob* is used to catch *balawis* and is comparatively three times bigger than the *timing-timing*. It is usually dropped at three m depth. If it is designed to catch *gangis* (*Nasotuberosus*) and other coral fishes, it is usually double the size of the taklob for *balawis* and usually placed in a coral reef 10 to 15 m deep.

Bobo is another fish trap but rectangular in shape. It is twice bigger than the *taklob* (2 m X 0. 6 m). This gear uses no bait and therefore requires less fishing time and effort. Monitoring and taking off the catch is done twice in a week only. It is dropped 15 to 20 meters deep and allows epiphyticalgaeto grow on it. Such depth of dropping minimizes coral disturbance. Various species of coral fishes may inhabit the *bobo*, trapping them inside.

All these fish trap gears need four stones approximately three kilos each for anchorage so they will not be moved by waves. For the *taklob* and *bobo*, it will be pulled up to the banca to harvest the catch with the use of a kaghid. Kaghid is a pulling device made of "V" shaped wood (usually one foot long) but a little long at one end and tied with a long string (**Figure 7**).Costs of fishing using traps are relatively low because the baits used (*lumot* or algae) are growing locally,

Figure 6. *Taklob* or big fish trap.

Figure 7. *Kaghid* (the one held), a pulling device.

collected mainly from the shore or fresh water ponds, and in the coast where sea urchins thrive. Construction and repair of traps are done by the fishers themselves. The designs of the *taklob* and *bobo* depends on a good local knowledge of tides, currents, habitats and fish behavior. A fisher unfamiliar with these information would have minimal catch. The acquisition of this comprehensive knowledge on traditional fishing practices requires huge investments in time and experience, including the construction, repair and maintenance of making trap fishing less attractive to young fishers (*Mangi et. al. 2007*).

Spear gun gear. The main gear is called Pana (a metal rod uses one to two meters long dependent in the depth of fishing area and the intended catch, triggered by a wooden gun-like structure). The use of this gear is accompanied with the use of antipara (goggles). Some folks also use panyapak or flippers (**Figure 8**). Improvised flippers are made either of wood or plastic materials hold tightly to the feet with rubber strings. All materials are taken from drifting wastes from the sea. When *pana* is used during the night time, this method uses flashlight wrapped with rubber to avoid leakage of water in it.

Fishnets. *Pokot, tagata* and *pamurugkas* (**Figure 9**) are similar in structure, but differ in the size of the mesh and the consequent species of fish the net is intended to catch.All forms of nets use *pamato* (metal anchorage) and involve a motorized *banca* during fishing activities. *Pokot* has a square inch mesh and is intended to catch all species of fish found in a 3 to 5-meter deep sea.The *Pokot* with a bigger mesh size and with longer span than an ordinary one is dipped in an open sea and is intended to catch big-sized fish. It needs large crew size but gives relatively high catch and per capita returns compared to other types of nets. *Tagata* differs from the pokot in mesh size; it is netted in such a way that each mesh would not allow a fish about 2-inch in diameter to pass through. This gear intends to catch small coral fishes. *Pamurugkas* is used to catch *burugkas* only. The mesh is about a centimeter in diameter.

Dala is a net fishing gear used to catch big fish at day time during months when the sea is rough. It is thrown simultaneously with the waves in the coastal area, as the fishermen believe fish swim to catch the bubbles of the waves. At night time, the movement of the schools of fish is an indication when and where to throw the dala. This gear ensures the availability of fish even during inclement weather.Throwing the net at the exact places and time requires extra ordinary skills such that mostly elder fisher folks practice it.

Sharing of the returns of the fishing activities depends on the type and size of net. When larger nets, like *Pokot* and

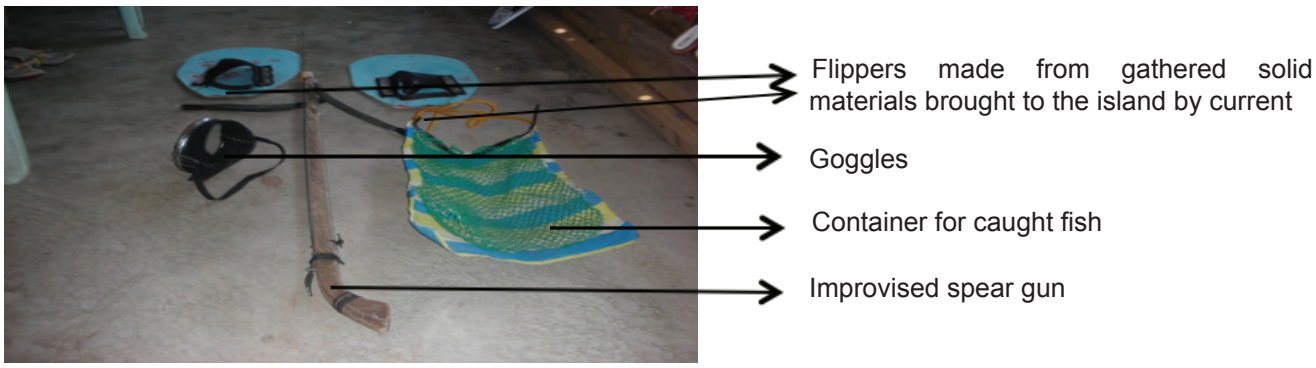

Figure 8. *Pana* (spear gun) and accompanying paraphernalia.

Figure 9. Types of fish net: (a) *Pokot*; (b) *Tagata*; and (c) *Pamurugkas*.

Tagata are used, the total amount of sale is divided into three shares. One part is the net owner's share, while the remaining two shares are equally divided among the crew (fishermen). In ordinary nets, the net owner, *banca* owner, and the crew have equal shares of the catch. Net fishing is very attractive to ordinary fisher folks employed as crews since they are not required to contribute cash inputs during fishing activities. Fishnets need a huge capital for initial investment, however, the gear has a long life span and hence, over time it becomes a worthwhile investment. A well-managed and carefully maintained net can last up to more than ten years compared to motorized boats that require big capital investments.

Along with the practice of using these fishing materials and gears is a ritual called *pag-agon*, believed to ensure big fish catch and prevent bad luck like accidents and small catch. The *pag-agon* is usually done during the first day of the gear's usage and when the fisherman feels he can hardly have a good catch. In the ritual, the gear is whipped with *pandan* and *panauli* leaves accompanied by prayers are said for abundant catch. Permission to the unseen stakeholders is also asked. Another way of doing *pag-agon* is by burning *kamangyan* (myrrh) in charcoal and letting the gear be smoked. This practice also strengthens the material the gear is made of because of the heat exposure during smoking.

Traditional fishing methods

The most common method is the hook and line locally known as *Pamangaraw* (*lingkawan*) and comes in three forms hook and line on the shoreline: hook and line using a non-motorized *banca* and hook and line using a motorized banca. The islanders with less capital usually fish only on the shoreline or on waist-deep water (0.5 m) either by hand line or hook and line with bamboo stick. Since the materials are common and simple, this is the least expensive and least damaging among the hook and line fishing methods. Damage to fish and habitats through removal of high proportion of juvenile fish is minimized and direct coral damage is avoided (*Mangi, et. al. 2007*). Hook and line fishing using a non-motorized banca is done from 10 to 20 m depth. Yielding different sizes and kinds of the fish catch. *Pamangaraw* can be done either in the day or nighttime depending on the tuig or season. Hook and line using a motorized *banca* can be in the form of *kitang, lagolo* or *rambo*. These require high initial costs; however, fisher gets a large return from the usual big catch.

Trap fishing is another commonly used fishing method employing the different trap fish gears described above. People's deep knowledge of the sea environs is shown by the timing of dropping of the trap gears known as *pagtunod*. It is highly dependent on the *landos* (direction or flow of the current). The best dropping time is during *humugot*, when the current is towards the lighthouse or during tumaob when the moon is about to set. A fisherman's *taklob* is dropped in one setting. The distance of one *taklob* is few meters away from the other *taklob* for safeguarding and for easy harvesting. In the rough months of August to February, but still tolerable for fishing, placing the *taklob* in the *turis*

(gully) during night time is a mechanism to safekeep the gear from strong waves. *Pagtibaw* or visiting and at the same time harvesting the catch is during *humugot* or exactly the same with the *pagtunod*. This is done two to three times in a day. These practices that are considered as human assets emanated from the islanders' day to day association/ integration with their environment resulting to effective adaptive mechanisms to pursue livelihood activities even at times the weather limits the opportunities.

Pamana is a method that uses spear gun and can be done either day or night. It uses a *pana* (spear), *antipara* (goggles), and *panyapak* or flippers (**Figure 7**). The method fits the common fisher folks since this requires the least monetary cost. Spear guns require low initial costs, and no cash input in maintenance, and no boat are required. However, spear guns are associated with high labor input when using them and require relatively longer time in fishing. In addition, though it is cheap, it is also the most damaging to fish and habitats by removing of high proportion of juvenile fish causing high rate direct coral damage per unit catch and unit area (*Mangi et al. 2007*).

Panilo is another method only done during night time, either at low or high tide. This method uses a kerosone-powered source of light called petromax or taway. During high tide, the petromax is hand-held on a knee-deep level to see the desired fish catch. During low tide, *panilo* is done in the coastal coral line. Fish and other mollusks are usually caught and gathered. *Sundang* or sharp pointed *bolo* and *pana* or spear gun are used to catch the fish, crabs and a lot more.

At times, circumstances force fisherfolks to go on fishing even if the phase of the moon and the flow of the current are not fit for fishing. The common reasons are: if a member of the family is sick; a high school or college student in the family needs money; there is a special occasion, fiesta is coming; or the family does not have anything to eat.

Illegal fishing methods

In contrast to the above described fish-conserving gears and traditional fishing methods (**Table 6**) that are resource-conserving are the illegal methods very few islanders still practice at present.

The use of poisonous plants is one of the illegal fishing methods used by the fisher folks. It started in the 1940's and continued until their use was banned in the 1980s. Farmers cultivate these plants in their farm or in their yard up to the 1970s. Plant saps of *Tubli* (*Derris elliptica*) and *Tigaw-tigaw* (*Callicarpa formosana*) are used to poison fishes in the coastal zone and in seagrass communities. At present, only very few use them and only at night to avoid detection as people report them to the authority. Such is an indication of the awareness of the ill-effects of the illegal act to mankind and the environment. Rarity of these types of plants further signifies intolerance of the fisherfolks on illegal fishing using poisonous substances.

Use of *Kum'prisor* or compressor fishing is another illegal fishing method in Capul. It uses a motorized *banca* with two engines in it. One engine runs the motorboat and the other engine is for the different equipment used to supply oxygen to the divers while on the seafloor 50 to 100 m deep. In the island, the small scale method where three to five persons run the whole *kum'prisor*, is the most common type of compressor fishing.

In Cebu and Palawan, the method is comparable to the *pa-alinga* form of net fishing. It uses two big shipping vessels and employs around 40 fishermen in each boat crew. Compressor is the machine used to provide air underwater. The purse-shaped net is usually dropped in areas where fishes congregate, identified by sonar vibrations, usually at over 50 m to about 100 m deep. It is a variation of the banned *muro-ami*. In the latter method, fishermen used rocks to bang the coral reef to drive fishes towards the net. In *pa-aling,* instead of rocks or weights, fishermen use air bubbles to drive fish into nets, causing less damage to reefs. The bubbles come from a series of long tubes connected to the compressor. In both *muro-ami* and *pa-aling* the crew arranged themselves in a line acting as a human barrier on the other side of the reef. The men then march slowly over the reef towards the net pushing all types of fish into the net. The net is then shut and floated to the surface to be pulled on to the boat. In *pa-aling* fishermen divers also use the tubes from a compressor to breathe underwater which allow them to stay in the deep for over half an hour at a time. *Pa-aling* is so efficient that fishermen can catch more than 50 percent of the fish standing stock after a short series of dives over an area. *Muro-ami* was banned in 1986 since it was proven to be dangerous for children-divers and destructive to the coral reefs. *Pa-aling* is as dangerous and as destructive as *muro-ami*. The divers can die or be paralyzed if they cannot get enough air when the supply tubes from the compressor get entangled. The high efficiency of the process results in rapid depletion the fish stock even in remote coral reefs (*Andreo Calonzo GMA News TV January 2011 and Timothy Allen Timothy Allen humanplanet.com/timothyallen/2011/01/pa-aling-fishing* (*downloaded, May 10, 2011*).

In Capul, the *kum'prisor* method entails the biggest initial and maintenance capital of all the fishing methods

used in town. It started in the early 80s when there were more or less five groups operating. As mentioned, it endangers the health of the crew. In the municipality, there were crews that end up with paralyzed bodies. In the 1990s, the rising initial and maintenance cost and the increasing awareness of the people on the hazard this method brings and the perception that the *kum'prisor* does not do good to the coral and fisherfolk communities pressured the practitioners such that operators voluntarily stopped the operation. Lack of capital to maintain the operation also helped stop this practice. Only one operator remains at the time of this study. Dynamite fishing is also one illegal method employed before. At present, peer pressure eventually forced this method to be abandoned.

Despite the danger and hazard it brings to the health of the common fisher folks (crew) the *kum' prisor* is very attractive because of the high return and big share each crew member receives every fishing trip. The very low capital investment on the part of the crew and low skill requirement add to the attractiveness of the method among fisher folks. After taking out 10% of total sales to pay the expenditures, the owner and the major crew (divers and the engine man) take equal share while the water boy takes half of a single share.

Fish Productivity

The fish catch survey was conducted in two periods - one when the sea was rough (November - and another when the sea was calm that covered the complete phase of the moon. Data revealed that the island accumulated a fish catch of 20,126 kg in 28 days during the rough sea period and 8,864 kg in 28 days during the calm sea period in 2007. This means that the island has the potential to provide an estimated annual total of 115,355 kg of fish (**Table 3**). In barangays Landusan, Oson and Sawang the sea productivity were high during the typhoon season, the period when the sea is rough but the ocean current is good. At this time fisher folks have higher fish catch as the big, mature fishes move out of their refuge in search for food after few wavy days. Big quantity fish catch was directly delivered to the nearby places like Matnog, Sorsogon or Allen, Northern Samar because of the relatively high price than when the catch was sold in the island. The whole island had an approximate annual fish value of PhP 11,849,120 – 2007 PhP value (Table 3).There were 47 identified species of seagrass fishes during the rough sea period, and 21 seagrass fish species during the calm sea period. There were 108 pelagic and demersal open sea fish species identified during the rough sea period, and 56 species during the calm sea period. This means that the seagrass offered refuge for fishes during rough sea period. The high fish species richness during rough sea is an evidence of the good condition of the seagrass community and the coral subsystem functioning as fish refuges.

The study revealed that during the period when the sea is calm (March-April 2007 sampling), the average CPUE of the five fishing gears is 8.27 kg mhr^{-1} compared to the 10.89 kg mhr^{-1} average CPUE of the same fishing gears during the rough sea period (**Figure 10**). During the calm sea period, net fishing had the highest CPUE of 24.35 while compressor had the least with 1.23. It was fully known in the island that compressor fishing is prohibited. Such decline of catch could also be attributed to the closure of some compressor operation, leaving only one operator during the conduct of the study. On the other hand, there are possible reasons for the decline of the catch in the *Maharaya Tahut* coral atoll. Shell fish gathering especially deep-sea shellfish *koya* and *sisi*, commands high commercial value within and outside the island, but severely damages the coral reef.

Speargun fishing came out to have a CPUE of 7.57 indicative of the good condition of the coral cover and fishery resources in the entire island. This fishery method is done in shallow portion of the coastal zone. The majority of the fish caught were coral fishes. The high CPUE further indicates the good status of the fishery resources and the coral line. The increased CPUE during the rough sea period could be due to the people's knowledge that after the storm or wavy days the sea is so calm and the flow of the current is generally conducive for fishing. Fish seasonal migration could also be one of the reasons that further strengthen the good status of corals for fish spawning, directly contributing to the high availability of food in the area. This further implies deeper knowledge of the local people of the fish ecology and the life cycle of different fish species.

Hook and line is the third with the largest CPUE of 5.74 kg mhr^{-1} during the calm sea period at one hand, On the other hand, it has the highest CPUE during the rough

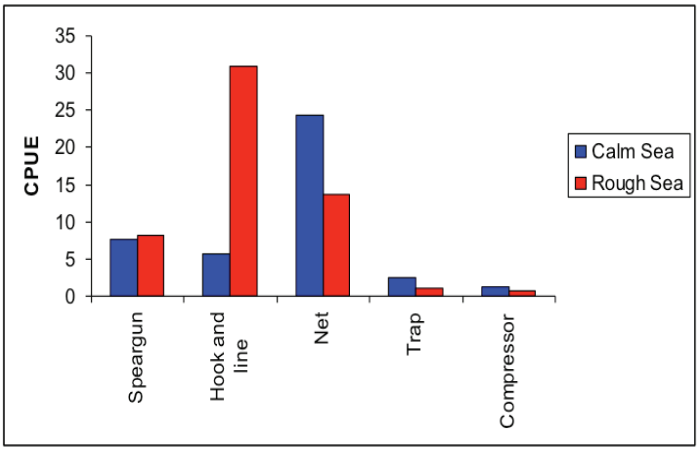

Figure 10. CPUE of five fishing gears during the calm and rough sea periods.

sea period with 30.91 kg mhr^{-1} (**Figure 10**). The increase brings implications like good condition of the fish resources and the coral cover.

Aside from the fishers' local knowledge of the temporal distribution of fish species, the high CPUE of hook and line recognizes the island fishers' ingenuity of designing baits. These are less expensive than when using real fish for baits and besides, artificial baits really lure and deceive fish for more catch. Each *paon* (bait) usually captures the target fish species. Proven for instance is the *rapala* that catches thigh-sized mature yellow fin; *rambo* gets the large-sized *kanoos* (squid), and a lot more. The 18.32 kg mhr^{-1} average seasonal CPUE is far above the CPUE of the same gear in Bolinao, Pangasinan, one of the rich municipal marine fishery resource in Luzon which ranges from 2.18 to 3.83 kg mhr^{-1} (*Maneja 2003*). It is important to note, however, that the present study covered daily catch for one month during the rough sea period and the calm sea period, while that of *Maneja* (*2003*) was done per fishing boat trip for one year. CPUE in Bolinao for hook and line was aided by a fish aggregating device (FAD) at the open sea area west-northwest of Bolinao (*Maneja 2003*). The CPUE for hook and line in the open sea of Capul was 5.74 kg mhr^{-1}during the calm sea period and 30.91 kg kg mhr^{-1} during the rough sea period, October-November 2007 sampling (**Figure 10**). No FAD was used in Capul, various forms and styles of artificial deceiving baits were employed to lure the fishes to the fishing gear. The fisherfolks' practices like identifying specific fishing areas for every gear, the prohibition of illegal fishing, the growing discipline among fisherfolks' group and the conduct of rituals for the gears are indeed geared towards the conservation of the marine resources in the island. Furthermore, their traditional knowledge on the sea current fit for fishing, on the life cycle and biology of the fish added to the said practices are all worth sustaining.

Correlation analysis

Pearson correlation was used to determine the influence of each variable to fish productivity during calm, rough seas and to total fish catch. Stepwise regression was used to establish the hierarchy of influence of the factors on fish productivity. (**Table 2)**.

The multiple regression equation explains only 73.7% influence of coral reef area to the total variation in fish catch (multiple correlation coefficient r=0.86). However, Pearson correlation shows that total fish catch is highly correlated with resource conserving fishing practices (r=0.961, p<0.001) and catch during rough sea (r=0.982, p<0.001). Resource conserving practices are highly correlated with rough sea catch (r=0.936, p=0.001). These correlations strengthen the observations on the high CPUE of the traditional fishing methods. Per cent live coral is highly correlated with condition of coral reef area (r=0.983, p<0.001) which is highly expected. Therefore we can surmise that it is the condition of the coral reefs and not necessarily the extent or total coral reef area that has high influence on fish productivity.

Stepwise regression analysis shows that resource conserving practices and per cent live corals are the most important factors influencing total fish catch and catch during rough sea (r = 93.74). In addition, percent live coral and condition of the coral are also important in rough sea fish catch (r = 98.85). The fish catch during calm sea is moderately influenced by coral reef area and the presence of sacred places (r =41.18).

CONCLUSION

This study showed that the cultural beliefs and practices related to fishing of the inhabitants of the island of Capul have helped in the conservation of the fishery resources of the island. Peer pressure and people's initiative in protecting the corals reduced the number of people engaged in destructive fishing methods such as the use of poisonous plants, dynamites and compressor machine. The fisher folks used mainly traditional fishing methods that were modified to suit their manpower capability and financial resources. People's ingenuity in making artificial baits has led to the conservation of fingerlings. The beliefs and practices are products of the people's close interaction with their environment, which have been developed for decades, and could enhance fishing practices to achieve the sustainable use of their fishery resources. Fish sanctuaries may have been unconsciously established through their respect for sacred places.

Fish yield of the island is relatively high in comparison to that of Bolinao, Pangasinan a known rich fishing ground in Luzon. The high fish catch using net reflects the good status of the fishery in the island's fishing ground particularly in the coral line along the coastal zone. This coincides with the fair condition of the coral cover (*MODE 2004*) and the good growth of seagrass particularly during the rainy season when there was enough sediment loaded to the coast essential for its growth (*Cabili and Cuevas 2010*).

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