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An Assessment of Macro-Invertebrate Gleaning in Fisheries on the Albay Side of Lagonoy Gulf

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Abstract
An assessment of macro-invertebrates gleaning in Lagonoy Gulf fisheries was undertaken to document relevant data sets that would shed light the gleaning fisheries. Rapid Resource Assessment (RRA) was used with survey questionnaire. This was supplemented by data from gleaning field work and key informant's interview.
Results showed gleaning to be a traditional practice conducted by women along with other family members. It is considered a subsistence fishing activity which takes place in shallow reef flats, mud flats, sand and rocky areas, as well as sea grass including mangrove areas, thus explaining the familiarity of the gleaners with the immediate coastal habitat. Species caught include shellfish, crustaceans and other invertebrates. The fishing methods employed are very simple with stakes, bolo or rods being used.
From an economic standpoint, gleaning is treated as a food source and as an additional income source. Monetary benefits derived from gleaning, includes an estimated annual production of 296 tons valued at PhP 5,920,000. This translates roughly to annual income of PhP 20,600 per gleaner. Ecologically, because the activity uses simple tools, exploited species are given time to regenerate with gleaning impacts being minimal. However, since invertebrates are lower down the food chain and are potential feed for larger species, the practice may result in "ecosystem over fishing". In-depth studies of biodiversity conservation; management and health and safety hazards are thus recommended.

Key words: gleaning, Lagonoy Gulf, Macro-invertebrate

Introduction

Lagonoy Gulf is a rich fishing ground located on the east coast of the Bicol Region. It is bordered by 15 towns in the three provinces of Albay, Catanduanes and Camarines Sur covering 165 barangays with 7500 fishers depending on multi-species fisheries for their livelihoods and employment. There are nine bays along its 221.08 km coastline which are the central fishing sites for 12 of the 15 species of tunas and tuna-like fish, small pelagic, crustaceans and shellfish of sustenance fishing which accounts for more than 90% of its 28,000-mt annual fish harvest (Soliman *et al*., 1995). More than 60% of the species caught in the Gulf are reef dwelling (Soliman *et al*., 1998).

Reports also showed that the Gulf's critical habitats have suffered heavy exploitation at an alarming rate. As of 1987 the remaining mangroves were estimated at 251.44 ha or 26 % (as of 1987) of their original cover in 1956 (Vega *et al*., 1995). Percentage cover of live coral in protected areas has not changed unlike in other areas where a decrease was noted (Garces *et.al*, 1994; Mendoza et.al, 2000 and Soliman *et.al*, 2000). Sea grass beds were either disturbed or altered at varying rates due to anthropogenic activities.

All though aware of these realities, fishing remains a major occupation in coastal areas and fishery resources are the main sources of income and livelihood. In 1997, the municipal and commercial fisheries sectors directly employed 675,700 and 56,700 fishers, respectively (Barut *et al*, 2001). A recent assessment report in the Gulf showed that the average income from fishing is comparatively low (PhP19, 422 to PhP 32,700) compared to non-fishing income (PhP 24,771 to PhP 41,173), making fishers worse off than their farming counterparts or other occupational groups (Pelea, *et al*., 2004, unpublished

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FRMP Report). Thus, the alleviation of poverty and food security is one of the major concerns that cannot be ignored in coastal areas which are dependent on these resources.

The Gulf has been the subject of major research undertaking. Of particular interest are the Fishery Sector Program (FSP) in the mid-1990, the Community-Based Coastal Resource Management (CB-CRM) in early 2000 and recently the Fisheries Resource Management Project (FRMP). Unfortunately, very little attention has been paid to the fisheries for macro-invertebrate gleaning despite it being a traditional practice among poor coastal dwellers, especially when fishing is not possible.

Macro-invertebrates have been traditionally found in inter-tidal and reef flats near coastal communities. Because most species are sedentary or slow moving; their population is highly vulnerable to over-harvesting. For instance, giant clam species (*Tridacna gigas, T. derasa, and Hippopus porcellanus*) were overfished according to the national survey in the mid-1980's (Juinio *et al*., 1989). The overexploitation of a sea urchin fishery in Bolinao, Pangasinan, resulted in the collapse of this multimillion dollar fishery (Talaue-McManus and Kesner, 1995).

Gleaning has been a traditional practice in many countries of the world. Campos, *et al*. (2005) conducted a survey of Macro-Invertebrate Gleaning in the Banate Bay Inter-tidal Area, Eastern Panay Island. Studies on gleaning for macro-invertebrates have been mentioned by Vinson, *et al*. (2005); however details of gleaning contribution to livelihoods and to the total fishery activity are often neglected. Official statistics and publications do not include gleaning as a subsistence fishing activity. Thus, datasets about gleaning are very difficult to access because of a research bias toward major fisheries. Knowing of its importance coupled with the imminent danger of its depletion and extinction, the need for a responsive course of action becomes extremely urgent (Juinio-Meñez, M.A. 2004). On this basis, the present study was undertaken to assess the fishery for macro-invertebrate gleaning activities in Lagonoy Gulf with an emphasis on the economically important species, their habitats, production and contribution to livelihoods.

1. Materials and Methods

The study is a descriptive research undertaking designed to assess the status of the macro-invertebrates gleaning fishery along the Albay side of Lagonoy Gulf.

The study made use of Rapid Resource Assessment (RRA) techniques in generating datasets with field survey questionnaires as the main data collection tools. This was supplemented by data taken from actual gleaning in selected sites along the Gulf. Key informant interviews were used to validate information and generate other relevant information.

For data on catch volumes, catch rates, species and size compositions, the density and biomass of species macro-invertebrates caught and annual catch volumes and the value gleaned in inter-tidal flats and reef flats, a gleaner-co-operator was also consulted during sampling. Turnover rate by species was calculated as annual catch volume divided by annual biomass where annual catch volume is the total volume of catch by species over the 12-months sampling period and the annual biomass is the total weight of the catch by species.

2. Results and Discussion

1) Rapid Resource Assessment (RRA)

Rapid resource assessment (RRA) showed that the majority of the gleaners are women and that gleaning is usually carried out together with children and other family members. Children comprise 58% of gleaners in Sagurong, Tabaco City and adults 42% of which 66% are women and 34% men. Natunawan Cove's gleaners composed of children (27%), adult (73%), of which 73% are women and 27% are men. While in Sogod, Tiwi, 33% of the gleaners are children and 67% adults, of which 65% are men and only 35% women.

Gleaning was undertaken in shallower coastal areas, in reef flats, mud flats, sandy or rocky areas, and in sea grass areas including mangrove areas, making them associated and more familiar with the immediate coastal habitat including reef areas. Similar information was noted in Fiji where women often go out daily to harvest resources, and thus, have a wealth of knowledge on the marine environment (Aliti, 1997). According to the Women's Fisheries Development Officer South Pacific Commission on the Pacific islands women perform a range of activities associated with the harvesting, processing and marketing of marine resources. They fish in lagoons and reef areas, catch fish, collect seaweeds and glean for shellfish, crabs and other invertebrates.

The RRA results showed that the fishing methods employed by gleaners are generally very simple with primarily traditional tools and technologies. When gleaning for certain species, stakes or rods are the only equipment used but this activity requires the use of the senses and a skilful utilization of knowledge about the fishery.

A total of 288 gleaners were identified in the three sampling sites, with Natunawan cove having the highest number (43%) of gleaners, followed by Sogod (40%)

with the smallest number found in Sagurong (17%) as shown in Figure 1.

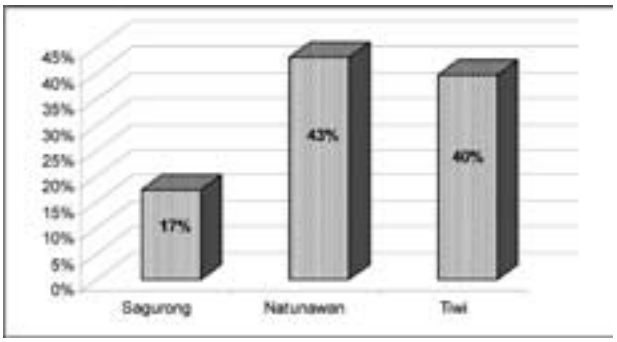

Fig. 1 Percentage of gleaners in different gleaning areas

In terms of gleaning frequency, data showed that 50% of gleaners in Sagurong and 75% in Sogod engage gleaning 6 to 10 days a month. In Natunawan cove, majority (68%) glean from 16 to 20 days per month (Figure 2). The findings also showed that the frequency of gleaning is apparently influenced by the proximity of the gleaning sites to a gleaner's residence and the timing of the lowest low tide when extensive gleaning areas are exposed.

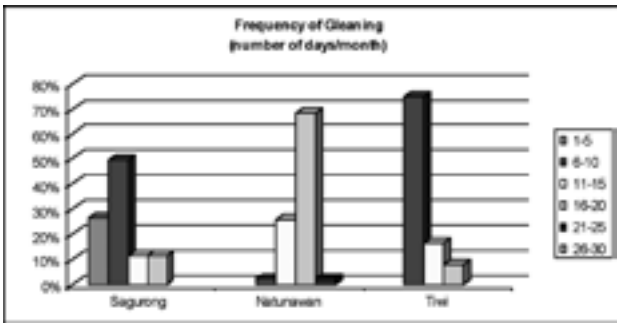

Fig. 2 Frequency of gleaning activities in different areas

The intimate knowledge and familiarity of gleaners with their immediate environment enable them to easily identify and harvest the target species where they are found. Gleaners usually cluster in different locations depending on the species they are harvesting. They also know exactly where to look for certain species and how to dig or pull them out.

The target species are mostly invertebrates (i.e. fish and crustaceans) and harvest either sold for cash or consumed by the family. Because invertebrates are lower down the food chain, they also serve as potential food for larger pelagic and demersal fish species. According to Vina Ram-Bidesi (1997), the practice of gleaning may in turn may affect the more economically important species due "ecosystem over fishing".

However, because these activities are simple and do not involve use of sophisticated equipment or technology, their impact is minimal. It can also be sustainable in the sense that the targeted locations vary, and target species vary and are usually seasonal, giving certain species time to regenerate.

2) Habitat Characteristics and Status in the Gleaning Area

Three sampling sites along Lagonoy Gulf were selected namely: Sogod in Tiwi, Natunawan Cove close to thecentral Tabaco City and Sagurong on the Island of San Miguel (Figure 3). Other sites such as Oson/Bunga on Cagraray Island were also assessed for their habitat characteristics as they are sites of occasional gleaning.

The gleaning areas identified are located on the east coast of Albay and on part of Lagonoy Gulf. Some of the gleaning areas are found on the islands located along the Gulf while others are connected to mainland Luzon. The bio-physical conditions of the gleaning areas were identified so that they could be distinguished from each other. The description of the gleaning areas is as follows:

(1) Sogod

Located on the north-eastern coast of Tiwi; connected to mainland Luzon. The Sogod River empties its water in this area creating estuarine water conditions. The gleaning area is considered rocky and the shoreline is exposed to large waves during high tides, so gleaning is done only during low tides. Observation showed that gleaners have to turn over rocks and boulders so that species of bivalves and univalves can be harvested. Gleaners use metal scrapping tools to assist them in collecting molluscs. An increased in gleaning activities occurs during neap tides since greater areas are exposed during these time.

Most gleaners are residents of the surrounding areas and their harvests are primarily consumed with any excess being sold to neighbours. As far as age and sex are concerned, observation reveals that gleaners are heterogeneous. If a neap tide occurs during weekends children of school age participate in the gleaning and thus increasing the exploitation of the resource.

(2) Natunawan Cove

The cove is located northwest of Malinao and southwest of Tabaco City. Its east side is bounded by the Natunawan peninsula from which it gets its name. The peninsula protects the area from large waves from the gulf making it an ideal place for gleaning. Aside from gleaning, gill nets, crab lift nets and beach seines are regularly operated in the area. Different species of bivalves

Fig. 3 Map showing three gleaning sites bordering Lagonoy Gulf

and univalves are harvested regularly in the area. The gleaning areas are sandy-muddy in character especially those near the shoreline. The area is characterized as 79% mud flats and about 21 % mangrove swamp. In the deeper part, sea grasses which serve as habitats for other species of molluscs and crustaceans can be found.

During the early 60's and 70's window pane shell or kapis (Placuna placenta) where thriving in the area but lately the species has disappeared. Gleaning is popular in the area and is considered as a source of livelihood by the residents and people from other places who compete to gather mollusc and other species. During neap tides the intensity of harvesting increases since more areas are exposed making it safe for the gatherer to roam further when collecting sea resources. Like in Sugod, there broad range of gleaners as far as sex and age are concerned.

(3) Sagurong

Located on San Miguel Island facing Lagonoy Gulf is a sea grass -seaweed area with a diverse fauna harvested by gleaners. The habitat is 65% sea grass and 35% reef flats. Most gleaners are residents and glean mainly for food consumption. The sea grass species thriving in the area are *Enhalus acoroides, Thalassia hemprichii, Syringodium isotefolium, Cymodocea rotundata, Cymodocea serrulata and Haludule uninervis*. The species collected are mostly molluscs, crustacean, sea urchins and sea cucumbers. Sometimes edible sea anemones are accidentally collected. Fishing other than gleaning is also undertaken in the area. Gill nets, spear guns, and traps are used daily. Sometimes the gleaners proceed to neighboring coastal barangays so that they can gather greater quantities. Similarly gleaning activities intensify during spring tides as more areas are exposed under these tidal conditions.

(4) Oson/Bunga

Located on the island of Cagraray which is adjacent to San Miguel Island. As in San Miguel, the gleaning area in Cagraray Island is covered with sea grasses and seaweeds. Gleaning activity coincides with the during the occurrence of low tides and most of the species collected are more or less the same as those found in San Miguel. Gleaning is pursued for food consumption. Most gleaners were residents of the island. Molluscs are the bulk of the harvest with a mix of crustaceans, sea cucumbers and sea urchins.

With regards to the habitat characteristics, it appears that the invertebrates are not uniformly distributed. The marine environment around each coastal area is unique and not all organisms are present in each of the gleaning areas. For instance, in soft bottom beds with sea grass and algae covered areas, molluscs (i.e. sea urchins and sea cucumbers), echinoderms (i.e. clams and octopus) and seaweeds are collected. In contrast, in hard bottom reef areas, mollusks, echinoderms and seaweeds are also found on coral and limestone bottoms. Shoreline, sand and beach gleaning will yield nerites and beach clams

while in mangrove areas, the resource is primarily crabs and other crustaceans are the main resources.

Changes in the gleaning areas were noted due to resource use pattern and exploitation. Comparative changes in habitat and resources reveal that five years ago about 62% of the gleaning areas within Sagurong were pristine and about 31 % degraded. Today, only about 27% remain pristine and 19% are highly degraded, with 15% moderately degraded and 38% degraded (Figure 4).

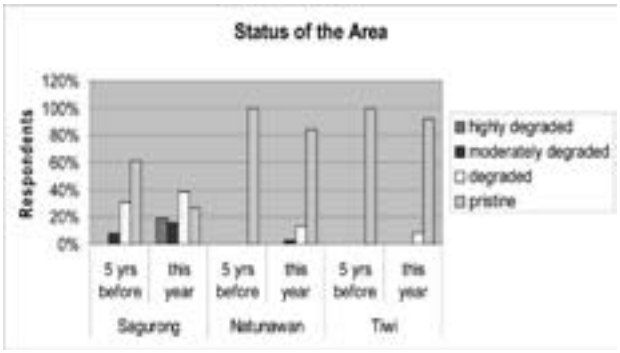

Fig. 4 Comparative status of the three gleaning areas by degree of degradation

In Sogod, Tiwi, gleaners believed that 92 % of their gleaning area remains pristine and only 8% degraded. Surprisingly, in Natunawan Cove, gleaners claimed that 84% of the gleaning area remains pristine with some 3% moderately degraded and 13% degraded. These changes can be attributed to an increase in the number of gleaners over time as shown in Figure 5. Undoubtedly, this is an alarming rate of abuse of these resources caused principally by human activities is alarming. Such conditions should motivate all concerned to take action to preserve what remains of their resources and to formulate a program of action to reverse the trend of declining resources.

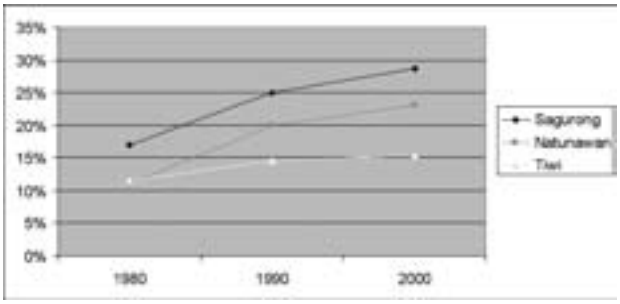

Fig. 5 Number of gleaners from year 1980 to 2000 in the sampling areas.

3) Estimated Production Data from Gleaning

(1) Harvest Volume and Rate

The harvest volume was calculated as the weight of the harvest in kilograms per gleaner and the harvest rate from the weight of the harvest per gleaner over time. The estimated harvest volume was based on a maximum of four hours gleaning time which correspond to the duration of low tides.

Data on the total volume of harvest by sampling sites is presented in Tables 1a, b and c. An aggregate harvest volume of 2,647.84 kg was realized over the past 7 months of monitoring. On average, the harvest volume per gleaner based on a maximum of 4 hours gleaning time was estimated at 9.28 kg for Natunawan; 6.12 kg for Sagurong and 1.73 kg for Sogod (Tables 1a,b and c). Per gleaner per hour, this is about 2.32 kg, 1.53 kg and 0.43 kg respectively. This finding showed that invertebrate's population and biodiversity varies with habitat. Among the sites, the mud flats of Natunawan Cove had the highest yield (1,578.84 kg) followed by the sea grass and reef flats in Sagurong, San Miguel Island (984.48 kg). The higher yield in these areas can be attributed to the nature of the substrate in these gleaning sites.

Table 1a. Aggregate total catch volume, catch volume per gleaner and catch rate in Natunawan Cove, Tabaco City

Month	No. of gleaners	Total Harvest Volume (kg)	Harvest volume per gleaner (kg)	Harvest Rate (kg/ gleaner/hr)
July	30	296.800	9.893	2.473
Aug.	24	495.000	20.625	5.156
Sept.	24	151.075	6.295	1.574
Oct.	20	134.460	6.723	1.681
Nov.	26	205.540	7.905	1.976
Dec.	24	157.840	6.577	1.644
Jan.	20	138.120	6.906	1.727
Total		**1,578.84**	**Mean = 9.28**	**Mean = 2.32**

On the other hand, the comparatively lower yield (84.52 kg) noted in Sogod, Tiwi can be explained by the difficulty in harvesting because of the rocky nature of the gleaning area. Gleaners have to overturn rocks and boulders or use metal scraping tools in collecting the target species.

These findings also reveal a general of decline trend in the gleaner harvest over time (Figure 6). A drastic decline in the volume of the harvest in Natunawan Cove for the month of September was observed and interaction with gleaners points out to the changing climatic patterns in the area such as the occurrence of heavy rainfalls and floods that drain off in Natunawan Cove towards the month of September. This is a possible cause of the erratic decline of the gleaning harvest.

In Sagurong, a continuous decline in the catch rate

Table 1b. Aggregate total catch volume, catch volume per gleaner and catch rate in Sagurong, San Miguel Island, Tabaco City

Month	No. of gleaners	Total Harvest Volume (kg)	Harvest Catch volume per gleaner (kg)	Harvest rate (kg/ gleaner/hr)
July	23	195.070	8.481	2.120
Aug.	23	166.540	7.241	1.810
Sept.	23	206.350	8.972	2.243
Oct.	23	190.200	8.270	2.067
Nov.	23	102.400	4.452	1.113
Dec.	23	38.320	1.666	0.417
Jan.	23	85.600	3.722	0.930
Total		**984.480**	**Mean = 6.12**	**Mean = 1.53**

Table 1c. Aggregate total catch volume, catch volume per gleaner and catch rate in Sogod, Tiwi, Albay

Month	No. of gleaners	Total Harvest Volume (kg)	Harvest volume per gleaner (kg)	Harvest rate (kg/ gleaner/hr)
July	7	13.900	1.986	0.496
Aug.	7	12.700	1.814	0.454
Sept.	7	16.400	2.343	0.586
Oct.	7	12.240	1.749	0.437
Nov.	7	9.920	1.417	0.354
Dec.	7	10.100	1.443	0.361
Jan.	7	9.260	1.323	0.331
Total		**84.520**	**Mean = 1.73**	**Mean = 0.43**

was observed coinciding with the seasonal monsoon which occurs during the last quarter of the year. While in Sogod, the trend appears to be generally consistent over the sampling period but is also indicative of a declining harvest over time. With the observed declining trend it is that imperative in the future attention should be given to in depth studies of biodiversity conservation and management.

(2) Species Composition

Catch monitoring was undertaken in Sogod, Natunawan and Sagurong. The English names, common and scientific names and species composition for each of three gleaning sites are shown in Table 2.

In Natunawan a total of nine species were collected, six species belong to Mollusca, one to Echinodermata, another to Crustacea and the last to Brachiopoda. The molluscs were the *Burugat, Burubitoon, Punaw, Sisi, Kud-kud and Tahong*. The echinoderm *Ik-ik* was the lone species, the crustacean was the *Bung-kang* and the brachiopod was the *Ugpan*.

In Sagurong a total of five species were collected regularly by the gleaners and all belong to the phylum Mollusca. These are the *Kud-kud, Libud-libud, Liswik, Punaw* and *Sarad*. In Sogod four species of molluscs are harvested regularly; *Halaan, Bugtay, Budbud and Buhuan*. The crustacean *Kalasakas* was also caught in association with these mentioned molluscs. Findings reveal that *Scapharca inequivalves, Paphia amabilis*, and *Pinna sp*. are common in mud flats and sea grass beds. Some species are caught only in a specific habitat within the coastal area.

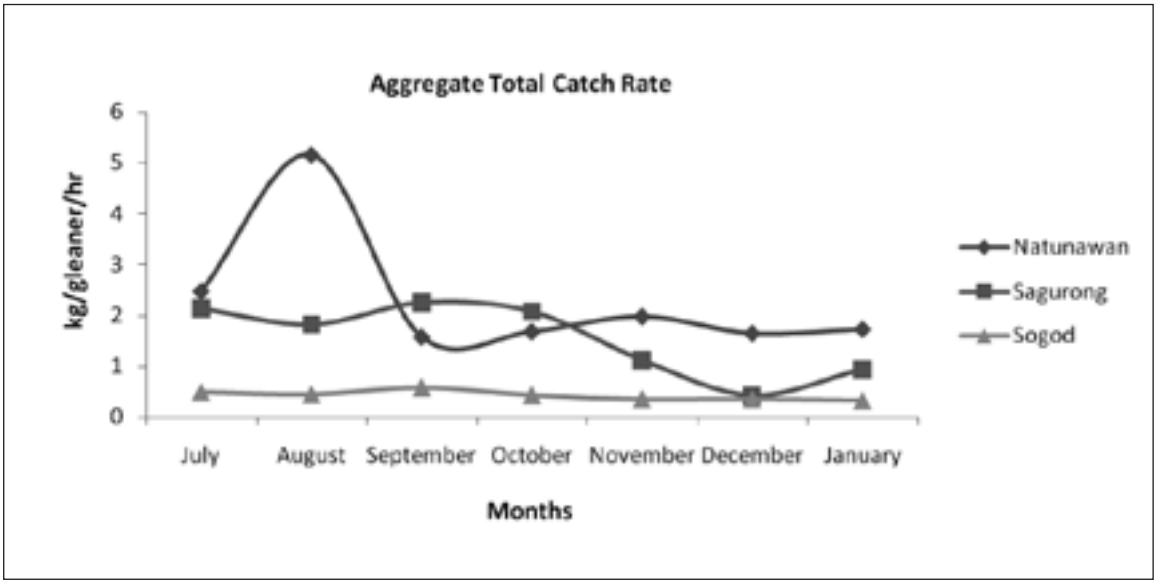

Fig. 6 Aggregate catch rates by gleaning site in Lagonoy Gulf

Table 2. Scientific name, English name and Common names of the species caught and percentage species composition by sampling sites

Scientific name[1]	English name	Common name	Sogod		Species Composition Natunawan		Sagurong	
			F	%	F	%	F	%
Scapharca inequivalves	Inequivalve ark	Kud-kud			0.76	6.95	1.69	15.78
Codakia tigerina	Tiger clam	Libud-libud					1.44	13.45
Strombus spp.	Conch	Liswik					1.27	11.86
Paphia amabilis	Lovely venus	Punaw/Halaan	0.69	27.60	0.63	5.76	1.12	10.46
Pinna muricata	Pen Shell	Sarad			0.22	2.01	0.82	7.66
Gafrarium pectinatum	Venus shell	Burugat			0.24	2.19		
Crassostrea cuculata	Oyster	Sisi			2.00	18.28		
Mytilus edulis	Blue Mussel	Tahong			0.59	5.39		
For Identification	For ID	Bugtay	0.56	22.40				
For Identification	For ID	Budbud	0.75	30.00				
Telescopium telescopium	Pond snail	Bagungon			0.52	4.75		
Turbo reevei	Turban shell	Buhuan	0.50	20.00				
Polinices spp.	Moon shell	Burubitoon			0.58	5.30	0.02	0.19
Lingula unguis	Lamp shell	Ugpan			1.06	9.69		
Lambis lambis	Common spider conch	Sahang					1.90	17.74
Conus spp.	Cone Shell	Tabo					0.36	3.36
Trachycardium muricatum	American yellow cockle	Karang karangan					0.12	1.12
Ocypode cerathopthalma	Crab	Bungkang			1.00	9.14	0.12	1.12
Holothuria spp.	Sea cucumber	Ik-Ik			1.08	9.87		
Peneaus spp.	Shrimp	Buyod			0.25	2.29		
Scylla serrata	Mud Crab	Haa'nit			1.00	9.14	1.00	9.34
Portunos pelagicus	Blue Crab	Kasag			1.00	9.14	0.85	7.94
Anomalocardia squamosa	Squamose venus	Kagot			0.01	0.09		
Total			2.50	100	10.94	100	10.71	100

[1] Based on *Guide to Philippine Flora and Fauna*, Volume Vl: *Gastropods and Pelecypods* by Rolando Garcia; *Annelids by Filipinas S. Palpal-latoc*, Natural Resources Management Center, Ministry of Natural Resources and University of the Philippines, Copyright 1986.

(3) Density and Biomass

The density of gleaned species was computed in terms of the number of organisms over the size of the area occupied in square meters. Biomass on the other hand, was estimated based on the weight of the organism over the size of the area occupied in square meters.

In Natunawan, six species were collected with a biomass of 2.46 g/m^2 with a density of 5.91 individual/m^2. It could be inferred from these findings that the weight of the harvested species is smaller but that the population is denser in some areas.

Twenty two species of macro-invertebrates were encountered during the field work in San Miguel Island, the highest among the three sites. Biomass is also highest in this area at 42.44 g/m^2 with a density of 0.42 individual/m^2. This implies that while the biomass of the species caught is high, the species density is low.

Due to some constraints in generating the biomass and density data for Sogod, datasets from Cagraray Island were used instead. That being said, the results obtained showed that at least 10 species of macro-invertebrates were encountered during fieldwork. Biomass is also relatively high in this area with 411.7 g/m^2 but with a lower density of 0.33 individual/m^2.

(4) Contribution of Gleaning to the Livelihood

Little was mentioned by Campos, *et al*., 2005 and Vinson, *et al*., 2005 about the contribution of gleaning to livelihoods and to overall fishery activity. In the present study, our findings reveal that gleaning does contribute to livelihood. Specifically, gleaners consider gleaning as a source of additional income and as a source of food. For instance, in Natunawan, nine nearby barangays (Bacolod, Cormidal, Nagsipit, Panal, Salvacion, San Antonio, San Ramon, San Roque and San Vicente) also benefit from gleaning. Similarly, in Sogod, at least four barangays (Cale, Cararayan, Libjo and Naga) also share in gleaning. Based on the study, the estimated aggregate number of

gleaners on average is 288 (Natunawan – 124; Sagurong – 50; Sogod - 114).

A majority (68.38%) considers their harvest as a source of additional income or extra income and the remaining 36.62% use it as an additional source of food (Figure 7). In the study by Quarto (2007), gleaning for shellfish during low tides represents food security not only for the family beneficiaries but also for other local residents as well.

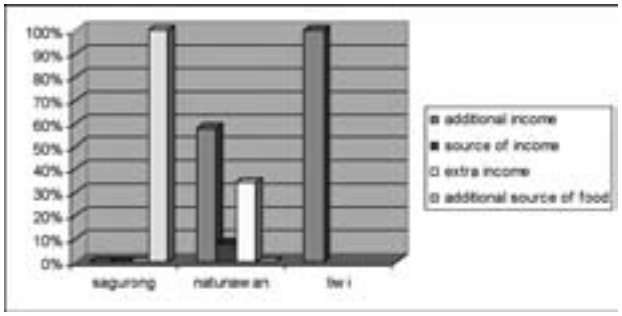

Fig. 7 Gleaners harvest utilization pattern

Considering the monetary benefits derived from gleaning, with an average volume of harvest of 5.71 kilos per gleaner, an estimated volume of harvest of 1,027.8 kilos can be realized assuming 15 days gleaning per month for 12 months a year. On an annual basis, the estimated 288 gleaners can harvest about 296,006.4 kilos or 296 tons of macro-invertebrates per year valued at PhP 5,920,128.00 at a selling price of PhP 20.00 per kilos. This translates roughly to an annual income of PhP 20,556 per gleaner.

In Natunawan and Sogod, where gleaning is considered as an additional source of income, a gleaner can earn PhP1, 713 per month. While in Sagurong where most of the harvest is consumed, it translate to savings which can be used for other economic needs. It should be noted that food in most small island communities like San Miguel Island is limited compared to urban areas where opportunities for trading are higher and other food sources are available. Given these benefits, gleaners are apprehensive about the decreasing harvest and the increasing number of gleaners as this in the future may affect the gleaning resources.

Conclusion and Recommendation

Gleaning is a subsistence fishing activity with economic and ecological significance. From an economic standpoint, it directly and indirectly contributes to overall fishing activities. Gleaning contributes at least 296 tons of macro-invertebrates valued at PhP 5,920,128.00 at a selling price of PhP 20.00 per kilo. At the household level, they are used either as additional income or as a food source valued roughly at PhP 20,556 per gleaner annually.

From an ecological perspective, since gleaning activities involve the use of simple tools the impact of their fishing activities is minimal. In addition, because the area fished and target species vary, it provides opportunities for some species to regenerate. However, since most invertebrates are lower down the food chain and are potentially consumed by larger pelagic and demersal fish species, the practice may in turn have an impact on economically important species due to "ecosystem over fishing". In-depth studies on these topic should be undertaken.

The need for biodiversity conservation and management studies and the issues associated with health and safety hazards are likewise recommended as factors in planning and management to sustain the resource on a long-term basis.

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