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NOTICE TO AUTHORS

PUBLICATION GUIDELINES

SILLIMAN JOURNAL welcomes submission of scholarly papers, research studies, brief reports in all fields from both Philippine and foreign scholars, but papers must have some relevance to the Philippines, Asia, or the Pacific. All submissions are refereed.

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Manuscripts of up to 20 pages, including tables and references, should conform to the conventions of format and style exemplified in a typical issue of SILLIMAN JOURNAL. Documentation of sources should be disciplined-based. Whenever possible, citations should appear in the body of the paper, holding footnotes to a minimum. Pictures or illustrations will be accepted only when absolutely necessary. All articles must be accompanied by an abstract and keywords and must use gender-fair language.

SILLIMAN JOURNAL likewise welcomes submissions of "Notes," which generally are briefer and more tentative than full-length articles. Reports on work-in-progress, queries, updates, reports of impressions rather than research, responses to the works of others, even reminiscences are appropriate here.

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SILLIMAN JOURNAL





"Don't appear so scholarly, pray. Humanize your talk, and speak to be understood. Do you think a Greek name gives more weight to your reasons?"

Jean Baptiste Molière
(1663)

"Life is surely given us for higher purposes than to gather what our ancestors have wisely thrown away, and to learn what is of no value but because it has been forgotten."

Samuel Johnson
The Rambler
(1750-52)

"There is only one meaning of life:
the act of living itself."

Erich Fromm
Escape from Freedom
(1941)



EDITORIAL NOTES

Welcome to this issue of *Silliman Journal*. This year is special because we are celebrating the centenary year of someone who was part of the original *SJ* editorial board responsible for publishing the first issues of *SJ* in 1954. Dr. Edilberto K. Tiempo, along with his wife, the National Artist for Literature Dr. Edith L. Tiempo—also part of *SJ* beginnings—will be honored in the second issue this year through the work of many writers.

But prior to that issue, the current one is multidisciplinary, beginning with two studies done by faculty from the Silliman University College of Nursing. Prof. Rowena Turtal and colleagues describe responses from communities served by student nurses and Prof. Evalyn

Abalos and others look into the quality of life of persons with diabetes.

These papers are followed by another community impact study, this time by social scientists Annie Alberto and Annie Teñoso surveying marine protected areas along the coast in Luzon, northern Philippines. The next four papers are science research into the spider conch in reef areas in Central Philippines, the fruit guyabano, intercropping, and biogenic amines. In particular, Analyn Mazo and her colleagues recommend that because the Spider Conch is economically important, there should be, as a management measure, a “closed season for collection of the species” during the peak spawning season in order to allow sexually mature individuals to reproduce prior to harvest.

Another important study by Ragasa et al. on *Annona muricata* Linn., commonly known as guyabano, reports diverse biological activities, including hypoglycemic, antiarrhythmic and antitubercular activities, inhibition of the proliferation and induced apoptosis in human solid tumors, anti-inflammatory and analgesic properties, cardioprotective effect and significantly suppressed colonic ACF formation and crypt multiplicity.

Then, Sue Calumpang and others at the National Crop Protection Center in UP-Los Baños investigate the impact of intercropping lemon grass on fruit borers in eggplant, given that insecticide use in eggplant production is quite heavy. The team found, in particular, that the field and laboratory trials demonstrate repellency effects of intercropping lemon grass with eggplant, potentially reducing insecticide use in eggplant production as well as increasing farmers’ income.

Equally important, Jonathan Barcelo and others at St. Louis University in Baguio City studied biogenic amines—non-volatile, nitrogenous, organic compounds produced from the microbial degradation of protein-rich food such as fish and fish products, meat and fermented foods. Adding that all food items basically rich in proteins or free amino acids promote bacterial production of biogenic amines, the authors felt that the manner of analysis of biogenic amines is important. Indeed, they found that thin layer chromatography coupled with image analysis can satisfactorily determine the concentration of biogenic amines in mixtures and food samples but the results may vary depending on the quality of the chromatograms and the appropriateness of image processing.

Finally, Dr. Enrique Oracion looks into the issue of keeping quality faculty in Baylor University, Texas as well as Silliman University in Central Philippines. Ike also wrote about both universities in *SJ* 2012, volume 53, number 2, after having been assigned a fellowship at Baylor through a grant

from the United Board for Christian Higher Education in Asia.

NOTES SECTION

Our two contributions to the Notes Section are both products of research work, but in very different settings. The first is reprinted with permission from Nurse.com and the author. Ruth Juana Flores-Eser Jose, RN, MSN is a Silliman University nursing alumna now based in Texas, U.S.A. Her article puts an interesting twist to research that may give many in nursing education and graduate research some “sweet ideas” for possible studies and shows how research can be fun.

The second paper comes from the research notes of the industrial-organizational psychology specialist, Prof. Michele Valbuena, who along with co-researchers investigated the variables of incivility, burnout, and work performance among Silliman University employees.

REVIEW SECTION

This issue has two reviews—the first, a review of poet Cesar Aquino’s *Caesuras* by Gio Romero Chao; the other, a look at the Dumaguete City music scene by Jaizer Nadal. Both Gio and Jaizer are creative writing students at Silliman University. I would like to thank their Critical Writing instructor, Ian Casocot, for alerting me to their written work.

ACKNOWLEDGMENTS

The cover art for this issue was commissioned work, “Woman in Red,” by Special Education instructor Ry Sedrick Bolodo. I would like to thank Ry for producing something worthy of an *SJ* cover, on demand.

I also wish to thank my editorial staff, especially English and French professor Philip Van Peel, recruited at the last minute, but gracious with his time and expertise. The editorial board both at Silliman and overseas continue to be generous with their time and support. The same goes to our board of reviewers—most of whom were recommended by our authors themselves, helping *SJ* to widen its network and enlighten us on many different areas of specialization. Finally, and most importantly, I thank all contributors to this issue, many of whom are from institutions with their own journals, yet trusted in *SJ* to publish their work.

Of nursing and health science, mullets and eggplant, education and research, nature and nurture—peering at the ineffable, so said Rowena Tiempo-Torrevillas in *SJ* 2007. “I ventured through adulthood with the sturdy sense one was equal to the imponderables lurking diminished and vanquished by the power of the word. In time, language became an end in itself, its permutations endless but comfortably proscribed by one’s experience.”

Margaret Helen F. Udarbe

Editor







The Quality of Life and Perceived Health Education Needs of Type 2 Diabetic Clients in Negros Oriental, Philippines

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This paper examines the factors influencing the quality of life (QoL) of Type 2 Diabetes Mellitus clients and their perceived health education needs. The 55 respondents of the study were recruited through convenience sampling from four diabetes clinics in Dumaguete City, Negros Oriental. The Ferrans and Powers Quality of Life Index (QLI) was administered, a test that has four subscales, namely: [1] health and functioning, [2] social and economic, [3] psychological/spiritual, and [4] family subscales. The subscale scores and the overall QoL score were then correlated with the profile of the respondents. The results showed no significant relationship between the socio-demographic profile and the overall QoL score, but only between individual QoL subscales such as educational level and the social and economic subscale, monthly family income and the social and economic subscale, and monthly family income and family subscale. The health topics they reportedly needed include blood sugar monitoring, diet, exercise and medications. Meanwhile, a health education program based on the specified needs should be developed and integrated into the curriculum of nursing students.

KEYWORDS: Quality of Life, Type 2 Diabetes Mellitus, Ferrans and Powers Quality of Life Index, health education needs, nursing curriculum

INTRODUCTION

Type 2 Diabetes Mellitus (T2DM) is a chronic metabolic disorder affecting 3.4 million Filipino adults, with an estimated 4.9 million more on the verge of developing the disease (IDF, 2010). Of the ten leading causes of mortality in the country, diabetes ranked eighth in 2006 (Department of Health, 2011). Complications and disabilities of DM include non-traumatic amputations, end stage kidney disease, blindness, heart disease, and stroke (Centers for Disease Control and Prevention, 2011). The study done by Soria, Vega, Abenir-Gallardo, Velandria, and Punzalan (2009) utilized a glucose homeostasis study (n=2,122) in six of the 17 administrative regions of the Philippines over a 9-year period from 1998 to 2007. The findings revealed an alarming growth of diabetic people in the country that warranted early aggressive intervention for prevention and management.

Globally, the countries with the highest prevalence in 2000, and highest projected numbers for 2030 were India, China, and USA. Italy ranked 9th in the list in 2000 but is predicted to be replaced by the Philippines in 2030 (Wild, Roglic, Green, Sicree, & King, 2004). According to UNITE for Diabetes Philippines (n.d.), a coalition of organizations that care for individuals with DM, Filipinos with fasting blood sugar (FBS) greater than 125 mg/dl had increased from 3.9% in 1998 to 4.8% in 2008 while those with DM based on history had increased from 2.6% in 2003 to 4% in 2008. When those who had pre-diabetes (10.2%) were added, the prevalence rose from 7.2% to 17.8%. This means that one out of every five Filipinos is likely to develop diabetes or pre-diabetes (UNITE for Diabetes Philippines, n.d.). These trends were substantiated by the authors through observation during supervision of students in hospital and community sites, prompting the development of the current study.

The chronic nature of DM has an impact on the quality of life (QoL) which, according to Rubin (2000), is recognized as an important health outcome, in that it represents the ultimate goal of all health interventions. To elaborate further, Rubin (2000) stated that:

Although health care providers sometimes focus on medical outcomes alone when assessing the efficacy of their interventions, any person with diabetes will tell you that these outcomes are truly meaningful only to the extent that they affect physical, emotional, and social well-being—that is, quality of life (p. 21).

Many studies have been conducted on the quality of life (QoL) of clients with DM, utilizing specific QoL instruments. Among these, the

study of Ghanbari, Yekta, Roushan, and Lakeh (2005) focused on nine QoL dimensions: physical function, pain, daily activities, feelings, sleep, relationships with relatives, overall health, problems with diabetes, and satisfaction with diabetes treatment methods. Their study sought to assess the pattern of relationships between personal background characteristics and the nine dimensions of QoL among outpatients in Iran. Moreover, Huang and Hung (2007) explored QoL and its predictors among middle-aged and elderly outpatient cases with DM in Taiwan. The results showed that diabetic self-care behaviors, economic status, and frequency of hospitalization were predictors of QoL.

Health education is an important aspect in diabetes management. Tang, Pang, Chan, Yeung, and Yeung (2008) conducted a study on diabetic control focusing on health literacy, complication awareness, and diabetic control in Chinese patients and concluded that educational strategies need to account for the patient's health literacy levels and self care skills in order for them to improve their diabetic control and avoid complications. Since a diligent search reveals that no studies have been published on QoL of people with DM in the province of Negros Oriental, this paper explores such issue and further connects it to the patient's socio-demographic profile, which may be a potentially important contributing factor to their QoL scores. The perceived health education needs of the respondents are likewise discussed. In doing so, it is anticipated that the findings will provide evidence for subsequent nursing interventions and academic curriculum development.

METHODS

A descriptive-correlational design was employed with respondents who were recruited through convenience sampling from four diabetes clinics in Dumaguete City. To recruit a sufficient number of respondents, the researchers allocated about two to four hours a day for approximately two months (January 8 to March 5, 2011) for recruiting and data collection. Those qualified to be respondents needed to be between 40 to 60 years old, diagnosed with Type 2 DM, with or without complications, able to read and write in English or Visayan (a local language), willing to participate in the study, and residents of Negros Oriental. Approval to implement the study was first secured from the Ethics Committee of the College of Nursing

of Silliman University. After which, permission to perform data collection was obtained from doctors from the four diabetes clinics in Dumaguete City, the capital city of the province, Negros Oriental.

Three sets of questionnaires were used to gather data. Two of these were formulated by the authors: [1] a questionnaire on the respondent's socio-demographic and medical profile; and [2] a questionnaire regarding their health education needs. The third and main questionnaire was the Ferrans and Powers QLI Diabetes version, which is a customized test that "measures both satisfaction and importance regarding various aspects of life" (University of Illinois at Chicago [UIC], n.d.). With permission from the original authors, Carol Estwing Ferrans and Marjorie Powers, the questionnaire was translated into Visayan, the local language in Dumaguete City. The QLI tool is comprised of five scale scores: a total scale or over-all QoL score, and 4 subscales: [1] health and functioning subscale; [2] social and economic subscale; [3] psychological/spiritual subscale; and [4] family subscale. According to UIC (n.d.), 48 studies that have used the said tool utilized a Cronbach's alpha coefficient ranging from 0.73 to 0.99. In 24 studies, alphas ranged from 0.70 to 0.94 for the health and functioning subscale, and from 0.78 to 0.96 for the psychological/spiritual subscale. Another 23 studies reported social and economic subscale alphas ranging from 0.71 to 0.92 while 19 studies reported ranges of 0.63 to 0.92 for the family subscale (UIC, n.d.).

Below are the items in the Ferrans and Powers' QoL Index with their corresponding numbers in the questionnaire as adapted and administered to the respondents to measure their quality of life according to the different subscales, given their health condition as diabetics.

Health and Functioning Sub-scale

1. Health
2. Health care
3. Energy (fatigue)
4. Ability to take care of yourself without help
5. Ability to control blood sugar
6. Changes made in life because of diabetes
7. Control over life
8. Chances for living as long as you would like
12. Sex life
17. Ability to take care of family responsibilities
18. Usefulness to others
19. Worries
26. Things for fun
27. Chances for a happy future

Psychological/Spiritual Sub-scale

- 28. Peace of mind
- 29. Faith in God
- 30. Achievement of personal goals
- 31. Happiness in general
- 32. Life satisfaction in general
- 33. Personal appearance
- 34. Self

Family Sub-scale

- 9. Family health
- 10. Children
- 11. Family happiness
- 13. Spouse, lover, or partner
- 15. Emotional support from family

Social and Economic Sub-scale

- 14. Friends
- 16. Emotional support from people other than your family
- 20. Neighborhood
- 21. Home
- 22/23. Job/not having a job
- 24. Education
- 25. Financial needs

Descriptive statistics were utilized to describe the profile of the respondents and their QoL scores on the different subscales while Pearson's *r*, Chi-square, Fischer's exact test were used to test the relationships between the variables (i.e., socio-demographic and QoL subscale scores). The possible range for the final scores was 0 to 30. Thus, to get the descriptive value of the QoL scores, the researchers developed a six-level scale: worst= 0-4.99, poor= 5.0-9.99, fair= 10.00-14.99, good= 15.00-19.99, very good= 20.00-24.99, and excellent= 25.00-30.00.

RESULTS

Demographic profile

Of the 55 respondents of the study, majority belonged to the age group of 53 to 60 years. They were mostly females (69%), Roman Catholics (83%), college educated (65%), and earned a monthly family income between PhP10,001-PhP20,000.00 (33%).

Table 1.

Demographic and Economic Profile of Respondents (n=55)

	Frequency	Percent
Age		
41-44	2	3.64
45-48	6	10.91
49-52	14	25.45
53-56	17	30.91
57-60	16	29.09
Gender		
Female	38	69.09
Male	17	30.91
Religion*		
Roman Catholic	45	83.33
Protestant	4	7.41
Others	5	9.25
Educational Attainment		
College	36	65.45
Doctoral	2	3.64
Elementary	8	14.55
High School	6	10.91
Masters	3	5.45
Monthly Family Income*		
Less than 10,000	16	29.63
10,001- 20,000	18	33.33
20,001- 30,000	8	14.81
30,001-40,000	9	16.67
More than 40,000	3	5.56

*With 1 missing data

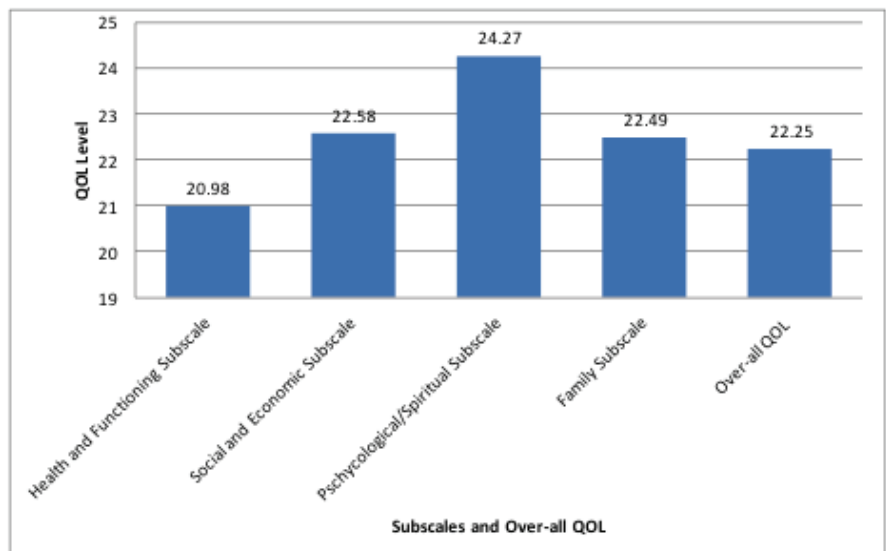
Majority of the respondents had Type 2 DM for the past 4 years while only 2 had the disease for 20 years or more (see Table 2). Furthermore, 22 of them reported changes in vision (micro-vascular complication) while 20 patients reported cardiovascular complications (e.g., hypertension).

Table 2.

Medical Profile of Respondents

	Frequency	Percent
Duration of Diabetes Mellitus		
0-4 years	24	43.63
5-9 years	14	25.45
10-14 years	10	18.18
15-19 years	5	9.10
20 years and above	2	3.64
Complications*		
Changes in vision	22	40.00
Cardiovascular	20	36.36
Peripheral Neuropathy	11	20.00
Kidney	2	3.63
Delayed Healing/ Infection	2	3.63

*Multiple responses allowed



*Where: mean = 22.5, standard deviation S = 3.5

Figure 1. QoL Subscale Scores and Over-All QoL Score

Quality of life in the different subscales

The over-all QoL score and the scores of the respondents on the four Sub-scales were all very good (20.98 - 24. 27) as shown in Figure 1. The results indicate homogeneity of the sample with regard to rating their quality of life. With respect to individual scores, the subscale with the highest score was the psychological/spiritual, followed by social/economic, and family. Understandably, health and functioning scored the least but still rated as very good.

No significant relationships were found to exist between total QoL score and the socio-demographic profile of the respondents (Table 3). Significant relationships are, however, seen when socio-demographic variables are correlated with specific subscales (Table 4 and Table 5).

Table 3.

Socio-demographic Variables Correlated with Total Quality of Life Score.

Socio-demographic Variables	Test Statistic	Correlation Coefficient	p-value	Remarks
Age	Pearson's r	-.066	0.63	No significant relationship
Sex	Chi-square	0.29	0.86	No significant relationship
Education	Chi-square	2.86	0.24	No significant relationship
Income	Spearman's rho	0.202	0.139	No significant relationship
Religion	Chi-square	1.27	0.53	No significant relationship

Demographics versus quality of life subscale scores

The correlation analysis shows that between the four subscales and the selected demographic variables, there were no significant relationships between [1] the demographic variables and the health and functioning subscale and [2] the demographic variables and the psychological and spiritual subscale. However, there was a significant relationship between [1] educational attainment and the social and economic subscale and [2] family income level and the social and economic subscale (see Table 4). There was also a significant relationship between the family income level and family subscale (see Table 5).

Table 4.

Relationship Between Social and Economic Subscale and Socio-demographic Variables.

Socio-demographic Variables	Test Statistic	Correlation Coefficient	p-value	Remarks
Age	Pearson's r	-.063	0.645	No significant relationship
Sex	Fisher's Exact Test	2.45	0.534	No significant relationship
Education	Fisher's Exact Test	39.544	0.000	With significant relationship
Income	Spearman's rho	0.480	0.000	With significant relationship
	Kendall's Tau-b	0.368	0.000	With significant relationship
Religion	Fisher's Exact Test	27.349	0.739	No significant relationship

Table 5.

Relationship Between Family Subscale and Socio-demographic Variables.

Socio-demographic Variables	Test Statistic	Correlation Coefficient	p-value	Remarks
Age	Pearson's r	-0.085	0.535	No significant relationship
Sex	Fisher's Exact Test	2.924	0.592	No significant relationship
Education	Chi-square	4.23	0.12	No significant relationship
Income	Spearman's Rho	0.312	0.241	With significant relationship
	Kendall's tau-b	0.019	0.019	With significant relationship
Religion	Fisher's Exact Test	40.68	0.923	No significant relationship

The social and economic subscale describes, among others, how important and satisfied patients are with respect to their education and income. Based on the profile, majority of the patients have attained college education and earned more than PhP10,000/month. Similarly, only income is significantly related to the family subscale which has to do with how patients perceive the importance of meeting family health and other emotional needs. The table therefore shows how education and income are two socio-demographic variables that are related to the patient's quality of life.

Perceived health education needs

Table 6 summarizes the respondents' answers to the items in the third part of the questionnaire. Among the topics which the respondents identified to be part of a potential diabetes management class are blood sugar monitoring, diet, exercise and medications.

Table 6.

Topics the Respondents Would Like to Be Included in an Education Program.

Topics	Frequency	%
Blood sugar monitoring	48	87.27
Diet	41	74.54
Exercise	39	70.90
Medications	39	70.90
Complications of Type 2 DM	38	69.09
Stress management	37	67.27
Risk factors of Type 2 DM	37	67.27
Disease process (DM)	26	47.27
Others (did not specify)	4	.07

*Multiple answers allowed

An overwhelming majority (89.09%) of the respondents expressed desire to attend a diabetes management class if this would be available to them. Saturday is the most preferred (38.18%) day. Other preferred days are Friday, Wednesday and Monday. Most respondents (47.27%) want the class to be conducted in the morning.

DISCUSSION

Health conditions of respondents

Majority of the respondents were between 53-60 years old and were females. It stresses the fact that the risk of acquiring Type 2 DM increases after age 40, and is more likely for females than males (Huether & McCance, 2005). Considering the chronic nature of disease development, majority of the respondents had developed Type 2 DM during their middle adulthood. If the disease is not managed properly, this may lead to acute and chronic complications associated with the condition and consequently, low quality of life (Wändell, 2005; Issa & Baiyewu, 2006).

Table 3 sums up the presence of complications related to Type 2 DM as reported by the respondents. The option of reporting multiple complications was made available in the questionnaire, resulting to 57 responses for five types of complications. The complications were categorized according to the body organs affected. Majority of the respondents (n=22) reported changes in vision (e.g., blurred

vision, difficulty in reading, development of cataract, spots in vision). Twenty respondents reported cardiovascular-related complications (e.g., hypertension, stroke, cardiomegaly or enlarged heart). Pain and numbness of extremities (peripheral neuropathy) was also reported by 11 respondents. Furthermore, two respondents had complications related to the kidney and another two experienced delayed healing and infection. All reported complications are known complications associated with chronic and poorly managed DM.

Changes in vision, peripheral neuropathy, kidney-related complications, and delayed healing and infection are considered as microvascular complications or complications which affect the small blood vessels, including the capillaries. Cardiovascular complications, on the other hand, are considered macrovascular or those affecting the large blood vessels (Smeltzer, Bare, Hinkle, & Cheever, 2010). Hypertension is a common health problem in people with diabetes; it predisposes them to have a cerebrovascular accident or stroke (LeMone, Burke, & Bauldoff, 2010). Diabetes is also associated with the development of other vascular complications such as coronary heart disease and neuropathies. These complications may arise from an acute onset or chronic progression of the disease. Hence, the aim of Type 2 DM management is to prevent the development of such complications while preserving the quality of life.

Results show that even with chronicity of DM and the existence of complications, the Total QoL score of the respondents was *very good* (Figure 1). This is contrary to the study of Wandell (2005) which suggests that the existence of vascular diseases such as coronary heart disease and stroke were found to be predictors for worse health-related quality of life (HRQoL) or were considered significant factors in decreased HRQoL. The scores in the four subscales (Health and Functioning, Social and Economic, Psychological/Spiritual, and Family) and over-all QoL scores of the respondents were above 20 or *very good*. Contrary to the study of Fatemi and Taghavi (2009) in Iran, none among the respondents of the present study reported any sexual problems, which can also be a complication of Type 2 DM.

With advances in treatment, dietary modification, and lifestyle change, people with Type 2 DM are living longer with their condition. However, the presence of complications in the study population has an implication on the need for long-term medical attention in order to manage them as well as limit the possible threat of more serious complications and consequently, shorter life-expectancy. Given the chronic nature of the disease, patients in the study population with

complications will have to be financially capable in order for them to avail of medical needs. Thus, there is also a need to emphasize prevention and treatment of existing complications.

Relationship between socio-demographic variables and QoL subscales

The results show that there were no significant relationships that exist when the total QoL score and the socio-demographic profile of the respondents were computed (Table 3). *This means that the correlation between any of the socio-demographic variables with the total QoL is weak.* This finding probably suggests a limitation related to the sample size (55) and the use of convenience sampling which does not allow for wider variability to allow correlation of the socio-demographic variables with the total QoL which is scored as very good across the different subscales. Significant relationships are, however, seen when socio-demographic variables are correlated with specific subscales (Table 4 and 5).

Table 4 shows that the social and economic subscale has a statistically significant relationship with two socio-demographic variables: educational attainment (Fisher's Exact test, where p-value = 0.000) and monthly family income (Spearman's Rho test and Kendall's Tau-b test, where p-value = 0.000). Thus, it can be inferred that one's level of education and income can affect one's quality of life. A person who has attained higher education will have a better QoL since one of the aspects in the successful management of DM is being able to understand its causes and its complications, the rationale for the different medications, how to manage stress, and even the selection of a proper diet. Likewise, when one has a good income, he/she can purchase the needed medications and can afford the doctor's consultation fees and laboratory examinations which are to be done regularly such as fasting blood sugar, glycosylated hemoglobin test, liver and kidney function tests, and lipid panel test, among others. Medications and laboratory tests entail expenses and long term management of Type 2 DM can be costly. In the United States, in 2002 the per-capita cost of health care was \$13,243 for people with diabetes while it was only \$2,560 for those without diabetes (Khardori, 2012). Similarly, in a cost-of-illness analysis study conducted in Iran, Type 2 DM consumes more than 8.69% of the country's total health expenditure and aside from the quantified costs, it also has high intangible costs on society in terms of reduced

quality of life (Javanbakht et al., 2011).

The economic subscale correlated with income may be expected to be significant since this subscale and income are redundant. On the other hand, it could be possible that income as a socio-demographic variable is not significantly related with the economic subscale. As a variable, income may not be associated with quality of life among type 2 diabetic patients due to other complex factors present such as the lack of social support, unemployment, and the presence of multiple complications, e.g. microvascular and macrovascular, that limit one's activities of daily living. The study of Issa and Baiyewu (2006) showed that poor QoL was associated with the presence of physical complications that included hypertension, cataract, weight loss, and sexual impairment among others.

In this study, the monthly family income of most of the respondents is between PhP10,001-20,000 which is above the poverty level of PhP7,000 according to the estimates of the National Statistical Coordination Board. This implies that they can at least afford minimum health costs related to Type 2 DM management. Dr. Tommy Ty Willing, President and Chairman of Diabetes Philippines, estimates that a Filipino diabetic would spend PhP106 per day for medication maintenance using generics drugs (the more complications, the more medications needed), PhP1,000 more every two to three months for regular blood tests, and PhP2,000 to PhP5,000 more every week if the diabetic patient needs to have dialysis which is ideally done every other day (Pazzibugan, 2009). Similarly, the cross-sectional study of Ayalon et al. (2008) among those with diabetes (n=400) showed that those who reported difficulties meeting basic needs, diabetes-related complications, worse subjective health, and dissatisfaction with medical care were more likely to report worse QoL.

Table 6 shows that in the family subscale, there is a significant positive relationship between monthly family income and the family subscale score (Spearman's Rho test and Kendall's Tau-b tests p-value of 0.019). This means that areas of family life of the respondents (family health, children, family happiness, spouse/partner, and emotional support) are all important and satisfactory. In many societies, the family is considered the basic unit of a community by which its members are nurtured and shaped. Families—regardless of their cultural background—share common functions such as producing children, providing affection and emotional support, maintaining and protecting the health of its members, and providing security. Furthermore, the health of individual family members can affect the

health of the family as a unit and vice-versa (Allender & Spradley, 2001). Thus, the ability of a family to perform its varied functions determines to a large extent its health status.

From the result, it can be implied that the respondents with adequate income are more able to accomplish the different family functions that are seen to contribute to QoL. More specifically, the QoL of the respondents with type 2 DM is related to their satisfaction and the importance given to the areas of family life with the provision of an adequate monthly family income. This can also be related to the earlier result pointing out to a significant relationship between family income and the social and economic subscale (Table 5).

Perceived health education needs

Identified topics which participants prefer to be included in a diabetes management class are: blood sugar monitoring, diet, medications, and exercise. This implies that participants lack the necessary knowledge needed to appropriately manage the disease. The study of Hawthorne, Robles, Cannings-John, and Edwards (2008) revealed that culturally appropriate health education for Type 2 DM in ethnic minority groups improved blood sugar control in participants, compared with those receiving 'usual' care, at three and six months post-intervention. Patients who are knowledgeable about their disease condition are able to do self-management. In fact, Holmström and Rosenqvist (2005), posit that patients with Type 2 DM need extensive support and education to learn to manage and live with their illness. Similarly, in a meta-analysis of 11 studies to evaluate the efficacy of self-management education on GHb (GlycoHemoglobin which measures the blood sugar for approximately 3 months) in adults with Type 2 DM, results showed that self-management education improves GHb levels at immediate follow-up, and increased contact time increases the effect. The benefit declines one to three months after the intervention ceases, however, suggesting that learned behaviors change over time, thus it is recommended that further study is needed to develop interventions effective in maintaining long-term glycemic control (Norris, Lau, Smith, Schmid, & Engelgau, 2002). Blood sugar monitoring, diet management, and compliance to medications are important aspects for blood sugar/glycemic control. In addition, Brown (1988) conducted a meta-analysis of 47 studies on the effects of patient teaching on knowledge, self-care behaviors, and metabolic control. Results showed that patient teaching has positive

outcomes in diabetic adults.

On the other hand, misunderstandings about illness and treatment among Swedish patients with Type 2 DM were qualitatively studied by Holmström and Rosenqvist (2005). Results revealed that misunderstandings of diabetes and its treatment were common and numerous despite regular checkups and good access to care. The patients adhered to prescribed regimens but did not know why they performed many routines or how they could benefit from them. Thus, it is of prime importance that the identified needs of the Type 2 diabetic clients in Negros Oriental become the basis for the development of a health education program specifically suited for them and for such program to be effectively delivered in a medium they can understand.

CONCLUSION AND RECOMMENDATIONS

The study concludes that the sample of respondents with Type 2 DM have very good quality of life based on the ratings they gave through the Ferrans and Powers QoL index. More specifically, education and income are significantly related with the social and economic subscale; and income with the family subscale, while age, gender, and religion were not significantly related to all four subscales and the total QoL. Majority of the respondents have obtained a higher education with an income above the poverty threshold.

Given the limitations of the study, the conclusions can be drawn only with respect to the sample size, that despite having type 2 DM for more than four years, with several complications, they have very good satisfaction with the different aspects of their life. This may be attributed to their adequate income and attainment of a higher education which allows them to better take care of themselves since this disease condition requires them to purchase medications and understand the complex treatment regimen.

It is recommended to further study the correlation between disease duration and complications with QoL scores. Also, a study which compares the QoL of those with Type 2 DM and those without Type 2 DM (comparison group) with similar socio-demographic profiles can be done. A health education program for diabetic patients based on their specified needs should be developed. This health education program can be made available to clients via tele-nursing (use of internet or cellular phones) and can be integrated into the nursing curriculum of students.

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Community Perception of the Benefits and Quality of Services Rendered by College of Nursing Students of Silliman University

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This study primarily aims to assess the benefits and quality of services rendered by Silliman University College of Nursing (SUCN) students in three barangays (villages) of Valencia, Negros Oriental, Philippines. The quantitative data were obtained through an interview schedule, from 236 respondents who were randomly selected from the three barangays. Purposive sampling was utilized to determine the participants of the focus group discussion (FGD) which consisted of formal leaders and leaders of organized groups. Quantitative data were analyzed using descriptive statistics (mean) while content analysis was used to analyze the data from the FGDs. The result of the assessment on the quality of services was interpreted as **very good** (mean = 3.35) while the assessment on the level of benefits of services was interpreted as **very beneficial** (mean = 3.42). The qualitative findings revealed that the presence of SUCN students in the three barangays influenced certain changes in health practices, and that knowledge and skills on health promotion and illness prevention were gained from the students.

KEYWORDS: primary health care, community health nursing, evaluation study, quality of services

INTRODUCTION

Evaluation, as one of the major steps in the application of the Community Health Nursing (CHN) process, helps in providing key decision-makers a concrete picture of the benefits of programs and services rendered to the community. It also provides the right direction for current and future implementation of programs and services. Furthermore, in the context of services provided by students as part of the curricular requirements, evaluation activities are linked to primary objectives of service to people in need and in the preparation of students for nursing practice in primary health care (Lindsey, Henly, & Tyree, 1997).

The students of Silliman University College of Nursing (SUCN), with the guidance and supervision of their mentors, have been engaged in the care of clients in the community setting through the CHN rotation. At the end of the rotation, students are evaluated based on set terminal competencies as they went through the different learning activities. Despite having recognized the importance of evaluation, one of the basic things that SUCN never had the chance to do was to measure and document the benefits and quality of services rendered by the students as perceived by the beneficiaries, hence the reason for this study.

The aim of this study is to present the perceptions of the community about the benefits and quality of services rendered by SUCN students in the barangays of Valencia in Negros Oriental served for at least three years which included Bong-ao, Liptong, and Balugo. More specifically, the assessment on the quality of health services rendered by the SUCN students covered working relationship, assessment of needs, planning, implementation and health teachings. Meanwhile, the perceived level of benefits of health services they rendered included health teachings, herbal medicines, shiatsu/acupressure, ventusa, urine examination for glucose and albumin, vital signs taking, physical assessment, home visitation, referrals, livelihood training (e.g. manicure, pedicure, haircut, food processing), family health workers training and first aid, and health and dental clinics. The health knowledge and skills the people in the communities have learned from the students are also presented as well as the corresponding changes in health practices in these communities. Finally, the suggestions of the communities to improve the services provided by SUCN students are discussed.

THEORETICAL CONSIDERATIONS

Health is recognized as a basic human right. In view of this, the Department of Health (DOH) has for its vision "Health for all Filipinos." Subscribing to Primary Health Care (PHC), the DOH has set the goal of "Health in the Hands of the People by the Year 2020" (Cuevas, 2007). PHC is a global strategy through which "essential health care that is based on practical, scientifically sound, and socially acceptable methods and technology is made universally accessible to individuals and families in the community by means acceptable to them, through their full participation and at a cost that the community and country can afford" (Maglaya, 2004, p.31).

To address health as a basic human right, the health care system with its health service delivery is indispensable. Nurses, together with other health professionals, compose the health human resources providing health care services. Historically, community health nurses have been on the forefront of promoting the health and well-being of clients which range from individuals, to families and communities. Any improvements needed in any aspect of nursing care must be based on formal assessment or evaluation. However, this type of assessment is noted to have limited operational definitions (Beckwith, 2009). Furthermore, Beckwith argues that the process of evaluation, especially in the community setting is "skilled and complex, and that in order to measure and demonstrate the quality of nursing practice within an arena dominated by the hegemonic power of medicine, it requires articulation and understanding" (2009, p.3). Undertaking an evaluation of the quality of services then poses a challenge to health care providers as well as health care beneficiaries such as community members.

Perceived quality has not been a subject of many investigations by researchers either regarding its measurement or its impact on utilization of services. There are two arguments put forward to explain the scarcity of studies using the approach of the subjective quality. Firstly, patients are unable to evaluate the quality of service they can get from the facilities due to biomedical and technical aspects of modern medical care. Secondly, demand-side characteristics are out of policy makers' control, unlike supply-side characteristics that are more amenable to policy interventions (Mariko, 2003). But needless to say, the assessment of community's perception on the quality of health care is vital for the improvement of health services.

Community health nursing (CHN) is a unique area of nursing

practice. Aside from its distinction in setting or location (not in the hospital/clinic setting), this practice requires the application of the nursing process at the "aggregate or community level" (Caretto & McCormick, 1991, p.179), where the client is not a single individual or a family, but a group of people. Its practicality in exposure to real life is one of the reasons why community health nursing is a required subject or program in the curriculum of students of nursing colleges. Caretto and McCormick (1991) also discuss that, in CHN, student nurses have:

...the hands-on experience of providing nursing interventions at the aggregate level; the opportunity to use the epidemiological approach in the assessment of a community; the ability to identify needs; risk factors and health patterns and to make nursing diagnoses; and then to plan, implement, and evaluate nursing actions carried out to help meet the needs of a community or a subgroup of the community (p.181).

Community health nursing may be viewed by some student nurses as just another major requirement in nursing curriculum that needs to be complied with. But for others, CHN is an invaluable learning experience where, amidst the hard work, was fun and fulfilling (Caretto & McCormick, 1991).

A qualitative-quantitative study was conducted by the University of North Dakota Nursing Center in assessing the quality of health care services rendered by student nurses to members of the community through client satisfaction. Clients answered a modified version of the Group Health Association of America (GHAA) Consumer Satisfaction Survey with 14 items. Of the 190 clients who were mailed the research instrument, 101 (53%) responded. The overall outcome of the study showed that the clients of the said Nursing Center were very satisfied with the health services rendered by the student nurses. Among the highlights of the clients' satisfaction was the amount of time spent by student nurses in teaching, commenting that such service would not have been available in the clinical setting. Other highlights include the inclusion of family members in health care programs, the professional yet friendly and sincere demeanor of student nurses, and the improvement of the health conditions of the clients (Lindsey et al., 1997).

METHODS

This is a descriptive-evaluative research which utilized a mix of quantitative and qualitative methods. Quantitative data were obtained through self-report using an interview schedule while the qualitative

data through a focus group discussion (FGD). The instrument used was a self-made tool based on the steps of the nursing process and the services rendered by SUCN students to the communities. This was critiqued by an expert. A pre-test was conducted and revision was done based on the results. The interview schedule was used since it had been noted after the pre-test of the tool that there were questions that needed to be explained to the respondents to enhance accuracy of their answers. Data collection was done during the months of April to June 2011.

There were two sets of respondents in the study. The respondents of the quantitative portion are representatives of families served by the students while in the qualitative portion respondents are formal leaders and leaders of organized groups of the barangays.

The respondents of the quantitative data were representatives of the families who have availed of the services in the barangays of Bong-ao, Balugo, and Liptong in the municipality of Valencia, Negros Oriental, Philippines. The barangays of Balugo and Liptong has been served by the students for five years while Bong-ao has been served for more than ten years, even up to the writing of this paper. The representatives of the families may not be the direct recipients of the services but have been aware of the feedback of their family members regarding the services and/or have availed of the services from other family members who have attended the health education sessions. The 236 respondents were chosen randomly after the researchers obtained from the supervising faculty the lists of families who were served by the students. Proportional allocation of respondents per purok (zone) was done. Consent of all participants was obtained before the start of actual data collection.

On the other hand, the participants of the FGDs were chosen using purposive sampling consisting of formal leaders (barangay officials) and leaders of organized groups. They were chosen because as officials, they are expected to be knowledgeable about the affairs and conditions of their constituents. The FGDs in the three barangays were facilitated by the two research assistants (RAs) guided by the following questions: [a] What knowledge on health care have the community learned from the students?; [b] What changes in health practices have been brought about by the presence of the students?; and [c] What suggestions can you give to improve the services provided by the SUCN students? Before the actual conduct of the FGDs, a practice session was done with

the facilitation of the research team. The FGD in each of the three barangays was accomplished in one day based on an agreed time. The number of participants ranged from ten to twelve individuals. The venue was the multipurpose hall of every barangay and the length of time for the FGDs ranged from 50-70 minutes. A digital recorder was used to record the discussions after consent was given by the participants.

During the conduct of the FGDs, one of the RAs facilitated the discussion based on the three research questions, while the other RA wrote the responses on a manila paper posted on the board or wall. Final validation of the responses was made before the RA summarized and concluded the session. Participants were provided with light snacks after the session as a way of expressing appreciation for their presence and cooperation.

Content analysis was used to analyze qualitative data from the FGDs. This was done separately by two researchers using the following process: the responses were read more than once, themes were coded; the two researchers met to concur on the recurrent themes, then final categories were derived from the responses. Suggestions for improving services were summarized separately.

Descriptive statistics using the mean was used to analyze the quantitative data. To measure the quality and benefits of the services, a Likert scale was used. Quality of services was rated on a scale of 1 to 4 (4 = very good, 3 = good, 2 = fair, and 1 = poor). A column for "No Evidence" was provided for those who had not experienced such services as rendered by the SUCN students. Likewise, the level of benefits was rated on scale of 1 to 4 (4 = very beneficial, 3 = beneficial, 2 = somewhat beneficial, 1 = not beneficial, and No Evidence).

The results for the quality of services based on the over-all mean and the respective interpretation are the following: 3.25 to 4.0 = very good; 2.50 to 3.24 = good; 1.75 to 2.49 = fair; and 1.00 to 1.74 = poor. Similarly, the results for the level of benefits of services based on the over-all mean and respective interpretation are the following: 3.25 to 4.0 = very beneficial; 2.50 to 3.24 = beneficial; 1.75 to 2.49 = somewhat beneficial; and 1.00 to 1.74 = not beneficial. Their ratings were based on their personal experiences with the health services rendered and observations on how the SUCN students did their activities in the community.

RESULTS

Assessment of quality of services rendered

The nursing process, being a systematic, organized, logical, and a dynamic method in providing care to clients, guides students in community health nursing practice (Bailon-Reyes, 2006). In this study, the students were rated on how well services were rendered in accordance to the steps of the nursing process which are applicable to the study. Establishing a working relationship with the people in the community is essential in community health nursing practice. This relationship can be facilitated by caring behaviors (such as being courteous, approachable, and sensitive/understanding) which need to be sustained throughout the duration of care. Table 1 shows that they were rated as *very good* (over-all mean = 3.48) in all the three qualities identified.

Assessment, in which the students' ability to identify community health problems and needs, was assessed to be *good* (over-all mean = 3.21). The areas that were particularly rated in their assessment skills were thoroughness, relevance and involvement of people. In the next phase which is planning for health services and programs, the students were rated as *good* (over-all mean = 3.23). In this portion, the areas that were looked into were whether services were based on the needs, whether community resources were incorporated and whether people were involved. Among these three parameters, the students were rated as *very good* in terms of planning of services based on the needs.

Furthermore, the respondents also rated the quality of services rendered by the students in terms of implementation of programs and services. More specifically, quality of services during implementation were rated according to utilization of community resources and involvement of the people, as well as personal attributes i.e., knowledgeable, skillful, sincere, and compassionate that enhance the quality of the services delivered. As an aspect of implementation, the quality of health teachings was rated with reference to personal characteristics of the students i.e., knowledgeable and articulate.

In Table 1, the results show that the respondents rated the quality of services during implementation and the quality of health teachings as *very good* (over-all means of 3.38 and 3.51 respectively). Looking at the specific ratings of the three barangays with regard to desirable personal characteristics manifested by the students during

Table 1.

Over-all Assessment of the Quality of Services Rendered by SUCN Students.

Assessment of Quality of Services	Balugo (n=96)	Liptong (n=61)	Bong-ao (n=79)	Overall Mean (n=236)	Interpretation
1. Working relationship of SUCN student nurses with the people					
a. Courteous	3.50	3.48	3.46	3.48	Very Good
b. Approachable	3.54	3.55	3.61	3.57	Very Good
c. Sensitive/Understanding	3.62	3.53	3.49	3.55	Very Good
2. Assessment of SUCN student nurses of community problems and needs	3.34	3.35	3.27	3.32	Very Good
a. Thorough/complete	3.20	3.31	3.14	3.21	Good
b. Relevant	3.23	3.26	3.12	3.20	Good
3. Involvement of the people	3.23	3.35	3.11	3.23	Good
4. Planning of health programs and services	3.13	3.31	3.18	3.21	Good
a. Based on the community's problems/needs	3.23	3.22	3.23	3.23	Good
b. Incorporating community's resources	3.35	3.32	3.35	3.34	Very Good
c. Involvement of the people	3.22	3.19	3.16	3.19	Good
5. Implementation of health programs and services	3.12	3.15	3.19	3.15	Good
a. Utilization of community resources	3.42	3.44	3.27	3.38	Very Good
b. Involvement of the people	3.29	3.32	3.14	3.25	Very Good
c. Knowledgeable	3.22	3.32	3.17	3.24	Good
d. Skillful	3.49	3.51	3.3	3.43	Very Good
e. Sincere	3.33	3.44	3.18	3.32	Very Good
f. Compassionate	3.61	3.47	3.32	3.47	Very Good
6. Conduct of health teachings	3.59	3.57	3.48	3.55	Very Good
a. Knowledgeable	3.52	3.60	3.41	3.51	Very Good
b. Articulate	3.54	3.59	3.36	3.50	Very Good
c. Articulate	3.49	3.6	3.45	3.51	Very Good
OVER-ALL	3.37	3.4	3.29	3.35	Very Good

implementation, all barangays rated the quality of services as *very good* (means ranging from 3.32 to 3.55). In the same manner, the three barangays rated the personal characteristics during health teachings as *very good*. On the other hand, all three barangays rated the application of principles of implementation (utilization of community resources and involvement of the people) as *good* (over-all mean = 3.24) to *very good* (over-all mean = 3.25).

Perceived level of benefits of services received

This section presents the results of the assessment of the perceived level of benefits of the services received from the SUCN students which include the following: structured health teachings (SHTs); complementary health services which include making and use of herbal medicines, application of shiatsu/acupressure and ventusa; urine examination; vital signs taking; physical assessment; home visitation; referrals; livelihood training; family health workers (FHW) and first aid (FA) training; and health and dental clinics (refer to Table 2).

Table 2 shows that all services were perceived to be *very beneficial* (over-all mean = 3.42). Livelihood training, such as pedicure, manicure, haircut and food processing, was the only service rated as *beneficial* (over-all mean = 3.17). It is noted that among the herbal medicines, *sunting* ointment had a rating of *beneficial* while all the others were rated as *very beneficial*.

Knowledge and skills learned

From the focus group discussion, the participants claimed to have acquired some knowledge and skills related to health from the services rendered by the students in the community. Primarily they have learned about the signs and symptoms, prevention and control, management of health conditions including hypertension, diabetes mellitus, tuberculosis, dengue hemorrhagic fever, smoking and related diseases, and others. Also, the participants learned general health promotion information such as healthy lifestyle (healthy/balanced diet and exercise), proper food preparation, environmental sanitation, responsible parenthood, and others.

Other important knowledge and skills learned by the participants are related to complementary therapies including the making of some herbal medicines, ventusa, and acupressure/shiatsu. Blood pressure taking, first aid, and health assessment including self-breast

Table 2.
Perception of the Community on the Benefits of the Services of SUCN Students.

SUCN Students' Services Indicators	Liptong	Balugo	Assessment (n=236) Bong-ao	Overall Interpretation
1. Structured health teachings (SHT) about health care, health promotion and disease prevention.	3.79	3.26	3.32	3.46 Very Beneficial
2. Making and use of herbal medicines	3.31	3.37	3.43	3.37 Very Beneficial
a. SLK syrup	3.42	3.42	3.61	3.48 Very Beneficial
b. BLS oil	3.4	3.32	3.38	3.37 Very Beneficial
c. Salabat powder	3.72	3.47	3.61	3.60 Very Beneficial
d. Sunting ointment	2.91	3.31	3.29	3.17 Beneficial
e. Kalachuchi ointment	3.15	3.35	3.28	3.26 Very Beneficial
f. Garlic tincture	3.23	3.33	3.38	3.31 Very Beneficial
3. Shiatsu/acupressure	3.77	3.57	3.45	3.60 Very Beneficial
4. Ventusa	3.67	3.45	3.54	3.55 Very Beneficial
5. Urine analysis	3.69	3.51	3.54	3.58 Very Beneficial
6. Blood pressure taking, temperature, pulse and respiration taking	3.74	3.61	3.73	3.69 Very Beneficial
7. Physical examination	3.43	3.32	3.23	3.33 Very Beneficial
8. Home visitation	3.41	3.41	3.45	3.42 Very Beneficial
9. Referrals	3.29	3.43	3.36	3.36 Very Beneficial
10. Livelihood trainings such as pedicure, manicure, haircut, food processing	3.11	3.25	3.15	3.17 Beneficial
11. Family health workers & first aid training	3.55	3.21	3.22	3.33 Very Beneficial
12. Health and dental clinic	3.58	3.39	3.58	3.52 Very Beneficial
OVER-ALL	3.46	3.39	3.42	3.42 Very Beneficial

examination were also learned as claimed.

Changes in health practices

The participants of the FGD claimed to have implemented some positive changes in their health practices from what were taught by the students. Many of them instituted changes in their lifestyle for health promotion and disease prevention purposes. These include eating a low fat and low salt diet, eating of more fruits and vegetables, moderation of activities, drinking alcoholic drinks moderately, stopping smoking, and others. In line with what they learned about complementary therapies, the participants also resorted to the use of acupressure, herbal medicines, and ventusa for the management of their common simple illnesses.

Improvement in their health seeking attitude and health monitoring including having a checkup and regular blood pressure taking have been observed by the participants as claimed. The utilization of first aid has also been mentioned. Furthermore, the services of the students also resulted to good environmental health practices like proper solid waste management, environmental sanitation, tree planting, vegetable gardening and the like.

Suggestions to improve the services provided by SUCN students

The participants of the FGD suggested a number of ways to improve the services provided by the SUCN students. These propositions are presented according to the number of responses from the highest to the lowest. Primarily, they suggested that the following be done: health education on family planning, Reproductive Health Bill (now Republic Act No. 10354 - Reproductive Health Act of 2012), sanitation, complementary therapies such as ventusa and other herbal medicines, smoking ill-effects and cessation, among others. Secondly, that a report on health should be endorsed to the barangay council. Thirdly, that services be delivered on weekends and that it should be done on a year round basis, even during vacation.

Furthermore, the participants proposed the inclusion of malnourished children and senior citizens as target clients and the conduct of livelihood programs and trainings on complementary therapies, acupuncture, first aid, and others. Lastly, the participants suggested that the SUCN students initiate or conduct specific

programs and services such as Operation “*Tuli*” (mass circumcision), feeding program, and blood sugar testing among others and also provide the barangays with first aid kits.

DISCUSSION

Related learning experience of student nurses

The SUCN teaching program for related learning experience (RLE) in the different areas of community health nursing from Levels II to IV provides for the utilization of the nursing process and relevant concepts such as Primary Health Care (PHC) and Community Organizing- Participatory Action Research (COPAR). The nursing process is used as a guide in working with the community. As a logical and systematic process, it begins with the establishment of a working relationship followed by the five phases namely: assessment, diagnosis, planning outcomes and interventions, implementation and evaluation (Maglaya, 2009). COPAR is a strategy used by the Health Resource Development Program (HRDP) to achieve the goal of community health development. The strategy combines the principles of community organizing (CO) and participatory action research (PAR). Jimenez (2008) defines CO as “the process and structure through which members of the community are tapped to become organized for participation in health care and community development activities” (p. 48). PAR is the process by which members of the community are able to take action and make changes on issues affecting them based on data gathered and analyzed.

The central objective of the RLE expects students to apply knowledge, skills, and attitudes (SKA) relevant to the specific experience (i.e. Family Nursing and Community Health Nursing) utilizing the nursing process. The items rated by the respondents in this study are part of the process of care which is deemed important in evaluating the quality of health services. In the study done by Mariko (2003), it is emphasized that a good process of care is one of the two main factors which have a positive and significant influence on the utilization of both public and private health facilities. In this study, a “good” process of care is one in which all of the necessary stages of care were performed. This means that the process of care is a key component in the use of health facilities and services.

Phases of the nursing process assessed by the community

Working relationship. The nurse-client relationship is an essential factor in health care delivery. According to Bailon-Reyes (2006), there are positive and negative factors in the parties involved that can either enhance or hamper the development of a good and satisfying relationship. Among the “nurse factors” are competencies required to effectively assume and carry out one’s roles and functions. A basic component of these competencies is the ability to initiate and sustain an effective working relationship with one’s client. Furthermore, certain personal attributes such as being good-natured and having a pleasant disposition are positive factors that facilitate a good working relationship. According to Haddad and Fournier (1995), in their study on the qualities that should be found among health workers, women appreciate interpersonal qualities such as respect, patience, courtesy, attentiveness, friendliness and straightforwardness, technical qualities and to a lesser extent, integrity. Majority of the female respondents in this study identified the relational component as the first between the two best qualities that a nurse should have (Haddad, Fournier, Machouf, & Yatara, 1998). From the results of the study, the students were rated as very good in these aspects, thus, conforming to the expectations of clients in terms of working relationship.

Assessment and planning. Assessment is the step in the nursing process where the nurse engages in rigorous fact finding, application of professional judgment in establishing the implications and significance of these facts to the client, the availability of the resources that can be mobilized, and the degree of change that nursing interventions are expected to affect the client (Cuevas, 2007). As such, it has to be thoroughly and properly done as it determines the precision of the nursing diagnosis and the aptness of nursing interventions (Bailon-Reyes, 2006). On the other hand, planning for nursing action is dependent on the actual and potential problems identified and prioritized. The planning activities include goal setting, constructing the plan of action, and development of an operational plan and evaluation parameters (Cuevas, 2007). From the results, the students were rated as good for both assessment and planning. These are areas that students can still improve on.

In both assessment and planning, community involvement is crucial. In this study, involvement and participation are synonymous. Participation refers to the “active and genuine involvement by

community people in defining problems/issues of concern to them; deciding priorities for action; formulating policies to address them; designing plans, implementing, managing, and monitoring solutions; and evaluating outcomes..." (Olico-Okui, 2004, p.10). Participation is a key in achieving the goal of self-reliant communities in PHC. Based on student achievement reports, participation of the community in assessment and planning was invoked during purok meetings and barangay council meetings. During these activities, resources and feasible solutions to the problems identified were discussed and explored with the key persons in the community (Barrera, Cabanban, Cabioc, Clamor, Lester, Tolentino, & Verano, 2009; Almero, Baloyo, Bucol, Bueno, Doria, Hamoy, Jumawan, Kuan, Liza, Lobaton, Lumapay, Manila, Opada, Sibala, & Yap, 2009; Edrial, Alas, dela Cruz, Limbaga, Tupaz, Carrera, Cinco, Perdido, Ucang, Ocupe, & Plantilla, 2008). With regard to involvement of the community, the students were rated from good to very good.

Implementation. Implementation refers to carrying out the plan of care designed to achieve set goals and objectives based on assessed needs (Cuevas, 2007). Utilizing principles and strategies of PHC and COPAR, this step is done with the involvement of the community as well as mobilizing community resources i.e. indigenous human and material resources including financial.

From the results, it is interesting to note that the respondents share a commonality in their perception of the quality of services rendered by the SUCN students. As a case in point, this is seen in their rating of the application of principles and strategies in PHC, i.e. involvement of the people and utilization of community resources respectively, which were assessed as *good*. In the same manner, the respondents had a common perception in their rating of the quality of health teachings i.e. personal characteristics of the students being knowledgeable and articulate, which was assessed as *very good*. Involvement may occur in three levels: individual, family, and the community. According to the *World Development Report 1993: Investing in Health*, "fostering greater involvement of communities and households in promoting healthier behavior on their own part..." is an integral element of the agenda for reform in the health sector (World Bank, 1993, p. 170). Although the family is considered the unit of care in CHN, clients of students may be at the individual, family or community level depending on the set activities in a particular rotation. In many activities during implementation, families are represented by one or

two adult members, while several families and/or groups represent the community.

Furthermore, involvement is a decision made voluntarily and not compulsory. As observed, there is variability in the extent of client involvement which may be attributed to factors such as: time, nature of livelihood, personal interest and motivation. Clients may perceive these as limitations to their involvement at one time or another. Nonetheless, based on the results, involvement was assessed as *good*. This is an area which can still be improved through the utilization of varied strategies considering personal interest and motivation, and timeliness.

Similarly, utilization of community resources as an aspect of planning and implementation was assessed as good. The three communities have farming as their main source of livelihood, with several active organized groups, and a land area rich with indigenous flora. Interventions such as herbal medicine making and other planned activities made the most of these resources whenever appropriate to an identified need. Members of the community were trained to acquire skills, i.e. retraining of barangay health workers, and first aid training, that would help expand the provision of health care. These are supported by the results of the focus group discussion.

An important role of the nurse is being a health educator, thus, giving health teachings is a major component of activities during the implementation phase. In the study of Lindsey et al. (1997), client satisfaction was related to the amount of time spent by student nurses in teaching. The quality of services provided by the students during implementation assessed the following personal characteristics: being knowledgeable, skillful, articulate and compassionate, and sincere. The characteristics of being knowledgeable, articulate, and skillful are aspects of cognitive and technical competence while being compassionate and sincere are caring behaviors. These are desirable qualities of a professional nurse during the implementation phase of the nursing process (Berman, Snyder, Kozier, & Erb, 2008).

In terms of personal characteristics (including during health teaching), students were assessed as *very good*. The result is consistent with many studies which have shown that certain personal characteristics of health workers were among aspects of quality of care which contribute to client satisfaction. Haddad et al. (1998) identified certain aspects of technical competence and interpersonal competence as important characteristics. They conclude that "the conduct of the healthcare professionals stands out as a central

element of the judgment that users make about health services" (p. 392). Case studies done by Pathania et al. (1997), as cited by Auer, Sarol, Tanner, and Weiss, (2000) have indicated that impolite health centre personnel may be an important reason for clients to consult private doctors rather than public health centers first. Clients have certain expectations of private health care providers: that they are more effective, more easily accessible, more sympathetic and more likely to respect privacy than governmental health care providers.

The training of SUCN students emphasizes cognitive, technical and interpersonal skills which are applied during their CHN rotations. From the results of the study, students have met the expectations of respondents in terms of personal qualities during the implementation phase of the nursing process. This is also supported by the findings on the perceived benefits of the services (i.e., health teachings) as well as the FGD results on knowledge and changes in health practices. A few respondents (n=46) expressed appreciation of the students' attitudes and behaviors i.e. accommodating to everyone, respectful/courteous, "*dili maarte maski dato*" (not pretentious even if they're rich).

Specific services and levels of perceived benefits

Among the services that were perceived by the respondents to be *very beneficial* were home visitation, vital signs taking and urine examination for glucose and albumin. These services were the most commonly utilized. Home visitation is a key strategy wherein the student nurses visit and provide services in the homes thereby establishing contact and a good working relationship with the family. Data gathered from this visitation is vital in assessing family situation, identifying family nursing needs and problems, and in implementing family nursing care plan as well (Bailon-Reyes, 2006). Vital signs taking (i.e. blood pressure), and urine examination are important procedures to detect early signs of illness. The data generated from these services could serve as bases for supplemental care, referrals, and health education. As expressed by several respondents: "Blood pressure taking helped a lot in monitoring the blood pressure of hypertensive patients, where they no longer have to go to Dumaguete City." Furthermore, to address various needs, referrals were made to agencies such as the Municipal Agriculture Office, Municipal Social Welfare and Development Office, Technical Education and Skills Development Authority, Philippine National Red Cross, Local Civil Registrar's Office, Mayor's Office, Silliman University College

of Business Administration, Rotary Club, and Silliman University Medical Center.

Ventusa, shiatsu/acupressure, structured health teaching, and herbal medicine making (except for sunting ointment) were among the services perceived as *very beneficial*. These are the procedures or activities commonly done by the students for the management of common health problems (i.e. SLK syrup for cough and colds, BLS Oil for joint pains, shiatsu/acupressure to relieve body pains). The services were evaluated to be *very beneficial* as these are provided by the students in the clients' homes to meet specific health needs and without monetary cost. Moreover, clients' satisfaction may also be attributed to the preparedness and readiness of the student nurses to provide the services which are aspects of desirable work attributes. In the study of Loquias and Salenga (2010), they concluded that the quality of service was perceived to be satisfactory among the target beneficiaries because of desirable work attributes of the staff of the Center for Health. As far as sunting ointment is concerned, it is rated as *beneficial* because it is indicated for fungal infections which are not among the common diseases in the communities involved.

Lastly, livelihood training (pedicure, manicure, hair cut, food processing) was the only service assessed to be only *beneficial*. Based on the achievement reports, this was only done in one barangay where it was identified as a need. Such trainings were facilitated by the students for the purpose of augmenting the income of the families.

Knowledge and skills learned from students

According to Potter and Perry (2001) clients have the right to health education. Cognizant of this, the SUCN teaching program for CHN rotation and other rotations makes health education a requirement for all the students. Health education is one of the most important components of health promotion that involves "motivating people to adapt health-promoting behaviors and help them to make decisions about their health and acquire the confidence and skills to put their decisions into practice" (Hubley, 1993, p.16).

On the other hand, PHC, as an international framework for health care delivery, recognizes the importance of health education and made it one of the basic elements in its implementation. PHC also recognizes the primacy of health promotion and disease prevention.

As to the results of the study, the knowledge and skills learned by the respondents from the students are for general health promotion,

disease prevention, recognizing the nature of selected diseases including their management, complementary therapies and simple skills such as blood pressure-taking and first aid. The result shows that the health education topics taken up by the SUCN students are aligned with the PHC guiding principle which is to give more attention to health promotion and disease prevention. At the same time, SUCN also took into consideration the expressed needs of the community by including topics on the nature and simple management of disease conditions which include diabetes mellitus, hypertension, tuberculosis, dengue hemorrhagic fever, and other diseases related to smoking that are commonly experienced by the people.

A lot of these illnesses also belong to the top ten leading causes of morbidity and mortality of the Philippines. According to Cuevas (2007), mortality statistics of the year 2002 in the Philippines showed that seven out of ten leading causes of deaths are diseases which are lifestyle related. Examples of these lifestyle-related diseases are diabetes mellitus, hypertension and other cardiovascular diseases, cancers, chronic obstructive pulmonary disease, kidney problems, and accidents. Furthermore, tuberculosis, which is a communicable disease, also belongs to the top ten leading causes of morbidity and mortality while dengue hemorrhagic fever is endemic in all areas of the Philippines (Integrated Management of Childhood Illness Manual, WHO, 2009) and has the potential to be fatal just like the other diseases.

A number of responses on things learned from SUCN students, such as acupressure, shiatsu, ventusa, and herbal medicines, are complementary therapies. These therapies started to become popular again when they were promoted by the WHO with the implementation and adaptation of PHC (Bailon-Reyes, 2006) way back in the 1980s. In its drive to come up with resources and technology that are accessible, affordable and acceptable to the people, one of its guiding principles is to utilize indigenous resources for care including complementary therapies. With the integration of PHC in the Bachelor of Science in Nursing Curriculum, selected complementary therapies have been taught to the students and in turn students also teach these to the people.

People are drawn to complementary therapies for three main reasons (Dr. Isadore Rosenfeld as cited by Bailon-Reyes, 2006):

1. Mainstream medicine's limited success in the areas of prevention and chronic diseases, especially degenerative diseases which

afflict the aging population.

2. The seductiveness of natural products. A “natural” herb is appealing and more attractive than the pills from the pharmacy which cost much more and often has unpleasant side-effects, and sometimes do not help. Many believe that natural products, having come from nature, are effective and free of toxicity and without danger.
3. Lower cost. Many patients cannot afford medications which doctors prescribe. Even the Philippine Department of Health is promoting the use of herbs like *sambong* and *lagundi* which are much cheaper compared to commercial drugs produced by pharmaceutical companies (p.409).

A number of cons of complementary therapies have also been cited but these are on the use of herbal medicine such as the possibility of being unsafe. In recognition of these, SUCN makes sure that students teach herbal medicines that have been studied and recommended for use by the Department of Health.

Improvement in health practices

It is the goal of health education to assist individuals, families, or communities in achieving optimum levels of health (Edelman & Mandle, 1998). This goal is never attained without a desired change in human behavior taking place (Potter & Perry, 2001).

The results of the study showed that much of the knowledge learned by the respondents had been translated into change in their health practices. The lifestyle changes and other health promotion changes which are a healthy diet, exercise, and smoking cessation coincide with the priorities of the Department of Health which considers lifestyle modification as one of the strategies to address the ever increasing incidence of lifestyle-related diseases which include diabetes mellitus, cardiovascular diseases, cancer, chronic respiratory diseases and others (Cuevas, 2007).

The negative impact of the major non-communicable or lifestyle-related diseases has become a universal knowledge due to the efforts of people who are deeply concerned about health. The dissemination of these negative effects has been made fast and easy due to the advanced technology. This information may have caused the respondents to be aware of the fatal consequences of these diseases and may have contributed to the respondents' desire to adapt health

promoting practices. This is aligned with the propositions of the Health Belief Model of Rosenstock and Becker, and the Protection-Motivation Theory of Rogers.

The Health Belief Model of Rosenstock and Becker postulates that when individuals perceive the seriousness of the disease and their vulnerability to it, this increases their perception of the threat of the problem. Coupled with positive perception of the benefits of an action, the individuals would likely change their behavior (Egger, et al., 1999). Similarly, Rogers in his Protection-Motivation Theory, believes that behavior change is influenced by one's motivation to protect the self from physical, social, and psychological threats. This desire to protect the self is increased when the overall appraisal of the threat is high and the coping appraisal which is based on the perceived efficacy of the action or behavior (response-efficacy) and the person's capability to perform the action or behavior (self-efficacy) is positive (Egger et al., 1999).

On the suggestions for improved health services

Health education. The first suggestion is centered on health education on specific topics, including complementary therapies, ill-effects of smoking, environmental sanitation and others. Though most of the topics suggested had somehow been tackled by students in the past years, it is understandable that these came out as suggestions since only a number of the people in the community were able to attend the structured health teachings for reasons such as conflict in schedule, venues that were not very accessible and other circumstances. Furthermore, the barangay officials who attended the FGDs noticed that a number of households still have the need for health teachings on such topics.

Endorsement of significant health data. The second suggestion is on the endorsement of the health data to the barangay council. Endorsement is an important aspect of care. This ensures continuity of care among the clients and this will allow the barangay health committee to monitor the health conditions of the people. With proper endorsement in mind, the SUCN requires students in every Community Health Nursing rotation to make two copies of an Achievement and Endorsement Report. A copy of which is kept at SUCN while one copy is supposed to be given to the barangay officials.

Availability of the services year round. The respondents of the focus group discussion also suggested that the students' services shall be available year round, even during holidays, weekends and vacation. Similarly, a good number of the respondents of the interview schedule expressed the same. While this suggestion is a pat on the back of the SUCN students as this implies that the respondents do appreciate their services, it is one thing that is difficult to address considering limitations which are curriculum and academic related. Other than meeting their related learning requirements in the community, the students have to attend to their other academic requirements which are equally demanding. Presently though, SUCN has a staff who serves as liaison officer who could look into the needs of the people during the times that the students are not available. Also, building the capability of some community members to deliver basic health care services could help address the expressed need.

Inclusion of children and elderly as target clients. The children and elderly are considered vulnerable aggregates of the society. They could easily succumb to diseases and accidents because of their physical and mental limitations that go with a weaker immune system. With these, it is reasonable that the respondents of the FGD would suggest the item.

As far as SUCN is concerned, the needs of the aggregates mentioned are sometimes dwarfed by the collective needs of the community. Although there were no specific programs intended solely for these groups, a lot of the elderly population and the children have been recipients of the services of the students during the health clinics, home visitation, health education, and other activities.

Conduct of livelihood programs. Many Filipino families are impoverished, thriving on an income that could hardly afford a decent living. As reflected in the needs assessment of the students, and as often expressed by the residents, improvement in their financial capability is one of the topmost priority needs and livelihood programs are seen as measures which could alleviate the problem.

A very limited number of training sessions had been facilitated by students for the purpose of augmenting the income of the families. These included manicure and pedicure skills training and a seminar and training for putting up a cooperative. However, due to limited resources, only a few of the residents were able to participate. The

trainings were conducted only in Barangay Bong-ao.

Conduct of health-related trainings. The respondents of both the FGD and interview schedule expressed their desire for trainings on first aid, basic health skills like vital signs taking, and complementary therapies which include acupuncture. A number of these health related trainings are considered beneficial by the community as supported by the result of the quantitative portion of the study. These skills are generally easy to learn and would come handy for health monitoring, health promotion, disease prevention and even for early treatment of simple illnesses.

On the part of SUCN, addressing this particular need would not be of much difficulty. The students are equipped to handle many of the topics suggested and in the area of complementary therapies, a number of SUCN faculty members are equipped to become resource persons.

Provision of specific health services. Operation “tuli” (circumcision) is a service that is conducted every summer vacation. This is often sponsored by non-government organizations. This is also true to the feeding program which is part of the government health services for malnourished under-five children. Furthermore, the blood sugar testing and other laboratory services like lipid profile, blood typing, urinalysis, complete blood count, and others are available at the Rural Health Unit free of charge. What is important is for these services to be made known to the residents through the students’ efforts.

Provision of first aid kit. First aid kit is essential for the management of minor illnesses and traumatic injuries. It will help the communities if each *purok* shall be provided with these supplies and equipment and at the same time will have trained residents to provide the first aid services.

CONCLUSIONS AND RECOMMENDATIONS

From the results, the quality of services was assessed to be very good, while the level of benefits was assessed to be *very beneficial*. The findings of the study have provided valuable insights on the communities’ assessment of the quality of services and the perceived level of benefits from the services rendered by the SUCN students. While the qualitative findings have validated to some extent these

assessments, it has also highlighted both the positive points as well as areas for improvement of students' services.

Evaluation is a very important aspect of any program. The result of the communities' evaluation is vital for the improvement of the health services. As the communities express their views on the presence of the students, health services or activities could be made more relevant to them. Recognizing the importance of evaluation, the researchers recommend that similar studies shall be conducted regularly by Silliman University College of Nursing and other schools of nursing to communities served by them. Furthermore, the results of this study shall be used by local government units and other community program implementers to address areas with specific needs and for more responsive health services. Further research to measure the impact of specific interventions can also be done.

From the suggestions of the respondents, the following are recommended to improve the future services:

1. **Health education.** It is necessary to determine who among the clusters still need health education on the suggested topics. Conscientious dissemination of the health teaching details like the topic, venue, and schedule will have to be done. The students should work closely with the key people in the barangay in the planning of the health education activities.
2. **Endorsement of health data.** The coordinator of Silliman University College of Nursing Extension Program (SUCNEP) must take it upon oneself to collect the Achievement and Endorsement Reports from the respective clinical instructors of the CHN rotations and give a copy to each of the communities served. It will also be best if periodic endorsement of significant information about the barangay be done during the council meeting.
3. **Inclusion of elderly and children.** With the expression of this need, SUCN must look into the probability of having specific programs for the elderly and children despite the limited resources. The school could also strengthen its partnership with the established organizations such the Senior Citizens Group and Barangay Day Care Centers.
4. **Other suggestions.** The conduct of livelihood programs, health related trainings, and provision of first aid kits should be facilitated through the collaborative efforts of SUCN and the local government units.

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Spawning Period and Size at Sexual Maturity of Spider Conch, *Lambislambis* (L. 1758) (Gastropoda: Strombidae), in Selected Reef Areas of the Visayas, Central Philippines

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A study on spawning and size at sexual maturity of the economically important spider conch, *Lambis lambis* was done in the Visayas, Central Philippines (10°59'10.73"N 125°39'58.61"E) which is useful information for the sustainable management of the overexploited spider conch. Spawning period was determined using histological analysis of gonads and data on gonadosomatic indices, as well as observations of spawning in captivity. Size at sexual maturity was determined based on a scatterplot of gonadosomatic indices (GSI) against shell length and noting other characteristics such as the thickening of the shell and marginal digitations and development of the penis (male) or egg groove (female). Minimum legal size was conservatively estimated at 80 mm but an important consideration should be that the folds of the marginal digitations are thick and solid and the penis or egg groove are fully developed. Spawning takes place year round usually 1-5 days around new moon and full moon with peak seasons during February-May and September-October. As a management measure, closed season for collection of the species can be enforced during the peak spawning season to allow sexually mature individuals to reproduce prior to harvest.

KEYWORDS: *Lambislambis*, spawning period, size at sexual maturity, spawning in captivity

INTRODUCTION

The spider conch is common in the reef and intertidal areas of the Indo Pacific region including the Philippines, Solomon Islands, Indonesia, Malaysia, India and Japan (Hamel & Mercier, 2006; Poutiers, 1998) where it is harvested for food and the shell craft industry. The spider conch fisheries in some of these areas are either showing signs of overexploitation or are already overexploited. In India, Jagadis et al. (2012) indicates that six of the eleven species of the genus *Lambis* are categorized under schedule IV of the Indian Wildlife Protection Act of 1972, which means commercial exploitation is being banned. In Singapore, it is categorized in the Singapore Red Data Book as vulnerable (Davison et al., 2008).

In the Philippines, the spider conch, *Lambis lambis* (Linnaeus 1758) is an economically important invertebrate. It is widely collected as food throughout the country (Poutiers, 1998; Germano et al., 2003; Hermosilla & Narido, 2007). It is sold in the market as boiled meat without the shell (150-250 Php/kg) or as fresh or live shell (3-10 Php/pc). The empty shell is also sold in the shell craft industry and even the operculum is sold at 2500-3000 Php/kg (Mazo et al., 2007). All parts of the spider conch are considered a source of income by fisherfolk. In some parts of the Visayas, the shell is collected almost daily from the wild except during bad weather conditions. A study on the spider conch fishery in Guiuan, Eastern Samar in the Visayas indicated that it is already overexploited based on the length frequency data analysis using the FAO ICLARM Stock Assessment Tool (FISAT II) (Mazo et al., 2007). This could be due to the unregulated and indiscriminate collection of the shell in the wild. Further studies that could be useful for the sustainable management of the spider conch are therefore much needed.

Determining the size at sexual maturity of the organism can provide information which could be used as basis for recommending a minimum legal size for collection. Furthermore, information on the spawning season can be used in aquaculture efforts as well as a basis for regulated collection or the establishment of open and closed seasons as possible means to be explored for sustainable management of *Lambis lambis*. Reproductive studies are important to support management efforts of any fishery resource (Stoner, 2012).

Many gastropods have already been studied to address problems of rapidly depleting stocks. For example, extensive

studies on the queen conch, *Strombus gigas*, have been reported, covering aspects of its reproductive biology (Appeldoorn, 1993; Appeldoorn, 1998; Aldana & Frenkiel, 2007; Frenkiel et al., 2009), fishery and population dynamics (Gascoigne & Lipcius, 2004; Stoner & Ray-Culp, 2000; CFMC [Conch Fisheries Management Council]/CFRAMP, 1999; Ehrhardt & Valle-Esquivel, 2008) and aquaculture (Shawl & Davis, 2004; Davis, 2005). This has led to various interventions to restore stocks including quota systems, collection moratoriums, gear restrictions, closed seasons, no-take zones and legal minimum size for collection (CITES, 2003). Export trade of the said species has been suspended by CITES (Theile, 2001; Acosta, 2006). Culture farms are also being established for aquaculture and reseeding wild populations. For *Lambis lambis*, a study was initiated at the Visayas State University to address the paucity of information for sustainable management. No data on reproductive biology of spider conch is yet available in the Philippines or elsewhere. This paper presents results on spawning period and size at sexual maturity of the spider conch, *Lambis lambis*, including spawning observations in the laboratory.

MATERIALS AND METHODS

In the reefs of Manicani Island, Guiuan, Eastern Samar (10°59'10.73" N 125°39'58.61"E), *Lambis lambis* are found in areas where there is an abundance of red and brown algae which serve as their food abound. The same is true in the Olango (10°16'35.32"N 124°04'33.37"E) and Caubian (10°12'49"N 124°6'2"E) Islands of Cebu. They are usually found at depths ranging from 1.5-5 m but they can also be found in deeper areas where fishing pressure is less. To determine gonadal development and size at sexual maturity, spider conches were collected from Manicani Reef, while samples used for the spawning in captivity were taken from the islands of Cebu.

Spawning period

Gonad staging

Approximately 30 individuals were obtained monthly to represent data for a period of one year for gonad histological analysis. Field sampling was done in January to June 2002 and July to Dec 2005.

Samples were measured for shell length (+0.01 mm) using calipers, and weight (g) using a Kern digital balance (+0.1 g). The gonad was removed by carefully breaking the shell to make sure that the gonad was intact. The samples were then preserved in Bouin's fixative for histological analysis. Gonad samples were processed into slides at the Microtechnique Laboratory of the University of the Philippines—Institute of Marine Fisheries and Oceanology. Developmental stages of gonads in prepared slides were determined from the predominant stage (i.e. $\geq 50\%$) of the entire gonad section based on descriptions of the different stages of development by Kennedy (1977) and Aranda et al. (2003). Gonads were classified into the following stages: Stage 1—resting; Stage 2—developing; Stage 3—ripe; Stage 4—spawning; Stage 5—redeveloping; and Stage 6—spent.

Gonadosomatic index

Gonadosomatic index was computed as $GSI (\%) = \text{gonad weight} / (\text{soft body weight} - \text{gonad weight}) \times 100$. This was used to infer the reproductive cycle of the spider conch. Since it was difficult to determine the sex based on gonad coloration and sexes were difficult to separate in younger specimens, male and female GSIs were not segregated. GSI was computed for a total of 300 individuals.

Size at sexual maturity

The size at the onset of sexual maturity was determined using the gonadosomatic indices as described earlier. A scatterplot of the GSIs against shell lengths (mm) was made to determine the minimum length at onset of active gonadal development which could be a good indicator of size at sexual maturity. Shell length was measured from the siphonal canal to the tip of the spire. Observations on the appearance of sex organs (penis and egg groove) as well as the thickening of the shell were also noted as indicators of sexual maturity.

Spawning in captivity

From October 2011 to December 2012, mature male and female spider conches were collected by commissioned collectors from the reef areas of Cebu either during full moon or new moon. This was done to observe possible copulation or spawning of spider conches under laboratory condition. As much as possible, large individuals were

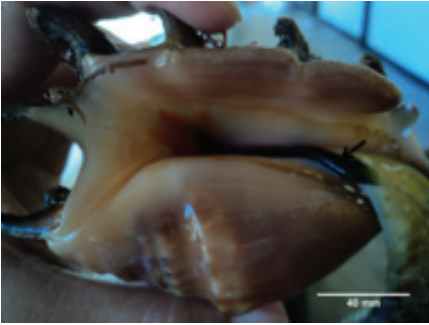


Figure 1. Sexually mature male *Lambis lambis* showing well developed dark penis (black arrow), thick shell lip and solid/closed marginal digitations (white arrow).



Figure 2. Sexually mature female *Lambis lambis* showing well developed egg groove (black arrow), thick shell lip and marginal digitations (white arrow).

collected to make sure that they are already sexually mature. Females and males were distinguished based on the presence of penis/verge in males (Figure 1) and egg groove in females (Figure 2). This was determined by holding the snails with the aperture facing the observer allowing the organism to extend its foot out revealing the verge or egg groove. If it did not extend out its foot immediately, it was stimulated by producing a sound through whistling (a technique used by locals to coax hermit crabs, which was also found to be effective for spider conches). Although not always reliable, sexes can also be determined using size as males are generally smaller than females. Using the external shell features, such as the marginal digitation, to differentiate the sexes was found difficult.

The spider conches were stocked in a conditioning tank in the laboratory with seawater and continuous aeration and fed ad libitum with a variety of brown, green and red algae such as *Sargassum sp.*, *Ulva reticulata*, *Chaetomorpha crassa*, *Eucheuma sp.*, and *Gracilaria sp.* They were stocked for possible copulation and spawning at a female to male ratio of 2:1.

RESULTS

Spawning period

The monthly gonad development stages of spider conch in Manicani Reef, Central Philippines are shown in Figure 2. Ripe and developing

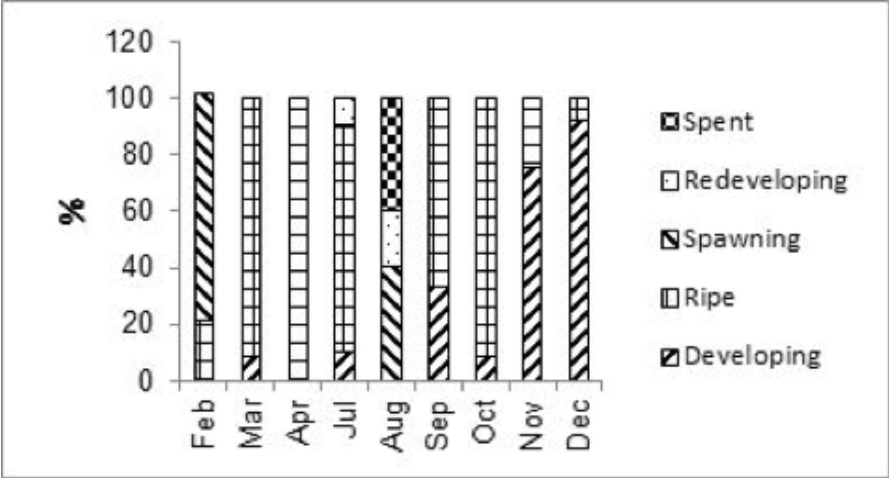


Figure 3. Percentage (%) of *Lambis lambis* observed in different stages from February to April 2002 and July to December 2005.

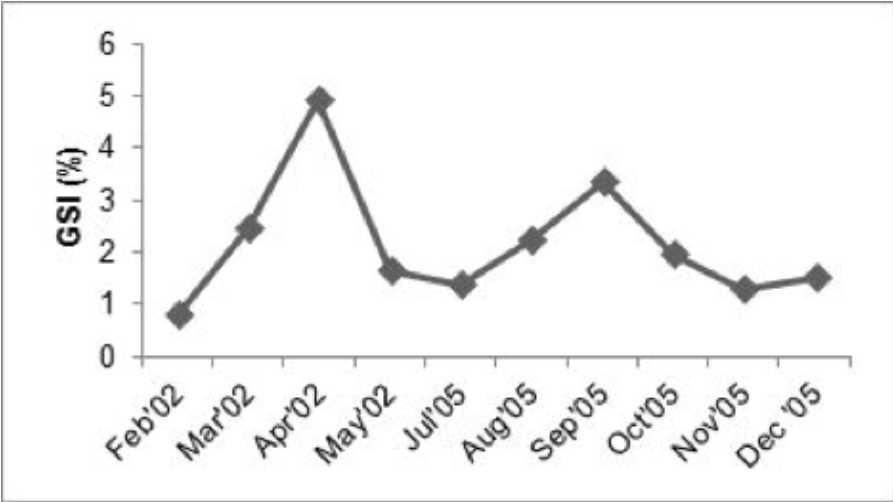


Figure 4. Gonadosomatic indices (GSI) of *Lambis lambis* from February to May 2002 and July to December 2005.

stages were observed in almost all months, with the highest numbers of individuals in ripe stage being observed during March, April, July and October. In agreement with this, peaks in GSI were noted during the months of April and September (Figure 3). Spawning stages were observed during the months of February and August, during which low GSIs were also observed.



Figure 5. Laid egg mass of *Lambis lambis* with brownish to bright yellowish colored embryos inside a transparent tube.

Size at sexual maturity

Analysis of pooled monthly scatterplots of gonadosomatic indices (GSI) against shell lengths indicates active gonadal development at around 65-75mm shell length (Figure 5). In addition to this finding was the observation in the laboratory that immature individuals had thin shells and marginal digitations that are not yet fully formed as indicated by their open/non-solid folds, and underdeveloped sex organs - penis/verge and egg groove. Immature males have small, light colored penises (Figure 6A) while immature females have less distinct egg grooves (Figure 6B). Conversely, mature males had well developed elongated and darkened penises (Figure 1A) and females have distinct egg grooves (Figure 1B).

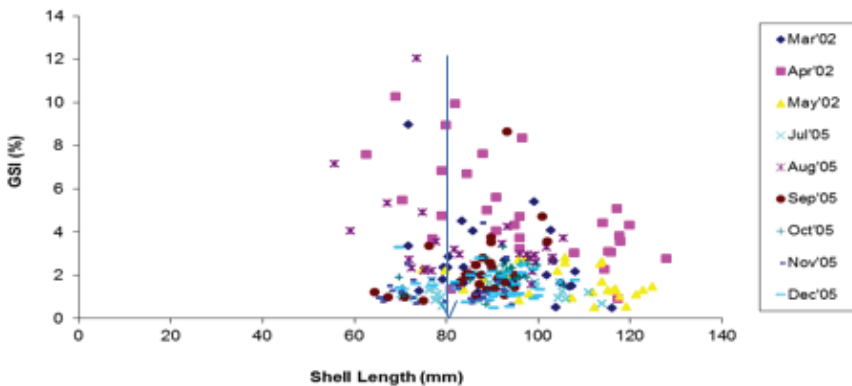


Figure 6. Scatter plot of gonadosomatic indices (GSI) against shell lengths (mm) of *Lambis lambis*. n = 300 individuals. Arrow is conservative estimate of length at massive sexual maturity.



Figure 7. Immature male *Lambis lambis* showing underdeveloped penis (black arrow), thinner shell and open digitations (blue arrow).



Figure 8. Immature female *Lambis lambis* showing egg groove (black arrow) and thin undeveloped marginal digitations (blue arrow).

Mature individuals of both sexes also had thicker shell and solid marginal digitations with closed folds. It was also noted that immature individuals having thin shells and underdeveloped sex organs could attain bigger shell lengths that could even reach up to >100 mm.

Spawning observations in captivity

Actual copulation and egg laying by *Lambis lambis* was observed for the first time in the Philippines under laboratory conditions in the months of October to December 2011, March to May 2012 and August to December 2012. Actual copulation in the laboratory was witnessed only once where the male and female spider conches faced each other with their marginal digitations somewhat interlocking. Throughout the observation period, there were egg layings that were observed one to five days before or after full moon. There were also instances that egg laying happened during or one to five days before or after new moon. The laid egg masses varied in size and consisted of transparent capsules with brownish to bright yellowish embryos inside (Figure 4).

Most of the laid eggs were found in the early morning, indicating that spawning had occurred during night time. However, actual day time spawning or laying of the egg mass was also observed in the laboratory on May 9, 2012. When laying the egg mass, the female extended out its foot and proboscis while positioned on its side with the marginal digitations facing up. A continuous strand of gelatinous filament that contained the eggs was laid through

the egg groove that runs through the foot. The female attached the egg filament to algal strands and available substrate in a maze of continuous coil with no specific pattern forming an egg mass. One of the medium sized egg masses was carefully uncoiled for length measurement and was found to be approximately 10 meters. The laying of an egg mass with this length was completed in ~7 hours. After laying, the female stayed near the egg mass, almost motionless. Some females were also found covering their newly laid egg mass with their shell.

DISCUSSION

Spawning period and spawning observations

Histological analysis of the spider conch gonad revealed that almost all months have gonads with developing and ripe stages, which indicates that spawning could be year round. However, the peak spawning season could be during February-May and September-October as indicated by the high number of ripe individuals during these months. This was corroborated by the GSIs which peaked during April and September indicating gonadal activity. These results on gonadal analysis were further corroborated by spawning observations in captivity. Year round reproduction was also suggested by Cardinas et al., (2005) on the reproductive pattern of *Strombus pugilis* in Mexico. Jagadis et al. (2012) indicated that spawning of *Lambis lambis* in India is seasonal, occurring during the months of October-December. In the study of Shawl and Davis (2004), egg mass production of *Strombus gigas* in captivity was continuous during warmer months while it slowed down or stopped when the temperature decreased during winter.

Based on our spawning observations in captivity, the female did not leave the spawn after laying the egg mass. Hamel and Mercier (2006) also observed such brooding or guarding behavior in *L. lambis* when they observed the organism, also in captivity. In contrast, Jagadis et al. (2012) who also observed *L. lambis* in captivity in India, found that the female left the egg mass shortly after spawning. Moreover, we found that an ~10 m egg mass was laid by *L. lambis* in ~7 hours, whereas egg laying took a longer time and was usually completed within 24 to 36 hours in *Strombus gigas* (Davis, 2005). The laid egg mass of *L. lambis* did not assume a specific shape unlike in other strombid species where the egg mass assumes a crescent shape (e.g. in *S. gigas*; Davis, 2005 and *S. canarium*; Cob et al., 2009).

We also found egg laying to occur during both day and night time although the spider conches were more active during night time and sought refuge in seaweeds during the day. Conversely, Jagadis et al. (2012) reported that spawning of spider conch occurs only during night time.

Size at sexual maturity

Although the onset of active gonadal development was at 65-75 mm, a more conservative estimate of length at maturity would be ~80 mm which could be used as the minimum legal size for both sexes. This is to allow the conch to reproduce prior to harvest. However, it is very important to emphasize that shell length should not be the only basis in determining sexual maturity but also the shell features and development of sex organs. Thus, the minimum legal size of spider conch that should be allowed for collection is 80 mm provided that the shell already thickened, the marginal digitations are closed and thick/solid, and the penis (male) or egg groove (female) is already well developed. In *Strombus* spp., internal reproductive structures and external genitalia develop simultaneously (Reed, 1995). In the queen conch, *S. gigas*, thickening of the shell is also used as the basis in determining sexual maturity. Theile (2001) indicated that queen conch do not start sexual maturity until the lip is 4 mm thick. Accordingly, 50% maturation is reached by the queen conch once the lip is 7 mm thick. However, Stoner et al. (2012) recently reported that the minimum lip thickness for sexual maturity is 12 mm for females and 9 mm for males. Although no actual measurement of lip or digital margin thickness was made in the present study, well developed sex organs (e.g. dark and elongated penis), in addition to thickened, solid marginal digitations are important indicators of sexual maturity. These characteristics are easier for the fisherfolk to determine. The observation on immature *L. lambis* individuals having shell length >100 mm indicate that the species grows by increasing shell length first, then later stops increasing in shell length and invests on shell thickening until sexual maturity is reached. Theile (2001) reported similar findings in *S. gigas*, which shows determinate shell growth. The shell stops increasing in length once the animal starts producing its typical large flared shell lip, and growth occurs by thickening of the shell especially the flared lip. Individuals that have started flaring their lips but have not yet reached sexual maturity are considered sub-adults. Theile (2001) further added that the linear growth of the shell and the flaring of the lip may occur simultaneously for some

time before the adult shell length is reached and the growth in shell length ceases.

In determining the minimum legal size for *Lambis lambis*, it is therefore important to consider not only the size but more importantly the thickness of the shell/marginal digitations and additionally, the appearance of the sex organs. It would then be useful to determine the specific thickness of the shell lip and marginal digitations of a sexually mature *L. lambis*. Furthermore, it is also worthwhile to determine the maximum shell length at which *L. lambis* starts to increase in shell thickness and stops increasing in length. However, for management purposes, especially at the fisherfolk level, using the structure of the marginal digitations in addition to the appearance of sex organs as indicators of sexual maturity would be easier to implement.

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Assessment of Marine Protected Areas in Four Coastal Barangays of Bolinao, Pangasinan

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This study aimed to assess the diversity of fish and macrophytes present in the marine protected areas (MPAs) in Barangays Balingasay, Arnedo, Victory and Binabalian in Bolinao, Pangasinan, and to determine the physical, chemical and biological characteristics in order to evaluate the present condition in these marine protected areas. The physical and chemical characteristics of the selected coastal areas in Bolinao were found to be of good water quality being within the optimum level set by DENR for marine species to thrive and replenish. The total coliform was high due to the presence of milkfish pens nearby and domestic wastes from residential areas.

Twenty marine fish species were identified from the four marine protected areas: 14 were found in Arnedo, 16 in Balingasay, 5 in Binabalian, and 5 in Victory. Overall four species, namely *Chromis dimidiata*, *Acanthurus olivaceus*, *Halichoeres hortulanus*, and *Chlorurus microrhinos* registered a high importance value index. The diversity of the marine fish species in the said areas was very low. Only 9 macrophytes were identified—7 seagrasses and 2 seaweeds. Eight macrophytes were found in Barangay Arnedo, 5 in Balingasay, 4 in Binabalian, and 5 in Victory. *Thalassia hemprichii* and *Caulerpa racemosa* had the highest percent cover in almost all of the study areas for macrophytes. The marine protected areas in Bolinao, Pangasinan have low diversity of fish and macrophytes and high total coliform due to anthropogenic activities. The marine protected areas have only recently made a modest start on their

way towards the rehabilitation of the coastal resources. Hence, a no take zone is imperative to bring back the integrity of the coastal resources. This would constitute a step towards the attainment of sustainability.

KEYWORDS: Marine protected areas, species diversity, fish, macrophytes, total coliform

INTRODUCTION

The coastal zone—the transition between the land and the sea—is one of the most fragile, complex, and productive ecosystems. It is bestowed with enormous resources, both living and non-living, and constitutes a potential area for the creation and harnessing of non-conventional energy resources (wave and wind energy). This is the zone of dynamic activity, constantly forming itself to maintain equilibrium, under the varying intensity of the natural processes operating in it. It is a region of diverse activities, both complementary and conflicting to each other. However, accelerated and unscientific developmental activities performed in it have induced catastrophic consequences.

Over the past 20 years, coastal areas in the Philippines have come under increasingly severe threat due to human activities. The coastal situation in the Philippines mirrors global trends where unsustainable use of natural resources, pollution and habitat destruction are resulting in a significant if not irreversible loss of the coastal life support system.

Coastal areas in the Philippines are experiencing rapid population growth due, in part, to migration to coastal areas. About 60 percent of the Philippine population lives within the 832 coastal municipalities and 25 coastal cities (DENR et al., 1997). There is also widespread poverty along the coastal areas where fishers are among the poorest of the poor and where declining fisheries productivity due to overharvesting and loss of habitats occurs (Courtney et al., 1999). According to the DENR et al. (1997), environmental damage in the coastal resources is also increasing at an alarming rate due to overfishing, the use of destructive fishing practices, and habitat conversion. Moreover, the increase in population goes hand in hand with land-based activities, industrial and urban development, deforestation and agriculture, which all contribute to the declining

productivity in the marine environment. As such, water quality is diminished implying an even greater impact from global climate change on coral reef ecosystems and on the fisheries they support, thereby affecting the status of the coastal resources (DENR et al., 2001).

The Lingayen Gulf is a major area for capture and coastal aquaculture in Northwestern Luzon. Its marine waters are biologically diverse, providing 1.5 percent of the Philippine Fish supply. But like most of the country's coastal waters, Lingayen Gulf is beleaguered by various concerns affecting its resources. Luna (1992) and Luna and Quito (1992) stated that the ability of Lingayen Gulf to support multiple uses of its coastal resources was critical because of several problems and issues related to resource-use in the gulf's coastal area. Moreover, Silvestre et al. (1991) revealed that the Lingayen Gulf has suffered from excessive fishing pressure since the late 1970s due to biological and economic overfishing. This unwanted scenario was earlier reported by Silvestre (1990), Calud et al. (1996), and Ochavillo et al. (1991) stating that the Lingayen Gulf has been dramatically degraded in terms of its resources.

Several studies were also made by concerned agencies. McManus and Chua (1990) compiled the reports on the coastal environmental profile of the Lingayen Gulf which constituted the basis for management interventions. The earlier study undertaken by Mines (1986) in the Lingayen Gulf disclosed the dismaying status of the gulf of which the exploitation rate has reached its critical point. This report triggered concerned agencies to save the gulf. In response to the threats to the environment and natural resources, the former president of the Philippines Fidel V. Ramos declared the Lingayen Gulf as an environmentally critical area by virtue of Proclamation no. 156 (LGCAMC, 1996).

Bolinao, one of the coastal municipalities in Lingayen Gulf, Pangasinan has experienced the challenges of degrading resources in its coastal areas. The local government unit of Bolinao is continuously working out to fulfill its vision through its coastal resources management programs and projects. These include fisheries registration and licensing (FRC), mangrove planting and management's support to rehabilitation and protection of other habitats and high value species, support to livelihood projects, revitalization of M/BFARMC, mariculture water quality management, and establishment of marine protected areas and management (DENR et al., 2001). Thus, the main aim of this study was to assess the



Figure 1. Geographic location of Bolinao, Pangasinan showing the four coastal barangays.

diversity of aquatic species particularly fish and macrophytes present in Barangays Balingasay, Arnedo, Victory and Binabalian in Bolinao, Pangasinan, and to determine the physical, chemical and biological characteristics in order to evaluate the present condition of these marine protected areas.

METHODOLOGY

Data Gathering

This study was conducted in the four coastal barangays of Bolinao, Pangasinan, namely Arnedo, Balingasay, Binabalian and Victory (Figure 1) from November to December 2009. These areas were identified to have an active coastal resource management program centered in Bolinao, Pangasinan, for the past few years. In this location, marine protected areas were established and mangrove ecosystems were managed. The data on marine protected areas management programs and activities in the four coastal barangays were gathered by means of an interview with the Municipal Agricultural Officer of Bolinao, Pangasinan.

Species Diversity

Three sampling stations were established in each of the coastal barangays of Bolinao, Pangasinan. These three sampling stations were established at the coralline areas of the marine protected areas.

The locations of the sampling sites were determined using a GPS (Global Positioning System) device. The economically important aquatic flora and fauna were assessed particularly in terms of the diversity of macrophytes such as sea grasses and seaweeds as well as the diversity of fish in the selected marine protected areas.

Fish, sea grass and seaweeds were sampled using a nondestructive method— snorkeling visual census. A random sampling of different species of fish and other economically important species in each station was done using the quadrat method. Ten quadrats were laid out in each station measuring 10m by 5m. After the quadrat was fully deployed, the divers waited for a minute in order for the fishes that were disturbed by the deployment process to resume normal activity patterns. The divers recorded and counted all fishes which were seen within the quadrat. Fishes that were seen were recorded using underwater writing slates or data sheets. Pictures using an underwater camera were also taken for verification in the identification of the species. Faster swimmers were recorded earlier than slow movers. The species of fish were identified using different references from the local government unit, the fishbase, and the local residents.

Seaweeds and sea grasses were assessed using a transect line and quadrat method. The method described by Saito and Atobe (1970) for the transect-quadrat method was adopted in this study. A transect line measuring 50 meters with a graduation of 1 meter was laid perpendicular to the shore. A quadrat measuring 50 cm x 50 cm which had subdivisions of 25 (5 cm x 5 cm) was used. After the quadrat was placed on the bottom, organisms or substrate type located under each intersection were recorded. The percent cover of the plants was estimated using the 25 cm grid of a quadrat. Each species was scored in the grid according to the method of Saito and Atobe (1970). The depth and the substrate at each interval were recorded to support the analysis of the study. Species were identified based on the works of Munro (1967), Conlu (1986), Fishbase (2010) and Matsuda et al. (1984). The number of individuals per species was recorded.

Macrophyte and Fish Community Structure

The macrophyte and fish community structure were determined in the four coastal barangays of Bolinao such as Arnedo, Balingasay, Binabalian and Victory. Using the quadrat method, data gathered were the following:

1. Frequency (%)

$$F = \frac{qn}{25} \times 100 = qn \times 4$$

where qn is the number of small squares within the quadrat in which an algal and other plant organisms species occurred/appeared.

2. Percent cover

The percent cover observer was estimated as the percentage of quadrat area filled by each taxon or substrate type. Quadrats were partitioned into smaller subunits with percent cover being independently estimated for each subunit for accuracy. In general, the smaller the sub-unit, the easier it was to estimate percent cover of included organisms. For convenience, the index numbers 5, 4, 3, 2, and 1 were used for recording data in the field.

Table 1.

Indices and Multiplier Used to Determine the Cover Value.

Indices	Degree of Algal Cover	Multiplier (CN)
5	Covering $\frac{1}{2}$ to $\frac{1}{1}$ of substratum surface	3.0
4	Covering $\frac{1}{4}$ to $\frac{1}{2}$	1.5
3	Covering $\frac{1}{8}$ to $\frac{1}{4}$	0.75
2	Covering $\frac{1}{16}$ to $\frac{1}{8}$	0.375
1	Covering $< \frac{1}{16}$ of substratum	0.1875

To compute for area in the substrate occupied by the species, percent cover was computed as follows:

$$\begin{aligned} \text{Percent cover} &= (qn5 \times C5) + (qn4 \times C4) + (qn3 \times C3) + (qn2 \times C2) + (qn1 \times C1) \\ &= (qn5 \times 3) + (qn4 \times 1.5) + \dots (qn1 \times 0.1875) \end{aligned}$$

where qn is the number of small squares in which a species occurred to have corresponding coverage area described in the above table.

3. Dominance

The dominance for each macrophyte was computed using this formula:

D = Percent cover of individual species/ total percent cover of all species

Dominant species are those species whose cover values constitute 5 percent or more fraction of the total algal cover while SD (sub-dominant) are those organisms whose cover values, when added to those of dominant, equals 75 percent or more of the total algal cover.

For each species, the following parameters were also determined (Smith & Smith, 1998 as cited by Paz-Alberto, 2005): [1] Number of individual species in each quadrat; [2] Frequency distribution (F); [3] Relative frequency (RF); [4] Density (D); [5] Relative Density (RD); [6] Dominance (Do); [7] Relative Dominance (RDo); [8] Importance Value Index (IVI) = RF + RD + RDo; and [9] Species Diversity. The species diversity of the macrophytes and fish were determined and computed using the Shannon Diversity Index formula (Smith & Smith, 1998):

$$H' = -\sum_{i=1}^S p_i \ln(p_i)$$

where H' = Shannon Index of Diversity

p_i = Proportion of species from the total species

$\ln$ = Napierian logarithm or natural logarithm

S = Total number of species.

Water Sampling and Analysis.

Two sampling stations from each of the four coastal barangays in Bolinao were selected. These two stations were located in the coralline areas where the marine protected areas were established. The physical, chemical, and bacteriological characteristics of the coastal water within the sampling sites were determined.

Physical Parameters

In situ analysis of physical parameters was done. Temperature was analyzed using a portable laboratory mercury thermometer. This was submerged immediately below the water surface for 5 minutes. Reading was done while the thermometer was in the water to avoid inaccuracy during temperature reading. This was done three times per station at varying depths within the coastal area.

Light penetration was determined by using a graduated secchi

disk. This secchi disk was lowered into the water until the black and white colors of the disk are not clearly noticeable. The water mark on the string was noted and recorded for the depth. The process was repeated and the average of the two readings was computed to get the measure of sunlight penetration.

Chemical Analysis

The pH and salinity were analyzed *in situ*. The pH of the water samples from every sampling station was taken by using a digital pen-type pH meter. A sample was taken and placed in a beaker then the pH meter was dipped until the water reached the probe mark. When the readings appeared on the pH meter screen, and it was stabilized, this reading was recorded as pH measurement.

In measuring the salinity, a drop of water sample was taken in the sampling site and placed into the glass mount of the refractosalinometer. The salinity reading was based on the blue level mark of the screen of the said device and expressed in parts per thousand (ppt). The glass mount was cleaned with distilled water for every sampling made.

The water sample was collected from each sampling station for the analysis of ammonia, nitrite, phosphate and total suspended soil solids (TSS) including the bacteriological analysis for the total fecal coliform. Water samples for laboratory analysis were collected at 4 to 5 feet depth from the four sampling stations during daytime. Sterilized bottles were dipped 6 inches below the surface of the water. The bottles were held by the hand near the base and plunged, neck downward from the middle of the surface water, then the bottles were turned until the neck pointed slightly upward against the water flow. These bottles were labeled according to the station where these were collected. These were put into a cooler with ice to maintain the temperature of 4°C while being transported to the laboratory. The samples were examined within a 24-hours period after they were taken from the site.

Two hundred milliliters of water sample was collected for each sampling station between 9:00 AM to 10:00AM for the analysis of ammonia, nitrite, phosphate and total suspended solids (TSS) including the bacteriological analysis for total and fecal coliform. Laboratory analysis for composite water samples was done in the BFAR-NIFTDC Limnological Laboratory in Dagupan City.

Gathered data on water quality were tabulated and analyzed

using their mean/average. These were compared to the standards set by the Department of Environment and Natural Resources (DENR) and Association of Southeast Asian Nation (ASEAN) for marine water.

RESULTS AND DISCUSSION

Coastal Resource Management Programs

The municipality of Bolinao has established several programs and projects in order to manage its coastal resources. Some of these can be found in Barangay Arnedo, Balingasay, Binabalian and Victory, where marine areas are protected and mangroves are managed by the LGU and NGOs or people’s organizations (Table 2).

Barangay Balingasay has 14.77 hectares of marine protected area which was launched in 1998; Victory has 4.8 hectares established in 2002, while Arnedo has 19.47 hectares established in 2004. The newest of the four study areas is the 10.8 hectares in Binabalian which started in 2006 (Figure 2).

Table 2.

Coastal Resource Management Programs in Barangays Arnedo, Balingasay, Binabalian and Victory in Bolinao, Pangasinan.

Programs	Activities	In-Charge For Management
Marine Protected Areas	Planning workshops and consultations Guarding and patrolling in cooperation with the community Deputized “bantay dagat” Regular monitoring	LGU KAISAKA Federation SAPA SAMMABAL SAMMABI SMMV

Marine protected areas in these barangays are part of the coastal resource management programs implemented by the local government units. These were established to bring back the integrity of the coastal resources which were degraded since the Lingayen Gulf was declared to be an environmentally critical area. The marine



Figure 2. Marine protected areas and mangrove management areas in Bolinao, Pangasinan.

protected areas were established to be a “no take” zone where fishing and other activities are prohibited to ensure the freedom of the species to replenish in the area.

Regular consultation with the community and information campaigns were done to ensure the progress of the program. Guarding and patrolling has been included in the activities in the areas in the form of deputizing “bantay dagat.”

All of these programs were launched and managed by the local government unit (LGU) in partnership with the people’s organization (PO), the Kaisahan ng mga Samahan Alay sa Kalikasan, Inc. (KAISAKA) Federation. Management of these projects was specifically given to the member organizations of the KAISAKA in every barangay. These members are the “Samahang Pangkalikasang Arnedo” (SAPA) in

Barangay Arnedo, “Samahan ng mga Mangingisda at Mamamayan ng Balingasay” (SAMMABAL) in barangay Balingasay, “Samahan ng Mangingisda at Mamamayan ng Binabalian” (SAMMABI) in barangay Binabalian and “Samahan ng Maliliit na Mangingisdang Victory” (SMMV) in barangay Victory.

Table 2.

Macrophytes Identified inside the Four MPA of Bolinao, Pangasinan.

Species	Location			
	Arnedo	Balingasay	Binabalian	Victory
Sea Grasses				
<i>Halophila ovalis</i> (R.Br.) Hook.f.	✓			
<i>Enhalus acoroides</i> (R.Br.) Hook.f.	✓	✓	✓	✓
<i>Thalassia hemprichii</i> (Ehrenberg) Ascherson	✓	✓	✓	✓
<i>Halodule uninervis</i> (Forsskal) Ascherson	✓			
<i>Halodule pinifolia</i> (Miki den Hartog				✓
<i>Cymodocea rotundata</i> Ehrenberg et Hemprich	✓	✓		
<i>Syringodium isoetifolium</i> Kutz	✓			
Seaweeds				
<i>Caulerpa racemosa</i> (Forsskål) J.Agardh	✓	✓	✓	✓
<i>Acanthophora spicifera</i>	✓	✓	✓	✓

* ✓ = species present

ASSESSMENT OF THE DIVERSITY OF
MACROPHYTES AND FISH

Macrophyte Identification

Macrophytes identified in the 4 marine protected areas include sea grasses and seaweeds. These macrophytes were identified from the 4 selected marine protected areas in Bolinao (Table 2). Eight of these species were found in Barangay Arnedo, 5 in Balingasay, 4 in Binabalian and 5 in Victory. The 9 identified macrophytes within the selected marine protected areas in Bolinao, consisted of 7 sea grasses and 2 seaweeds. The identified sea grasses were *Halophila ovalis*, *Enhalus acoroides*, *Thalassia hemprichii*, *Halodule uninervis*, *Halodule pinifolia*, *Cymodocea rotundata*, and *Syringodium isoetifolium*, meanwhile the identified seaweeds were *Caulerpa racemosa* and *Acanthophora spicifera*.

Table 3.

Observed and Identified Fish Species within the MPA of Four Coastal Areas of Bolinao, Pangasinan.

Family	Scientific Name	English Name	Common Name	Local Name	Arnedo	Occurrence	Balingasay	Binabalian	Victory
Pomacentridae	<i>Chromis dimidiata</i> (Klunzinger, 1871)	Damselfish		Palata	✓	✓	✓	✓	✓
Labridae	<i>Halichoeres hortulanus</i> (Lacepede, 1801)	Checkboard wrasse		Galis-galis	✓	✓	✓	✓	✓
	<i>Cheilinus trilobatus</i> (Lacepede, 1801)	Trippletail wrasse		Epes	✓	✓			
Scaridae	<i>Cheilio inermis</i> (Forsskal, 1775)	Cigar wrasse		Sangitan	✓				
	<i>Chlorurus microrhinos</i> (Bleeker, 1874)	Heavybeak parrotfish		Molmol, Loro	✓	✓	✓		✓
Acanthuridae	<i>Acanthurus olivaceus</i> (Bloch and Schneider, 1871)	Surgeon fish		Baliwak-wak	✓	✓	✓		✓
	<i>Cephalopholis leopardus</i> (Lacepede, 1801)	Coral Grouper		Lapu Lapu	✓	✓	✓		
Serranidae	<i>Plotosus lineatus</i> Thunberg, 1787	Eel-tailed catfish		Hito	✓				
Plotosidae	<i>Arothron hispidus</i> (Linnaeus, 1758)	Pufferfish		Butete		✓			
Tetraodontidae	<i>Nemipterus japonicus</i> (Bloch, 1791)	Japanese threadfin		Labayan	✓				
	<i>Scolopsis ghianam</i> (Forsskal, 1775)	Arabian monocle		Silay		✓			
Caesionidae	<i>Caesio cuning</i> (Bloch, 1791)	Fusilius, solid		<i>Dalagang Bukid</i>	✓	✓			
	<i>Balistapus undulatus</i> (Park, 1797)	Triggerfish		Papakol	✓	✓			
Lethrinidae	<i>Lethrinus harak</i> (Forsskal, 1775)	Thumbprint emperor		Rugso	✓				
	<i>Siganus canaliculatus</i> (Park, 1797)	Siganid		Baraa-ngan	✓	✓			✓
Mullidae	<i>Parupeneus insularis</i> (Randall and Myers, 2002)	Goatfish		<i>Gumyan</i>	✓	✓			
	<i>Heniocchus acuminatus</i> (Linnaeus, 1758)	Longfin bannerfish		Bayang-bayang		✓			
Ephepidae	<i>Chaetodon kleinii</i> (Bloch, 1790)	Butterfly fish		Alibang-bang		✓			
Chaetodontidae	<i>Zanclus cornutus</i> (Linnaeus, 1758)	Morish idol		Sangu-wanding		✓			
Zanclidae	<i>Macroramphosus scolophax</i> (Linnaeus, 1758)	Longspine snipefish		Trumpeta		✓			
Centriscidae									

* ✓ - species present

Fish Species Identification

Table 3 shows the 20 fish species observed and identified within the four marine protected areas of Bolinao, Pangasinan belonging to 17 families, namely; *Chromis dimidiata* for family Pomacentridae, *Halichoeres hortulanus*, *Cheilinus tribatus*, and *Cheilio inermis* of Labridae, *Chlororus microrhinos* under Scaridae, *Acanthurus olivaceus* under family Acanthuridae, *Cephalopholis leopardus* of Serranidae, *Plotosus lineatus* from Plotosidae family, *Arothron hispidus* of Tetraodontidae, *Nemipterus japonicus* and *Scolopsis ghanam* from family Nempteridae, *Caesio cuning* of Caesionidae, *Balistapus undulatus* of Balistidae, *Lethrinus harak* of Lethrinidae, *Siganus canaliculatus* of Siganidae, *Parupeneus insularis* from the family of Mullidae, *Heniochus acuminatus* of Ephepidae, *Chaetodon kleinii* of Chaetodontidae, *Zanlus cornutus* of Zancidae, and *Macroramphosus scolophax* from the Centriscidae.

Of these species, 14 of them were found in Arnedo from 12 families, Balingasay had 16 species belonging to 15 families, and Binabalian and Victory had 5 species identified belonging to five families.

Macrophytes

Table 4 shows that *Thalassia hemprichii* (31.07%) is the most abundant in Arnedo. This is followed by *Cymodocea rotundata* (10.37%) and *Syringodium isoetifolium* (9.20 %). In Balingasay, *Caulerpa racemosa* Table 4.

Percent Cover of Macrophytes inside the Marine Protected Areas of the Four Coastal Barangays in Bolinao, Pangasinan.

Species	Percent Cover (%)			
	Arnedo	Balingasay	Binabalian	Victory
Seagrass				
<i>Halophila ovalis</i>	1.87	0.00	0.00	0.00
<i>Enhalus acoroides</i>	1.17	5.13	2.93	2.93
<i>Thalassia hemprichii</i>	31.07	21.77	39.33	1.83
<i>Halodule uninervis</i>	2.83	0.00	0.00	0.00
<i>Halodule pinifolia</i>	0.00	0.00	0.00	13.6
<i>Cymodocea rotundata</i>	10.37	23.53	0.00	0.00
<i>Syringodium isoetifolium</i>	9.20	0.00	0.00	0.00
Seaweeds				
<i>Caulerpa racemosa</i>	3.90	2.53	11.17	14.6
<i>Acantophora spicifera</i>	6.27	9.63	7.23	7.23

(23.53%) had the highest percent cover. Next to it is the *Thalassia hemprichii* (21.77%) and *Acantophora spicifera* (9.63%). In Binabalian, *Thalassia hemprichii* (39.33%) also has the most cover. This is followed by *Caulerpa racemosa* (11.17%) and *Acantophora spicifera* (7.23%). Meanwhile, in Victory, *Cymodocea rotundata* (33.33%) had the highest percent cover which is followed by *Caulerpa racemosa* (14.67%) and *Halodule pinifolia* (13.67%).

Importance Value Index and Diversity of Fish in the Four Marine Protected Areas in Bolinao, Pangasinan

Results revealed that in Arnedo, *Chlororus microrhinos* had the highest importance value index of 47.75 percent (Table 5) which indicates that this species is the most dense, frequent and dominant in the area. This was followed by *Chromis dimidiata* (30.12%) and *Acanthurus olivaceus*

Table 5.

Importance Value Index of Fish in the Marine Protected Area of Four Coastal Barangays in Bolinao, Pangasinan.

Species	Importance Value Index (IVI)			
	Arnedo	Balingasay	Binabalian	Victory
<i>Chromis dimidiata</i>	30.12	59.00	86.45	66.38
<i>Halichoeres hortulanus</i>	9.76	1.31	47.84	34.98
<i>Chlororus microrhinos</i>	47.75	36.15	21.89	51.54
<i>Acanthurus olivaceus</i>	26.47	58.72	33.80	22.62
<i>Cheilinus tribatus</i>	6.71	1.95		
<i>Balistapus undulatus</i>	7.08	3.30		
<i>Plotosus lineatus</i>	15.66			
<i>Cephalopholis leopardus</i>	9.82	8.45	11.01	
<i>Parupeneus insularis</i>	1.64	4.18		
<i>Nemipterus japonicus</i>	1.41			
<i>Cheilio inermis</i>	6.37			
<i>Caesio cuning</i>	1.39	3.91		
<i>Lethrinus harak</i>	4.10			
<i>Siganus canaliculatus</i>	32.72	2.96		25.47
<i>Arothron hispidus</i>		2.04		
<i>Heniochus acuminatus</i>		13.44		
<i>Chaetodon kleinii</i>		1.86		
<i>Zanclus cornutus</i>		3.72		
<i>Scolopsis ghanam</i>		4.67		
<i>Macroramphosus scolophax</i>		1.95		

(26.7%). Meanwhile, the most dense, frequent and dominant species in Barangay Balingasay was *Chromis dimidiata* which obtained the highest importance value index of 59% followed by *Acanthurus olivaceus* (58.72%) and *Chlorurus microrhinos* (36.15%).

Moreover, Binabalian had only five species observed and identified. These were dominated again by *Chromis dimidiata* which obtained the highest importance value index (86.45%). The second highest IVI was obtained by *Halichoeres hortulanus* which got an importance value index of 47.84 % followed by *Acanthurus olivaceus* (33.80%).

Meantime, results in Table 5 show that only five species were identified in Victory, Bolinao where *Chromis dimidiata* obtained again the highest importance value index (66.38%). This was followed by the *Chlorurus microrhinos* (51.54%) and *Halichoeres hortulanus* (34.98%).

Species Diversity of Fish

Table 6 shows the diversity index values of the different fish species present in the marine protected areas in the four coastal barangays of Bolinao, Pangasinan. Results revealed that the diversity index values of marine fishes in the marine protected areas of the four coastal barangays are very low.

Although the MPA in Arnedo was established only in 2004, the diversity of fish species in this marine protected area was very low which was almost the same as Balingasay MPA. The abundance of these species is due to their characteristics which are well adapted to the area. These species are tropical fishes which inhabit lagoons and seaward reefs and are abundant in large aggregations of reef tops, bare rocks or mixed rubble and sand (Meyers, 1991).

Table 6.

Diversity Index Values of Fish Present in the Marine Protected Areas of the Four Coastal Barangays in Bolinao, Pangasinan.

Barangay	No. of Species	No. of Individual	Diversity Index Values
Arnedo	14	861	1.99
Balingasay	16	1,129	1.90
Binabalian	5	544	1.14
Victory	5	1,797	1.46

Binabalian got a diversity value index of only 1.14 which was also very low. Binabalian was the youngest MPA established among the four study areas. This explains why there are a few species observed and why it has low diversity. The area is still starting to recover from overfishing and environmental degradation after it was declared as a marine protected area in 2006. Despite this, results indicated that even if there were only a few species found, the number of individuals was observed to be high in every sampling area. They appeared to have reproduced and increased in the said environment where they were not disturbed allowing them to grow until they spill over. Diversity of species in the MPA in Victory had 1.46 which is also very low due to environmental disturbances which occurred in the area.

THE PHYSICO-CHEMICAL AND BACTERIOLOGICAL CHARACTERISTICS OF THE COASTAL WATERS

Physical parameters

Assessment of the physical characteristics of the study areas (Table 7) showed that the temperature values ranged from 27.5°C to 28.4°C in the marine protected areas. These temperature values taken from the waters of these barangays are within the criteria or standard value of DENR (Table 2). In terms of turbidity, Barangay Binabalian had the lowest turbidity value of 1.2 m among the four stations. This indicates lower transparency in the waters of the said barangay. Despite this, however, the turbidity values are within the allowable limits set by the DENR. The water depth varied from each station, where Barangay Balingasay had the highest water depth of 10 m while Barangay Binabalian is the shallowest with 3.2 m. Still, the water depths in all stations fell within the standard value given by DENR.

Chemical Characteristics

The basic and important chemical parameters in the marine protected areas as shown in Table 8 show the salinity values from 34 ppt (Arnedo) to 36 ppt (Binabalian). However, the dissolved oxygen (DO) concentrations varied across stations where Barangay Victory had the highest value (8.44 mg/l) while Barangay Arnedo had the lowest (6.53 mg/l). The DO concentrations were within the criteria value set

Table 7.

Physical Characteristics in Four Marine Protected Areas (MPA) of Bolinao, Pangasinan.

	Temperature (°C)		Turbidity (M)		Average Station Depth	
	MEAN	SD	MEAN	SD	MEAN	SD
Arnedo	28.0	0.28	7.2	0.57	7.2	0.57
Balingasay	27.5	0.71	9.0	0.71	10.0	0.00
Binabalian	28.3	0.42	1.2	0.28	3.2	0.14
Victory	28.4	0.14	4.0	0.35	6.0	1.41
Mean	28.05	0.40	5.4	3.45	6.6	2.79
DENR Standard (SA)	26-30		> 100		> 3	

by DENR and ASEAN except for Barangay Arnedo (Table 8). The hydrogen ion concentrations differed from station to station. Barangay Victory had the highest pH value of 8.33 while Barangay Arnedo got the lowest with 8.0. The pH values were within the allowable range given by DENR and ASEAN. The highest total suspended solids (TSS) value was recorded in Barangay Binabalian with 49.92 mg/l. In contrast, Barangay Arnedo obtained the lowest TSS value of 16.04 mg/l. However, TSS values of the four stations were within the criteria value set by ASEAN but two stations failed under the DENR standard for Class SA. These are Barangays Binabalian and Victory.

The phosphate concentrations fluctuated from 0.014 ppm (Arnedo) to 0.243 ppm (Balingasay). All these phosphate values fell within the allowable concentrations set by DENR and ASEAN, except that of Barangay Balingasay. In terms of ammonia, the concentrations ranged

Table 8.

Chemical Characteristics in Four Marine Protected Areas of Bolinao, Pangasinan.

	Salinity	D.O. (MG/L)	pH	TSS (PPM)	Phosphate (PPM)	Ammonia (PPM)	Nitrate (PPM)
Arnedo	34	6.53	8.0	16.04	0.014	0.030	0.144
Balingasay	35	7	8.24	16.26	0.243	0.039	0.132
Binabalian	36	8.38	8.31	49.92	0.021	0.053	0.031
Victory	35	8.44	8.33	30.45	0.049	0.030	0.043
Mean	35	7.59	8.22	28.17	0.082	0.038	0.088
SD	0.82	1.28	0.15	15.47	0.182	0.207	0.371
DENR Standard (SA)		7	7-8.5	25	0.1	< 1	1.0
ASEAN criteria		5	6-8.5	50	0.48	0.5	0.395

from 0.030 ppm (Arnedo and Victory) to 0.053 ppm (Binabalian). These ammonia values taken were within the standard value set by DENR and ASEAN. Likewise, the nitrite concentrations varied from 0.031 ppm (Binabalian) to 0.144 ppm (Arnedo) which was within the accepted value given by DENR and ASEAN.

Bacteriological Characteristics

The bacteriological characteristics in all the marine protected areas and mangrove management areas (Table 9) were identical in the total coliform values at > 1,100 MPN/100 ml. In terms of fecal coliform, the values ranged from 0 MPN (Victory and Balingasay) to 7.3 MPN/100 ml (Binabalian). The total coliform in all stations obtained high values and did not meet the criteria set by DENR and ASEAN for MPA (Table 5). However, the four stations passed the criteria set by DENR and ASEAN for fecal coliform.

Table 9.

Bacteriological Characteristics in Four Marine Protected Areas (MPA) and Mangrove Management Areas (MMA) of Bolinao, Pangasinan.

	Total Coliform (MPN/100 ML)	Fecal Coliform (MPN/100 ML)
Arnedo	> 1,100	3.6
Balingasay	> 1,100	0
Binabalian	> 1,100	7.3
Victory	> 1,100	0
DENR Standard (SA)	1,000	200
ASEAN Criteria	1,000	200

DISCUSSION

Results indicated that the species observed and identified were very few as compared to the over 100 species of fish documented and found in Bolinao by the UP-MSI in the 1950s. This can be attributed to the Bolinao experience of degrading coastal resources, and the loss of its species due to dynamite fishing. Also, the rise in milkfish grow-out pens and massive fish kills and bleaching during the 1998 El Niño and 1999 La Niña (Uychiaoco et al., 2000) could have caused the depletion

of these marine species. This data of decreasing species was further supported by the data gathered over a 4-year period (1988–91) by McManus et al. (1992). This revealed evidence of overharvesting of reef fish that decreased the adult-fish density and species diversity, as well as the size of reproductively mature fish.

Overharvesting of coral fish resulted in decreased adult fish density and in species diversity as well as in the size of reproductively mature fishes. McManus et al. (1992) documented these trends for adult fish communities along the slope of the Bolinao reefs from 1988 to 1991. For siganid fishes, the smallest recorded size of reproducing females was down to 3 cm. This showed that intense fishing pressure has selected small and fast reproducing individuals. With the massive exploitation of the Lingayen Gulf by commercial fisheries, artisan fishers and peasants who depend on the Gulf to provide food for them and their family are struggling to compete for marine resources, resorting to Malthusian overfishing (Dayton et al., 1995). Malthusian overfishing illustrates the imbalance of sustainability in the Lingayen Gulf. Fisherman are forced to use any means possible to obtain fish such as blasting, cyanide, etc., in order to obtain fish. Such cutthroat tactics are resorted to because commercial trawling has drastically reduced the numbers of several fish species available to common fishers (Ochavillo et al., 1989).

A significant portion of the coastal habitats (like sea grass beds) is at high risk of being lost in the next decade. About half have either been lost or severely degraded during the past 56 years (Chou, 1994; Fortes, 1994), and the rate of degradation is increasing.

These studies led to recommendations for the creation of protected areas, the development of alternative or supplemental livelihoods, and the promotion of public education. These can provide the needed social sanctions against economically efficient but illegal fishing methods (McManus et al., 1992).

The overall goal of an integrated coastal management, like the establishment of the Marine protected areas in Bolinao, is to improve the quality of life of human communities who depend on coastal resources while maintaining biological diversity and productivity of coastal ecosystems. Adoption of the coastal area management philosophy (and its corresponding planning and management framework) is essential to long term sustainable use and conservation of sea grass resources of the country (DENR et al., 2001).

The marine protected areas in Arnedo, Balingasay, Binabalian and Victory were established to be a “no take zone” to bring back the

species lost in the coastal area. An MPA was established in Balingasay in 1998, in Victory in 2002, in Arnedo in 2004 and in Binabalian in 2006. The Bolinao experience shows that establishing “no take areas” is important to bring back the diversity of species in the area.

Binabalian and Victory are both on the coast of Santiago Island that is why they share almost the same characteristics. In Victory, only five species were also identified but these appeared to be with high number of individuals in every sampling station similar to Binabalian. This shows that even though Victory was established several years earlier (2002) than Binabalian, the same numbers of species were observed in the area but with lower diversity value. This may be due to its small area as it has only 4.8 hectares, as compared to Binabalian with an area of 10.8 hectares. Still the area had a high number of individuals per species indicating that the species thriving were also given a chance to find a permanent spawning area which is undisturbed and that they were able to increase in number. This effect was also shown in the review of 31 studies made on MPAs and their effect by Dugan and Davis (1993). They found out that of the 31 studies they conducted 24 studies showed increased density of species within the boundaries of MPA core zones.

The data showed that whichever had the highest species density would have the highest dominance index, relative dominance and species importance value. Overall four species, namely; *Chromis dimidiata*, *Acanthurus olivaceus*, *Halichoeres hortulanus*, and *Chlororus microrhinos* registered a high importance value index in the four marine protected areas. Abundance of food and shelter for these species within the marine protected areas contributes to the increase in their number, particularly their reproduction. The marine protected area has been declared a “no take zone,” so this allowed them to reproduce freely and grow until they are ready to spill over. *Chromis dimidiata* feed mostly on plankton and usually seen in solitary reefs, staying close to the substrates of about 10 m (Kuitert & Tonozuka, 2001).

Meanwhile, according to Meyer (1991), *Chlororus microrhinos* are tropical marine fish which are reef associated and usually found in schools together whereas *Acanthurus olivaceus* inhabits waters nine to at least 46 m in depth. It feeds on the surface film of detritus, diatoms and fine filamentous algae covering sand and bare rocks. While *Halichoeres hortulanus*, on the other hand, feeds mainly on hard-shelled organisms including mollusks, crustacean and sea urchins.

The Philippines, with its 18,000 km of coastline, has sizeable sea

grass areas spread discontinuously along the shallow portions of the coastline. According to Fortes (2004), 16 species of sea grasses were identified in the Philippines. However, this study found only 8 species of sea grasses thriving in the MPAs of Bolinao. Seaweeds also have been observed to be naturally occurring in the marine protected areas. This is an indicator of a good quality of water since seaweeds are sensitive to pollutants. The presence and growth of seaweeds in the MPAs can enhance the ecological system.

Presence of sea grass and seaweed cover in the MPAs is an indication that the area is now recovering from degradation particularly in terms of water quality since sea grasses are sensitive to pollution (Fortes, 2004). Although the percent cover is still thin, the habitat is an important factor to help in the regeneration of species in the area. Sea grass beds are an ecologically significant marine habitat, and serve as a nursery area for juvenile marine animals while providing food and shelter. Sea grass beds colonize and grow in areas of shallow water especially in the presence of unstable mud, silt and sand substrates. Some sea grasses grow at greater depths, but will vary according to the amount of sunlight they can receive through the water column. These areas are important in maintaining biodiversity and are vulnerable to environmental pressures (Fortes, 2004). Sea grasses found in the MPAs of Bolinao are bound to be conserved to maintain the different species thriving in the area. According to the survey, percent cover of each species of seaweeds and sea grasses ranges only from 7% to 33%. This is an indication that macrophytes covering the area is still thin and still in the process of recovery. With the marine protected area, these species can be conserved and managed through the proper management of the quality of water and the environment.

The four marine protected areas observed showed very low diversity of species. Balingasay is the oldest MPA but still shows a very low diversity like the other three which are younger. Moreover, this shows that the programs for the establishment of the marine protected areas have not shown the best outputs through the years that they were established, particularly in Balingasay and Victory. These 2 MPAs have been there for more than 10 years. This can be attributed to poor management due to the manpower structure where there are only a few staff members from the local government unit who handle and manage the programs. Likewise, the first hand management was given to the People's Organizations for whom there are no evaluation and monitoring programs regarding their specific roles and duties guaranteeing the success of the CRM programs. Many environmental

problems and issues contribute to the results obtained particularly the destruction of critical habitats due to overfishing, pollution and coastal erosion. Moreover, results can also be attributed to the reality that the establishment of the “no take zone” has not yet been effective for the past years as these areas showed very little improvement in the species diversity.

The higher salinity values are inherent to seas being salt water. The salinity values suggest that the marine sanctuaries are not affected by river runoff which is one of the criteria in setting up a sanctuary. The DO levels are acceptable except for Barangay Arnedo which was lower than the required 7 mg/L for marine protected areas. Although the DO in Barangay Arnedo value fell short of the required DO level, the obtained reading did not substantially affect the biota of the MPA. The higher DO concentrations in the three MPA might have been caused by constant agitation of the water by sea current and the abundance of phytoplankton and algae in the area considering that these areas are protected areas. The slight alkalinity of the marine sanctuaries is attributed to the chemical nature of the sea. The carbon dioxide-carbonic acid- bicarbonate system acts as buffer to keep the sea water slightly alkaline from 7.5 to 8.4 (Nybakken, 1992). The total suspended solids concentration is very critical to MPA. Higher TSS may limit the light penetration and hamper the photosynthetic activities of plants particularly those on the benthic portion. McGlone et al. (2004) reported higher TSS values in some areas of Lingayen Gulf where river runoffs are evident. The absence of river runoffs may have caused the lower values of phosphate, ammonia and nitrite in the MPAs. Domestic and agricultural wastes, through river runoff, contribute to the increase of phosphate, ammonia and nitrite (McGlone, et al., 2004).

Results of the present study indicated that there was a great improvement in the water quality of Bolinao as compared to the previous studies. The Lingayen Gulf suffered from pollution from point and non-point sources and runoff. Microbial contamination, fertilizers, pesticides, heavy metals, silt, and untreated sewage are the main pollutants of the Lingayen Gulf (Guarin, 1991). Pollution has caused a multitude of problems for the Lingayen Gulf, including eutrophication of coastal areas, deaths of marine life, sedimentation, and destruction of the physical habitat (Guarin, 1991). The study of Azanza et al. (2006) revealed that the nutrient concentration in Bolinao waters had been increasing which was been attributed to the increase in fish pens and fish cages. However, a significant decrease

in nitrate and nitrite had been observed between 2002 and 2003 which was parallel to the decrease in fish pens and fish cages due to a massive milkfish kill. On the other hand, ammonia, a more reduced form of nitrogen was higher in 2003, which implies a low oxygenated environment that favors its formation that can be attributed to continued build up of decomposing products (fish feeds) and other organic materials. In addition, Azanza (2005) also reported the death of milkfish was clearly the result of lack of oxygen mostly from the collapse of the algal bloom. The optimal level of dissolved oxygen is about 5 mg/l for milkfish growth in tropical waters. The observed dissolved oxygen during the fish kill was 2.1 mg/l in 2002 (Azanza et al. 2005).

Results of the analysis of chemical characteristics of water, particularly the DO concentrations, phosphate, ammonia and nitrite in Bolinao waters in this study revealed an enhanced water quality that largely surpassed the limit set by DENR and ASEAN for marine water. The improved water quality may be attributed to the coastal resource management programs being implemented in the four coastal barangays such as coastal cleanup, no take zone policy, monitoring and evaluation of the coastal resources by the local government agencies, NGOs and people's organizations.

However, the total coliform in all study areas had high values which did not meet the criteria set by DENR and ASEAN for marine waters. The higher values for total coliform in all the MPAs of the four stations could have been caused by the nearby milkfish pens (Azanza et al. 2006) which can create excess bacteria and light-blocking algae as well as domestic and agricultural wastes from the land. McGlone et al. (2004) hinted that an increase of total coliform is triggered by the domestic and agricultural wastes carried through the river. According to Fortez and Paningit (2007), the uncontrolled milkfish culture characterized by high feeding inputs and the proliferation of fish cages and pens have contributed to the deterioration of the water quality of Bolinao coastal areas. However, the fecal coliform count in all the MPAs is still manageable as it passed the ASEAN criteria and DENR standard. Marine protected areas are deemed ideal ecosystem that meet all the appropriate physico-chemical standards.

The Bolinao experience of deteriorating marine resources shows that establishing no-take areas is important to bring back the integrity of their coastal areas. According to Uychaco et al., (2003), for a complex multi-species fishery sustaining diverse user groups, multi-pronged approaches are necessary to make any headway and in

order to generate good results. Therefore, the initiatives in Bolinao—particularly the establishment of marine protected areas as no take zones in these barangays—are indicators of good practices for coastal resource management programs in order to bring back the integrity of the coastal resources which were degraded since the Lingayen Gulf was declared to be an environmentally critical area. Even though the diversity of species is still low but in time if the marine protected areas will continue to be “no take” zone areas where fishing and other activities are prohibited to ensure the freedom of the species to replenish in the area and if other management measures are pursued in the context of integrated coastal management, perhaps in the future, it will make a difference.

CONCLUSION

Marine protected areas (MPAs) were established in Barangays Arnedo, Balingasay, Binabalian and Victory and several programs and projects were initiated to manage these coastal resources. Nine (9) macrophytes such as 7 sea grasses and 2 seaweeds and 20 fish species were observed and identified in the selected MPAs in Bolinao. The diversity of species in the MPAs is still very low because the MPAs are still starting to recover from overfishing (McManus et al., 1992; Dayton et al., 1995), and environmental degradation (Chou, 1994; Fortes, 1994) after they were declared as marine protected areas in 2006. The physico-chemical characteristics of the marine protected areas in the four barangays of Bolinao, Pangasinan are within the desirable range set by the standards of the DENR and ASEAN. However, the total coliform in all the MPAs in the four barangays exceeded the optimum level set by DENR and ASEAN due to the presence of fish cages (Azanza et al., 2006; Fortez & Paningit, 2007) nearby and from domestic wastes (Guarin, 1991; McGlone et al., 2004) from the residential areas. The fecal coliform were below the standard value given by the DENR and hence, passed the DENR and ASEAN criteria. Overall, the physico-chemical characteristics of the MPAs have improved considerably and the water quality has likewise greatly improved compared to the water quality three to five years ago (Azanza, 2006; Fortez & Paningit, 2007; McGlone et al., 2008) due to the management activities conducted in the areas. A no take zone in the MPA is very imperative to bring back the integrity of the coastal resources. The MPAs in Bolinao, Pangasinan have only

just made a first start on their way towards the rehabilitation of their coastal resources.

RECOMMENDATIONS

1. Regular biodiversity assessment and monitoring should be done in the marine protected areas of Bolinao in order to determine the success of the management initiatives in the MPAs and to examine the diversity of fish and macroflora.
2. Regular water quality monitoring should be done not only in the MPA but also in the nearby milkfish cage culture areas.
3. Information, communication and education on the management of marine protected areas should be strengthened by the local government units and the people's organizations to intensify public awareness and obtain community involvement and participation in the management of MPAs.
4. The Solid Waste Management Act and Clean Water Act should be strictly implemented in Bolinao to lessen pollution and continue the restoration and rehabilitation of coastal resources.

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Sterols and Triterpenes From the Fruit of *Annona muricata* Linn.

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Annona muricata Linn., commonly known as guyabano, is a well-known medicinal tree. The bioactivities of *A. muricata* are varied, but the commonly isolated compounds are acetogenins which exhibit anticancer properties. This study reports on the isolation of the sterols: β -sitosterone (1), β -sitosteryl fatty acid ester (2) and β -sitosterol (3); and the triterpenes: β -amyirin (4), β -amyirin (5) and squalene (6) from the dichloromethane extract of the freeze-dried fruit of *Annona muricata* Linn. Compounds 1-6 were isolated by silica gel chromatography and identified by NMR spectroscopy. These compounds were reported to possess diverse bioactivities.

KEYWORDS: *Annona muricata*, Annonaceae, sitosterone, β -sitosteryl fatty acid ester, β -sitosterol, β -amyirin, β -amyirin, squalene

INTRODUCTION

A*nnona muricata* Linn. of the family Annonaceae, commonly known as *guyabano*, is a well-known medicinal tree with anti-bacterial (Oberlies et al., 1997), antiviral (Padma et al., 1998; Betancur-Galvis et al., 1999), molluscicidal (Dos Santos &

Sant'Ana, 2001), anti-oxidative stress (Adewole & Caxton-Martins, 2006) and diuretic properties (Quisumbing, 1951). The bioactivities of *A. muricata* are varied, but the commonly isolated compounds are acetogenins which are known for their anticancer properties. Annohexocin, a mono-THF annonaceous acetogenin from the leaves of *A. muricata*, showed significant inhibitory effect against six human cancer cell lines: lung, breast, colon, pancreatic, kidney carcinoma and prostate adenocarcinoma (Zeng et al., 1995). Muricoreacin and murihexocin C, acetogenins from the leaves of *A. muricata*, exhibited significant cytotoxicities against six human tumor cell lines with selectivities to the prostate adenocarcinoma (PC-3) and pancreatic carcinoma (PACA-2) cell lines (Kim et al, 1998a). Annomuricine and muricapentocin showed significant cytotoxicities against six types of human tumors, with selectivity to pancreatic carcinoma (PACA-2) and colon adenocarcinoma (HT-29) cell lines (Kim et al., 1998b).

In our earlier study, we reported the isolation of three acetogenins: *cis*-annoreticuin and sabadelin from the fruit; and annoreticuin-9-one from the seeds of *A. muricata* (Ragasa et al., 2012). Annoreticuin-9-one was earlier reported to exhibit cytotoxic activities against the human pancreatic tumor cell line (PACA-2), human prostate adenocarcinoma (PC-3) and human lung carcinoma (A-549) (Craig Hopp et al., 1997),

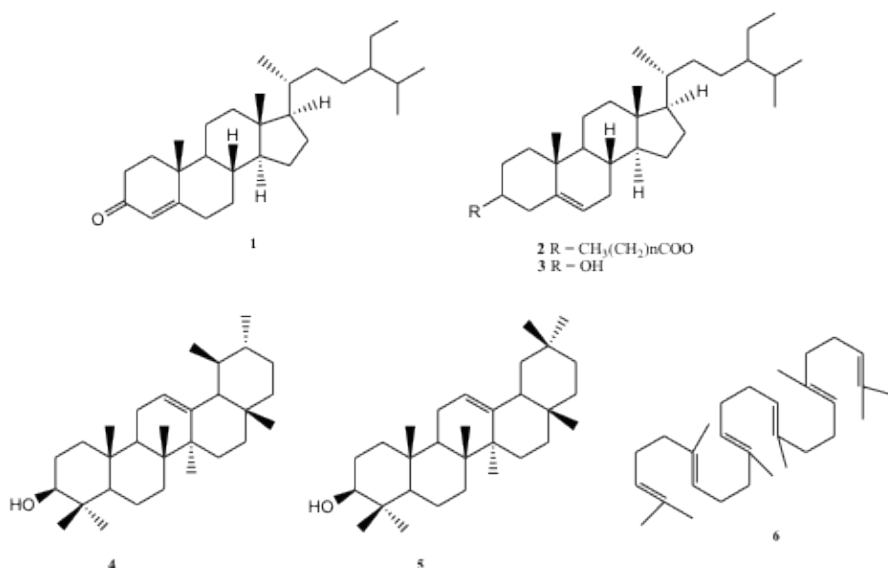


Figure 1. The sterols: β -sitosterone (1), β -sitosteryl fatty acid ester (2) and β -sitosterol (3), and triterpenes: α -amyrin (4), β -amyrin (5), and squalene (6) from the freeze-dried fruit of *Annona muricata*.

while *cis*-annoreticuin exhibited cytotoxicity against human hepatoma carcinoma cell line (Hep G2) (Liaw et al., 2004).

This article reports on the isolation of the sterols: β -sitosterone (1), β -sitosteryl fatty acid ester (2) and β -sitosterol (3); and the triterpenes: α -amyrin (4), β -amyrin (5), and squalene (6) from the fruit of *Annona muricata* (Fig. 1). To the best of our knowledge, this is the first report on the isolation of 1-6 from *A. muricata*.

MATERIALS AND METHODS

General Experimental Procedures

NMR spectra were recorded on a Varian VNMRs spectrometer in CDCl_3 at 600 MHz for ^1H NMR and 150 MHz for ^{13}C NMR spectra. Column chromatography was performed with silica gel 60 (70-230 mesh). Thin layer chromatography was performed with plastic backed plates coated with silica gel F₂₅₄ and the plates were visualized by spraying with vanillin/ H_2SO_4 followed by warming.

Plant Material

The *Annona muricata* Linn. fruits were collected from Painaan, Rizal, Philippines in September 2012. The specimens of the plant were authenticated at the Bureau of Plant industry, Quirino Avenue, Manila, Philippines.

Extraction and Isolation

The flesh of the *A. muricata* fruit (3 kg) was separated from the seeds and fruit peel, and then freeze-dried. The freeze-dried flesh of the fruit (550 g) was ground in a blender, soaked in CH_2Cl_2 for three days and then filtered. The filtrate was concentrated under vacuum to afford a crude extract (5 g).

The crude extract was fractionated by silica gel chromatography using increasing proportions of acetone in CH_2Cl_2 (10% increment) as eluents. A glass column 18 inches in height and 1.0 inch internal diameter was used for the fractionation of the crude extract. Five milliliter fractions were collected. Fractions with spots of the same *R_f* values were combined and rechromatographed in appropriate solvent systems until TLC pure isolates were obtained. A glass

column of 30.5 cm height and 1.3 cm internal diameter was used for the rechromatography. Two milliliter fractions were collected. Final purifications were conducted using Pasteur pipettes as columns. One milliliter fractions were collected.

The CH_2Cl_2 fraction from the chromatography of the crude extract was rechromatographed using petroleum ether as eluent. The less polar fractions were rechromatographed (3x) in petroleum ether to afford **6** (6 mg). The more polar fractions were rechromatographed (2x) in petroleum ether to afford **1** (4 mg). The 10% and 20% acetone in CH_2Cl_2 fractions were combined and rechromatographed (2x) using 1% EtOAc in petroleum ether, followed by 2.5% EtOAc in petroleum ether and finally, 5% EtOAc in petroleum ether to afford **2** (9 mg). The 30% and 40% acetone in CH_2Cl_2 fraction was rechromatographed using 5% EtOAc in petroleum ether, followed by 7.5% EtOAc in petroleum ether and finally, 10% EtOAc in petroleum ether to afford **3** (12 mg) and a mixture of **4** and **5** (8 mg) after washing with petroleum ether.

RESULTS AND DISCUSSION

The dichloromethane extract of the freeze-dried fruit of *Annona muricata* afforded the sterols: β -sitosterone (**1**), β -sitosteryl fatty acid ester (**2**) and β -sitosterol (**3**); and the triterpenes: α -amyrin (**4**), β -amyrin (**5**), and squalene (**6**) by silica gel chromatography. The structures of **1** and **2** were elucidated by extensive 1D and 2D NMR spectroscopy and confirmed by comparison of their ^{13}C NMR data with those reported in the literature for β -sitosterone (Prachayasittikul et al., 2009) and β -sitosteryl fatty acid ester (Julien-David et al., 2008), respectively. The structures of **3-6** were identified by comparison of their ^{13}C NMR data with those reported in the literature for β -sitosterol (Kojima et al., 1990), α -amyrin (Mahato & Kundo, 1994), β -amyrin (Mahato & Kundo, 1994), and squalene (Brown & Martens, 1977), respectively.

Literature search revealed that the compounds isolated from *Annona muricata* were reported to possess diverse bioactivities. β -Sitosterone exhibited significant hypoglycemic (Alexander-Lindo et al., 2007), antiarrhythmic (Hotta et al., 2003) and pronounced antitubercular (Saludes et al., 2002) activities. β -Sitosterol had been shown to inhibit proliferation and induce apoptosis in human solid tumors such as colon and breast cancers (Park et al., 2007). α -Amyrin

and β -amyrin were reported to possess anti-inflammatory (Recio et al., 1995; Madeiros et al., 2007) and analgesic properties (Otuki et al., 2005; Soldi et al., 2008). Squalene had shown cardioprotective effect which is related to inhibition of lipid accumulation by its hypolipidemic properties and/or its antioxidant properties (Farvin et al., 2006). Furthermore, this triterpene significantly suppresses colonic ACF formation and crypt multiplicity which strengthens the hypothesis that it possesses chemopreventive activity against colon carcinogenesis (Rao et al., 1998).

CONCLUSION

Compounds **1-6** which were isolated for the first time from *A. muricata* were reported to possess diverse biological activities. β -Sitosterone exhibited significant hypoglycemic, antiarrhythmic and antitubercular activities, while β -sitosterol inhibited proliferation and induced apoptosis in human solid tumors. α -Amyrin and β -amyrin were reported to possess anti-inflammatory and analgesic properties, while squalene showed cardioprotective effect and significantly suppressed colonic ACF formation and crypt multiplicity.

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Impact of Intercropping Lemon Grass (*Cymbopogon citratus* Stapf.) on Infestation of Eggplant Fruit and Shoot Borer (*Leucinodes orbonalis* Guenee) in Eggplant (*Solanum melongena* L.)

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The impact of vegetation diversity through intercropping was assessed for its ability to reduce the infestation of eggplant fruit and shoot borer (EFSB), (*Leucinodes orbonalis* Guenee) on eggplant (*Solanum melongena* L.) inasmuch as insecticide use in eggplant production is quite heavy. The eggplant-chives-lemon grass cropping system did not give rise to EFSB damage. The population dynamics of insect pests and natural enemies in this mixed eggplant-herbs organic garden showed flea beetles, leafhoppers and mealy bugs while beneficial insects included ants, spiders and coccinellid beetles. In a follow-up study for two consecutive years, the effect of intercropping eggplant with lemon grass on pests populations and yield was compared with farmers' practice of insecticide use in small plot field trials at the Central Experiment Station, College of Agriculture, UP Los Baños. Eggplant intercropped with lemon grass had lower average leafhopper and aphids but there was no difference for whitefly populations compared to the monocrop. Percentage shoot damaged by EFSB in eggplant intercropped with lemon grass was significantly lower than the monocrop at 9 and 10 weeks after transplanting, although chemical control had the lowest damage. The average weight of eggplant fruit was highest for eggplant intercropped with lemon grass. Total yield in terms of number and weight of marketable fruits was significantly higher in

the intercropped plots than in eggplant monoculture and farmers' practice. To elucidate the operative mechanism in the field, damage potentials and host finding behavior of EFSB in the presence of eggplant and lemon grass were investigated in the laboratory using choice and no-choice cage bioassays. A significant decrease was observed in the number of moths alighting on eggplant with lemon grass, compared to eggplant alone at 24 h after introduction. The average percent shoot damage per plant for the 1:1 eggplant-lemon grass combinations was significantly lower than eggplant alone. Our field and laboratory trials demonstrate repellency effects of intercropping lemon grass with eggplant which has the potential to reduce insecticide use in eggplant production as well as increase income of farmers.

KEYWORDS: Habitat management, intercropping, polyculture, vegetation diversity

INTRODUCTION

Eggplant (*Solanum melongena* L.) is one of the most important vegetables in the Philippines in terms of volume and value of production (BAS, 2011). The eggplant fruit is a good source of potassium and it is a major part of the average Filipino diet because it can easily be prepared into various dishes. The local average production of 8.67 metric tons per hectare is low compared to the world average yield of 17.90 metric tons per hectare. Problems associated with eggplant production that contribute to low yield include arthropod pests (eggplant fruit and shoot borer [EFSB], leafhoppers, whiteflies, cutworm and mites), diseases (bacterial wilt, *Phomopsis* and *Phytophthora* fruit rot), and weeds. Farmers rely heavily on the use of chemical pesticides to control insect pests resulting in an average spray application of 40 times per cropping season that accounts for about 24% of the total cost of production (Navasero et al., 2004). There is widespread pesticide misuse ranging from wrong choice of pesticides, timing, rate and manner of application, to using restricted or banned pesticides. The situation persists in spite of several studies that showed the possibility of using non-pesticide control alternatives. Non-pesticide management tactics for EFSB include sanitation or removal and destruction of damaged plant parts and use of barrier structures like net (Arida et al., 2004), use of biological control agents like *Trichogramma* (Bustamante et al., 1994;

Gonzales et al., 2004) and earwigs (Javier, personal communication).

Four major insect pests occur regularly at high population levels during the dry season, namely *Amrasca biguttula* (Ishida), *Bemisia tabaci* (Gennadeus), EFSB, and *Thrips palmi* Karny. EFSB is the most difficult to control with insecticides. The rest had more or less occasional or sporadic occurrences. Some species were found abundant such as *Aphis gossipii* Glover, flea beetles, *Spodoptera litura* (Fabr.), *Chrysodeixis eriosoma* (Doubleday), and *Liriomyza* spp. or other species like phytophagous mites were favored by dry conditions. Only EFSB was found abundant in Batangas while this species and *Epilachna* sp. were abundant in Pangasinan during the wet season. The application of pesticides can reach as much as 40 times per season when chemical control is relied upon heavily (Navasero et al, 2004).

The effects of plant community diversity on the population dynamics of some major insect pests of eggplant were studied in mixed and monocultures of eggplant intercropped with bush sitao (*Vigna unguiculata* x *Vigna unguiculata* var. *sesquipedalis*), mungbean (*Vigna radiata* L.) and radish (*Raphanus sativus* L.). Significant differences were observed in the ten-week total count for EFSB.

The lowest count, of EFSB population in the three intercrops, was registered in eggplant-radish intercrop at 9 to 11 weeks after transplanting. Laboratory experiments on insect behavior, revealed a significant reduction in the average number of moths alighting on eggplant-radish combination (0.50) compared to eggplant alone (1.96) and significantly lower percent shoot damage as well (Navasero & Calumpang, 2013).

Volatile compounds are continuously emitted by plants into the air and these may be utilized by herbivores to locate their food plants. Companion planting and diversified planting utilize volatile plant chemicals which affect insect behavior. Companion planting is a cultural practice that uses plants that contain insect-repellent chemicals interspersed with other plants thus providing protection to the other plants. Most plants considered as companion plants are herbs or plants that have volatile odors. Diversified planting takes advantage of the feeding preferences of insects that locate food sources by shapes of the plants, colors and odors. Thus, mixing the plants helps decrease the attraction to insects and damage to the crops (MSU Cares). Plant chemistry is a very important source of information for insects which determines its oviposition behavior and its choice of a host plant. Acceptance or rejection of a plant is determined by the overall effect of the opposing positive and negative semiochemical

cues that the insect receives from the environment (Renwick & Chew, 1994). The identification of plants (crops or weeds/ non-crops) that provide semiochemicals that serve as repellents for the insect pests and/or attractants to parasitoids is important for pest management in the field. These plants could be grown as intercrops or companion plants, thus reducing the need for chemical control.

The understanding of the chemically-mediated behavior of insects would lead to the development of an IPM component in vegetable production. The usefulness of incorporating behavioral control measures into integrated pest management systems, will surely benefit farmers through reduced dependence on commercial inputs. The insights generated by this study will be able to elucidate mechanisms that play a part in the population reduction of these economically important pests.

In the current study, we examined the influence of mixed cropping of eggplant with a variety of herbs and vegetables on the arthropod community in a diverse agricultural system. Furthermore, we determined if eggplant intercropped with lemon grass (*Cymbopogon citratus* Stapf.) could suppress major insect pest damage and increase yield of eggplant hence assess its potential as an IPM component technology for major insect pests of eggplant. As lemon grass is a common culinary herb that has similar agronomic requirements as eggplant, a source of essential oil of commercial value (Elson et al., 1989; Lee et al., 2008; Ojo et al., 2006), and a popularly known repellent against mosquitoes (Oyedele et al., 2002), we studied the effects of lemon grass on the host finding and oviposition behavior of EFSB in laboratory cage experiments.

MATERIALS AND METHODS

Eggplant-Chives-Lemon Grass-Flowering Plants Field Trials

A preliminary trial on mixed herb-vegetables was conducted in the Institute of Plant Breeding, University of the Philippines Los Baños experimental area in the wet season of 2003. The area was maintained for organic vegetable production and previously planted with various vegetables intercropped with various herbs such as onion, garlic, and bordered by lemon grass (*Cymbopogon citratus* (DC.) Stapf, sunflower (*Helianthus annuus* L.), cosmos (*Cosmos bipinnatus* Cav.), oregano (*Coleus aromaticus* Benth.), and marigold (*Tagetes erecta* L.).



Figure 1. Field trial of eggplant intercropped with lemon grass.

Eggplant was intercropped with chives (*Allium schoenoprasum* L.) in 1000 m² of land and sunflower, cosmos, marigold and lemon grass were planted in the borders. No pesticides and synthetic fertilizer were applied. Ten bags of chicken manure were broadcast in the area before planting and an organic liquid fertilizer was sprayed on the furrows as additional basal fertilizer.

Insect pests and natural enemies were monitored using visual count and sweep-net methods done on the same day with visual counts done before sweeping. Visual counts were done for 10 plants in half of the plot so as not to disturb the whole plot. Ten sweeps were likewise made in the other half of the plot. Samples from sweeping were sorted, identified and added to visual counts as total insect counts. Aphids were assessed according to the standard aphids rating scale: 1 = no aphids, 3 = presence of winged adult, 5 = presence of 1 colony, 7 = presence of 2 or more distinct colonies, 9 = colonies indistinct/overlapping.

Eggplant-Lemon Grass Field Trial

With the observed arthropod pest reduction in the mixed herb vegetable garden, a follow-up experiment was later set-up in a 0.5 ha field at the University of the Philippines Los Baños Central Experiment Station (Figure 1). The field was plowed and harrowed twice and furrowed at 0.50 m apart. Eggplant seedlings (cv. Casino), were planted on the ridge at a distance of 0.75 m between hills on June 2008 and a second trial was planted on June 2013. Lemon grass plants were planted earlier, with a planting distance of 1.5m. between

Table 1.

Insecticides Applied in Farmers’ Practice Plots (NCPC, 2008).

WAT	Brand (Active ingredient)	Rate	WAT
1	Actara –drench (Thiametoxam)	2g/16L	1
7	Agrimek (Abamectin)	20ml/100L	3
8	Cartap	1.5 tbs/16L	4
9	Fenos(Flubendiamide)	75 ml/ha	5
11	Fenos(Flubendiamide)	75 ml/ha	6
13	Fenos(Flubendiamide)	75 ml/ha	7

hills and 0.75 m between rows. Eggplant intercropped with lemon grass, eggplant monocrop and farmers’ practice plots were laid out in a randomized complete block design (RCBD) with 4 replications. Treated and control plots (10 x 10m) had a 2 m buffer zone between treatments and 1.5 m between replicates. Irrigation and fertilization were done regularly. Farmers’ practice involved weekly spraying of insecticides (Table 1)

Weekly counts of pests and beneficial insects started 2 weeks after transplanting. Data gathered include weekly monitoring of insect populations, damage of pests to the crop and crop yield. Insect populations were based on weekly actual counts/20 sample plants/plot. Harvesting in 20 sample plants was done twice a week up to 12 primings while damage assessment for EFSB was done weekly. Damaged and marketable fruits, damaged and undamaged shoots and yield data were likewise collected. The data were averaged per hill and analyzed using the F-test ANOVA. Difference between individual treatments were tested for significance using Least Significant Difference (LSD) test.

Insect Collection and Rearing

EFSB larvae were collected from infested eggplant fruits in Calamba, Laguna, Philippines. These were reared in the laboratory in plastic pans lined with paper towel and fed daily with chips of eggplant fruits under controlled temperature (28°C), 16 h light:8 h darkness and relative humidity of (70-80%). Pupae were subsequently collected and placed in Petri plates for holding. When about to emerge, pupae were placed in a cage and emerged adults were transferred to egg-

laying chambers for mating and oviposition. The egg-laying chamber was a glass ball jar with mesh cloth strips for oviposition. A cotton ball soaked in 10% sucrose, hung on a wire attached to the mesh cloth cover, was offered as adult food. After 3-4 days, adults were removed and the mesh cloth strips with egg masses were transferred to eggplant chips for further rearing according to the method described by Gonzales (1999).

Damage potential laboratory bioassays

The response of EFSB adults was observed in screen cages using potted eggplant (flowering stage) and lemon grass in choice and no-choice tests in laboratory from January 2008 to March 2009. One potted eggplant and one lemon grass plant were placed inside wire screen cages (75 cm x 75 cm x 150 cm) after that, 2 males and 2 females of the laboratory reared mated adult moths were released into the cage. Shoot damage was monitored and assessed 2 weeks after introduction. The number of damaged shoots was counted and percent damaged computed based on total number of shoots per plant. Each cage setup represented one replicate and the experiment was replicated 25 times. Different sets of adults were used for each replicate. The assays were conducted in ambient room conditions (32°C; 70-80% RH).

Host-finding behavior laboratory bioassays

The response of EFSB adults was observed in screen cages using potted eggplant (flowering stage) and lemon grass in choice and no-choice tests in laboratory from January 2010 to November 2012. One potted eggplant and one lemon grass plant were placed inside wire screen cages (75 cm x 75 cm x 150 cm) after which, 4 virgin females of the laboratory reared moths were released into the cage. The behavior was monitored by recording if they alighted on the plant or on the cage at 0, 1, 2, 3, 4, 5, 6, 7 and 24 h after introduction under dark room conditions, with 3 hours artificial light prior to 24 h readings. Controls were exposed to 1 potted eggplant per cage in a separate room from the choice test setups. The assays were conducted in ambient room conditions (32°C; 70-80% RH). The adults were used only once. Each cage setup represented one replicate and the experiment was replicated 25 times.

Table 2.

Total Insect Counts in Organically Grown Eggplant Intercropped with Chives, and Bordered with Lemon Grass at the Flowering/Fruiting Stage (1 Month After Transplanting), IPB, UPLB 2002.

	1 WAT	2 WAT	3 WAT	4 WAT	5 WAT	6 WAT	7 WAT	8 WAT
Insect pests								
Leafhoppers	2	91	279	240	271	274	246	316
Flea beetles	35	10	22	19	19	23	38	56
Whiteflies	3	0	0	18	3	2	1	3
Cutworm	9	15	0	0	1	1	1	0
Aphids	0	1.5	3	2.14	1.16	1.4	1.34	1.07
Semi-loopers	1	1	0	2	0	0	0	0
Fruit/shoot borers	0	0	0	0	0	0	0	0
Pentatomid	0	2	1	3	0	0	0	0
Natural enemies								
Spiders	2	4	16	11	3	10	15	4
Coccinelids	0	4	18	7	3	10	3	2
Ants	1	10	3	121	5	12	14	7

**RESULTS
AND DISCUSSION**

Arthropod Populations in Eggplant Intercropped with Chives and Lemon Grass

The dominant insect observed during the entire season was green leafhoppers (*Amarasca bigutulla*) (Table 2). Leafhopper counts increased from 2 to 91 from 1 to 2 WAT, increasing to 316 at 8 WAT. On the other hand, EFSB was practically nil throughout the sampling period. Flea beetles, cutworm and whiteflies were also observed but counts were low. Flea beetles were recorded on the 2nd week until the last sweeping. A minimal number of aphids and semilooper (1-3 per plants) were always present during the monitoring period (Table 2).

This mixed herb-eggplant cropping system did not give rise to EFSB damage although leafhopper counts were not reduced. Natural enemies, such as ants (black and red), spiders and coccinelids were observed. The highest numbers were recorded for ants (121), followed by coccinelids (2-18) and spiders (2-16). These insects feed on soft-bodied insects, such as aphids, whiteflies and cutworm larvae and serve to reduce insect pest populations.

Table 3.

Mean Number of Plant Hoppers, Aphids and Whiteflies in Eggplant Intercropped with Lemon Grass Compared with Farmers' Practice from 2 to 10 Weeks after Transplanting (WAT) 2008.

Hoppers	2 WAT	3 WAT	4 WAT	5 WAT	6 WAT	7 WAT	8 WAT	9 WAT	10 WAT
With lemon grass	1.125 a	0.575 b	0.800 b	0.475 b	1.175 a	1.175 a	0.975 a	1.425 a	1.125 ab
Eggplant alone	1.300 a	1.450 a	1.250 a	1.100 a	1.325 a	1.450 a	1.525 a	1.875 a	2.250 a
Farmers' practice	0.260 b	0.100 c	0.300 c	0.483 b	0.383 b	0.600 a	1.050 a	0.740 b	0.900 b
Significance Level	1%	1%	1%	5%	1%	ns	ns	5%	1%
Aphids	2 WAT	3 WAT	4 WAT	5 WAT	6 WAT	7 WAT	8 WAT	9 WAT	10 WAT
With lemon grass	1.225 a	0.850 b	1.400 b	0.400 a	0.425 b	0	0	0	0
Eggplant alone	1.550 a	2.050 a	2.600 a	2.175 a	2.225 a	1.250 a	0.650 a	0.075 a	0.200 a
Farmers' practice	0.083 a	0.265 c	0.050 c	0.633 a	0	0	0	0	0
Significance Level	ns	1%	5%	ns	1%	5%	1%	ns	ns
Whiteflies	2 WAT	3 WAT	4 WAT	5 WAT	6 WAT	7 WAT	8 WAT	9 WAT	10 WAT
With lemon grass	0.075 a	0.025 b	0	0.125 b	0.100 a	0.150 a	0.150 a	0.125 a	0.100 a
Eggplant alone	0.325 a	0.025 b	0.275 a	0.125 b	0.250 a	0.125 a	0.225 a	0.500 a	0.375 a
Farmers' practice	0.150 a	0.218 a	0.183 a	0.465 a	0.440 a	0.218 a	0.290 a	0.283 a	0.150 a
Significance Level	5%	1%	ns	5%	ns	ns	ns	ns	ns
Average of 4 replicates, 10 plants per replicate									

In a column, means followed by the same letter are not significantly different based on F-test ANOVA and LSD at the significance level indicated.

Arthropod Populations in Small Plot Field Trials of Eggplant Intercropped with Lemon Grass

In general, the intercropping of lemon grass with eggplant reduced the populations of the three major insect pests, green leafhoppers, aphids and whiteflies compared to the monocrop (Table 3). The leafhopper counts were significantly lower in eggplant with lemon grass ($P < 0.01$, F-test ANOVA and LSD) at 3 to 5 WAT compared with eggplant monocrop but it had higher leafhopper count than that of farmers' practice only at 2 to 4 WAT and 6 WAT.

Lemon grass intercropping produced significant reduction on aphid populations, which were lower in intercropped plots compared to monocrop plots, in general, throughout the sampling period representing peak of fruit period at 3 to 8 WAT (Table 3). Aphid populations were observed only until 5 and 6 WAT for farmers' practice and lemon grass intercrop, respectively and significantly lower counts in the former than the latter were recorded at 3, 4, and 6 WAT. Lemon grass intercrop also reduced whiteflies when compared with the monocrop and farmers' practice. Farmers' practice of drenching the seedlings with thiamethoxam at 1 WAT and spraying other insecticides (Table 1) resulted in lower leafhopper and aphid counts than eggplant monocrop and eggplant intercropped with lemon grass. The insecticides used in the 2008 trial were not able to control whiteflies adequately. However, reduced whitefly count in eggplant monocrop and eggplant intercropped with lemon grass as compared to the farmers' practice may actually be due to dominance of leafhopper over whitefly. A population dynamics study by Navasero (2004) showed that a higher population of leafhoppers results in yellowing of leaves which appear to be less preferred by whiteflies.

These results indicate that lemon grass has the potential to reduce hoppers and aphids populations in the production of eggplant. This agrees with the reduced insect counts observed in eggplant grown with selected culinary herbs (Gonzales et al., 2004).

The reduction in leafhopper populations is quite significant considering that eggplant var. Casino is very susceptible to leafhoppers (Lit et al., 2002). In addition to reducing insect pest populations, lemon grass is a good intercrop as it has commercial pharmaceutical, fragrance, and medicinal value (Elson et al., 1989; Lee et al., 2008; Ojo et al., 2006) as well as anticancer properties (Lee et al., 2008). It is also an important source of essential oils which include several bioactive marker compounds such as neral, geranial, geraniol, limonene,

citronellal, and β -myrcene (Schaneberg & Khan, 2002). Chemicals that possess insecticidal activity against the larvae of diamondback moth, *Plutella xylostella* L. (Lepidoptera: Yponomeutidae), larvae were found in the essential oil of lemon grass, such as 3,7-dimethyl-2,6,-octadienal or citral. (Dadang & Ohsawa, 2009). On the other hand, volatile organic chemicals found in lemon grass, such as limonene was demonstrated to have significant repellent and oviposition deterrent effects on *P. xylostella* (Liang et al., 2004). Limonene is also found in the volatiles emitted by red clover (*Trifolium pratense* L.) root extracts and repelled the red clover borer (*Hylastinus obscurus* Marshami) in olfactometric bioassays (Tapia et al., 2007).

Eggplant Shoot Damage

Lemon grass reduced EFSB populations as evidenced by the lower number of damaged shoots in plots with eggplant intercropped with lemon grass than those in monocropped plots at 8 to 10 WAT (Table 4). Percent shoot damage in eggplant grown with lemon grass ranged from 4.82 to 5.26% and was lower than that in eggplant grown without lemon grass (7 to 12%) which were statistically significant at 9 to 10 WAT. However, the percentage of damaged shoots in farmers’ practice plots was significantly lower (0.5% and 2.17%) than both treatments indicating better control of ESFB using insecticides (Table 4).

Table 4.

Mean Number of Damaged Shoots/Plant From 8 to 10 Weeks After Transplanting (WAT).

	2008, Wet season		
	8 WAT	9 WAT	10 WAT
Number of damaged shoots			
With lemon grass	4.75 b	5.00 b	4.75 b
Eggplant alone	6.25 a	8.25 a	11.00 a
Farmers’ practice	0.133 c	0.017 c	0 c
Percent shoot damage			
With lemon grass	5.26 a	4.85 b	4.82 b
Eggplant alone	7.29 a	9.27 a	12.08 a
Farmers’ practice	2.17 a	0.168 c	0 c

Average of 3 replicates, 10 plants per replicate
In a column, means followed by the same letter are not significantly different based on F-test ANOVA and LSD at 1 % significance.

Table 5.

Average Yield of Eggplant Intercropped With Lemon Grass.

Treatments	2008, Wet Season		
	Total Number of Marketable Fruits	Total Weight (g)	Weight of Fruit (g/fruit)
Grown with lemon grass	79.0 a	6063.75 a	78.13 a
Grown without lemon grass	60.0 b	3512.50 b	59.46 a
Farmers' practice	48.30 b	3515.00 b	72.39 a
Significance level	5%	1%	ns

In each column, means followed by the same letter are not significantly different based on F-test ANOVA and LSD test.

Eggplant Yield

Total yield of intercropped eggplant was significantly higher than the eggplant monoculture (Table 5). Subsequently, yield of marketable eggplant was significantly higher in plots grown with lemon grass. Yield from farmers' practice plots were lower due to the incidence of fruit rot on eggplant (28%) (Gonzales et al., 2007).

Similar results using other herbs were reported recently, coriander and fennel were found to be equally effective in reducing EFSB infestation when intercropped with eggplant. Total yield of intercropped eggplant was significantly higher than the eggplant monoculture yield (Satpathy & Mishra, 2011). In another study by Quisay and Roxas (2004), intercropping of eggplant with several vegetables, okra, string beans, corn and pepper resulted in more (number and weight) marketable fruits. There were significantly higher populations of leafhopper, thrips, mites, and EFSB during the entire observation period in the plots planted solely to eggplant than in those with intercrops.

Volatiles have also been demonstrated to protect plants by attracting herbivore natural enemies, such as parasitic wasps, predatory arthropods and possibly even insectivorous birds (Unsicker et al., 2009). Beneficials and herbivores are attracted by chemical cues. Benzaldehyde and phenylacetaldehyde attract both pollinators and florivores (Theis, 2006). Syrphid flies use olfactory and not visual cues to find a pollen/nectar host-plant. Among the compounds eliciting

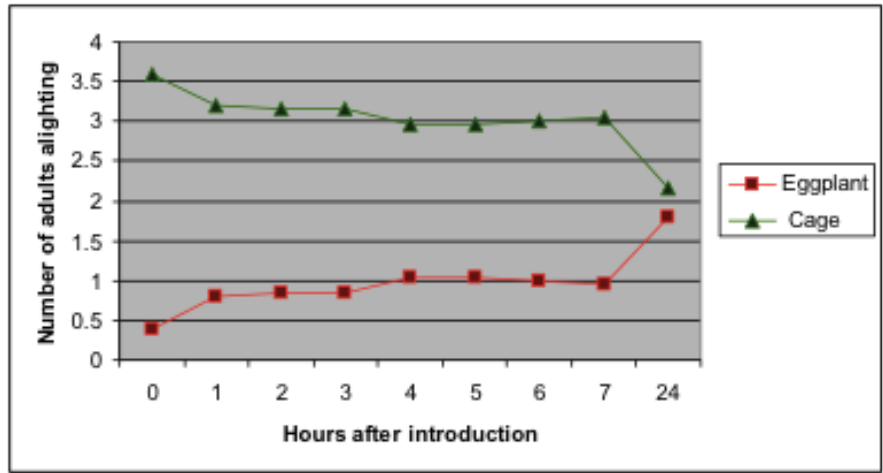


Figure 2. Number of eggplant fruit and shoot borer (*Leucinodes orbonalis* Guenee) adults alighting on eggplant in cage experiments.

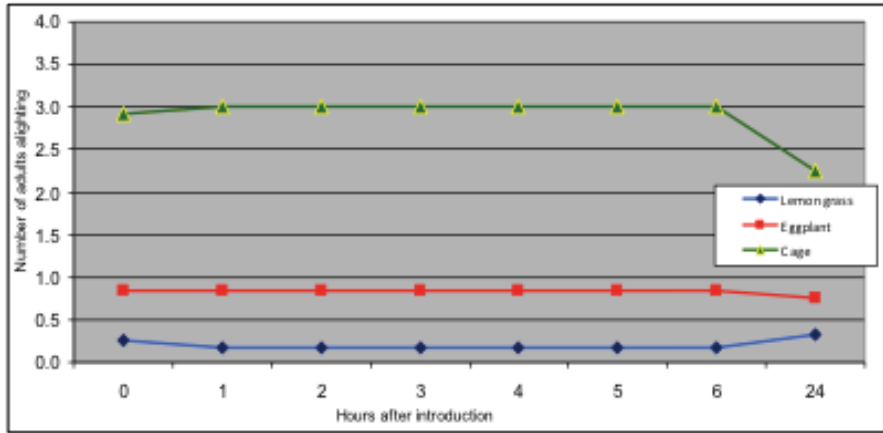


Figure 3. Number of eggplant fruit and shoot borer (*Leucinodes orbonalis* Guenee) adults alighting on eggplant (*Solanum melongena*) and lemon grass, (*Cymbopogon citratus*) (1:1) in cage experiments.

an antennal response in syrphid flies are methyl salicylate and 2-phenylethanol (Primante & Dötterl, 2010). Floral volatiles serve as attractants for species-specific pollinators (Pichersky & Gershenzon, 2002). *Mythimna separata* caterpillars utilize plant volatile information to modulate their daily activity patterns, thereby potentially avoiding the threat of parasitism (Shiojiri et al., 2006).

Intercropping of lemon grass with eggplant, essentially reduces the need for insecticides to control eggplant fruit shoot borer, leafhoppers and aphids. It can be used to complement other biological control methods to reduce use of insecticides for low input farming. Nucleopolyhedrosis virus (NPV) is now used by farmers in Central Luzon to control cutworm infestation (Navasero & Navasero, 2003). This could reduce farm inputs for eggplant where insecticide use is heavy, reaching up to 40 times per season in some areas (Navasero et al., 2004).

Host finding behavior

Basic studies on EFSB behavior in cage experiments were conducted to elucidate the mechanism for its reduced counts in eggplant-lemon grass intercrop. No-choice cage bioassays showed EFSB adults constantly alighted on the eggplant leaves and shoots immediately after introduction, with 1 adult spending about 1-2 min on the leaves within the first 7 h. The number increased to about 1.8 per plant at 24 and 48 h after introduction (Figure 2) but this was reduced to 0.8 EFSB moths on eggplant when lemon grass was present (Figure 3). Female EFSB hardly alight on the lemon grass plant, preferring to stay on the cage screen most of the time. These observations show that lemon grass repels EFSB and its presence with eggplant reduces the opportunity for EFSB ovipositing on fruits and shoots of eggplant. This phenomenon explains the decrease in eggplant shoot damage resulting in an increase in number and weight of marketable eggplant fruits when lemon grass is intercropped with eggplant in the field.

CONCLUSIONS

Intercropping fits into environmentally acceptable and sustainable vegetable production. Intercropping of eggplant with herbs can reduce populations of some insect pests in the field. A mixed garden of eggplant with several herbs demonstrated reduced eggplant EFSB damage but was not able to manage leafhopper populations. On the other hand, lemon grass when intercropped with eggplant, reduced hoppers, aphids and whiteflies, and shoot damage caused by EFSB, subsequently increasing the yield of eggplant in small plot field trials.

Laboratory insect behavior studies demonstrated reduced alighting on eggplant when lemon grass was present which is

consistent with field trial results. Volatile organic chemicals of lemon grass repel EFSB female adults thus disturbing the host finding behavior of the adults in the field. This behavior explains the observed reduction in fruit and shoot damage in the field.

Intercropping of eggplant with lemon grass provides the potential for increasing income of farmers while providing options for pest management which can reduce insecticide use. This cropping system needs to be further evaluated on a larger scale as both economic and ecological conditions must be fully evaluated before an economic intercropping-based commercial production scheme can be recommended.

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Determination of Biogenic Amines Using Image Analysis of Ninhydrin-Visualized Biogenic Amine Spots in Thin Layer Chromatography

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Image analysis was performed on ninhydrin-visualized spots of putrescine dihydrochloride, cadaverine dihydrochloride, spermidine trihydrochloride and tyramine hydrochloride in thin layer chromatography using the ImageJ software. The original image was processed and analyzed to determine R_f values, pixel area, mean gray values and circularity. The TLC methodology produced adequate differential separation of tyramine hydrochloride and cadaverine dihydrochloride from putrescine dihydrochloride and spermidine trihydrochloride in biogenic amine mixtures and fish paste extract. Regression equations showed adequate linearity when the pixel areas ($R^2 > 0.946$, $p < 0.01$) and mean gray values ($R^2 > 0.866$, $p < 0.01$) were utilized. TLC-image analysis using ImageJ software shows good potential in quantifying biogenic amines in aqueous solutions and food samples due to its low cost and simplicity.

KEYWORDS: biogenic amines, image analysis, mean gray values, pixel areas, R_f values, thin layer chromatography

INTRODUCTION

Biogenic amines or polyamines are non-volatile, nitrogenous, organic compounds produced from the microbial degradation of protein-rich food such as fish and fish products, meat and fermented foods (den Brinker, Kerr, & Rayner, 2002), following the decarboxylation of free amino acids by gastrointestinal bacteria (Kalac & Krausova, 2005). Basically, all food items which are rich in proteins or free amino acids may promote bacterial production of biogenic amines by decarboxylases produced by several bacterial genera such as *Bacillus*, *Citrobacter*, *Clostridium*, *Klebsiella*, *Escherichia*, *Proteus*, *Pseudomonas*, *Shigella*, *Photobacterium*, *Lactobacillus*, *Pediococcus*, and *Streptococcus* (Karovicova & Kohajdova, 2005). Histamine, tyramine, putrescine and cadaverine are the most commonly found biogenic amines in food (Ladero, Calles, Fernandez, & Alvarez, 2010).

The names of biogenic amines are based from the amino acids that give rise to them. For instance, histamine is named after histidine, tryptamine is named after tryptophan and phenylethylamine is named after phenylalanine. Cadaverine, however, is derived from lysine while putrescine is derived from ornithine or arginine (European Food Safety Association, 2010). Kantaria and Gokani (2011) classified biogenic amines as aliphatic (putrescine, cadaverine, spermine, spermidine), aromatic (tyramine, phenylethylamine), or heterocyclic (histamine, tryptamine).

In very high concentrations, biogenic amines have various toxicological effects which are associated with allergy-like symptoms, neurological, and blood pressure problems (Ladero et al., 2010; Shukla, Kim, & Kim, 2011). The roles of biogenic amines in cell growth and proliferation have also been studied extensively because of their involvement in tumor development (Kalac & Krausova, 2005). Fermented food products such as red wines, cheese, fish pastes, sausages, and lactic acid fermented vegetables are rich in putrescine, cadaverine, spermidine, spermine, histamine and tyramine (Karovicova & Kohajdova, 2005) and daily consumption of these food items may also increase the dietary intake of biogenic amines. Because of these health risks, there is a need to determine the concentration of biogenic amines in fermented food items.

Detection of biogenic amines in various samples can be performed using enzymatic methods, immunoenzymatic methods, flow injection analysis, fluorometric methods, gas chromatography, high performance thin layer chromatography, high performance liquid chromatography, and capillary electrophoresis (Etienne, Ifremer, &

Nantes, 2006), although these methods are expensive and require longer preparation time and analysis. Thin layer chromatography has been used as a simpler alternative to detect the presence of biogenic amines in biological samples since quantification is performed qualitatively. Sherma (2000) emphasized that thin layer chromatography (TLC) has multiple applications in the area of food composition, intentional additives, adulterants, contaminants, and decomposition involving determination of amino acids, lipids and fatty acids, sugars, biogenic amines, vitamins, and organic acids.

In the local setting, thin layer chromatography was used with image analysis and densitometry to quantify biogenic amines in fermented sausages (Bandolin, Pham, & Barraquio, 2010) and cheese samples (Vallejos, Pham, & Barraquio, 2011) using Biosoft™ Quantiscan for Windows (Biosoft 2004). Most biogenic amines are non-chromophoric or non-fluorophoric and derivatization is often required in most TLC methods through the use of dansyl chloride or o-phthalaldehyde (Kantaria & Gokani, 2011; Ayesh, Ibraheim, El-Hakim, & Mostafa, 2012) to visualize them in TLC plates. Visualization of biogenic amines can also be performed using a cheaper alternative such as ninhydrin (Morincova, Dicakova, & Bystricky, 2009; Bandolin et al., 2010) since the amino group of biogenic amines can form complexes with ninhydrin, forming a purple complex.

In addition, other image analysis software such as Sorbfil TLC Video densitometer software, and Scion Image were already utilized by other studies to identify and quantify the compounds in thin layer chromatography (Zakrzewska, Parczewski, Kazmierczak, Ciesielski, & Kochana; 2007; Tie-xin & Hong, 2008; Phattanawasin, Sotanaphun, Sriphong, Kanchanphibool, & Piyapolrungraj, 2011), suggesting the wide application of image analysis in analytical procedures. Thin layer chromatography is a cheaper and faster method to separated compounds in a given sample, but is limited in providing an accurate quantification of the separated compound. ImageJ, an image processing program created by Wayne Rasband of the Research Services Branch, National Institute of Mental Health in Bethesda, Maryland, has several features which could be used to process and analyze images in most commonly used image formats (Abramoff, Magalhaes, & Ram, 2004). ImageJ can be used to process images in TIFF, GIF, JPEG, PNG, DICOM, BMP, PGM and FITS formats (Ferreira & Rasband, 2012). To our knowledge, very few studies utilized ImageJ as a tool to quantify and describe visualized biogenic amine spots and other compounds in thin layer chromatography.

Hence, this study was conducted to attempt to develop a simple thin layer chromatography-image analysis method to detect and quantify biogenic amines in biogenic amine mixtures and sample fish pastes using the "particle analysis" pathway of the ImageJ software. Specifically, this study aimed to compare the visualized spots of putrescine dihydrochloride, cadaverine dihydrochloride, spermidine trihydrochloride and tyramine hydrochloride in terms of their R_f values, pixel area, mean gray value and circularity, determine the regression equations for quantifying biogenic amines using their pixel areas and mean gray values and quantify the biogenic amines present in biogenic amine mixtures and fish paste solutions.

MATERIALS AND METHODS

Reagents

Authentic standards of putrescine dihydrochloride, cadaverine dihydrochloride, spermidine trihydrochloride, and tyramine hydrochloride (Sigma Aldrich, Germany) were purchased from Chemline Scientific Corporation. Acetone, acetic acid, methanol, ninhydrin and ammonium hydroxide were obtained from Fisher Scientific and purchased from Saint Louis University Natural Science Research Unit (SLU-NSRU). All reagents utilized in the study were analytical grade.

Preparation of Standard Solutions and Mixtures

In a separate sterilized Erlenmeyer flask, 500 mg of each of the biogenic amines were dissolved in 50 mL methanol according to a modified methodology of Bandolin et al. (2010). The standard solutions were diluted into 2 mg/mL, 4 mg/mL, 6mg/mL, 8mg/mL using methanol as the diluent. For biogenic amine mixtures, 100 mg of each of the biogenic amine standards were mixed together in 400 mL of methanol. The solutions and mixtures were stored inside the refrigerator ($\approx 4^{\circ}\text{C}$) until used.

Thin Layer Chromatography Conditions

The methodology of Valls, Bello, and Kodaira (2002) was used with few modifications. The mobile phase was 5% ammonium hydroxide in acetone while the developing agent was 0.2% ninhydrin with 2% acetic acid in methanol. The developing chamber was rinsed with the

mobile phase twice before placing the TLC plates. A volume of 10 μ L of the biogenic amine standard solutions ranging from 2mg/mL to 10mg/mL (interval of 2mg/mL) was applied on five silica coated TLC plates (Merck) using a micropipette at a distance of 1.0 cm from each spot. After running the procedure of twenty-five minutes, the TLC plates were oven-dried at 95°C for five minutes until dry. The spots were visualized by dipping the TLC plates in acidified ninhydrin solution and oven-dried again at 95°C for five minutes until the spots were visible. The image of the chromatogram was captured using a Canon PowerShot A490. The image was not edited before the image processing using ImageJ software. The R_f value was computed using the distance of the center of the spots and the distance of the mobile phase. The distance of the spots and solvent front were determined using the pixel numbers set on ImageJ software.

The R_f value was calculated using the formula:

$$R_f = \frac{\text{Distance migrated by substance (pixels)}}{\text{Distance travelled by solvent (pixels)}}$$

The circularity of the biogenic amine spots using their pixel areas was determined using the formula:

$$\text{Circularity} = 4 \pi (\text{area/perimeter}^2)$$

Preparation of Linear Regression Equations

The ImageJ program was used to determine the mean gray value and pixel area of the image of the chromatogram after image processing through background subtraction, conversion to 8-bit format and inversion of color patterns. The computed mean gray values and pixel areas of the biogenic amine samples (n=5) in different concentrations were used to formulate the regression equations. The concentrations of biogenic amines were determined using a simple linear regression equation $y = mx + b$ where x refers to the concentration of biogenic amine (mg/mL) and y refers to the pixel area or mean gray value of the visualized spots.

Extraction of Biogenic Amines from Fish Paste Samples

Fish paste samples were obtained from Baguio City Market. The

method of Bandolin et al. (2010) was used with few modifications. In a clean test tube, 10 grams of homogenized fish paste sample was mixed with 10 mL of methanol and vortexed for one minute. The extract was transferred to an Erlenmeyer flask and immersed in a water bath at 60°C for 15 minutes, cooled, and transferred to a 50 mL volumetric flask. Extraction of the same sample was done until subsequent extracts appeared clear and free of suspended particles. Additional methanol was added to the volumetric flask to yield 50 mL of the extract. The extract was transferred to tubes and centrifuged at 5000 rpm for ten minutes to remove the suspended particles. The test tubes were sterilized before analysis to avoid bacterial contamination of the extract. Samples were freshly prepared daily before analysis.

Treatment of Data

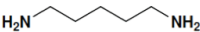
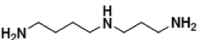
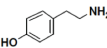
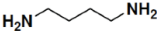
The results of image analysis of TLC chromatograms were presented using tables. Data collected from the analysis of images were presented as mean $\pm$ SD. Least Squares Method was utilized to obtain the linear regression formulae of the standard biogenic amines using their mean pixel areas and mean gray values. The coefficients of determination of the linear regression equations using the concentration of biogenic amines as influenced by pixel area and mean gray values were determined at $\alpha=0.01$ (two-tailed). The program used for statistical analysis was SPSS 18.0 for Windows.

RESULTS AND DISCUSSION

The determination of biogenic amines in TLC plates is dependent on the formation of Ruhemann's purple from the reaction of ninhydrin and biogenic amines. The molecular structures of the biogenic amines shown in Table 1 can form complexes with ninhydrin (Patil, Devdhe, Kawder, Kulkarni, Nagmoti, Patil, & Kale, 2012) and produce a purple color. In alkaline medium, ninhydrin is converted to o-carboxyphenyl glyoxal which reduces ninhydrin to 2 hydroxyindan-1,3-dione. The primary amino group of the biogenic amines reacts with ninhydrin to give diketohydrindylidenediketohydrindamine.

Table 1.

Profile of Biogenic Amines

Biogenic Amine	Molecular Weight (g/mol)	Chemical Name	Chemical Formula
Cadaverine	202.2	1,5-diaminopentane	
Spermidine	145.3	N-(3-aminopropyl)-1,4-butanediamine	
Tyramine	137.3	4-(2-aminoethyl)-phenol	
Putrescine	88.2	1,4-diaminobutane	

Source: Shukla, S., Kim, J-K., & Kim, M. (2011). Occurrence of biogenic amines in soybean food products, soybean and health (Hany El-Shemy, Ed.). Retrieved from <http://www.intechopen.com/books/soybean-and-health/occurrence-of-biogenic-amines-in-soybean-foodproducts>

Image Processing of Biogenic Amine Spots

The total procedure took forty minutes for the development of the chromatogram and image analysis. Biogenic amine spots visualized with 0.2% ninhydrin with 2% acetic acid in methanol showed minimal tails and blots in all chromatograms. Biogenic amine spots appeared purple because of the formation of Ruhemann's purple as discussed earlier. Visualization using 0.2% ninhydrin in methanol and iodine vapors were also performed according to the methodology of Vallejos et al. (2011) but the results showed poor resolution.

After processing the images, interfering colors were removed through background subtraction in order to produce a better resolution of the visualized spots. The image was converted to 8 bit format and analyzed using ImageJ software using the particle analysis pathway to determine the mean gray value and pixel area of the spot. An 8-bit format displays a 256 gray level of the image (Ferreira & Rasband, 2012).

The color of the 8 bit image was inverted to black and white to compute the pixel area of each spot using the "wand tool" of ImageJ software. The wand tool creates a selection by tracing an object with uniform color or threshold objects. The images of visualized spots of

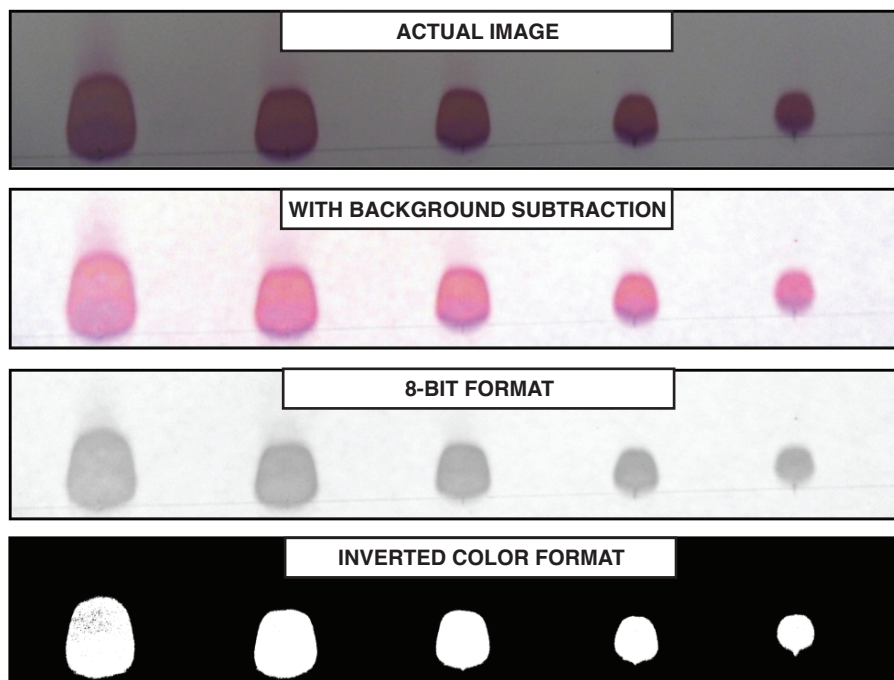


Figure 1. Images of TLC chromatogram of spermidine trihydrochloride before and after processing with ImageJ program.

spermidine trihydrochloride after processing with ImageJ software are shown in Figure 1. Image processing is performed to obtain an image with adequate resolution for image analysis.

Rf Values of Biogenic Amines

The R_f values of cadaverine dihydrochloride, putrescine dihydrochloride, tyramine hydrochloride and spermidine trihydrochloride are shown in Table 2. Based on the results, the tyramine hydrochloride has the highest R_f value (0.852) while spermidine trihydrochloride has the lowest value (0.06). Using the methodology in the study, there is poor separation between the spots of spermidine trihydrochloride and putrescine dihydrochloride since the spots overlap. Table 3 shows that among the four biogenic amines, tyramine has also the highest R_f value even if the mobile phase used is ethanol-based (Vallejos et al., 2012) while the R_f value of putrescine dihydrochloride is still low. The results show that the composition of the mobile phase influences the rate of migration of

biogenic amines. For instance, Khan (2006) reported that methanol, acetone, chloroform, ethyl acetate, benzene, hexane and ether do not produce adequate differential movement of spermidine, cadaverine and spermine in silica-coated TLC plates. The mobile phase used in the study however produced adequate separation of cadaverine dihydrochloride and spermidine trihydrochloride.

Table 2.

Rf Values of Biogenic Amines Standard Solutions and Mixtures.

Biogenic Amines	Individual Solutions	Mixture 1	Mixture 2	Mixture 3
Cadaverine dihydrochloride	0.168 ± 0.044	0.169 ± 0.012	0.166 ± 0.034	0.169 ± 0.02
Putrescine dihydrochloride	0.092 ± 0.002	*	0.092 ± 0.003	—
Spermidine trihydrochloride	0.060 ± 0.007	*	—	0.061 ± 0.008
Tyramine hydrochloride	0.852 ± 0.003	0.856 ± 0.031	0.857 ± 0.006	0.852 ± 0.005

Mixture 1: 10µg of cadaverine dihydrochloride, putrescine dihydrochloride, spermidine trihydrochloride and tyramine hydrochloride in methanol

Mixture 2: 10µg of cadaverine dihydrochloride, putrescine dihydrochloride, and tyramine hydrochloride in methanol

Mixture 3: 10µg of cadaverine dihydrochloride, spermidine trihydrochloride and tyramine hydrochloride in methanol

*overlapping spots

Pixel Areas, Mean Gray Values and Circularity of Visualized Biogenic Amine Spots

Figure 2 shows the differences in the shapes, sizes and color intensities of the four biogenic amine spots. Tyramine hydrochloride seemed to appear circular while cadaverine dihydrochloride, putrescine dihydrochloride and spermidine trihydrochloride appeared more elliptical. The color densities of cadaverine dihydrochloride and

Table 3.

Comparison of Mobile Phase and Rf Values of Biogenic Amines.

Biogenic Amines	Mobile Phase	Rf Values	Reference
Cadaverine dihydrochloride	Acetone: ammonium hydroxide (95:5)	0.24	Valls et al., (2002)
	Ethanol: ammonium hydroxide (80:20)	0.059	Wackes et al. (2005)
Putrescine dihydrochloride	Acetone: ammonium hydroxide (95:5)	0.17	Valls et al., (2002)
	Chloroform: toluene: triethylamine (60:28:12)	0.17	Chakradhar & Naik (2007)
	Ethanol: ammonium hydroxide (80:20)	0.046	Wackes et al., (2005)
Tyramine hydrochloride	Acetone: ammonium hydroxide (95:5)	0.72	Valls et al., (2002)
	Ethanol: ammonia (80:20)	0.75	Vallejos, et al., (2011)
Spermidine trihydrochloride	Chloroform: toluene: triethylamine (60:28:12)	0.33	Chakradhar & Naik (2007)

spermidine trihydrochloride appear evenly distributed while tyramine hydrochloride appears denser towards the solvent front. Putrescine dihydrochloride appears broader than the rest of the spots. However, the borders of spermidine trihydrochloride appear denser compared to the other biogenic amines.

The mean gray values of the biogenic amine spots were characterized using the surface plot function, plot profile function and “analyze particles” function instead of using the “gel analysis” pathway because of a greater repeatability in computing the pixel area of the spots. Figure

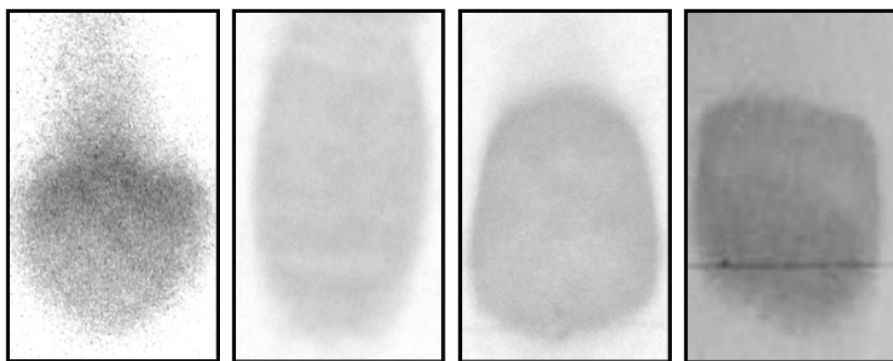


Figure 2. Appearance of the spots in TLC chromatograms.

A = Tyramine hydrochloride

B = Cadaverine dihydrochloride

C = Spermidine trihydrochloride

D = Putrescine dihydrochloride

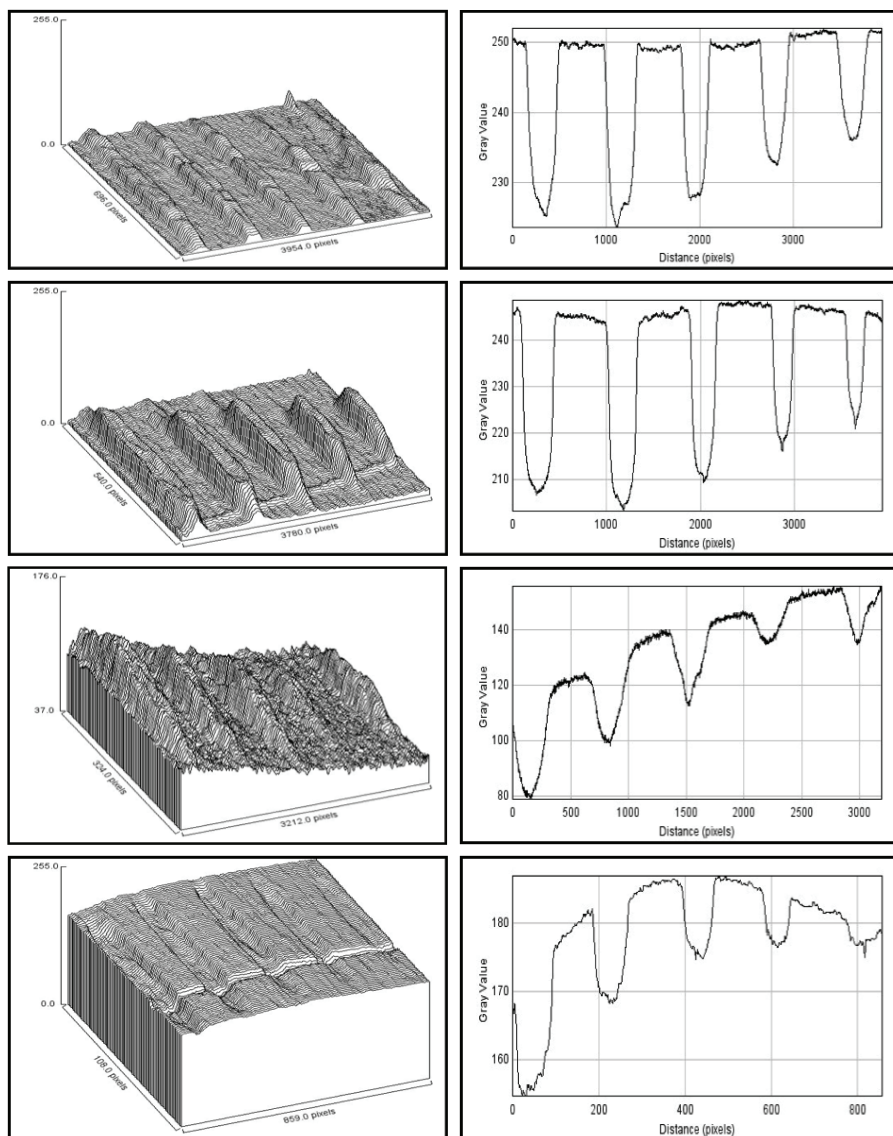


Figure 3. Surface plot and mean gray values of biogenic amines.

A = Cadaverine dihydrochloride C = Tyramine hydrochloride
 B = Spermidine trihydrochloride D = Putrescine dihydrochloride

3 shows the surface plots and mean gray values (integrated densities) of cadaverine dihydrochloride, putrescine dihydrochloride, spermidine trihydrochloride, and tyramine hydrochloride with concentrations ranging from $2\mu\text{g}$ to $10\mu\text{g}$ per spot.

The surface plots and line graphs illustrated the consistency of the color intensities on the surface of the silica-coated TLC plates in terms of gray values. It can be observed that the pixel area and color intensity increases as the concentration of the biogenic amine standards increases. However, it could also be observed that the baseline density is influenced by the appearance of the chromatogram, as seen in tyramine hydrochloride.

Based on the results, the ImageJ program can detect the relative color densities of the spots of the TLC chromatograms. Density of the spot is illustrated by a hyperbolic appearance of the line graph. The relative area of the spots is illustrated by a wide base. Cadaverine dihydrochloride showed the greatest mean gray value. A higher gray value indicates that the actual color intensity is lighter (Ferreira & Rasband, 2012). However, the surface of the spot is not consistent as revealed by the surface plot. The lowest mean gray value was observed in tyramine hydrochloride.

The contrast of each spot with its background influences the baseline of the surface plots and line profiles. Both tyramine hydrochloride and putrescine dihydrochloride had a darker background in the chromatogram, resulting in varying levels of initial baselines of the surface plots and line profiles. The pencil mark also influenced the appearance of the surface plots and line profiles. This was observed in the chromatogram of tyramine hydrochloride and putrescine dihydrochloride, resulting in a linear depression on the surface plot.

Linearity of Regression Equations of Pixel Areas and Mean Gray Values vs. Concentration

The use of image analysis based on mean gray values relies on the quality of the image produced. Using the program, the chromatograms were transformed into pixels and subsequently processed, providing a quantitative evaluation of the biogenic amine spots. Furthermore, the concentrations of each biogenic amine in the study were correlated with pixel areas and mean gray values. The linear regression equations of the different biogenic amines were constructed using the two parameters.

Table 4 shows that the linear regression equations and mean circularity of the biogenic amine spots. The linear regression equations using pixel areas showed varied slopes and intercepts and higher coefficients of determination ($R^2 > 0.940$, $q < 0.01$, two-tailed) compared

Table 4.

Linear Regression Equations and Mean Circularity of Biogenic Amines.

Biogenic Amine	Regression Equation 1 (Concentration vs. Pixel Area)	R ²	Regression Equation 2 (Concentration vs. Mean Gray Value)	R ²	Mean Circularity
Cadaverine dihydrochloride	y = 17755.1X + 37140.2	0.981*	y = 2225082.15X - 703306.95	0.993*	0.9152 ± 0.01
Putrescine dihydrochloride	y = 726.0X + 113.0	0.948*	y = 1167354003X - 496545674.1	0.866*	0.9864 ± 0.01
Spermidine trihydrochloride	y = 12549.15X + 1069.9	0.988*	y = 2746515.15X -11483.1	0.952*	0.9584 ± 0.02
Tyramine hydrochloride	y = 10291.4X - 23232.4	0.946*	y = 150070.7X - 33682.55	0.884*	0.8574 ± 0.10

*Results are significant at α=0.01 (two-tailed), x=concentration (µg/10µL), n=5

to the equations which utilized mean gray values ($R^2 > 0.880$, $q < 0.01$, two-tailed).

The largest pixel area was observed in the visualized spots of cadaverine dihydrochloride while the smallest pixel area was seen in putrescine dihydrochloride. The pixel area seems to increase as the concentration of biogenic amines increases. The greatest circularity and mean integrated density were observed in putrescine dihydrochloride while the least circularity was noted in tyramine dihydrochloride.

A higher mean integrated density means that an image is lighter (in terms of mean gray value) while a circularity value of zero means that the spot is elliptical and a value of one means that the spot is perfectly circular (Ferreira & Rasband, 2012). Based from the mean circularity value in Table 4, putrescine dihydrochloride has the greatest value as observed in Figure 2. The difference in the results between direct inspection and image analysis may be attributed to the ability of ImageJ software to exclude parts of the image which do not show consistent color densities. The lowest mean gray value was observed in tyramine hydrochloride, meaning, it produced the darkest color intensity compared to other biogenic amines.

Determination of Biogenic Amines in Sample Fish Paste

Using the methodology described in this study, the biogenic amines in a fish paste extract was determined. The image of the chromatogram was converted to 8-bit format for the determination of mean gray values using the particle analysis of the software. After background subtraction, the TLC spots were not visible. In order to quantify the biogenic amine spots, 10 μ L of each of the biogenic amine samples (10mg/mL) was added. Using the linear regression equations, the concentrations of each of the biogenic amines were determined. The known concentration of the biogenic amines was subtracted from the detected amounts to estimate the concentration of biogenic amines in the sample.

Using the linear regression equations in Table 4, the mean concentration of biogenic amines in a sample fish paste ($n = 5$) was determined after image processing. Compared to other analytical methods, thin layer chromatography was characterized to have relatively lower reproducibility and moderate sensitivity (Cserhati & Szogyi, 2012), probably because there are several interfering compounds in the development of the chromatograms. One anticipated

problem in the study was the contamination which might be caused by free amino acids. According to Valls et al. (2002), the R_f values of amino acids using the mobile phase (acetone: ammonium hydroxide, 95:5, v/v) are below 0.10. This necessitates the utilization of alternative methods to validate the presence of spermidine trihydrochloride and putrescine dihydrochloride in the fish paste sample. However, this was not performed in the study since the methanolic extracts of fish pastes were mixed with a known concentration of biogenic amines. The relatively larger standard deviations in spermidine trihydrochloride and putrescine dihydrochloride could be explained by possible interference of amino acids in the extract. The pixel areas and circularity of the spots from fish paste were compared to the characteristics of the spots of the standard solutions to validate that the spots were biogenic amines.

The chromatogram appears diffuse although there is visible separation of distinct spots. In order to visualize the biogenic amines, 10 μ g of each of the biogenic amines was added in the methanolic fish paste extract and the total concentration obtained using the regression equations were subtracted from the concentration of biogenic amines added to the solutions. Since the spots of putrescine dihydrochloride and spermidine trihydrochloride overlap, two mixtures containing only three biogenic amines were used in order to determine the individual concentrations of spermidine and putrescine. The concentrations obtained without adding the standard solutions were subtracted from the concentrations obtained when standard solutions were added.

Quantification of biogenic amines was done by utilizing the regression equations obtained using the pixel areas and mean gray values as parameters (Table 4). The image was converted to 8 bit format and then analyzed using Image J software. Based on the results shown in Table 5, the fish paste sample showed varying concentrations of biogenic amines when the linear regression equations using the pixel areas and mean gray values were used. Generally, the values obtained using the mean gray values yielded higher concentrations of biogenic amines and higher standard deviations as compared to the results when the pixel areas were used, probably due to presence of free amino acids in the sample. The biogenic amines were also identified based on the characteristics of the spots such as the circularity and R_f values. Results show that the most abundant biogenic amine in the sample fish paste is putrescine, followed by spermidine, cadaverine and tyramine. The values obtained are higher compared to the results

obtained by Visciano, Schirone, Tofalo, and Suzzi (2012) using fish paste samples in Italy.

Table 5.

Biogenic Amine Content of the Fish Paste Sample.

Biogenic Amine	Average Amount Detected Using Pixel Area (µg/spot)	Average Amount Using Mean Gray Values (µg/spot)	Rf Values
Putrescine	13.20 ± 0.20	14.50 ± 2.10	0.08 ± 0.02
Tyramine	2.83 ± 0.12	3.45 ± 1.22	0.87 ± 0.11
Cadaverine	3.42 ± 1.14	4.13 ± 1.64	0.17 ± 0.07
Spermidine	6.22 ± 2.30	6.85 ± 3.12	0.06 ± 0.06

Generally, the level of allowable biogenic amine content of food samples vary from one country to another. Based on the biogenic amine levels in the fish paste sample, the concentrations of biogenic amines detected in the fish paste sample are higher compared to the results in other studies. The amounts of cadaverine, putrescine, spermidine and tyramine were higher compared to the allowable limit in foods as set by the US Food and Drug Administration as generally accepted level of biogenic amines which is 5 mg/100g. The amount of tyramine in the fish paste is lower compared to the legal limit set by the Nutritional Codex for the Slovak Republic which is 200 mg/kg or 20mg/100g (Vallejos et al., 2011). Ladero et al. (2010) proposed that the total biogenic amine level should be 750 to 900mg/kg.

The biogenic amines in the sample fish sauce are influenced by its storage condition, salt concentration, preparation and type of biogenic amine-producing microorganisms (Zaman, Abdulamir, Abu Bakar, Selamat, & Bakar, 2009; Chong, Abu Bakar, Russly, Jamilah, & Mahyudin, 2011). Karovicova and Kohajdova (2005) reported that biogenic amine synthesis is possible if there are available amino acids, presence of decarboxylase-positive microorganisms, and other conditions which promote decarboxylase activity and synthesis, and bacterial growth. These factors might have played a role in the formation of biogenic amines in the fish paste samples. Furthermore, the concentrations of biogenic amines in the fish paste sample may imply possible contamination by decarboxylase producing bacteria

during fish preparation and fermentation process.

CONCLUSIONS

Thin layer chromatography coupled with image analysis using the ImageJ program can satisfactorily determine the concentration of biogenic amines in mixtures and food samples using the pixel area and mean gray values of the ninhydrin-visualized TLC biogenic amine spots. However, the results may vary depending on the quality of the chromatograms and the appropriateness of image processing. Cadaverine dihydrochloride and tyramine hydrochloride were adequately separated from spermidine trihydrochloride and putrescine dihydrochloride using the ammonium hydroxide: acetone mobile phase. Overlapping spots is minimized by ninhydrin solution acidified with acetic acid. The TLC method obtained reproducible R_f values in biogenic amine mixtures and methanolic extracts of fish paste while the linear regression equations utilizing mean gray values and pixel areas showed adequate linearity when used to quantify the biogenic amine concentrations. Using the regression equations, the biogenic amines were quantified in the TLC chromatogram image of fish paste. Thin layer chromatography combined with image analysis provides a cheaper and faster method in quantifying biogenic amines compared to other analytical methods in small laboratory settings since expensive visualizing agents such as dansyl chloride and o-phthalaldehyde can be replaced by ninhydrin. Furthermore, ImageJ, which is free and downloadable, can be readily used to analyze an image from a simple digital camera without compromising accuracy and precision of results. Additional studies could be performed to compare this simple method to highly analytical methods such as high performance liquid chromatography or gas chromatography. Furthermore, studies about varied choices of mobile phase, TLC plates and visualizing reagents may be explored.

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Baylor and Silliman: Keeping Quality Faculty in Two Christian Universities

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The experiences of Baylor University and Silliman University are compared as they both struggle in keeping the religious tradition upon which they were founded while ensuring that a quality education responsive to changing times is provided to all types of students. As a UBCHEA Fellow at Baylor University for four months, the researcher modestly documented how Baylor kept Christian faculty while maintaining quality scholarship and how such practices are different or similar with Silliman University. The aspirations of the two universities to recruit develop, and keep Christian faculty with high levels of scholarship are embedded in their respective strategic plans. They demonstrate the need for Christian universities, if they want to maintain such identity, of having a critical mass of Christian faculty who are also academically competent to integrate faith and learning. This is anchored on the argument that the successful transmission of Christian ideals and values, measured by the quality of a university's graduates, is dependent upon the Christian commitment of its faculty members.

KEYWORDS: Christian university, quality education and faculty, tenure, scholarship, strategic plan

INTRODUCTION

The faculty members of any university are on the forefront of providing quality education because they are directly engaged with the students. All other things being equal, they make or break a university, which shows how influential they are to students. Therefore, the pursuit of quality Christian education correspondingly requires Christian faculty. The chapel or church, religion courses,

spiritual programs, and community services are important visible elements of the Christian identity of a university, but they only remain as facade if Christian faith is not effectively interfaced with instruction. But how could a university have or maintain a pool of faculty members who manifest such ability? Taking off from the suggestion of Evans (2007), the solution may be by inviting faculty who are already Christians or to have them commit when hired to uphold the Christian ideals of the university. However, the process is always controversial because it evokes tension between preserving institutional identity and protecting individual religious freedom.

With this backdrop, this paper compares the experiences of Baylor University in Waco, Texas, USA and Silliman University in Dumaguete City, Negros Oriental, the Philippines (henceforth, Baylor and Silliman, respectively) in their struggles of safeguarding the religious tradition upon which they were founded while ensuring that a quality education that is responsive to changing times is provided to all types of students. I had the opportunity to learn about Baylor through books and documents in its libraries, campus activities, conversations with some faculty and administrators, and discussion with the Vice Provost for Academic Affairs and Policy Dr. James Benighoft. Silliman, where I served as Research Director and Professor of Anthropology and Sociology, sent me to Baylor with support from the United Board for Christian Higher Education in Asia (UBCHEA) Fellows Program from January to May 2012. Interestingly, although separated by bodies of water, they shared certain parallel political and academic histories and a Protestant heritage that shaped their visions and missions amidst the growing secularization of higher education institutions around the world (Oracion 2012). Since there are lessons that could be learned from Baylor and Silliman, I wrote this article for administrators of higher education institutions anywhere, big or small.

STARTING AT THE HIRING PROCESS

Let me start with how faculty hiring is done although the discussion that follows is about tenureship or the process by which a faculty gains a permanent status. In Baylor it is a long process, particularly for hiring faculty for tenure-track, which starts with expressing or requesting a need for faculty in a particular discipline to the administration. The approval of this request is dependent upon the

allocation or availability of a budget to hire a new faculty. When approved, a notice is published on the website of Baylor or sent out to other institutions for dissemination. A search committee is organized in the department needing the faculty that will first screen the applicants through the resume they submit in order to shortlist those who will eventually be invited to the campus for interview. The applicant has to be interviewed at different levels that start with the search committee, dean, and finally the provost who ultimately approves or disapproves the candidate for hiring.

In the past, a president of Baylor was actively involved in the hiring process but he was misunderstood by critics who considered the practice an act of intervention. He later wrote that this accusation happened when he turned down recommendations even if his reasons were academic rather than religious (Sloan, 2007, p. 321). But even if he vetoed certain appointments because of issues related to faith and theology, which he considered as final criterion for hiring, it "was an exercise of legitimate authority being the president" who is mandated to protect the Christian character and ideals of Baylor (Sloan 2007, p. 323). He was just enforcing what is in Baylor 2012 strategic plan (Baylor University 2002, p. 24): to recruit faculty, aside from having scholarly background, "who embrace the Christian faith and are knowledgeable of the Christian intellectual tradition" and who will "exemplify the integration of faith and learning in their disciplines and in interdisciplinary or collaborative activities." Sloan (2007, p. 325) further wrote that the ordinal preference for hiring, which is a longstanding policy, would be "Baptists and other evangelicals, mainline Protestants, Catholics, Greek-Orthodox, and Jews."

Certainly, the significant contributions of the faculty, both intellectually and spiritually as determined in the potential and willingness of the candidates to pursue the imperatives of Baylor 2012, constitute the model that guides the hiring process of Baylor (Parsons 2003). And because the prospective faculty members are already informed about the Christian ideals of Baylor, when the opening for hiring is posted or invitation letters are sent out, they have the option not to apply if they realize that they do not fit into the quality of faculty the university is looking for. Evans (2007, p. 140) opines that if keeping permanently a school's Christian identity is a priority, then it has the right to deliberately have all or a critical mass of Christian faculty. To ensure this critical mass, Baylor holds an orientation of new faculty every year about policies and issues that cover teaching, research, students, community engagement, and, more importantly,

faith and learning. The Institute for Faith and Learning of Baylor is actively involved in the orientation program, according to its Director, Dr. Darin Davis.¹ He further explained that it is important that the new faculty members are well-equipped to carry out their tasks at Baylor because it is through them that its Christian identity is felt by students.

Silliman also maintains the policy of only hiring faculty who are Christians, notwithstanding their particular religious affiliations, but who have the competence that will contribute to the university's pursuit of academic excellence. As at Baylor, applicants for college faculty at Silliman must have the appropriate graduate degrees in the discipline for which they are applying. However, the process of hiring at Baylor is more systematic and, even if urgent, takes a year before the position is filled or longer if a qualified applicant is not found within a year.² The department at Silliman that is urgently in need of a new faculty immediately looks for candidates; interviews them and requires those shortlisted to undergo a teaching demonstration. The best applicant is recommended for hiring through the Human Resource Development (HRD) Manager who issues the appointment to be signed by the president but on a provisional status for three years. The religious affiliation of a candidate is considered in the hiring but it is not a very heated issue because religious expression is always considered personal. New Silliman faculty members also undergo orientation but the focus is not the same as in Baylor and more limited. Both do not cover community engagement of faculty while there are no orientation topics at Silliman that deal with research and faith and learning integration. In June 2012, after my return to Silliman from Baylor my suggestion to include the aforementioned topics in the orientation of new faculty members was considered for the first time.

PROCESS OF GETTING TENURE

Security in employment, for a faculty member, is equated with tenure; for the administration, tenure is to keep them and to ensure the quality of faculty. But it takes more time and requirements for Baylor faculty to be tenured as compared to Silliman faculty. After three years of provisional service with a minimum graduate degree and a satisfactory teaching performance for the period, a Silliman faculty member is given a permanent teaching status. He or she

becomes eligible to all the benefits enjoyed by regular faculty. In contrast, it takes six years for a Baylor faculty member to be tenured provided that he or she has satisfactory teaching performance and has published articles in refereed journals. The publication of the faculty is not a requirement for tenureship at Silliman, but this is only necessary for promotion in rank from assistant professor to associate and full professor—not from instructor to assistant professor. Therefore, the prevailing “publish or perish” policy of many US higher education institutions, including Baylor, is not strictly observed at Silliman—a faculty member is only denied promotion in rank for failure to publish. A Baylor faculty member I interviewed who is in her sixth year, said that tenureship indeed allows Baylor to retain quality faculty, and that it is what keeps her busy in research and writing for publication.

A Baylor faculty member who is not tenure-track is given the title of lecturer and may be removed from teaching when the need or the condition requires a faculty member who is tenured. A status of lecturer or tenure-track faculty member is already determined during the initial stage of the employment. Unlike the lecturer, the tenure-track faculty member has to undergo an annual review process and is expected to meet the requirements for tenureship throughout the period of six years that he or she is teaching. For example, if the tenure-track faculty member fails to do so during the first or second year of employment, he or she will not be issued a letter of appointment for the following year. And when the faculty member fails to do so after the second year, a terminal letter of appointment will be issued for the succeeding year. The status of a faculty member who still continues in the succeeding years will be finally determined in the sixth year which is considered as the tenure year. If the faculty meets all the requirements then he or she will be given the long awaited tenure—a regular status.

Generally, the bases of the evaluation of tenure-track faculty at Baylor cover teaching performance; scholarship and professional activities; service within and outside the immediate academic environment; community and religious service; interpersonal relationships with students and those within the academic circle; and statement of support to the goals and mission of Baylor. Teaching performance is evaluated by students and peers while scholarship is determined by the quantity and quality of publications, particularly in refereed journals. It should be noted also that among other non-academic bases for evaluation, community and religious services as well as statement of support to the goals and mission of the university

are considered. These concerns are perhaps assumed to manifest the Christian faith of the candidate. The tenure-track faculty member has to prepare his or her credential notebook which is updated annually and is made available to the evaluation committee on particular dates during the scheduled tenure review period.

Since there is no review process for tenure at Silliman but only for promotion, let me just compare how the latter works in comparison to that of Baylor for the sake of appreciating the procedure and to determine if Christian faith is considered. The faculty members who are qualified for promotion, based on the points earned under the Faculty Salary Administration Scheme (FSAS), have to submit their documents which include professional activities, publications, creativity, and teaching performance evaluation³ to the HRD Manager who then convenes the promotion committee⁴ to review the documents and to recommend appropriate action. The review schedule has no definite dates, unlike at Baylor. The favorable action of the promotion committee is forwarded to the Deans Conference which again reviews the documents to concur or dispute the recommendation of the former. If the Deans Conference recommends the promotion, this is submitted to the President (if it is only for assistant professor) and the Board of Trustees (if it is for associate or full professors) for approval and issuance of appointment.

Take note that, in contrast to Baylor, there is no clear criterion at Silliman that looks into the religious involvement of the candidate for promotion. There is also a practice at Silliman that two conference papers can be counted as one "publication" if the candidate failed to produce the required number of published articles needed for promotion. There is also no strict distinction between refereed and non-refereed journals where the articles are published. It is in this respect that Silliman lags behind Baylor in strictly imposing the pursuit for visible manifestation of faith in teaching and practice as well as the pursuit for scholarship of faculty. Although the Silliman administration has been strongly promoting the integration of faith in instruction, research, and extension work and publication in refereed journals; it has yet to seriously consider it as parameter or reinforce its observance in the promotion of its faculty similar to what is done in the tenure process for Baylor faculty. Besides, no tool has been developed at Silliman to measure the extent of faith integration done by the faculty in order that this can be included in annual performance evaluation.

So what really is a Christian faculty member? Is it only what a

faculty member says or how a faculty member acts? Is it only inside the classroom or in the community? I believe that a Christian faculty member cannot only be identified in one's denominational affiliation; but also in what one says and how one acts inside the classroom and in the community. It could be done in different ways as long as one is able to demonstrate Christian faith. That means a Christian faculty is empirical—seen and felt—not abstract or imagined. But I agree with Bennighof (2003, p. 41) when he says that Christian narrative and secular narrative, in some ways and instances, “will not coexist comfortably.” This may be easiest for the humanities, somewhat difficult for the social sciences, but most difficult for the natural sciences (see also Parsons 2003, p. 75). But how faith is to be integrated in a lesson cannot be prescribed, except perhaps the techniques. It can be done in different ways and forms depending upon the lesson or topic, and in a convenient or natural manner. It can be spontaneous or planned and can be within or at the concluding part of the lesson where the meanings beyond the empirical are examined. Arguably, a faculty member with strong Christian foundation is comfortable towards faith integration in his or her profession.

PUBLICATION AS SCHOLARSHIP AND A UNIVERSITY CULTURE

Aside from books published, creative outputs and exhibitions, there are three established measures of scholarships of faculty in terms of their journal publication which include number of research articles, citations, and peer ratings. Using just one of the measures is not enough as compared to having a combination of the three measures together, according to a study conducted by Kirkpatrick and Locke (1992). Desiring to measure the impact of their research articles, researchers are at present publishing in journals that are cited by the Institute for Scientific Information (ISI) of Thompson Scientific or Scopus of Elsevier, among others. These are refereed journals that have met scholarship standards and, therefore, are given more credits compared to non-refereed journals. Meanwhile, the Commission on Higher Education (CHED) of the Philippines endorses and likewise provides financial assistance to selected private universities that are members of the Philippine Higher Education Research Network (PHERNet).

The emphasis on research involvement and quality of publications

of faculty may explain why the tenure process at Baylor requires the segregation of the two kinds of journals in the credential notebook of the candidate. More importantly, knowing the citation index and peer ratings of the articles published by the candidates would help in determining their level of scholarship. But it is not that easy to promote research in a university whose tradition was in teaching or among older faculty members who were not expected to pursue research in previous decades and who were focused on classroom instruction. According to Hankins and Schmeltkeopf (2007, p. 339) two camps emerged at Baylor because of the controversy around research when it first aspired to become and eventually became a research university. The first camp includes the traditionalists who want Baylor "to remain a university that provides an excellent education primarily in undergraduate and professional fields, within a campus culture that nourishes lifelong friendships, moral character, and a sense of public service." The other camp refers to the progressivists who believe that Baylor must "assume much larger responsibilities in the world of higher education, the wider religious community, even for our entire culture." They look for mature accomplishments on all levels of tertiary education as well as in research and publications of faculty beyond the rigors of classroom instruction. These two camps are also present at Silliman and, as the Research Director, I sided with the progressivists in order to convince the traditionalists that there is much to be gained by engaging in research as seen in the accomplishments of the former group.

Unlike Silliman, research is a major enterprise at Baylor, classified by the Carnegie Foundation for the Advancement of Teaching as a research university, in terms of organization and funding. The Vice Provost for Research (VPR), who is under the Office of the Provost, heads its research unit with the Assistant Vice Provost for Research. According to VPR Dr. Truell Hyde, an assistant is needed because of the number of units to oversee: Administrative Services and Communications, Compliance, Faculty Development and Internal Funding, Undergraduate Research and Scholarly Achievement, Office of Sponsored Programs, Institutional Research Advancement and Technology Management, and Industrial Relations. There are also other research centers and institutes at Baylor that the VPR oversees. The Research Policy Council and the Research Council of Deans work closely together with the office of the VPR. Meanwhile, the research funds of Baylor come from internal as well as from sponsored programs. The internal funds are for the following: Faculty

Research Investment Program, Young Investigator Development Program, Arts and Humanities Faculty Research Program, University Research Committee Small and Mid-Range Grant Programs, and Undergraduate Research and Scholarly Achievement Small Grant Program. The funds for sponsored programs come from state and private organizations.

Silliman has both internal and sponsored or external research funds but the amount is smaller compared to Baylor, and it only has internal research funds for faculty and not for students. Nonetheless, Silliman gets external research funds from government and private organizations, particularly for biology research and conservation, both terrestrial and marine. This is its bias because of the works of its pioneering natural scientists. But it is now moving towards integrative and collaborative research programs by encouraging more of its social and health scientists to do research and publish, as well as to work with the natural scientists. Since 2007 it has allocated annually between Php 250,000 to 500,000 (US\$ 6,098 to 12,195 at US\$ 1 = Php 41) or Php 50,000 (US\$ 1,219) per research project of new researchers to hone their skills so they can eventually bring in external research funds as they improve their track records. In 2011, Silliman was designated by CHED as a research university and a member of PHERNet, and this is a welcome development because a budget of 10 million annually for three years was promised for its research programs.⁵ But there is still more room for improvement in terms of the number of Silliman faculty getting involved and the quality of their research articles.

While Silliman's goal was clearly toward becoming a research university, there was a debate at Baylor over a provision of Baylor in 2012 about its aspiration of becoming a highly-ranked research university because this was going to be costly. The faculty members who will engage in research need to have reduced teaching loads, and this requires hiring additional faculty to fill in the vacancies in some courses. Therefore, the salaries of the faculty who have research projects are derived both from the equivalent loads assigned to their research engagement and the courses they teach during a particular semester. On the positive side, having small teaching loads would allow faculty a significant interaction with students while they also conveniently pursue their research projects, involving some of their students, and this would enhance their teaching (Sloan 2007, p. 324). This shows how research and teaching reinforce each other, and the cost incurred can actually be justified according to those in favor of Baylor's quest for research university status.

At Silliman, requiring the faculty to do research is a must although this would mean an additional task for them. It is also difficult to give reduced teaching loads in favor of research because of limited faculty; in fact, the majority is already overloaded. This suggests the limited budget of the university to hire new faculty. Having teaching overloads is used by some faculty to justify their failure to do research (Fontejon-Bonior 2009, p. 98); but if actually made to select between teaching additional courses and doing research, many would prefer the former to the latter because they perceive the income as immediate and higher. Others also perceive teaching to be easier. Meanwhile, those faculty members who ably managed their time and combined teaching and research have actually earned more and enjoyed other benefits from their research outputs. These added values of research include additional income from honoraria, cash incentive for published articles, promotion in rank, attendance at conferences to present papers, professional growth, and additional knowledge to enhance teaching (see also Fontejon-Bonior 2009). But more importantly, engagement in research and publication improves the quality of faculty that contributes to the university's ranking.

RESEARCH ETHICS AS CHRISTIAN ETHICS

Research ethics is not only needed to ensure scholarly work but also to protect the rights of human and animal subjects. It is a government requirement in the US for seeking state or university funding, and is strictly enforced by universities because of its legal implications. At Baylor, the Institutional Review Board (IRB), which has a multi-disciplinary composition and has its own head, is a part of the Compliance Unit under the Office of Vice Provost for Research. Although not all research proposals may require IRB approval before these are recommended for internal or external funding, since some do not pose potential harm or have only minimal harm to the subjects, it is only the board that has the authority to decide on whether a proposal is exempted or not. Silliman has yet to institute its IRB at the university level—only the College of Nursing has organized it at present. And although Silliman's IRB has to be under the office of the Research Director, it has to have its own head to prevent conflict of interest—promoting versus regulating research.

In a Christian university the place of the IRB cannot only be seen

as a bastion for ensuring the observance of the ethical, legal, and scientific requirements of research. In the past, data gathering may have been carried out by deception or exposing to harm the subjects during and after the research process, and the researchers were able to get away with it for the sake of science. From a Christian perspective it was wrong because the sense of value of the lives of humans and animals involved in research was downgraded, regarding them as commodities. The other required traits of ethical researchers such as being honest, caring and nurturing, conscientious or accountable for their actions, stewards of living and non-living elements, and related others are really imprints of Christian ideals. These ideals are what identify Christian researchers in their search for new knowledge, but more importantly in interpreting this knowledge to what it means to the quality of life and living. It is beyond what is simply observed—like what I said about a Christian faculty. So while an aspiring research university is for more faculty publications and citations, it must be inspired by its Christian faith and ideals that all research results should contribute to the betterment of the majority and not only of the few.

BRINGING IN EXCEPTIONAL TEACHERS AND RESEARCHERS

Baylor also has a program for bringing in teachers and scholars from other universities with exceptional teaching abilities to widen the learning exposure of its students. One of these is the Robert Foster Cherry Award for Great Teaching which started in 1991. This was created by a Baylor alumnus, Robert Foster Cherry who was inspired by how his life had been changed by significant teachers. The award was created not only to recognize excellent teachers but also to bring them in contact with Baylor students. The Cherry Award recipient, as well as his or her home institution, receive a substantial cash award for being at Baylor for a semester (“Recognizing great teaching,” 2012, p. 7). Aside from its academic significance, the idea behind this program is actually a reflection of the Christian value of sharing with others the blessings one has enjoyed. This is another example of how a Baylor graduate must have internalized the Christian ideals he or she learned in college. There are also Silliman alumni who support this concept but I cannot identify an established program of this kind in the university.

Meanwhile, the construction of the Baylor Research and Innovation Collaborative (BRIC) in a location that is going to accommodate the Central Texas Technology and Research Park is an example of bringing out to the community the research expertise and resources of the university. Although primarily a place for graduate research of its School of Engineering and Computer Science and for select Baylor interdisciplinary research centers and institutes, the BRIC will also host advanced technology training and workforce development for nearby colleges. It can be a venue as well for joint research symposia and educational meetings with other institutions and for other industry partners to establish their structures. Dr. Marlan Scully, who is both a Christian and a scientist and has been named Distinguished Research Academician of Science and Engineering at Baylor University, will establish his research laboratory in the BRIC ("BRIC draws 'Renaissance' research," 2011-2012, p. 15). This development will further boost the self-identity of Baylor as a Christian research university. Silliman has yet to pursue further this practice particularly among the alumni returning to Dumaguete through its Alumni College under the Graduate Studies Program. It coordinates with alumni who agree to present lectures, seminars, and related activities as ways of sharing their expertise with students of their alma mater.

FRAMING OR SUSTAINING THE FUTURE

A strategic plan is a comprehensive document that articulates what an institution wants to be or to have, and how this will be achieved. It expresses the institution's dreams which are guided by its vision and mission; these do not represent a particular individual or group but rather a collection of people who identify themselves with the institution. Because of these dynamics the process of preparing a strategic plan is lengthy and tense, but the result is always inspiring when everyone is significantly involved. It addresses a particular time frame, and the process will start again after a certain period. Baylor 2012, which covered a period of 10 years from 2002 to 2012, and the Baylor community during my stay had already finished in refining the draft of the new strategic plan. Although the new plan is called *Pro Futuris*, which is a reminder of the link between the past and the future and an extension of Baylor's motto *Pro Ecclesia, Pro Texana* ("Baylor strategic planning process," n.d.), I will call it Baylor 2022 to compare it with what Silliman has. Because Silliman has its

strategic plan still in effect from 2008 to 2016, but divided into two terms for implementation and monitoring, i.e., 2008-2012 and 2012-2016, I will only examine the last term and call it Silliman 2016; the first term is Silliman 2008.

Baylor 2022

The final version of Baylor 2022 includes five aspirational statements ("Baylor strategic planning process," n.d.), but I will focus more on those that concern academic programs, faculty quality, and research promotion. The strategic vision which articulates these aspirations contains what Baylor has to achieve that starts with this phrase "Baylor will be a community...." Dr. Elizabeth Davis, Executive Vice President and Provost, during the planning process said that there will be new metric benchmarks to be developed consistent with the strategic visions as bases for the annual evaluation of the university.⁶ Moreover, a quick look at Baylor 2022 leads one to ask what is new as compared to Baylor 2012 because the difference seems to be only on the manner of articulating what had been done, as well as the desire to sustain and intensify all existing efforts and resources to achieve more. It conveys the impression that there is now no turning back in Baylor's effort to be one of the top Christian research universities. On January 15, 2012 an editorial of *Waco Tribune-Herald* stated:

In short, Baylor seems to be codifying and internalizing worthy pursuits and initiatives that teachers, students and administrators have been undertaking in recent years. The draft strategic plan puts all this into print, ensuring such goals are fully acknowledged, vetted and critically measured by university leaders in charge of such matters. It ensures such priorities don't disappear just because top administrators retire and students move on.

Baylor 2022 also puts more emphasis on what the various academic units had started with regard to bringing education and the expertise of its students and faculty members through service-learning, community outreach, and volunteer or mission work to the people of the city of Waco, the state of Texas, the US, and even the world. The emergence from a "Baylor bubble" referred to by the *Waco Tribune-Herald* editorial, and reaching out more than before to the community in need is anchored in the Christian principles that guide Baylor's programs about working to better one's neighbors. When interviewed by Bill Whitaker (2012), Dr. Davis explained that "...our Christian faith calls us to do it, to care about the community

we live in.” So the new academic programs envisioned, both at the undergraduate and graduate levels, should not only build on the existing strengths within departments and schools but also programs that are vital in responding to the existing needs of society such as in the health sciences.

Furthermore, igniting leadership potentials is essential to the aspiration of Baylor of what its academic program for the next ten years can produce. Toward this end, it will continue to “attract, retain, and reward” outstanding faculty who can ably integrate faith and learning. It believes that the making of ethical leaders can be enhanced by their engagement in research with faculty and involvement in experiential learning programs such as service-learning, mission trips, and volunteerism. Actually, these already exist and only need to be enhanced; and they are already proven to develop the mind, body, and spirit of the students. More importantly, Baylor plans to enhance spiritual life programming that will help students explore and discern their beliefs, convictions, and vocations as Christians. Dr. Davis elaborates that to achieve all these “we have to hire faculty who have an active Christian or Jewish faith...” because “...faith matters and faith informs how they go about their work every day” (Whittaker 2012).

Even as it competes with secular universities for rankings, Baylor further aspires to its Christian faith promoting a desire among its faculty and students to help address systemic problems and to be fully aware of the needs of others. In Baylor 2022, the relevance of research goes beyond knowledge for its own sake to the aspiration that it will be useful to “discover and illuminate solutions” to problems besetting the community. On the other hand, the plans for creative endeavors are geared to reflect the span of God’s creation and not simply for art or beauty’s sake. The ultimate aim is to “promote stewardship” of what God has provided to humanity. To realize all this, external funds generation and more collaboration have to be vigorously initiated. When asked about the common theme from the various inputs to the strategic plan, Dr. Davis easily answered: “Do not lose your Christian identity” (Whittaker 2012)—an inspiration for the current administration to preserve Baylor’s Christian heritage as it pursues academic excellence.

Silliman 2016

In contrast to the aspirational statements of Baylor, the thrusts of

Silliman as embodied in its strategic plan are divided into four major areas that are reflective of its tradition for enhancing Christian faith and pursuing excellent education. These major thrusts are Christian witness, academic excellence, governance, and relevance and reach (Silliman Strategic Plan, 2008). It can be noticed that faith-related matters are first in the hierarchy of thrusts which ends with those that concern how the outcomes of Silliman education will benefit from external linkages and subsequently impact the wider community and the environment. What will be discussed here covers only those thrusts that have direct relevance to this article.

The specific thrust toward Christian witness includes increasing the involvement of faculty and staff in faith-related activities outside while widening their spiritual growth within the university. In doing so, the plan likewise aims for broadening of Silliman's involvement with national UCCP and other churches. The specific thrust toward academic excellence is for strengthening the integration of volunteerism and service-learning as well as on-line academic services to reach a greater number of clients that aspire to benefit from Silliman education. These thrusts also demand the improvement of the credentials and capacity of faculty members along these areas. The specific thrust toward governance is focused on the improvement of the organizational and technical capacities of Silliman to deliver the above major thrusts as well as to protect its operation from potential risks. Finally, the specific thrust toward relevance and reach is for widening and sustaining Silliman's professional, financial, and spiritual linkages with organizations and institutions that could help in keeping or realizing its vision and mission. Thus, a good strategic plan, like those of Baylor and Silliman, does not just project what has to be achieved but also tells where and how financial and technical support could be generated.

Silliman 2016 specifically outlines the desired results based on what had been achieved in Silliman 2012, in terms of indicators to measure its achievement at the end of the period, and ultimately the desired outcomes. It states that when realized, the strategic outcomes will make Silliman a leading Christian institution of learning that models the integration of faith and excellent scholarship, the delivery of knowledge and learning to more people in wider communities particularly with its on-line learning, and the promotion of integration and collaboration across disciplines and among its faculty and staff (Silliman Strategic Plan 2008, p. 121). From what it has achieved now, Silliman still desires, among other goals, to have a certain number

of faculty members with advanced degrees, new degree programs both in the undergraduate and graduate levels, modified programs to meet the demands of the time particularly with the implementation of the K to 12 basic education curriculum, integrated general education courses for holistic learning, and a broader on-line learning program. Correspondingly, it desires to have a certain number of faculty and staff with improved qualifications and capabilities, as well as younger faculty and staff, who are involved in the above broadening of programs and undertakings (Silliman Strategic Plan 2008, p. 131).

CONCLUSION

Baylor and Silliman have significantly achieved what they need to prove that they are Christian universities and have competently delivered quality higher education evident in the performance of their graduates. Furthermore, they are distinguished as national research universities—a status that is not self-ascribed but awarded by legitimate academic institutions in recognition of the scholarship of their faculty members. However, the threats brought about by secularization of universities because of modernism, materialism, consumerism, individualism, relativism, and so on have challenged Christian ideals and values. In response, they do not need to reframe their respective visions and missions to confront these threats, but to have strategic plans that will sustain the present efforts they carried out which achieved the imperatives enumerated in Baylor 2012 or the desired outcomes listed in Silliman 2012.

The strategic plans of Baylor and Silliman, therefore, are not only documents but are expressions of their continuing aspiration or desire to be at the pinnacle of promoting quality Christian education along with other institutions with the same commitment within their regions. The presence in the plans of the strengthening of what they have achieved so far, and not the framing of several other new things to pursue, however, is indicative of the hidden anxiety that something may go wrong and the two institutions may become just like other secular universities but of highest quality. So having a critical mass of Christian faculty who are also academically competent and can ably integrate faith and learning with a high level of scholarship is paramount to their strategic plans or visions. The successful transmission of Christian ideals and values, which can be observed in the quality of a university's graduates, is dependent upon

the Christian commitment of its faculty members. For Silliman, the *Code of Christian Collegiality* that enumerates how its faculty, staff, and students should live and relate to each other is another tool toward this end (“Code of Christian collegiality,” n.d.).

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END NOTES

¹ The institute was founded in 1997 to assist the university in achieving its mission of integrating academic excellence and Christian commitment (see <http://www.baylor.edu/ifl/>). Among its other programs, it organizes retreats for new faculty members after a year of their employment or those who had not attended before to reflect about being Christian educators and to encourage collegiality among them. It also caters to students.

² A temporary faculty or lecturer is hired to handle a course without a teacher in the meantime while the process of hiring is on-going or a qualified faculty member has not yet been hired.

³ The teaching performance at Silliman is based on the evaluation of the students, immediate head, peers, and the concerned faculty or self-evaluation.

⁴ The Promotion Committee is composed of the Dean of the College where the candidate comes from, the HRD Manager, the representative of the faculty union, and a faculty with the rank similar to the one considered for promotion. In contrast, no faculty union is organized at Baylor.

⁵ Prior to PHERNet, Silliman was designated by CHED as a Zonal Research Center (ZRC) and tasked to capacitate higher education institutions in research within its assigned regions. Among its several big projects related to the environment, Silliman was commissioned by the Asian Development Bank-Department of Environment and Natural Resources (ADB-DENR) Integrated Coastal Resources Management (ICRM) Project to assist the Regional ICRM Centers in Regions V, VII and XI in their research and marine conservation activities. It was also contracted by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) and the Protected Area and Wildlife Bureau (PAWB) of DENR to implement the Protected Area Management Enhancement (PAME) Project in four regions in the country which included Regions IV-B, VI, VII, and VIII.

⁶ She stated this in an interview by Daniel Houston of *Baylor Lariat* (2012) after a

faculty meeting on January 12, 2012 to discuss the draft plan. I attended that meeting and there were only three questions or issues expressed, which suggests that the draft plan was well-accepted. There were no heated discussions. President Ken Starr was present on stage with Dr. Davis to answer questions.

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NOTES



Sweet Rewards: Texas Children's Hospital Nurses Make Participating in Research More Palatable

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Evidence-based practice (EBP) and research are integral to clinical practice and central to the nursing philosophy at Texas Children's Hospital, Houston. As a Magnet-recognized hospital, nurses at TCH are expected to use EBP in making patient-care decisions that are based on current scientific knowledge and research findings. But participating in research can be intimidating for staff nurses who view the process as too complex and often cite common barriers such as lack of time or lack of access to scientific literature as reasons for not actively engaging in clinical research.

The Research Scholars Program's research council and faculty spearheaded the Great American Cookie Experiment project in October as a method to provide research education and engage staff nurses in a fun, non-intimidating, hands-on research project. The experiment was first used by Clinton Thiel, RN, in 1987 to desensitize undergraduate nursing students to research phobia. As a research educator, he devised the teaching strategy to decrease nursing students' fear by using the non-threatening research question, "Which cookie tastes better?"

Replicating the experiment at TCH allowed RSP members to practice conducting a research project. The year-long program, which meets weekly, is designed to teach basic research skills necessary to conduct clinical research.

More than 500 participants, including 300 staff nurses, were recruited to take part. Data were collected at the TCH Main Campus and at TCH West Campus by two-person teams, members of the RSP who were blinded to the composition of the cookies. Participants

were asked to taste-test two physically identical, but nutritionally different, chocolate chip cookies and complete an evaluation form that rated the moistness, flavor and overall preference between the two cookie types. As expected, staff members were eager to taste test cookies and enthusiastic about finding out the results, which pointed to a preference for regular chocolate chip cookies.

The experiment provided a valuable opportunity for staff nurses to learn about research. "It was interesting to see research applied to such a fun project," staff nurse Jenell Dancy, RN, MSN, said.

Marlene Walden, RN, PhD, NNP-BC, CCNS, who led the project, said the cookie experiment is as relevant today as it was when it was described as pedagogy over two decades ago. The RSP members said they felt that the project was successful in raising awareness and demystifying the research process. "Working on the GACE allowed me to expand my knowledge of the research process," participant Geneva Shores, RNC, LRN, said. "There are so many steps to the start-up process that I felt overwhelmed. This experiment was a fun way to work out my fear," she added.

By promoting an environment that facilitates inquiry and critical thinking, RSP members said they hope staff nurses will be more open to engaging in research that ultimately allows them to improve their patients' lives.

Research Challenges and Initial Results in the Measure of Incivility, Burnout, and Work Performance of Employees in Silliman University

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INTRODUCTION

People seem to consider certain types of uncivil behavior to be normal responses to everyday occurrences. Drivers pin another driving vehicle to get their way through or cut each other off for parking spaces. An employee does not return a phone call because one just does not feel like doing it, or find it appropriate to curse at the caller when it is a wrong number. People refuse to greet one another, or cut others off while they are still talking. One leaves a piece of trash for someone else to pick up just because one does not see a trash bin nearby. These are behaviors of incivility that comfortably sit in many aspects of interpersonal interaction that people no longer think about their rudeness and insensitivity towards others. These behaviors have become thoughtless so much so that many of them are already immediate and spontaneous responses.

The workplace is a concrete space where incivility springs and lives as a thoughtless behavior. Pearson, Andersson and Porath (2000) explained that in the workplace, “people treat each other rudely by using demeaning language or gestures, ‘flaming’ network colleagues, slinging innuendos, or merely perching impatiently over the desk of someone engaged in a telephone conversation” (p. 123) and that these expressions of uncivil behavior are frequent. In some organizations, workers may see these behaviors as the norm without giving much thought about the potential long-term harm they can cause (Pearson, Andersson & Wegner, 2001), therefore, many organizations let uncivil behaviors pass, much more, do not do anything about them. Because incivility is often an ambiguous behavior, it is paid the least attention

in organizations as a kind of interpersonal and organizational mistreatment, unaware that it actually has individual costs and in the long run, organizational costs.

Academic incivility injures the welfare of faculty, staff, students and the entire school/university community (Clark, 2008). Uncivil behaviors among faculty and staff may influence students to engage in similar behaviors, create negative emotions among them, affect their work performances and eventually put the school/university at stake. Because any academic institution is crucial to shaping and developing young adults to be loving, caring individuals in society, incivility becomes a huge concern especially that, when it is unaddressed, become pervasive leading to more aggressive acts like bullying. Bullying has been known to have obvious adverse effects on individuals, many of them suffer from emotional problems (others opting for suicide), and on organizations with members losing trust and commitment, and seeking retribution.

THE IMPORTANCE OF LOOKING AT BURNOUT, INCIVILITY AND WORK PERFORMANCE

In the past recent years, there have been local reports of suicide among students. In the past couple of years, there have been reports of teachers and academic staff suffering from emotional problems with others reporting to have clear thoughts of suicide. In the past year, students have reported observing teachers swearing (e.g. *shit* and *bullshit*) casually in the classroom or in any other school premises especially during school hours in front or within the hearing distance of the students. There often have been reports by students of teachers who do not respond to them well when they seek consultations. There have been stories told by teachers and staff who have been maltreated in phone conversations by their colleagues. There had been recent cases of abuse of power by teachers many of them done through sexual harassment against their students. There continually are telltales of misdemeanor among academic faculty and staff, and students. Many of these behaviors are categorized as uncivil, while others are the more overtly aggressive ones that sprung most likely from repetitive uncivil behavior escalating to a more aggressive behavior like bullying which has more obvious adverse effects like severe emotional problems leading to suicide.

One may hypothesize that incivility among individuals may have

resulted from overworked states, hence experiencing burnout. People who have mismatched workloads experience burnout too often. A mismatch in workload may mean excessive workload, having the wrong kind of work and being required to display emotions that are inconsistent with their feelings (Maslach, Schaufeli & Leiter, 2001). Burnout almost always adversely changes one's behavior, and incivility may be one of them. However, for people who have initially been receivers of uncivil behavior and frequently experience such, may be more prone to burnout than those who do not experience incivility. When an individual struggles to meet optimum performance given a workload, an unsupportive environment, such as an atmosphere of incivility, makes the experience much more emotionally exhausting.

There is a substantial volume of researches on burnout among employees/workers illustrating its antecedents and consequences including its adverse effect on work performance. There is also a substantial volume of studies on incivility, its definition, the frequency of its occurrence in the work settings and its harmful effects to the wellbeing of an individual. Almost all of these latter researches though were among nurses and in the health care settings. Research studies on work performance clearly explain what an ideal work performance level should be in order to contribute to optimum organizational performance for increased productivity. However, literature on burnout, incivility and work performance does not demonstrate the association among them.

In a world that is fast changing putting a vast workload on the employee/worker, there is a high risk for burnout to occur. Additionally, incivility has been a growing concern in the workplace because of its increasing occurrence. Hence, it is necessary to keep track of the burnout states of employees/workers and frequency of incivility among employees/workers so that appropriate interventions are given to keep them from performing unfavorably and from harming their wellbeing. Croom and Moore (2003) explained that the academic profession is one of the most ostensible professions, that is why the world continues to put high expectations on teaching even though improvements have been made to develop better student achievements. Therefore, it is seemingly significant that important factors in the workplace, like burnout, incivility and work performance are studied in the academic setting so that academic teachers and staff are able to deliver education to their students that will not only enhance their intellectual skills but also improve their wellbeing and develop in them human skills of care and respect

towards others. Being the leading Christian academic institution in Asia, Silliman University should continue to uphold values that cater to the enhancement and development of an individual's full potential. It must take care of its employees so that the best education is delivered to a generation who will be responsible of running the society in the future. One study reiterated that HRD researchers and professionals are the change agents for reducing uncivil workplace behaviors and improving organizational performance (Reio & Ghosh, 2009).

It is from these specific interests that a group of faculty members, and graduate and postgraduate students in psychology came up with a research topic, "Incivility as a mediator and moderator variable between burnout and work performance among faculty and staff of Silliman University." The researchers personally had been experiencing and observing uncivil behaviors among co-workers in the university. They definitely were aware of the implications the research may have on the university which may come over as displeasing to some people. However, they also believed that there could be no better way to know accurately except to gather empirical data. As employees and students in the university, the researchers had personally experienced feeling exhausted at their own job tasks, which, in many ways, pushed them to manifest uncivil behaviors toward others. They wondered if this was part of feeling burnt-out in their given tasks, thinking similarly too of their co-workers manifesting the same psychosocial behaviors in the workplace. In addition, the researchers also believed that the continuing incivility they observed among employees in the university should be addressed before they proceed into becoming bullying behaviors. It is the primary hope of the study to give a baseline data the university can use to help develop enhancement programs for all employees. It is not sufficient for employees to accomplish their tasks based on what is only required of them, but most importantly for them to feel happy in their jobs. Employees spend most of their days in a week and most of their hours in a day in their workplaces, therefore the impact of their work on their wellbeing is actually larger than what is normally thought of. Especially in the profession of education, no reward or fulfillment is bigger than the positive impact these employees make on their clientele-the students, given that this kind of profession, as it may pay sufficiently, is in reality not comparable to the much higher paying jobs in the corporate world. As what is usually said about the education profession, "Teaching is a noble profession."

The study that is currently done will facilitate a better understanding of employees' welfare in Silliman University, and hopefully help in conceptualizing interventions for developing and maintaining wellbeing among them. In turn, and as results of such interventions, the organization will be able to uphold its thrust for "character, competence and faith". This most importantly holds true to those comprising the faculty and staff positions as they are the "frontliners" who mostly represent the University to stakeholders such as students.

There are stories below that may be sensitive to others. It must be noted that they are empirical data found on incivility and burnout. It must be understood that the purpose of the research project is to open avenues for enhancement and development of the workforce, while the challenges described below contribute to the whole research agenda in Silliman University in terms of improving methodology. The experiential learning of the researchers is also shared to the academic community in the desire that others may learn from them.

CHALLENGES

The full research project comprises two studies. One is a survey of all faculty and staff of Silliman University randomly assigned to three groups. Groups A, B and C were tested at different times in the semester: A at the beginning, B at the middle and C at the end of the semester. This procedure would show at what times in the semester employees were experiencing burnout and incivility knowing that the three different periods in a semester demand for certain kinds of tasks to be accomplished and these tasks may impact different levels of stresses on the individual which may cause burnout and may thereby impact the occurrence of incivility. The scores on burnout and incivility were to be correlated with work performance ratings. The work performance ratings of the participants were asked from the Instructions Department in charge of facilitating the evaluation and reporting of the employees' scores by students, colleagues and supervisors. These ratings were what employees regularly get in a school year. It is primarily used for personal assessment of one's performance-a gauge at the strengths to be maintained and sustained, and weaknesses to be overcome. It is also used by supervisors to check how well their teachers and staff are performing, and it is what is used by the university as basis for giving cash incentives to faculty and

staff who gained high ratings, in the hope that it will be a motivating factor for them to maintain good performance or work better.

The second study is a qualitative investigation of 15 faculty and staff on their experiences of incivility in the workplace. As of the writing of this article, 11 interviews have been completed.

In study 1, out of the 779 faculty and staff indicated to us by the Human Resource Department Office as of October 2011, only a total of 166 participated in the survey. Although that can be an ideal number to aim for a normal distribution statistically speaking, it still becomes a very poor response rate considering that all 779 were randomly assigned to the three groups. Also, it would have been ideal to test all 166 across the three periods in a semester, however, given that the research project planned to look at burnout and incivility scores in relation to their work performance ratings, these ratings were only done once in a semester for each employee. Hence, it was inappropriate still to test incivility and burnout across different periods using dependent samples with only one set of work performance ratings regardless of what period in the semester they were rated. Having borne this in mind at the planning stage of the research project as the reason why three independent samples were used, the researchers failed to realize that not all of the employees were actually rated in both semesters of a school year, therefore, not all 166 participants actually had work performance ratings in the semester when they were tested. It was also wrong to think that a correlation could be done among burnout, incivility and work performance in each of the three periods (or three independent groups), when work performance ratings were done any time in the semester while the time of tests on burnout and incivility were controlled in the three periods.

Among the 166 who participated, there were 81 ($n_{\text{faculty}}=41$ and $n_{\text{staff}}=40$) in group A, 58 ($n_{\text{faculty}}=32$ and $n_{\text{staff}}=26$) in group B, and 27 ($n_{\text{faculty}}=20$ and $n_{\text{staff}}=7$) in group C. Emphasizing earlier that the 166 was not an efficient response rate, it was all the more unappealing to any researcher to see the sample sizes of each of the independent samples A, B and most especially C. Nevertheless, one might say that the data set gathered from these small samples may not be as relevant as when the sizes were efficiently big, these were still data and they were believed to be relevant to the Silliman University community. It is also believed that this research project can be a good baseline for further study on such topics with bigger sample sizes and a more efficient methodology.

Given the aforementioned procedural limitations in study 1, the direction of the discussion of the original research project has now changed. It now focuses more on the relationship between incivility and burnout of faculty and staff across the three periods in the semester. It will still look at how work performance ratings are associated with incivility and burnout but may no longer be in mediation and moderation analyses, unless the date when the employee was rated for one's work performance coincides with the period in the semester one was tested for burnout and incivility. For example, in testing mediation and moderation effects of incivility in the relationship between burnout and work performance, if the employee was rated on work performance at the end of the semester and also belongs to group C, one's data will be considered for analysis. If this employee belonged to either group A or B, one's entire data set will not be considered for analysis, because mediation and moderation effects of incivility between burnout and work performance will actually not make sense. Also, even when work performance ratings of participants coincide with the period when they were tested for burnout and incivility, there is presumably a decrease on the group's sample size which all the more makes the analysis deficient. Nevertheless, like what was mentioned, all three variables can still be analyzed in correlations, and this would have been a lot more efficient if the response rates were higher than they were in the three groups.

It was a huge challenge for the data collectors to encourage recruited participants to complete the survey. The data collection for each period was time constrained so the data collectors had to follow-up the recruited participants almost every other day. The decrease in the response rate from the beginning of the semester to end of the semester could have been indicative of the stresses they experienced in their jobs that made them unresponsive of tasks outside of their work descriptions. These stresses perhaps increased as the semester drew to an end.

Another challenge data collectors experienced when they were in casual attires when they approached the recruited participants to ask them to answer the survey, many would not respond positively, either automatically disagreeing to participate because they were busy, or would not really talk to them in a nice way and behaved dismissively. They believed that the recruited participants probably thought they were students whose requests were not a priority. When they would come to them in business attires, the data collectors

observed that the recruited participants responded to them very positively, either agreeing to participate or talked to them very nicely. The kind of clothing by data collectors gave the impression of the value of the research project they were asked to participate in. Also, maybe, a business attire somehow projected authority that a casual attire could not. In addition, the data collectors also indicated that for those who initially would say for them to come back for the answered questionnaires on a specific day, when that day came, they would be told to come back another day and then another day and then another day, saying in all of those times that they were busy. On the average, the questionnaire only needed to be answered in 15 minutes. It was not surprising to have observed such behaviors during the data collection because similar behaviors have been observed many times before in other contexts especially on other research or survey projects. On a personal level, the actions of the recruited participants could be examples of uncivil behaviors. These behaviors might not have been measured by the questionnaires used, but as they are direct experiences of the researchers/data collectors, they were also important to give attention to and report about. On an academic level, such behaviors could be indicative of the poor research culture in the university finding less or no value in research undertakings, and this is necessary to look at in relation to what will be mentioned about the participants' PA levels later.

One experience by some of those who refused to participate illustrated how they were anxious and afraid about others using the data against them. A few of them expressed that their supervisor might know about what they will indicate in the questionnaire and it might be taken against them or become a source of relationships getting soured. On hindsight, the individual must be experiencing incivility in one's work station, hence the fear about revealing those stories.

Meanwhile, there were participants who willingly completed the survey and even took the initiative to bring the questionnaires back to the researchers/data collectors. There were others who complied with the deadline for submitting the finished questionnaire. Those who were very apologetic for having forgotten about it the first time, made sure they did not miss completing the survey the second time they were reminded. There were those who called on the phone and talked about how they also felt that the research was necessary.

While this entire research project is yet currently being completed while addressing the challenges along the way, an initial presentation

of results is made here on the participants' scores on burnout and incivility.

INITIAL RESULTS

Employee burnout was measured using the Maslach Burnout Inventory-Educators Scale (MBI-ES) for faculty members and Maslach Burnout Inventory-Human Services Scale (MBI-HS) for staff members. Emotional exhaustion (EE), depersonalization (DP) and personal achievement (PA) were dimensions of employee burnout. Emotional exhaustion are feelings of being emotionally overextended and exhausted by one's work, depersonalization is having an unfeeling and impersonal response toward recipients of one's service, care treatment, or instruction, and personal accomplishment is defined as feelings of competence and successful achievement in one's work (Maslach, Jackson, Leiter, Schaufeli & Schwab, 1986). Incivility was measured using the Workplace Incivility Scale (WIS) where participants rated the degree of uncivil behaviors they received from their co-workers, and the Instigated Workplace Incivility (IWI) scale where participants rated the degree to which they behaved uncivil towards their co-workers (Blau & Andersson, 2005).

Burnout

Generally, the participants were low in EE and DP, but also low in PA. Looking at each group of faculty and staff, the same pattern is seen on their EE and DP. However, on PA, the staff sample was moderate to high and the faculty sample was low. There were more participants that were faculty members and so the over-all mean scores were influenced by the number of faculty members who were primarily scoring low on PA. To understand this better at this stage, in all three groups across three periods in a semester, their EE and DP remained low, but PA was moderate except for the staff in the middle of the semester that scored high. Theoretically, given that EE and DP were low, PA should be high. For faculty members, their PA was only moderate and remained the same all throughout the semester regardless of the differences in the tasks to be accomplished and deadlines to meet. One may hypothesize that PA is highest at the end of the semester when grades of students have been submitted and

when watching students graduate in March. Someone engaged in the education profession should feel a huge sense of accomplishment when knowing that one is able to contribute to the success of one's students. This is not true among the faculty participants. This specific finding should be studied some more because it would be undesirable for any academic institution to have faculty members who are non-achievers especially that they are in the teaching profession. It will also be good to take a look at this in relation to the fact that only a handful of faculty members have been and continue to engage in research, a dimension in an academic institution that is not only important but necessary. Research should be an integral part of being able to feel accomplished in the education profession because it is primary to one's promotion.

Interestingly, one may wonder why the staff members were high in PA in the middle of the semester when they are not facing many academic tasks to be done. On second thought, it may be very important to look at the nature of work of the staff because their "midterm" is actually not the same "midterm" of the faculty. The staff works all year round including the summer term. Most faculty members do not have academic tasks in the summer, enjoy more days in the semestral and Christmas breaks, unlike the staff whose work in the office continues regardless of whether classes are held or not.

When the requested employee data from the Human Resource Department comes in, it will be interesting to know how PA is correlated with years of service and salary. Would PA be high with more years in the workplace or are younger employees higher in PA? Would someone receiving higher salaries be seeking lower levels of PA or not?

Incivility

Contrary to what was initially hypothesized, all participants in the three groups scored low in both experienced and instigated incivility. It might not be very attractive to say that this may be due to the fact that the employees could have adapted well to incivility in the workplace they have come to look at it as only a natural occurrence, and so not something that employees saw as largely uncivil. Although the qualitative interviews are not complete yet, looking at the responses of the interviews with regard to their experiences of incivility and bullying, the behaviors they defined as bullying were actually

uncivil behaviors. This showed that the actual uncivil behaviors were unrecognized as inappropriate behaviors. Seemingly, these uncivil behaviors have come to be accepted as normal day-to-day interactions, and not necessarily that incivility in the workplace was really low. In addition, it might be important to explore more on another test to measure incivility in the workplace, or perhaps expound or develop the already WIS and IWI tools that is Silliman University specific. Although the items in the questionnaire were general statements on incivility and may be appropriate for many contexts, there might be more information that can be seen once the tool is designed primarily for Silliman University. It might even be best to create an incivility measuring tool from the qualitative interviews done, knowing, for example, like what has been mentioned, that interviewees misunderstood incivility as bullying.

Correlations

There was seen a high positive correlation between DP and WIS and IWI in group A and between DP and IWI in group C. On first thought, in the case of group A, these confirmed the hypothesis that the more burnt-out the employee is, the more s/he experiences incivility. However, what becomes a big question is why this was the case at the beginning of the semester when stresses at work had not built up yet. Thinking deeper into the nature of work among faculty members, the beginning of the semester might be the most stressful among all the three periods because this is a time that primary preparations for classes are done like making syllabi, getting to know one's students, putting a routine in one's classrooms, and adjusting to one's daily schedules which might even change for sections additionally opened and closed at the last minute. On the part of the staff, this is also the time of finalizing class schedules, classroom assignments, and assisting late enrollees, to name a few of the office work they have to accomplish to set the semester right. It would be understandable then that given this huge workload at the beginning of the semester, faculty and staff tend to become very less personally connected with others along with experiencing a certain degree of incivility.

In the case of group C, it is not surprising to know that when an employee becomes more depersonalized, one may become more prone to instigate incivility to others. Being detached from others does not make anyone sensitive to the feelings and needs of others therefore

it becomes easy to instigate incivility. The end of the semester may also be a very stressful time for employees because examinations for graduating seniors are prepared in advance and checked fast for grades to be submitted in time for graduation requirements. Further, deliberation on graduating students with academic problems and recommendation for honor graduates were almost always stressful. Complaints from graduating students were usually raised at this time too. Meanwhile, as faculty members and staff are swamped with graduation demands, lower-level students also raised their concerns and they were observed to usually get "I can't attend to you right now because we are busy with graduation" responses. As students, they could not respond any other way except to forcibly accept to themselves their situation and left to wait until their teachers and department staff members were available to accommodate them. They did not have the capacities to instigate uncivil behaviors toward their authorities in school.

Although it may be apparent to believe that when the employees are instigating incivility, they should also be experiencing incivility from each other and which should also be associated with their being depersonalized. It can be thought that when one is receiving incivility from one another, the one being instigated might detach oneself from the instigator hence making one more depersonalized. That may be true in other contexts but this period in the semester for the participants seemed to only allow them to focus attention on getting their academic tasks done so much so that any uncivil behavior displayed to them becomes unrecognized. Also, their being required by the situation to focus intently on getting things done because they were urgently needed for graduation, could have been a possible reason why there was a very low response rate at this period.

CONCLUDING STATEMENTS

Having learned from the inadequacies in the methodology that pushed the research to a different direction, and having known the initial results, it becomes necessarily important to re-implement the original research proposal with a more robust procedure for more efficient findings. To be robust would mean to use dependent samples in testing burnout, incivility and work performance across different periods, not in a semester, but in an entire school year. This is so because the academic activities in the first semester are different

from those in the second semester, like Founder's Day Celebration in the first semester, and Intramurals and College Weeks in the second semester. These activities require certain specific kinds of tasks done by faculty and staff.

It is highly hoped for that the university, both at the faculty and staff, and administration levels, continue to support researches such as this to improve its workforce. At the individual level of the employees, it is desired that they continue to believe that enhancing oneself and being aware of their experiences like being burnt-out, both in accomplishing tasks and in relating with others especially in facilitating civility towards one another, contribute to their total wellbeing at the personal and professional levels. At the administration level, it is desired that support is given to faculty and staff so that they will not be afraid to participate in a research project that may seem sensitive to many. This way, strategies at improving the institution can be done with much ease and care, along with an accurate knowledge of human experiences in the workplace. Hence, the contribution of the entire Silliman University community to research undertakings is a salient part in the development of a wholesome academic environment.

ACKNOWLEDGMENT

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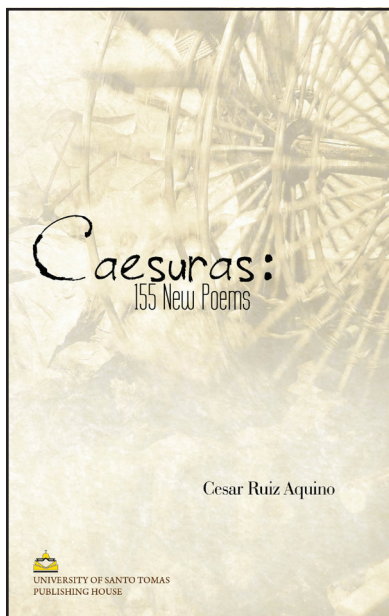
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REVIEW





César Ruíz Aquino

Caesuras: 155 New Poems

Manila: University of Santo Tomas
Press, 2013, 193 pages

Caesuras as Metapoetry

Review by Gio Romero B. Chao

César Ruíz Aquino's *Caesuras: 155 New Poems*—the title is also a pun for the word “thesaurus”—is as effortless as it is inventive. Riddled with muses and haikus, otherwise provisional, Dr. Aquino hits us with the impossibility of word play, showcasing “a quicksilver mind ever in motion,” as poet Marjorie Evasco once put it, which shouldn't come as a surprise for readers of his poetry.

Though this essay limits itself to analyzing five poems from the collection, the reader provides a critique on the nature of the author's poetics through the post-structural lens.

The meta acts as a principle character in *Caesuras*, resulting in a kind of inner-monologue involving the persona and the author re-writing his poem. Because we live in a web of meaning, we debunk texts through our own understanding of this web: our age, our economic background, our intellectual capacity, and so on and so forth are seen as contexts. In one poem titled “Coming to Siquijor,” Dr. Aquino writes: “We were about a mile away from shore/when the engine (a genie there) conked

out.” By injecting the observation of a genie, the poem becomes self-aware. Scratch away the title, suspend any notion of what the text *might* mean, and simply look at these two lines. If we were to omit the phrase “a genie there,” the narrative would still be coherent and intelligible. We proceed to question the device: *was it deliberate on the author’s part?*, and so on. The line urges us to perceive the text in a particular way. Looking into the framework of the poem, the device can be thought of as the speaker’s passing observation. Similar to when a person is telling a story, he gets distracted by the things around him when he’s about to deliver his speech.

From an understanding of post-structuralism, meaning is derivative of itself and other meanings. In this case, Siquijor is the text and itself the context from which the narrative is understood. Without prior knowledge of Siquijor—its political history, locality, and culture—the reader would come across this line and think that it is a “clumsy” line.

In Structuralism, we talk about our dependent use of sign and signifier in the scheme of language. According to Jacques Derrida, “every linguistic unit is bipartite and involves both aspects... both the signans ‘signifier’ (Saussure’s signifiant) and the signatum ‘signified’ (signifie). These two constituents of a linguistic sign (and of sign in general) necessarily suppose and require each other.” To illustrate what Derrida is trying to say, think of an apple. “An apple a day keeps the doctor away,” as the saying goes. In this instance, assuming we have a singular understanding of the quote, we subconsciously attach meaning to the text. Apple *equals* good health. Seeing there is nothing to contradict this statement, meaning has transpired. Supposing there is a hierarchy of language from which meaning is derivative, how then can we explain the existence of other meanings inherent in a text? Going back to the illustration, the apple can mean a number of things, other than being a fruit.

This shows the instability of meaning. Again, it’s all a matter of context. If, say, a child will hear the saying, “Justice prevails.” We have to ask ourselves: what is his idea of justice? If he lives in Mandaluyong City, what are the politics there? Better yet, what is contemporary media showing about politics? The child will simply go to the nearest thing he can associate it with, which is probably cartoons. These representations help us to understand the gaps in language and its meaning.

Dr. Aquino’s *Ceasuras* emphasises on the invention of language, primarily rooted in syntax (the arrangement of words), phonology (the sound of words), and its playful approach on exploiting these nuances. In “Coming to Siquijor,” the speaker introduces us to the

island. As follows, he talks about how Siquijor got its name. "... if you'll pardon:/'kiyod' is the Visayan word for 'pump'/and, unlike its English equivalent,/ has only one meaning...." In this passage, the word pump is an implication of sex. Though the poem doesn't state this, we become aware of what the speaker is trying to say. Naturally, when the word "pump" and "island" appear in the same text, it follows that pump is referring to the device, typically used in fishing. In this poem, pump is an allusion for sex. The speaker elevates this allusion by revealing that Kiyod is, in fact, a person who indulges in sex. "Thus: si Kiyod," he writes.

In "A Lecture in Metaphysics," the speaker demonstrates the reflexive nature of words—how words can be taken out of context, re-patterned, and be understood in a different way. The speaker starts by addressing the class: "Stein means glass/Einstein, one glass." The logic of this poem lies in the etymology of *ein* and *stein*. Unfortunately, there is a slippage in the use of *stein*. (*Stein* is an abbreviation of the German *Steingut* 'stoneware,' the common material for beer mugs before the introduction of glass. The word alone is not used within Germany, rather "Krug" or "Steinkrug" are more often used.)

Let's say the speaker is talking about the beer mug. A narrative surfaces from the Meta; perhaps, the speaker is thinking of his drink, or insinuating that he hasn't had one. Then, with the fourth line in the poem, the speaker contradicts himself by introducing a refining statement of his former "Stein means glass/Einstein one glass" by saying: "There is only one Einstein," thereby, dispelling the image of beer. In the fifth and sixth lines, the speaker directly addresses the class: "And tomorrow no class/See a movie, class." What is he trying to say? X is representational of the former statement, "Einstein one glass"; Y is representational of the latter "There is only one Einstein." To start, the speaker convinces us that X is true, therefore injecting our consciousness into the consciousness of the poem. Then, he corrects X by introducing Y, dismantling our notion of the speaker wanting a drink. By the end, the speaker lets go of the class: "And tomorrow no class/Watch a movie, class." We have to ask ourselves, what is going on here? Is there really no class tomorrow? If so, why does he require them to watch a movie? The two lines can be seen as irrelevant statements, having nothing to do with either X or Y—but if we were to read beyond what is stated, we would notice that the speaker is shifting the focus of the poem, from the class to himself. What are his activities tomorrow, and how will it relate to the statements X and Y? An inevitable conclusion arises from the collective, unsaid: he is having

an Einstein tomorrow.

Another point of focus, when discussing Dr. Aquino's poetics, is the independent use of pastiche and parody. He uses pastiche to illustrate an abstraction (authors as points of reference, poems as templates); and parody to underline the absurd (mimicking, caricaturing). The two other uses of parody, as seen in his works, are to inflate or defuse tension. After Aiken's "Music I Heard with You" is a pastiche poem, reiterating the style of Conrad Aiken, and expounding on his verse, "Music I heard with you was more than music" becoming "Poems I wrote for her/were more than poems."

The "Love Son of Alien Ginsbeer" is a parody that uses the same style. It is less funny when the reader doesn't know who Allen Ginsberg is, or what Ginsberg's "Howl" is all about, not to mention, "The Love Song of J. Alfred Prufrock" by T.S. Eliot. The poem makes fun of "Howl" by revising its first line, "I saw the best minds of my generation..." to "I saw the best men of my general."

"The Love Son of Alien Ginsbeer" reflects on the human condition set in the time of Aguinaldo ("I saw the best minds of my general/ General Emilio Aguinaldo/go under and in short I was afraid."); whereas "Howl" presented a machine for the grand, longish narrative. But unlike "Howl," "The Love Son of Alien Ginsberg" restricts the reader to a small setting, an episode. Humor lies in this shortness, which plays out as a joke. As stated by Gayatri Spivak, "The strategy of deconstruction...often fastens upon such a small but tell-tale moment." By exchanging words, the speaker is able to deliver the line in a different context while staying true to the satire. That aside, the title is its own deconstruction. For instance, Ginsberg was openly gay. So for the man to have a "Love Son" (or love child, rather) is an uncommon occurrence in gay communities. But it's also possible that the term is figurative, meaning the author figuratively adopted Ginsberg's line. We can also see this in the poem "Coming to Siquijor" when where we are introduced to the native, Kiyod; "Coming" becomes a substitute for the sexual sense of the word "climaxing."

Finally, there's "Eyoter," the longest poem in the collection. As such, it also exhibits all of these post-structuralist elements as well as some additional ones: intertextuality, anti-chronology, and a greater emphasis on the deferral of meaning.

The poem starts off by referencing T.S. Eliot's *Old Possum's Book of Practical Cats*: "No need to quote Old/Possum, O that this too, too solid/flesh would melt/wasn't how I felt." The poem creates a distinction. *Cat* is synonymous to a word which pertains to the female genitalia.

Therefore, at the touch of the speaker, the “flesh would melt” or soften. Without knowing this, the verse sadly falls apart.

As for the second stanza, the speaker focuses our attention on the time of day: “When we met/when it hit me,/when it dawned on me/that it was sunset.” *It* here denotes time. Dawn comes before sunrise; and sunset comes before night. It continues in the third stanza where the speaker rhymes *trust* to *thrust*. Aside from assimilating the act of reproduction, what is there to trust? The speaker affirms that he is knowledgeable about these things, due to the fact that he is willing to “put [his] trust in lust.”

It also mirrors modern psychology, if we take into consideration the history of disagreement in the Catholic Church regarding the use of contraceptives. The fourth, fifth, sixth, and seventh stanzas guide us through the process of intercourse. The speaker conducts himself as both host and recipient: “Grunt, grunt harder/because you’re gone/all is not gone, is not done.” When the speaker says, “grunt harder/ because you’re gone,” it is not so much an instruction as it is an explanation of a biological process. The woman was a virgin; what is gone is her virginity. Grunting is the result of her defloration. It is, at the same time, the result of her release. That’s why the speaker confirms that, in the paramount of pleasure, “all is not gone, is not done.” They must not stop. In the sixth stanza, Dr. Aquino writes: “To kingdom come/all ye fretful,” instead of “Thy kingdom come” and “all ye faithful,” which is a perversion of Christianity. When the speaker discusses innocence, he cites David Hume, who argued that reason is, and ought only to be the slave of the passions. In the ninth and tenth stanzas, the speaker reveals that the woman “...slew at least eight [men]/and not even in bed...,” thereby, likening her to a goddess, whose mountainous breasts matched the “chocolate hills” of Bohol.

The poem is a contradiction; at the same time, it is a metaphor. Speaking of which, the fourteenth and fifteenth stanza constitute a metaphor for ejaculation: “The white glare is heaven, believe me/It has unhinged me/that if then I was an idiot/Now I am idioter.” Case and point, the speaker mentions Rain Man, Charly, and Tom O’ Bedlam who were all idiots in love. Throughout the poem, we learn that the Eyoter isn’t the one speaking, despite the “I” referring to himself as Eyoter. Rather, the Eyoter is “every man.”

In the twenty-first and twenty-second stanza, the poem incites sexual hunger. *Eating ham* qualifies as cunnilingus; “to ham” means to have sex. “To ham” also means to lavish. Conversely, when the speaker brings up *suman*, a penis-shaped delicacy, in the poem, it indicates that

the speaker is open to gay sex, which surprises our notion of Eyoter being heterosexual. As it turns out, Eyoter is not man (in a traditional sense); Eyoter is sex. For all we know, his partner could be another man, consigning to the fact that our speaker is male.

Let's examine the distinction. The word "catsup" appears before "donut." Donut can mean one of three things: the vagina, the anus, or the mouth. In any case, due to bleeding, there is a proportionate amount of pain and pleasure in this activity. This goes on until the thirty-fourth stanza when the speaker establishes that a deviation from the three kinds of sex could be deemed "irreverent": "You cannot have/the thing in its chewed/& swallowed/self," the poem goes. "You cannot have your virgin &/ eat her too..." In other words, once innocence is gone, *innocence is gone*. Then, as an answer to Gertrude Stein's "A Rose is a Rose," Dr. Aquino writes: "arroz es arroz es arroz/caldo. I eat pain." Eating is a pleasurable activity as well as a biological need. The Eyoter treats pain as a pleasurable experience.

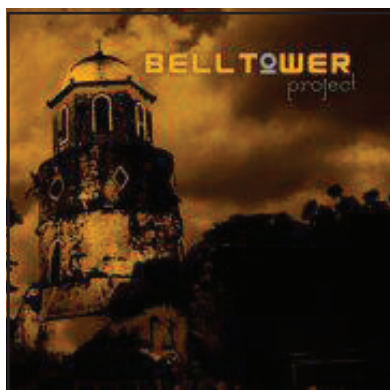
In stanzas forty-nine and fifty, Dr. Aquino retreats to word play and pastiche. There are three lines that appear in another poem entitled "Typewriter Blues": "What's all that we have?/This typewriter. You're my type/& I'm your writer." Working our way to the fifty-fourth stanza, the speaker asks: "[W]ho's Eyoter, what is he?" The speaker objectifies him: "The word is English,/English English in fact." *Eyoter* is both masculine and feminine—cruel and sensitive. In the same way he is "bilingual." Then again, *Eyoter* transcends man.

In a nutshell, the poem takes on a range of topics—from self-identity, to Sigmund Freud, to feminism, to love and all its conceivable meanings. Even after all these, the poem is still quite hard to pin down. Meaning, as always, is never stable.

Caesuras is the universe of language: an experience like no other, which immerses the reader in the world of the metanarrative only to be "lost for the nth time," as if being lost is the reason for it all. We can even say that *Caesuras* has no meaning. Instead, that meaning emerges from us, the readers and critics of our own creations—a dream with no beginning and no end. It just is. *Caesuras*.

ABOUT THE REVIEWER

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Various Artists

Bell Tower Project

Dumaguete City: Bell Tower Project, 2013.

Recording Music and the Enhancement of Sound

Review by Jaizer Jim R. Nadal

In 1935, German literary and cultural critic Walter Benjamin argued for a connection between changes in the technology of culture—such as the development of film and photography—and changes in consciousness. In principle, according to Benjamin, a work of art has always been reproducible. These days, for example, one can experience the Louvre through the comforts of a picture book, or witness a concert via DVD, or watch some theatre through television, and so on and so forth.

These copies or imitations, of course, can never truly capture the authenticity of the original. But then also, these reproductions can be manipulated, enhanced, and reach a wider audience the way the original never can. Through technology, we are subsequently exposed to more art, specifically works that were previously only accessible to the privileged class.

But the question remains: does this mass-media art lack the quality of the original? Or does it, in a way, become an art form in itself? Let us look at this through the panorama of the Dumaguete music scene.

For young bands, recording is the gleaming stepping stone to a good career in music. This sentiment is especially pertinent in Dumaguete where musicians submit demos of their songs to organizations which advertise their music by getting them so-called gigs and appearances.

The Bell Tower Project is one such organization. It is just one of many eclectic collections of musicians in the local music scene. As a group, it has incorporated indie, jazz, reggae, punk, and alternative rock into their sound.

The group's first album release—also titled *The Bell Tower Project*—consists of original compositions by their current roster of bands. As an album, it is a certainly a showcase of a promising group of artists with their own distinctive music. After listening to them both live and on the album, one can only expect more from upcoming outputs.

The album begins with “Fight for the Ruins” by The Spacepets. Equal parts Coldplay and Snow Patrol, it is the most contemporary-sounding of the tracklist. Consisting of delay drenched riffs, searing guitars, and hi-hat heavy drumming, it is clear that disco and early 2000 indie are influences. Ultimately, there is nothing quite distinctive about the song—garden variety pop-fare, really. And the lyrics don't help in our understanding of what it is about. Apart from language mishaps, the song does not make sense. It talks about a butler losing his coffee, then he goes to fight “ruins,” then he comes home to a friend. Still, this is the most commercially viable among the set, which might justify why this song was chosen as the album's opener.

That is not to say, however, that there aren't any curve balls in the set. “Bisayang Pag-ibig” by HOPIA is quite the pleaser, especially for fellow musicians. It starts with a jarringly diminished chord, which gives one the impression that this is going to be a brooding track. But it quickly gives way to a jazzy, Apo Hiking Society-esque groove, and we never hear that chord again. The song, in a word, is breezy. And then there is the bridge, which infuses humor into the song, with some Cebuano spoken swiftly that the singer actually seems to lose wind mid-sentence. The interweaving of dialects throughout the song is more than just a gimmick, as the song talks of a Bisaya guy courting a Tagalog damsel. This track, in turn, makes for a wide demographic.

ENCHI marks their return to the studio with “8:21 sa Buntag.” Given that this is *the* band that has put Dumaguete music on the music map, expectations are indeed high for the BisRock legends. Which is

why this track is such a disappointment. They have stayed true to their reggae roots, but have not incorporated anything new to their sound. The result is something that would have passed as filler in their previous album *Dungagi Ni...* The lyrics, finally, are the saving point of the piece. As with their other songs, it talks about a particular Dumaguete lifestyle.

The upside though is that we are through with the fillers of *The Bell Towerb Project*, and it's all killers from hereon, musically at least.

And the genre marathon kicks off with Finpot's "One for the Road." This is a prime example of what punks can accomplish, if only they will stray from the three-chord stylistics of their Sex Pistols forefathers. Laden with double-pedals and a surprise modulation in the second verse, this track dips its toes in core, which is not necessarily a bad thing. And their live performances are mosh inducing, which is basically the only thing punks look for in a concert.

The band in the next track hails from Silliman University. 5VOLTS's "Panaginip" sounds like a stroll through OPM avenue: everything, from the twinkling guitars and hopscotch bass, is an homage to the pop that has ruled Pinoy FM during the 1990s. These are obviously adept musicians behind this song: the drumming is superb, alternating patterns like it is no one's business. This song has massive appeal, catchy enough for the masses yet instrumentally exciting for the musicians.

Much like 5VOLTS, The Chocodog Invasion consists of Sillimanian musicians as well. Their song, "Then We Bow," is among the breed of alternative metal that has been coming out of the Visayan region of late. It would not feel out of place in an Urbandub or Franco album. The only thing that seems off about the song is the way it has been recorded. The track sounds like a demo, which might have worked for The Black Keys, but does not quite gel with the heavier-than-heaven distorted guitars. Although off-putting, the melody is definitely strong. One surmises that this is better live than listened to on stereo.

Trigger Gypsies emulates the metal of yore with "Bullet Holes." If Greyhoundz did a collaboration with ZZTop and tapped Scott Stapp on vocals, it would sound exactly like this track. Clocking in at 6:16, it is the longest song on the album. But there is not one minute wasted in the song, as every aspect seems vital to its progression. The solos, in particular, are slippery with blues-swagger.

The album ends with the only song sung entirely in Cebuano, HOPIA's "Abby Ko," which is a mosaic of 1970s pop. The melody sounds vintage enough, but it is juxtaposed with a contemporary sounding bass. This is a fitting song to end the set.

Upon listening to the album in its entirety, one thing becomes evident: the way music is recorded not only defines its quality but also reveals the artist's intentions.

This indeed resonates with Walter Benjamin's sentiments in his essay, "The Work of Art in the Age of Mechanical Reproduction." He contends that a reproduction of art can never have the authenticity of the original, but it allows us to experience it in certain conditions that, normally, we would not have access to. Also, he posits that this reproduction can become an art form in itself.

And just as the artist must be creative, this is also to be expected of the producer. It is the producer's job to help the musician hear the sound that exists in his head. But sometimes, the outcome is not as desirable as intended. Trigger Gypsies, for example, sets out to imitate the metallic chug that was popularized by Metallica and Greyhoundz. But in attempting to do so in this album, they instead sound like they came from somewhere between the late 1980s and early 1990s. The mixing sounds so outdated that it is easy to overlook the musicianship, which is otherwise good.

Another concern of the producer is to capture as much as possible the energy of a band's live performance on record. But both Trigger Gypsies and The Chocodog Invasion were not able to achieve this in their recordings for the album. This is unfortunate, because apart from the added aura of the crowd, the instruments sound louder and more distinctive when heard live—and this is missing in the album.

The same can be said with Finpot. Their record, clean as it is, still pales in comparison to their live performances. Perhaps the vibe we are looking for lies in the drunken chants of bar patrons singing along with the band—but whatever seems missing, the album should have captured.

Some in the roster, however, have used studio technology as an enhancer. The song "Fight for the Ruins," for example, sounds so much better on CD than heard live. It is clear that the band makes full use of stereo by assigning different tracks to both speakers: the result is a panorama of sound that is quite immersive when enjoyed in between a pair of earphones.

Benjamin argues that modern art is tailor-made for mass production, and this is especially true for music. The goal, at least for most aspiring artists, is to let as many people hear their music as possible. This requires a hefty amount of advertising, which leads to mass distribution of material. In the end, the issue of authenticity is irrelevant in recordings. Bands such as HOPIA and Finpot have come to

this realization, and both have produced songs that are amalgamations of every aspect of their identity.

The rise of media has divided the culture of music into two separate entities: the *live performance* (which symbolizes pure art in the sense that it is the direct and unprocessed output of the artist) and the *recording* (which is designed, specifically, to cater to the media audience).

There is no longer any need for questions as to which is better. Rather, a different kind of method is required for the two art forms. The current generation of music lovers is undergoing great technological progress, and the result of this is not exactly a decline of artistry, there being more imitation than authenticity.

Instead, what we now have is a wider selection of avenues for expressing art. For anyone who says otherwise, a ticket to a Bell Tower Project live gig might settle the doubt. Then, maybe, one will finally get the album.

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