

## *Message*



***Dr. Zenaida Baoanan***  
***President, PSSN***

First, let me thank all the officers and members of the Society who believed in my capacity to hold over the position as President of the organization until this year. Last year’s conference at Baguio City was a historic one since we celebrated the 10<sup>th</sup> Anniversary of the Society. The commitment of our members was challenged when typhoon Juan struck Northern Philippines including the City of Baguio just two days before the conference. True to its theme on climate change adaptation, the occurrence of typhoon when it is least expected was a clear indication of climate change. Nevertheless, we were able to adapt to the aftermath of typhoon Juan by managing to have 157 participants from secondary and tertiary schools including some representatives from Government sectors.

As we enter the second decade of our existence, we are faced with persisting problems and new challenges. The theme in this 11<sup>th</sup> conference highlights the need for scientific and technological innovations that are necessary for the management of environmental resources and natural disasters that strike anywhere in the globe.

I am forever grateful to the founders, past and immediate officers, members and institutions who had helped the Society survived through the years. The Society is indebted to the faculty and staff of Faculty of Management and Development Studies for assisting the local organizing committee. This conference was made possible by the co-hosting of the University of the Philippines Open University and the Institute of Biological Sciences, UP Los Baños. May we have a fruitful conference, and may God always be with us.

A handwritten signature in black ink, appearing to be 'ZB' or similar initials.

**FIRST DAY (MAY 25, 2011)..**  
**Centennial Center for Digital Learning**  
**University of the Philippines Open University**

## **KEYNOTE SPEECH**

### **RENATO U. SOLIDUM JR. Ph.D.**

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## **BEST PAPER**

### **POLICY ALTERNATIVES ON HOUSEHOLD SOLID WASTE MANAGEMENT IN MANDAUE CITY, PHILIPPINES: BASED ON THE JAPAN EXPERIENCE**

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#### **Abstract**

The study's concept is to develop policy alternatives for the household sector of Mandaue City, Philippines with regards to solid waste management. The household sector was the focus of the study since it is believed that the community is not only one of the major sources of solid wastes but, when properly managed can aid in minimizing the turnover of solid wastes, ultimately reducing pollution. The Japan experience in curbing environmental pollution is taken into consideration. A historical account was done starting from the time of rapid economic growth until the current state of environment. An analysis on the strengths and weaknesses of Japan's efforts is done to serve as point factors in developing an SWM model for Mandaue City.

Data indicated more female than males, most are aged from 30 to 53 years old with some or full tertiary education. Majority of the households has 4-6 members and lived in concrete or concrete and wood houses that were rented and/or constructed on rented lots. Roughly 60 % have low to average income levels ranging from five thousand to eleven thousand pesos. Ninety one percent was aware of ordinances related to solid waste management, however, more than 50% do not practice segregation and more than 3/4 do not compost their kitchen wastes. Around 90% support the construction of an incinerator however; they want its construction away from the community. Household income has a significant effect on the respondent's willingness to pay garbage fees. Furthermore, the level of education did not have a significant effect on waste management practices, specifically composting and segregation. Since

everybody is an active participant in solid waste generation, full enforcement and implementation of SWM projects, therefore must be a collaborative effort of the government, the private sector, the industries, the civil societies and the community.

Keywords: solid waste management, household sector, policy, collaborative effort, urbanization and industrialization

**IDENTIFICATION OF THE ENVIRONMENTAL PERSPECTIVES AND INFLUENCES OF THE 6<sup>TH</sup> GRADE ELEMENTARY SCHOOL STUDENTS OF THE PUBLIC SCHOOLS OF BALANGA CITY, BATAAN**

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**Abstract**

Effective environmental management maximizes the potentials of all stakeholders to aid in the resolution of current environmental issues. In the goal of enjoining and empowering the youth towards environmental responsibility, the author identified the current environmental perspectives and influences of the Section I Grade 6 students of the nineteen public schools of an urbanizing locality, Balanga City, Bataan. Results show a slightly skewed perspective of the environment, with majority of the respondents equating the term with nature and excluding manmade inventions. Prevailing environmental practices also show half-baked attempts to be “environment-friendly”, with their educators pointing towards inconsistencies at home preventing the successful inculcation of taught practices. The children are aware of the importance of the environment and its direct correlation to the condition of their lives, but in order to enhance their active participation in effective environmental management maximization of the home as a source of influence should be achieved.

Keyword: environmental management, elementary students, perspectives

**A CORRELATIONAL STUDY ON THE RELATIONSHIP BETWEEN LEVEL OF AWARENESS AND LEVEL OF WILLINGNESS TO PARTICIPATE ON THE MARINE PROTECTED AREA PROGRAM IN BAUAN, BATANGAS: BASIS FOR ENHANCED MANAGEMENT PROGRAM**

**Divine Joy J. Arguelles**

**Abstract**

This study focused on the relationship between the level of awareness and level of willingness to participate of the local residents of Barangays Locloc and San Pablo, Bauan, Batangas on the San Pablo de Bauan marine protected area (MPA) program (N=332). Specifically, it aimed to determine (a) the respondents' level of awareness on the MPA, (2) their perceived ecological and socio-economic impacts of the MPA, (3) the respondents' level of willingness to participate in the MPA program, (4) if there is a significant relationship between the local residents' level of awareness of MPA and their level of willingness to participate in the program and (5) if there is a significant difference between the two barangays in terms of their level of awareness and level of willingness to participate in the MPA program. The descriptive type of research was used in this study, with questionnaire as the main data gathering instrument with personal interview to complement the questionnaire. Opportunistic sampling was used in choosing the respondents to be included in the sample. Pearson r correlation analysis, T-test, and F-test were used in the analysis and interpretation of the data.

Majority of the respondents were aware of the existing sanctuary, the ordinance and its provisions governing its management. Their level of awareness was verbally interpreted as “considerably aware”. The top three perceived ecological impacts by the respondents were increase in fish size, increase in number of fish and other marine species and increase in population of fish within the sanctuary. On the socio-economic benefits, the top perceived impacts include MPA increases aesthetic value of the environment, serves as a tool for protecting marine species, can decrease the number of users of destructive fishing methods and promotes discipline in using marine resources. In terms of willingness, their mean score was interpreted as “moderately willing”.

Pearson r correlation analysis showed low positive correlation. T-test verified significant relationship between the level of awareness and level of willingness to participate. There was a significant difference both on the level of awareness and level of willingness to participate between the two barangays, respondents from Brgy. San Pablo being more aware and more willing to participate in the program than those from Brgy. Locloc.

Keyword: awareness, willingness, marine protected area, Bauan, Batangas

**WATER QUALITY AND THE DIVERSITY OF MACROINVERTEBRATE SPECIES IN MAJOR RIVERS OF  
CEBU CITY, PHILIPPINES**

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**Abstract**

Rivers serve as a critical element in many urban landscapes across the globe and its physical and biological condition through time could signify the over-all effects of environmental changes. In this study, two major rivers of highly-urbanized Cebu City, Philippines namely; Butuanon and Lusaran, were assessed in terms of diversity of macroinvertebrates species and water quality status. A total of 1442 macroinvertebrate individuals were found in both rivers representing a total of 39 genera belonging to phyla Arthropoda, Mollusca and Annelida. Lusaran River harbors higher diversity of macroinvertebrates than Butuanon River and the species' Index of Similarity is about 38.90%. The dominant species in Lusaran River are the pollution-sensitive caddisflies (*Hydropsyche sp.*) with relative abundance of 40.98% while the non-biting-pollution-tolerant midges (*Chironomus sp.*) dominated Butuanon River with relative abundance of 47.87%. The t-test values showed that 3 physico-chemical parameters: Ammonia, salinity and Dissolved Oxygen, were significantly different between the two rivers that could be considered as possible factors explaining the disparity between the macroinvertebrates composition of the two rivers which was also found to be statistically different. This paper provides an additional listing of the freshwater invertebrate communities in the Philippines and Southeast Asian region, and contributes in the understanding of the relationship of its diversity to water quality that up to present has been given less attention. Given that resources may not be readily available to governmental regulatory agencies, the assessment of macroinvertebrate species could be a feasible and cost-effective approach in complimenting or as an alternative to oftentimes-costly water quality analyses.

Keywords: macroinvertebrates, water quality, Cebu City, kick sampling

## **MATHEMATICAL MODELS OF RUMOR PROPAGATION FOR DISASTER MANAGEMENT**

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### **Abstract**

This paper focuses on the study of rumor propagation for possible application to disaster management. We introduce two conceptual mathematical models that simulate rumor spread. The first model converts a compartment diagram of rumor spread to a system of ordinary differential equations. The second model simulates the mutation of information during the propagation using Monte Carlo method. The two models reinforce some of the existing rumor theories and rumor control strategies.

Keywords: rumor spread, disaster management, mathematical modeling

## **HABITAT DISTURBANCE AND PATTERNS OF OCCURRENCE OF PHILIPPINE SMALL NON-VOLANT MAMMALS AND THEIR ECTOPARASITES**

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### **Abstract**

The Philippines support a great diversity of small non-volant mammals but the threat of habitat degradation as a result of deforestation and agricultural activities may limit us in understanding this partially explored richness. A faunal study conducted across a disturbance gradient in Mt. Sto Tomas (1980-2200 masl), in southern Cordillera Luzon Island, Philippines, recorded nine species of small non-volant mammals and at least 17 species of ectoparasites. Data support the general patterns of occurrence between native and non-natives. Native species are generally restricted and more common to intact forest habitats although some species have varied degrees of tolerance to disturbances. For the ectoparasites, most species are mesostigmatid mites while a lower diversity is observed for lice, fleas and ticks, of which, many are new records. It appears that ectoparasites are common to most hosts with varying degrees of host preference as supported by measures of intensity, mean intensity, density and prevalence. Host specificity and account of diversity is not conclusive because of the movement of hosts between different habitat types, which facilitates the transmission of ectoparasites. Results

have important implications both for conservation of intact habitats and control of diseases. Healthy habitats maintain a good niche for native species while disturbed habitats increase more area for non-native species including the ectoparasite and disease they carry.

Keywords: Small non-volant mammal, ectoparasite, habitat disturbance, agriculture

## **ASSESSMENT OF MANGAL MALACOFUNA (GASTROPODS AND PELECYPODS) IN THE CONSERVATION FOREST AREA OF BRY. PINAGBAYAN, SAN JUAN BATANGAS**

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### **Abstract**

A survey has been conducted during the months of August to October of 2010 to assess the species diversity of molluscan fauna, focusing on gastropods (univalves) and pelecypods (bivalves), in the near pristine mangrove area of Brgy. Pinagbayanan, San Juan Batangas.

In each of the five 10-m<sup>2</sup> plots, a 20-minute catching period was conducted to collect molluscan epifauna. Environmental variables were also recorded in each plot. During the present survey, a total of 13 species of molluscs were recorded. Nine of species of gastropods namely *Bufonaria subgranosa*, *Cassidula nucleus*, *Chicoreus* sp., *Conus figulinus*, *Littoraria scabra*, *Nassarius (Zeuxis) olivaceus*, *Nerita albicilla*, *Telescopium telescopium*, *Terebralia sulcata* and four species of pelecypods - *Isognomon ehippium*, *Katelysia japonica*, *Lanceolaria grayana*, *Polymesoda erosa* were identified. All of these species fall under the category of common species as classified by the National Museum of the Philippines and the Bureau of Fisheries and Aquatic Resources and based on the IUCN Red List and the Molluscs in CITES. Among the identified species, *Chicoreus* sp. and *Nerita albicilla* are the two most dominant while *Bufonaria subgranosa* and *Oliva* sp. are the two least dominant. Species diversity is found to be highest at sampling plot 5.

Keywords: mangal, malacofauna, gastropods, pelecypods,

**A COMPARATIVE STUDY ON THE ANTIFUNGAL EFFECTS OF TAMARIND (*Tamarindus indica*)  
AND GARLIC (*Allium sativum*) EXTRACTS ON BANANA (*Musa spp.*) ANTHRACNOSE**

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**Abstract**

A study was conducted to investigate and compare the antifungal activity of tamarind and garlic extracts against anthracnose in bananas. Using the 100mg:1L ratio, extracts of the plants were prepared as T1 – tamarind and T2 – garlic while T3 – commercial pesticide, and T0-no treatment served as the controls. After inoculation with *Colletotrichum* sp. spores, five (5) banana samples were dipped in all the treatments and were observed for nine (9) days. Statistics revealed that VQR, Firmness, DDI, degree of shriveling, aroma, off-odor, incidence of dis-ease, marketability, color index, off-flavor, sweetness are significantly different. T2 was found to be the best treatment, even better than T3 and much better than T1. For the peel quality and pulp quality ratings, T2 was comparable to T3 in terms of off-odor and color index, while the rest of the parameters showed that T2 was still the best treatment. After the nine days of treatment, the anthracnose which started to de-velop on the third day was least in T2 next in T3 and T1 while T0 showed the highest incidence of the disease. Generally, for all the tests used, the samples treated with T2 were the best, followed by T3 and T1. Likewise, T2 had the best quality banana samples. Based on these results, it can be concluded that the treatment with garlic (T2) is better than the treatment with tamarind (T1) in preventing anthracnose in bananas. Moreover, T2 was found to be comparable or even better than the commercial fungicide (T3). In terms of cost and a negative ef-fect on the environment, these plant extracts may be used by farmers as substitute to commercial fungicides in the natural prevention of the postharvest diseases of bananas. However, it is recommended that a study on the specific concentrations of garlic and tamarind which are best for treating the disease be made as well as considering naturally occurring diseases of bananas.

Keywords: banana, tamarind, garlic, anthracnose

**DEGRADATION OF CRUDE OIL AND UTILIZATION OF HYDROCARBON COMPOUNDS BY BACTERIAL ISOLATES FROM USED ENGINE OIL-CONTAMINATED SOIL AND DETECTION OF THE HYDROCARBON-DEGRADING GENES**

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**Abstract**

Two strains of *Gordonia terrae* were isolated from soil contaminated with engine oil using mineral salt medium (MSM). Initial identification using Biolog Microbial Identification System revealed the isolates as *Rhodococcus coprophilus* and *Gordonia rubropertinctus*. However, nucleotide sequences from amplified 16S ribosomal DNA (rDNA) and phylogenetic analysis showed that the two isolates (designated as G1 and G2) were two different strains of *Gordonia terrae*. The isolates are capable of degrading hydrocarbons specifically *n*-alkanes as demonstrated by HC utilization fingerprints and GC-MS experiments. They cannot, however, utilize polycyclic aromatic hydrocarbons as their sources of carbon and energy. Their capability to grow on a wide range of saturated hydrocarbons is attributed to the presence of the alkane hydroxylase gene (*AlkB*). However, PCR investigation revealed that the naphthalene catabolic gene (*nah*) did not coexist with the *AlkB* gene.

Keywords: *Gordonia terrae*, engine oil contaminated soil, Hydrocarbons, GC-MS, alkane hydroxylase gene, naphthalene catabolic gene

**DIVERSITY OF VINES IN TAMBO MANGROVE FOREST, ISLAND GARDEN CITY OF SAMAL**

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**Abstract**

Barangay Tambo mangrove forest is the first mangrovetum in Mindanao. This study was conducted to identify the species of vines present, to determine its diversity, density, frequency and to quantify the intensity of invasiveness of climbers for invasive classification. Vegetation was sampled in a 300 meter transect of 15 quadrats, 20mx20m each with no interval. A total of nine vine species were identified, namely, *Derris trifoliata*, *Ipomoea pes-caprae*, *Coronilla varia*, *Dioscorea bulbifera*, *Cucumis* sp., *Momordica* sp., *Phaseolus* sp., *Ipomoea* sp. and *Dioscorea alata*. Density of these vine species is very low ranging from 0.0025-0.01 except for *D. trifoliata* and *I. pes-caprae* which showed the highest density of both 0.2. *D. trifoliata* has the highest frequency of 100% followed by *I. pes-caprae* having 87 % frequency rate while *Phaseolus* sp. and *D. alata* got the lowest value of 40% and 47%. In the case of *D. trifoliata* and *I. pes-caprae*, there is a correlation between its girth and host species' girth, girth ratio (GR) value. *D. trifoliata* climbed in a mangrove tree of four plots, two are severely affected ( $GR \geq 0.33$ ) and the other are moderately affected ( $GR \geq 0.18$  but  $< 0.33$ ) while *I. pes-caprae* dominated the fourth quadrat having 0.61 GR value. Thirty three percent (33.34%) of investigated plots were affected by these climbers and found to be highly invasive. Based on Simpson's index value of 0.4, vines are moderately diverse in the area. By understanding the vine characteristics, its biological and ecological processes, conservation of the mangrovetum is possible.

Keywords: Tambo Mangrovetum, mangrove, diversity, vines

**INVASIVE VINES IN BARANGAY MADAUM MANGROVE FOREST, TAGUM CITY**

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**Abstract**

The study was conducted to identify vines which tend to be invasive in the area as well as the assessment of their population density, frequency, severity of damage (species-to-host correlation), diversity and distribution pattern. The area was sampled using a 300 meter transect line laid parallel to the shoreline with 15 quadrats placed all the way to the transect line measuring 20 by 20 with no interval.

Status of each invasive vine was characterized whether a certain species is potentially invasive, moderately invasive and highly invasive, respectively. There were a total of five invasive vines found in the area, namely, *Cuscuta* sp. (Highly invasive), *Ipomea pes-caprae* (Highly invasive), *Derris trifoliata* (Moderately invasive), *Canavalia maritima* (Moderately invasive) and *Vigna* sp. (Potentially invasive). *Cuscuta* sp., *I. pes-caprae* and *D. trifoliata* were found to be the densest species in the area with density values of 0.41, 0.33 and 0.30 followed by *C. maritima* and *Vigna* sp. with values of 0.23 and 0.16. In terms of frequency, *Cuscuta* sp. and *D. trifoliata* were found to be the most frequent species with values of 0.93 and 0.87. The most diverse species in the area was *Cuscuta* sp. (0.09) followed by *I. pes-caprae* (0.097) and *D. trifoliata* (0.098). It was found in this study that the spread of invasive vines (especially *Cuscuta* sp.) positively affect mangrove species, however, the effect is still at a controllable state.

Key words: invasive vines, mangrove, *Cuscuta* sp.

**THE EFFECTS OF FLUCTUATING SALINITIES ON THE LARVAE AND JUVENILES OF *Stichopus horrens* (ECHINODERMATA: HOLOTHUROIDEA)**

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**Abstract**

The curry fish (*Stichopus horrens*) is a commercially important sea cucumber that is currently being studied for its mariculture potential. Being a shallow-water species, the influence of salinity changes on its survival and physiology is an important consideration. In this study, larvae and juveniles of *S. horrens* were subjected to different levels of salinity (35ppt, 29ppt, 25ppt, 20ppt) to determine their effects on larval growth and development, as well as on the crypticity and tolerance of juveniles. Results show that survival decreases with decreasing level of salinity among both larvae and juveniles. At salinities lower than 25ppt, larval development was delayed and survival was low due to cell rupture and disintegration, thus 20ppt was observed to be lethal. Similarly, the juveniles also exhibited the same response to low levels of salinity. Formation of skin lesions, although mild, was observed among juveniles exposed at 25ppt and was more severe among those exposed at 20ppt. The longer the juveniles were exposed to lower salinities, the more they suffered from the adverse effects which include the formation of skin lesions, induction of evisceration and disintegration. Crypticity or hiding behavior of the juveniles was mainly affected by time regardless of salinity and days of exposure. It was observed that the juveniles were exposed at night to actively feed and cling to the walls of the treatment jars and that they remained hidden at daytime. Crypticity was mainly affected by time regardless of salinity and days of exposure. The information obtained from this study will be useful in mariculture for the proper rearing of larvae and juveniles of curry fish so as to maximize survival and yield. Moreover, proper sewage disposal and dumping of freshwater into shallow-water areas should be carefully managed to minimize mortality and decimations in wild populations of this species.

Keywords: salinity, larvae, *Stichopus Horrens*

**THE IMPACT OF PREDICTED OCEAN TEMPERATURE AND pH LEVELS ON THE DEVELOPMENT OF  
SEA URCHIN (*Tripneustes gratilla*) LARVAE**

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**Abstract**

Due to global warming, an increase in ocean temperature by about 4°C, as well as a corresponding decrease in ocean pH by about 0.3-0.5 units, is predicted by the end of the century. As a consequence, various processes governing marine life may be potentially affected including fertilization success, development and calcification. In this study, the effects of elevated temperature and reduced pH on the larval development of the sea urchin (*Tripneustes gratilla*) found in Bolinao, Pangasinan were evaluated. Projected ocean warming was simulated with the use of a temperature-regulated water bath while pH was reduced with the addition of 1% HCl. Two temperature ranges were employed, namely, a control or ambient temperature (26-28°C) treatment and a heated treatment (30-34°C). As for the pH, two controls were used (ambient levels during the 2 experiments equal to 8.2 and 7.7 pH units, respectively) and experimental pH treatments were obtained by reducing ambient pH by 0.3 and 0.5 pH units. Developmental success was determined by periodically counting number of cells in stages of cleavage, blastula, gastrula and prism after fertilization. Results show that temperature considerably influenced the developmental success of the larvae regardless of the pH. Reductions in pH, on the other hand, did not significantly affect the development of the larvae. Thus, it can be inferred that sea urchin development is most likely to become more affected by anticipated rise in sea water temperature than by acidification.

Keywords: temperature, pH, sea urchin, larvae

**SECOND DAY (MAY 26, 2011)..**

**Institute of Biological Sciences  
University of the Philippines Los Baños**

**PLENARY SPEECH**  
**GOVERNING NATURE AND PEOPLE**

**HONORIO M. SORIANO, Ph.D.**

*President*

Pampanga Agricultural College

**PAPERS**

**TAKING REAL ACTION BEYOND THE VIRTUAL CLASSROOM: A RESEARCH PROJECT ON ENVIRONMENTAL PLANNING AND MANAGEMENT OF UP OPEN UNIVERSITY DENRM STUDENTS**

**Anthea V. Mariano<sup>1</sup>, Liberty P. Tanangco<sup>2</sup>, Serafin A. Cuya<sup>3</sup>, Patricia Anne L. Rivera<sup>4</sup>, Maria Teresa Q. Doble<sup>5</sup>, Anna Liza de Jesus<sup>6</sup>, Emerson Y. Sy<sup>7</sup>, and Maria Theresa Espino-Yap<sup>8</sup>**

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**Abstract**

The research project on environmental planning and management is no ordinary feat as it was an effort of students with a unified vision to take what they learned from the virtual classroom into the real world. Challenged by geographical distance and time, the group worked with passion, motivation and professional guidance towards the formulation of an Environmental Management Plan for an LGU.

This paper focuses on how the action planning was done from inception to an output presentation to the target LGU. The planning process was done as a simulation of the actual process. Given the available data, the group conducted eco-profiling, sectoral and inter-sectoral analysis, visioning, identification and prioritization of projects. The planning process

was based on DILG Memorandum Circular 2008-156 Guide to Comprehensive Development Plan Preparation for LGU.

What the group took home was a glimpse of how an action planning can be done and how to facilitate such in a form of a workshop. At the end, the group managed to present the elements of the process and ultimately, a mini-version of an environmental management plan for the chosen LGU.

**Keywords:** DENRM, LGU-based participatory planning, action planning, Environmental Management Plan

### **THE USE OF THE ISA PROTOCOL AS AN INTEGRATIVE AND SIMPLE TOOL TO ASSESS HEALTH RISKS OF TOXIC POLLUTION: THE PHILIPPINE EXPERIENCE**

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#### **Abstract**

Pollution from abandoned dumps, legacy and artisanal mines, industrial activities is a worldwide problem but the impacts are usually most severe in areas within poor and disadvantaged communities and so the scale and extent of the problems have not been recognized. Consequently, the health and pollution issue has not received the attention that it deserves. The impacts of pollution to human health have also been secondary in doing scoping works for these activities. There is also no known comprehensive database that identifies and prioritizes most affected sites by mining and industrial pollution for remediation in developing countries such as the Philippines.

Blacksmith Institute, an international engineering based charity organization, has undertaken a number of projects to remediate toxic sites. In addition, it is currently implementing the Global Inventory Project, which aims to gather data about toxic hotspots in countries like the Philippines that pose significant health risks to human communities. In the Philippines, it has partnered with the University of the Philippines Los Baños to conduct the site assessments.

It uses the Initial Site Assessment Protocol (ISA) developed by John Hopkins School of Medicine in the conduct of rapid site assessments. The ISA Protocol identifies the type of toxic pollutant, possible pathway to human communities and extent of population affected by the pollution –

these serve as the criteria to determine the health risks of the pollution in the area. The paper aims to describe the use, advantages, challenges in using the said protocol for risk assessments in the country.

Keywords: risk assessment, health and pollution, initial site assessment, mining and industrial pollution

### **PROMOTION OF PUBLIC AWARENESS THROUGH THE ASSESSMENT OF AMBIENT AIR QUALITY: THE CASE OF TARLAC CITY, PHILIPPINES**

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#### **Abstract**

This study aimed to monitor the level of air pollutants in the ambient air of Tarlac City. Samples were collected from different parts of the city to evaluate the highest level of pollutants and the effect of seasons. Results were compared and interpreted using the standards specified in Republic Act 8749 otherwise known as the Clean Air Act of 1999. According to the Provincial Development and Physical Framework Plan (PDPFP) of Tarlac, there are no available data on air pollution levels in the different urban areas of the province. The Environmental Management Bureau (EMB), which is responsible for air quality monitoring, has not installed (as of May 2008) any monitoring station in the province to gauge the level of air pollutants in the area. Thus, in order to address this problem, the Tarlac State University Research Office has facilitated in the ambient air monitoring activities of the city. Parameters like sulfur dioxide (SO<sub>2</sub>), nitrogen dioxide (NO<sub>2</sub>), Total Suspended Particulates (TSP), carbon monoxide (CO), and lead (Pb) were analyzed and compared with the allowable limits given by the standards. The findings will be used for policy formulation in the city government of Tarlac.

Keywords: Environment, Ambient Air Pollution, Monitoring, Environmental Management Plan

**MICROBIAL DENSITIES OF *Caulerpa lentillifera* DISTRIBUTED IN THE MARKETS OF CARMEN, DANAOS CITY AND CARBON, CEBU CITY, PHILIPPINES**

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**Abstract**

*Caulerpa lentillifera*, locally known as *lato*, are cultured and distributed in Northern Cebu, Philippines. The ready to eat seaweed distributed in Carbon Market, Cebu City; Carmen, and Danao City Public Markets, were analyzed based on microbial parameters particularly Total Plate Count, total coliform, *Escherichia coli* and *Staphylococcus aureus* in colony forming unit using 3M-Petrifilm and pour plate method. The *Caulerpa lentillifera* taken from Carbon market had highest bacterial total plate count ( $3.6 \times 10^5$  cfu/g) compared to the markets of Carmen ( $2.5 \times 10^5$  cfu/g) and Danao City ( $3.0 \times 10^4$  cfu/g). The total coliform count was  $1.8 \times 10^3$  cfu/g,  $1.0 \times 10^3$  cfu/g, and  $3.0 \times 10^2$  cfu/g) with the detection of *Escherichia coli* more than 100 MPN/g sample for all samples and *Staphylococcus aureus* count of more than 100 cfu/g for Carbon Market, Cebu City samples. The enumeration and evaluation of the water used by the seaweeds vendor should be investigated to determine its safety as a ready to eat seaweed commodity.

Keywords: *Caulerpa lentillifera*, microbial density, ready to eat

**CONSERVATION STATUS OF INDIGENOUS TREES IN ARGAO RIVER WATERSHED RESERVE,  
CEBU PHILIPPINES: A LOCAL INITIATIVE**

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**Abstract**

A preliminary assessment of the local conservation status of indigenous trees in Argao River Watershed Reserve (ARWR) in Argao, Cebu, Philippines was conducted. A total of 18 families, 27 genera and 32 taxa have been encountered and identified. Four taxa were categorized as Endangered (EN) while 28 taxa were categorized as Vulnerable (VU). All of the indigenous tree species encountered during the expedition were classified under threatened categories because the whole watershed especially where the sampling has been done are under an alarming threat of continued forest destruction and degradation and most of the species population are becoming very scarce.

There is a need to conduct further assessment to address the knowledge gap as to the conservation status of the biodiversity resources particularly the indigenous trees species that are present within the watershed area. In that way the information can be provided to the local policy-decision makers so that they can design alternative solutions that are responsive to biodiversity protection and conservation.

Keywords: Indigenous tree species, Argao River Watershed Reserve (ARWR), IUCN Red list, conservation status, threats, local assessment.

**EXPLORING THE RELEVANCE OF AN ONLINE PROGRAM IN ENVIRONMENTAL AND NATURAL  
RESOURCES MANAGEMENT: A GIS-BASED ANALYSIS**

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**Abstract**

With the creation of Web 2.0, the internet has now become a venue for learning interactions. Online tools were utilized in creating virtual classrooms. Courses in environmental and natural resources management (ENRM) programs have been made available via the internet to widen their reach and make them more responsive to current needs, hence making them more relevant.

The study explores the relevance of an online program in ENRM, which is offered in a distance education institution in the Philippines. Relevance is defined in two ways: one is whether or not its students are located in biodiversity hotspot areas (BHA) in the country, and two is whether or not it attracts learners in various generation groups. The profile of ENRM students from 2003-2007 were analyzed, and students were then classified into BHA-located and non-BHA located. Geographic information system (GIS) facilitated this analysis. On the other hand, four generations were identified based on Lacey’s categorization, and these are as follows: veterans (1922-1943), baby boomers (1943-1960), Xers (1961-1980), and Nexters (1980 and beyond). Students were classified by using these categories.

The analysis shows that more students are located in BHA than in non-BHA though there is a decreasing trend of enrollment through time. This highlights the importance of inputs of the program to the learners in BHA vis-à-vis addressing the needs of these areas in terms of management and conservation. Though the program has attracted learners in all four generations, it caters more on the Xers generation, which was accounted for 78% in the 2007 enrollment data. There is also an increasing trend on the number of baby boomers and Xers in the program from 2003-2007.

Keywords: biodiversity hotspot area, online program, generation

## **AVIFAUNA ASSESSMENT IN CAMOTES ISLANDS, CENTRAL CEBU, PHILIPPINES**

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### **Abstract**

Field sampling was conducted on Camotes group of islands specifically in San Francisco and Poro for a total of five days from May 16-20, 2005 in areas with vegetation (natural forest, mixed forest, plantation forest, and agro-ecosystem) at different elevation gradients. Primary data were collected to assess the avifaunal diversity in the selected sites for better understanding and management of the wildlife resources. Because the island of Camotes is small, mist netting was the only method used to capture the birds. A total of 74 birds representing 10 species were recorded of which seven were Philippine endemic.

Most of the endemic birds namely, Philippine night jar (*Caprimulgus manillensis*), white-eared brown dove (*Phapitreron leucotis*), black and white triller (*Lalage melanoleuca*), pygmy swiftlet (*Collocalia troglodytes*), red-keeled flower pecker (*Dicaeum australe*), Philippine coucal (*Centropus viridis*), and Philippine swiftlet (*Collocalia mearnsi*) were captured at forest edges and forest interior. A single species of bird, the pygmy swiftlet was distributed across altitudinal slopes and vegetation types while white-eared brown dove was the most frequently captured among the endemic birds. Both the yellow vented bulbul (*Pycnonotus goiavien*) and Asian glossy starling (*Aplonis panayensis*) were widespread on the area.

Habitat loss due to human intervention and hunting of birds for food were observed to be the biggest threats to the avifauna on Camotes Islands. The conservation efforts of these islands were focused on marine resources with less concentration to terrestrial wildlife.

Key words: Avifauna, Camotes Islands, Central Cebu

**THE FOREGROUNDING OF THE AGRARIAN IN THE LIFE AND WRITINGS OF DR. JOSE P. RIZAL**

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**Abstract**

The province of Laguna was the womb that gave life to the greatest Filipino of all time. Dr. Jose P. Rizal was born in Calamba on June 19, 1861. His parents were engaged in the cultivation and management of land, renting around 390 hectares from the Hacienda owned by the Dominicans, and today most of these properties are in Brgy. Pansol and Brgy. Real. In Rizal’s very own words, he described his family roots as coming from the farming class. His paternal ancestor by the name of Domingo Lamco (later Mercado) was attracted to the verdant plains and fertile soil of Biñan, that by late 17<sup>th</sup> century, he decided to live permanently in a village aptly named Tubigan. The fruits of the land were generous to his descendants. The Mercado bloodline occupied political positions as local officials and notables. Francisco, the son of Domingo, a mestizo was an acknowledged leader of the community. He was Biñan’s gobernadorcillo in 1783. Juan, who was a son of Francisco and by virtue of his birth, was classified as an indio continued the same interest in agriculture. He served as gobernadorcillo for three terms in 1808, 1813, and 1823. A person with keen vision for his township, his administration was marked by honesty and equal treatment for everyone. The father of Rizal, one of the thirteen children of Juan and the namesake of the first Francisco, decided to transfer to the frontier town of Calamba where he met and married Teodora Alonso Realonda whose family was also originally from Biñan. The booming cash crop economy inspired Francisco and Teodora to follow their ties with the soil. Opening fields for planting were invested with blood and tears, reminiscent of the story of Cablesang Tales in El Filibusterismo. A sister of Francisco died during these pioneering years. Even in the Noli Me Tangere, the family of Ibarra, had a founder who mustered enough strength to clear the uninhabited forests for purposes of agriculture. Therefore, there was intimacy with the land in the lineage and experiences of Dr. Jose P. Rizal. The surname which became their badge of honor and emblem of resistance to colonial rule was directly connected with their basic source of livelihood, Rizal (Ricial) means “greenfield” or “land where wheat cut while still green sprouts again”. Rebirth and transformation are the themes in Rizal’s life and works. In 1883, Paciano Rizal wrote his brother who was already in Europe at that time that the Hacienda was collecting fees without issuing official receipts. In the ensuing years, the people were in arrears, with the rental amount even becoming exorbitant and arbitrary. A court case befell the town of Calamba against their landlord. By 1890, the Rizal family was ordered to leave their own abode as punishment for their leadership against the estate. The following year, the fiery El Filibusterismo was published which proudly announced in its cover that it was a “novela filipina”. Rizal by then was no longer

an individual with limited affiliation but the leader of an emerging nation. He chose to be a progressive and made his personal plight as representing the rest of the inhabitants of the archipelago.

Key words: Jose Rizal, agriculture, agrarian history

## **HERPETOFAUNA OF THE NORTHWESTERN SLOPE OF MT. ARAYAT**

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### **Abstract**

A herpetofaunal study was conducted to provide baseline information on the inventory of amphibians and reptiles in the northwestern slope of Mt. Arayat. The Fixed Area Cluster Method was employed to determine the herpetofaunal and community structure which was based on population diversity indices. There were eight (8) reptile species collected, identified and classified under suborder Sauria in four families: Gekkonidae, Scincidae, Agamidae and Varanidae; and five (5) species under suborder Ophidia, in three families: Colubridae, Pythonidae and Viperidae. There were ten (10) amphibian species under Order Anura in five families: Ceratobatrachidae, Dicroglossidae, Microhylidae, Ranidae and Rhacophoridae present in the study area. The most diverse species of all reported reptiles was *Eutropis multifasciata* while *Occidozyga laevis* among the amphibian species. The distribution of herpetofaunal population was greatly affected by humidity, altitude, temperature, soil moisture, and soil pH.

Keywords: Herpetofauna; northwestern slope of Mt. Arayat; species diversity, population diversity indices

**AGRO-MORPHOLOGICAL CHARACTERIZATION OF MILLET (KABOG) GROWN IN NORTHERN CEBU**

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**Abstract**

An agro-morphological study of millet “kabog” locally grown in the Northern part of Cebu was undertaken to characterize, identify and relate to commercially known millets (foxtail, pearl, proso and finger millets). The observations were recorded on the morphological traits (leaf blade and leaf sheath colour, leaf angle pubescence, ligule and auricle colour and structures, node and inter node colour, panicle habit, stamen and stigma colour and amount, shape and colour of grains, lemma and palea pubescence, seed coat colour, type of root system, number) and agronomical traits (number of days of seedling emergence, number of days from emergence to panicle initiation, number of days from first panicle initiation to blooming, number of days from blooming to ripening, number of days from ripening to harvesting, number of leaves produce from planting to panicle initiation, panicle height, plant height, fresh weight above-ground biomass, fresh weight panicle, number of grain per panicle, dry weight of above-ground biomass, dry grain weight per panicle, weight of 1000 dry seeds, fresh root weight, dry root weight, root number per plant and diameter of the biggest root).

“kabog” has more or less similar common morphological and agronomic characteristics with proso millet as based on the morphological and agronomic performance of the 4 common cultivated millet species presented by Plant Resources of South East Asia (PROSEA) 4: Forages 2004 and Plant Resources of South East Asia (PROSEA) 10: Cereals.

Keywords: Agronomic characterization, Morphology characterization, Identification and correlation of traits

**IMPACTS OF SOCIAL SYSTEM DYNAMICS ON AGRICULTURAL ECOSYSTEM OF THE IBALOIS IN  
TUBLAY, BENGUET**

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**Abstract**

This paper analyses the interconnection of social and agricultural ecosystems of Tublay, an indigenous municipality in the rural mountains of Benguet. It investigates the dynamics in the social structures and the impacts it brought to farm ecosystems. It was noticed that socio-cultural assimilation has a divergent influenced on the agro-ecosystem depending on its extent. Areas that experienced significant deviation from the indigenous way of farming have lesser biodiversity and poorer soil quality. In contrast, areas that are more intact tend to have better soil quality and agro-biodiversity.

Extent of sociological changes manifested in the practice of indigenous ideas resulted to remarkable patterns in agro-ecosystem management. More indigenous areas have low intensity and subsistence farms while less indigenous areas have high intensity and commercial farms and areas that are aggressively developing have abandoned or converted their farms into residential and/or business areas.

Education, accessibility and reactivity of the place are the most influential occurrence that accelerates social as well as agro-ecosystem modification. On one hand, financial benefit is the main constraint of the indigenous farming system, which facilitates the shift from traditional to commercial farming. This conversion demands major alterations on the strategies, giving much pressure to the indigenous system. Farmers budged to commercial crops, looking on financial aspect as the sole indicator of benefits, discounting the socio-ecological implications especially farm sustainability.

Key words: Agro-ecosystem, Agro-biodiversity, social system, Indigenous practices,

## **ECOLOGICAL STUDIES AT A MONTANE FOREST IN NORTHERN PHILIPPINES**

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### **Abstract**

The research was conceptualized to conduct an ecological study on the mossy-forest ecosystem of the Mt. Data National Park focusing on the assessment on the soil characteristics and the vegetation, particularly the tree species present in the study area, in the context of a changing and threatened landscape due to encroachments from agricultural activities. Indeed, the Mt. Data National Park is still a diverse forest ecosystem. However, there has been a significant decline through the years as evidenced by the further encroachments into the protected area, by the expansion of farming areas being cultivated. There were still tree species which were identified some decades ago (about 50 years), but some probably have declined in terms of their abundance in that forest. It is imperative to protect this landscape because of its strategic function of performing the role of an important watershed in the Cordilleras, including parts of lowland provinces of Ilocos as well as Cagayan.

Keyword: Mt. Data National Park, montane forests, ecological studies

## **RECENT INITIATIVES TO PROMOTE WASTE SEGREGATION AND RECYCLING THROUGH GOOD GOVERNANCE: EXPERIENCES FROM SELECTED ASIAN DEVELOPING COUNTRIES**

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### **Abstract**

Inefficient waste collection and the lack of disposal facilities are the common problems in many developing countries. Due to the lack of resources to purchase advanced and expensive technologies to support waste management activities, developing countries are more affected than developed countries. Also, “solid waste problems are not the only environmental problems, and environmental problems are certainly not the only issues competing for attention and funds” (UNEP-IETC 1996: 16). In addition, solid waste management is not “an isolated phenomena that can be easily compartmentalized and solved with innovative

technology or engineering” (Srinivas 1998:1). There are also other issues that need to be considered such as the political, economic, technical and social aspects of environmental governance. Considering the characteristics of waste generated and the common condition in most developing countries, this paper presents some of the recent initiatives on how to address various concerns on waste management given limited resources but with relatively high level of efficiency. Using the experiences of some selected case studies from Asian developing countries, it illustrates the potentials and benefits of recycling both in addressing the waste management problems and in alleviating poverty. This paper concludes that the application of good governance through participation of various stakeholders, strong awareness campaigns, and promotion and replication of innovative and appropriate technologies are necessary to achieve sound waste management and sustainable recycling industry.

Keywords: waste segregation, recycling, governance

## **VEHICLE-INDUCED MORTALITIES OF BIRDS AND MAMMALS BETWEEN ABORLAN AND PUERTO PRINCESA CITY PALAWAN**

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### **Abstract**

Building of paved road networks as part of the development in the province causes further habitat fragmentation and the alarming increase in the number of road users intensifies the possibility of vehicle induced wildlife mortalities.

Despite the risks, the wildlife mortalities resulting from vehicle collision in the province are not yet documented. Hence, this study was conducted to provide a baseline information on the species composition of road killed birds and mammals along the highway section connecting the municipality of Aborlan and Puerto Princesa City. Collection of data was conducted four times a month from January to December 2010 by travelling along the road section on board a motorcycle with an average travelling speed of 40km/hr. Carcasses of birds and mammals found along the road were counted and identified.

A total of 47 mammal and 80 bird carcasses were recorded. Seven species of mammals belonging to 6 families and 33 species of birds representing 22 families were identified. Out of the 40 identified species of animals, three species of mammals and 4 species of birds were considered as Palawan endemic species. Among the identified species of road-killed animals, the Common Palm Civet (*Paradoxurus hermaphroditus*) and the Large-Tailed Nightjar

(*Caprimulgus macrurus johnsoni*) are the most frequently recorded mammalian and avian species respectively.

Although most of the identified animal species were classified by the IUCN Red List of Globally Threatened Animals (2010) as “Least Concern”, two mammalian species were classified as “Vulnerable” and one bird species was listed as “Near Threatened”.

Keywords: birds, mammals, road-kill

## **INFLUENCE OF SEASONAL VARIATION ON THE BIO-PHYSICOCHEMICAL PROPERTIES OF LEACHATE AND GROUNDWATER IN CEBU CITY SANITARY LANDFILL, PHILIPPINES**

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### **Abstract**

Characterization of leachate and groundwater composition in Cebu City Sanitary Landfill, Central Philippines has been studied during wet and dry seasons. Selected physicochemical and biological parameters were assessed for temperature, pH, electrical conductivity (EC), total dissolved solids (TDS), total suspended solids (TSS), total solids (TS), dissolved oxygen (DO), biological oxygen demand (BOD<sub>5</sub>), chemical oxygen demand (COD), selected metals (lead (Pb), chromium (Cr), cadmium (Cd), and copper (Cu)), and coliform (total and fecal). Results showed that coliform count were substantially high in both leachate and groundwater exceeding the national standards for drinking water. The determined average metal concentrations were found to be higher in leachate compared to groundwater. The relative order of heavy metal in the leachate regardless of seasonal variation is Cu>Pb>Cr>Cd. For groundwater it is Cu>Pb>Cr>Cd. Distinctively, concentration values for Pb, Cd, and Cr in leachate and Pb in groundwater exceeded the national standards. Likewise, the mean BOD<sub>5</sub> and COD values were relatively higher in leachate compared to groundwater. Comparable results were also obtained for TDS, TS, TSS, temperature, conductivity, and pH. Noticeable parameters for leachate during the wet season indicate high levels of both organic and inorganic pollutants as compared to groundwater brought about by rain dilution. However, quantification of groundwater contamination brought by landfill’s leachate is diverse, originating from anthropogenic and natural ecosystem cycles. Consequently, further monitoring is essential to ensure the environment and public health.

Keywords: leachate, groundwater, physicochemical, characterization, and sanitary landfill

**AN ANALYSIS OF THE FACTORS CONTRIBUTING TO THE ENVIRONMENTAL PUBLIC HEALTH OF  
GAWAD KALINGA IN PUTHO TUNTUNGIN, LOS BANOS, LAGUNA**

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**Abstract**

The Gawad Kalinga is one of the foundations in the Philippines with a mission to end poverty for 5 million families by the year 2024. The socioeconomic, good resources and services, and ecological dimensions are linked to determine the environmental public health of the present and future generations. This paper determined the existing and future environmental population health in Gawad Kalinga Village at Los Baños Laguna using qualitative and quantitative analysis through population forecasting and the effects of chosen factors such as socio-economic and demographic, resources/services, and environmental condition in comparison with the beneficiaries' socio-economic and environmental health condition. Waste management, water consumption, education, household size, and other diseases were the variables that showed 10 percent significance on its effect to the future environmental health of the inhabitants. They were environmentally aware, however, monitoring must be conducted periodically to manage the population growth and waste generation in the area in order to sustain the current condition and avoid future conflicts.

Keywords: public health, Gawad Kalinga, Putho-tuntungin, Los Baños

## **MOVEMENT ANALYSIS OF TINIKLING: Sustenance Of The Cultural Landscape**

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### **Abstract**

*Tinikling* is one of the most popular folk dances not only in the Philippines but to many parts of the world where there are Filipinos. This dance attests the close association of the Filipinos with the biodiversity in the environment. *Tinikling* was once the national dance of the Philippines portraying the attempts of the farmers to catch *tikling*, the worst enemy in the ricefields.

The dance notation of *tinikling* reflecting the movements of both farmers and the *tikling* was described and analyzed. The notated dance figures are compared with the present dance movement used. Leaping, hopping, skipping are prevalent movements in *tinikling*. In other countries, a 4/4 tempo is used but in the Philippines we sustain the use of the ¾ tempo. There is a need to explain fully the variation to avoid confusion.

Keywords: bio-cultural landscape, cultural environment, geographic influences, folkdance, *tikling*

## **INDIVIDUAL ETHNOBOTANICAL KNOWLEDGE ON MEDICINAL PLANTS OF THE MERANAOS IN BRGY. AMBARI, PAGAYAWAN, LANAOS DEL SUR**

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### **Abstract**

Past works on Philippine ethnobotany has centered on gathering information on the plants themselves, in particular, the medicinal plants used by various indigenous groups and how they are used for treating various ailments and for general health care. On the other hand, individual ethnobotanical knowledge focuses on the individual as the unit of analysis. This paper describes the individual ethnobotanical knowledge on medicinal plants of the Meranao residents in Brgy. Ambari, Pagayawan, Lanao del Sur. Thirty informants, representing the total number of households in the barangay/village, irrespective of gender, were interviewed guided by a semi-structured questionnaire. A total of 104 species were used to treat 79 diseases. The

information was quantified by calculating the informant consensus factor (ICF) of the ailment categories and fidelity level (FL) of each medicinal plant. The average ICF value for all disease categories was only 0.3974 indicating a low level of informant agreement whereas the medicinal plants that were used as remedy for a specific disease had higher FL values than those that were used to treat more than one disease. Certain socio-demographic characteristics of the informants were related to their degree of ethnobotanical knowledge as measured by their number of cited medicinal plants. Individual ethnobotanical knowledge on medicinal plants of the Meranaos of Brgy. Ambari, Pagayawan, Lanao del Sur was still extensive and varied in accordance with some socio-demographic factors.

Keywords: individual ethnobotanical knowledge, Meranao, medicinal plants

### ***IN SITU* CHARACTERIZATION OF MILLET CULTIVARS GROWN IN CEBU, PHILIPPINES: CROP IMPROVEMENT PROPOSALS**

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#### **Abstract**

The main purpose of this study was to characterize the three Cebu millets cultivars based on their morphology (qualitative) and agronomic (quantitative) performance under CTU-Barili Campus condition, identify their relationship and the millet genera each cultivar belongs, and formulate proposals on Cebu millets improvement technology.

The results of the Study showed that based on morphology, “Kabog Pakdas” and “Kabog Pilit” had more or less similar performance. They varied only in their culm orientations, panicle and grain size. The two Cebu “Kabog” cultivars belong to millet genus *Panicum* but under different subspecies. “Kabog Pakdas” is under subspecies *Panicum patentissium*; while “Kabog Pilit” is *Panicum compactum*. Morphologically “Dawa” showed different performance, especially on the panicle appearance. “Dawa” produce panicle with a foxtail appearance with bristles, thus, the cultivar belongs to millet genus *Setaria*.

Significant results were obtained on the agronomic performance of the three cultivars. “Kabog Pilit” produced numbers of tillers, high production of above and under-ground biomass, longer and heavier panicle, high harvest index and grain yield. “Kabog Pakdas” had the shorter plant height, shorter life cycle and produced bigger and heavier grains and “Dawa” also provide good agronomic performance specifically the leaf area index (LAI). It produced the greater numbers of grains per panicle and the tallest among the three cultivars.

Based on the significant results, the study came up with a Cebu millet cultivars production technology guide and proposed work plan for Cebu millet improvement program specifically production of improved millet cultivars in the future.

Keywords: cultivars, Cebu, millet,

### **ALLELOPATHIC POTENTIAL OF SELECTED GRASSES (*POACEAE*) ON GERMINATION OF LETTUCE SEEDS (*LACTUCA SATIVA*)**

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#### **Abstract**

Allelopathy is the production of chemicals (allelochemicals) of a plant which can influence the growth and development of another plant that can be either negative by reducing germination or positive by increasing growth. This study was conducted to (1) determine the allelopathic potential of the following grasses (Family *Poaceae*), *Chloris barbata*, *Eleusine indica* and *Saccharum spontaneum* in Tigbauan, Iloilo on the germination of lettuce (*Lactuca sativa*) seeds; (2) determine the grass extracts that can inhibit or induce the germination; and (3) determine if there is a significant difference on the allelopathic potential of the grass extracts on the germination of lettuce seeds in each assay used. Filter paper and soil germination assays were the growth assays used. Results of the study revealed that the grasses used had significantly reduced and differ in their germination rate of lettuce seeds at 0.05 level of significance using One-Way Analysis of Variance and post hoc Tukey analyses. Both germination assays used, showed that *S. spontaneum* has the lowest germination rate. *Eleusine indica* has the highest germination rate in filter paper assay while *Chloris barbata* in soil germination assay. The grass extracts used have an allelopathic potential by decreasing the germination rate of lettuce seeds. This study suggested that allelopathic activity is one feature of attributes that enable invasive species to dominate in habitat space of communities they are present. Identifying these attributes and clarifying the relative importance could enhance our ecological understanding of the problematic species and facilitate the management of plant invasions.

Keywords: Allelopathy, *Poaceae*, *Lactuca sativa*

**CORRELATION BETWEEN ENVIRONMENTAL AWARENESS AND SOLID WASTE MANAGEMENT PRACTICES OF RESIDENTS IN BARANGAY SAN JUAN, SURIGAO CITY**

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**Abstract**

This study explored the correlation between environmental awareness and solid waste management practices of residents of Barangay San Juan, Surigao City. It endeavored to find the extent of solid waste management as to the following practices pertaining to garbage disposal, garbage segregation, garbage recycling, garbage reduction and garbage collection. Kruskal-Wallis Analysis of Variance (ANOVA) was used to determine the significant difference in the perceptions of the respondents when grouped according to their profile variables. In the light of the above findings and conclusions drawn, the following recommendations are offered; there is a need for the local government to assist the unemployed respondents who are residents of Barangay San Juan to find a job in order to alleviate their economic condition and become more responsible. Information drive on environmental concerns and solid waste management practices are inclined to be a need to those who are renting a house; programs on environmental concerns and solid waste management practices should be focused to those residing at Purok 8 and Purok 11; constant monitoring on these Puroks is suggested. Keeping the residents of Barangay San Juan, Surigao City need to sustain their awareness on environmental concerns and keeping the programs working all year round in order to make the place environmentally-friendly.

**Keywords:** Environmental awareness, solid waste management practices, pollution

**IMPACTS OF CROP ROTATION ON SOIL QUALITY AS AFFECTED BY THE PERIOD OF  
CULTIVATION IN TUKUCAN, TINOC, IFUGAO**

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**Abstract**

The study was conducted to assess the impacts of carrot-cabbage rotation scheme to soil quality as affected by the period of cultivation in Tukucan, Tinoc, Ifugao, Philippines. It aimed to compare the change in soil quality of a mossy forest (Site 1) from three crop-rotated agroecosystem (formerly mossy forests) cultivated for two (Site 2), eight (Site 3) and ten (Site 4) years employing carrot-cabbage rotation scheme. Parameters used were pH, organic matter (OM), nitrogen (N), phosphorus (P) and potassium (K) content. It also documented farming operations employed in the three crop-rotated agroecosystem. The study was conducted from February to May 2009.

A general trend was revealed which signifies that period of cultivation affected soil degradation with carrot-cabbage rotation scheme. Soil quality improved in Site 2 in terms of OM, N, and K while slight decrease in pH and P occurred. As the year of cultivation was extended to eight years, values in all the parameters decreased. Nevertheless, as the year of crop rotation was extended to 10 years, all the parameters increased which is attributed to the deep tillage employed in this farm except in the case of OM and moisture content which decreased. Deep tillage improved the farm's soil quality by recovering or mining back the nutrients and minerals that percolated into the deeper portion of the soil. Moreover, documentation on the farming operations employed in the three agricultural sites revealed that the same farming operation is employed except for the deep tillage which is employed only in Site 4.

Keywords: Crop Rotation, Soil Quality, Period of Cultivation, Farming Operations

**AGRICULTURISTS’ ATTITUDES AND OPINIONS TOWARDS ORGANIC FARMING AND LGU  
ORGANIC AGRICULTURE PROGRAMS IN NEGROS ORIENTAL, PHILIPPINES**

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**Abstract**

The Philippine government promulgated Republic Act 10068 or the Organic Agriculture Act of 2010 meant for the development and promotion of organic agriculture in the country. This has reinforced local initiatives to make the two provinces comprising the Negros Island the center for organic agriculture in the region through the establishment of the Negros Island Sustainable Agriculture and Rural Development (NISARD) Foundation in 2005. The agriculturists of the Local Government Units (LGUs) of Negros Oriental have led efforts to promote and encourage adoption of organic farming practices in the province. Hence, this study sought to ascertain the attitudes and opinions of LGU-affiliated agriculturists towards organic farming practices, and organic agriculture programs promoted by the LGUs in the province. The study also sought to investigate factors that trigger or discourage farmers’ conversion from conventional to organic farming.

LGU agriculturists in the province expressed positive attitudes towards organic farming which they regard as environment friendly, produce better quality and highly marketable products, and relatively easier and cheaper to implement. However, they expressed apprehensions on the effect of conversion to organic farming on yield, particularly in the short term. While most (99.1%) of the respondents were inclined to adopt organic farming practices in their own farms, less than half (47.6%) indicated a willingness to adopt a completely organic farming system, with more respondents inclined to follow “partial” adoption. The perceived environmental and health benefits of organic farming practices were cited as the most compelling reasons for farmers’ conversion to organic farming practices. On the other hand, decrease in yield particularly in the short term, lingering doubts in organic farming’s success, and the difficulty of dealing with agricultural pests and diseases using entirely “organic” control measures were identified as obstacles to conversion to organic farming systems. Reportedly, all of the LGUs represented in the study have implemented programs related to organic farming, albeit at varying levels of intensity, with the majority indicating that their LGUs have pursued organic agriculture programs to a “moderate extent.”

Keywords: Organic farming, conventional farming, sustainable agriculture, adoption of innovations

## **THE IFUGAO RICE TERRACES: A CULTURAL HERITAGE IN DANGER**

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### **Abstract**

The Ifugao Rice Terraces (IRT) are the pride of the Filipino people. They were inscribed in the World Heritage List but are in danger of being delisted because of the many problems besetting the terraces. One of these concerns is who is going to continue to till the terraces given that the present generation of farmers are quite old already? With this question in mind, the authors conducted a study among 100 Ifugao students in the four municipalities of Ifugao where the most beautiful rice terraces declared as World heritage sites are located. The study aimed to determine whether the youth of today intend to continue farming on the terraces and what factors would influence their decision to farm or not farm on the terraces or be involved in agriculture after finishing their studies. The study also aimed to determine the students' attitude and perception of the IRT. To generate the data needed to achieve the objectives of the study, a survey research was conducted using a structured questionnaire and a correlation analysis was done to analyze the data. Based on the results, only about 20% of the respondents indicated agriculture as a future profession and majority intended to be in the medical profession as nurses or in information technology. It is implied therefore that in the future we will not have enough farmers to till the terraces and the fear of them being continuously degraded and lost is a looming reality. The paper therefore provides some recommendations to address this very important concern.

Keywords: Ifugao Rice Terraces, cultural heritage, students' attitude and perception of Ifugao Rice Terraces

**A STUDY ON THE PHYTOCHEMICAL SCREENING AND ANTIBACTERIAL ACTIVITY OF THE LEAF EXTRACTS OF *Tinospora crispa* FROM FIVE DIFFERENT SAMPLING SITES**

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**Abstract**

This study aimed to identify the secondary plant metabolites, and the selected microbiological tests of *Tinospora crispa* taken from five sampling sites. Two different leaf extracts were analyzed in the study, the crude aqueous extract and the ethanolic extract.

A rotary evaporator was used to efficiently remove the solvents to obtain a concentrated extracts. The phytochemical screening, results showed that there are two secondary metabolites, namely, tannins and alkaloids, present in both decoction and ethanolic extracts, while saponins, steroids, terpenoids, and flavonoids are absent. The antibacterial assay revealed that decoction extract from five sampling sites show a higher mean inhibitory zone against *E. coli* (11.5-12.0mm) and *S. aureus* (13.0-14.75mm), compared with ethanolic extract, *E. coli* (9.75-10.75mm) and *S. aureus* (10.5-12.25mm).

Statistical analysis of the zone inhibition at 95% confidence level for aqueous and ethanolic extracts between the two test organisms-sampling sites interaction is 0.000. Thus, it indicates that there is significant difference between the test organisms and between sampling sites.

The aqueous extracts from five sampling sites showing the highest antibacterial activity was obtained from Tagoloan, Misamis Oriental with a highest mean zone of inhibition of 14.75 mm using *S. aureus* and 12.50 using *E. Coli*. This extract was further tested for MIC following serial dilution method. *S. aureus* showed a 9.0 mm mean zone of inhibition at 1.56 mg/mL and none was observed at lower dilutions while *E. Coli* showed an 8.0 mm mean zone of inhibition at 6.25 mg/mL and none was observed starting at 3.125 mg/mL and below.

Keywords: phytochemical, leaf extracts, *Tinospora crispa*

## **EURYCUMA LONGIFOLIA (TONGKAT ALI) POPULATION IN SOUTHERN PALAWAN, PHILIPPINES**

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### **Abstract**

A survey of *Eurycuma longifolia* (Tongkat Ali) in Palawan was conducted to determine the population of this economically important species of plant which are sought by older men with diabetic problems and sexual dysfunction among others. This plant is popularly known as a component of dietary supplement with brand name Endurance and a component of the Tongkat Ali coffee.

A survey was conducted at Rio Tuba Nickel Mining in Bataraza, Palawan; Berong Nickel Mining in Quezon, Palawan both mining sites and in Rizal, Palawan a forested area but heavily disturbed through kaingin activities and ‘carabao logging’. All these sites were found to have population of this plant.

Conservation efforts and rescuing activities in mining sites of this plant is recommended and other plants present in these areas with economic potential. Plantation of this species is important to provide supply of raw materials for the product made out of this plant.

Keywords: *Eurycuma longifolia*, Palawan, tongkat ali

## **LIVELIHOOD AND SETTLEMENT OPPORTUNITIES FOR MINING-AFFECTED COMMUNITIES IN SOUTHERN PALAWAN**

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3Palawan State University, Palawan

### **Abstract**

This paper presents opportunities of the mining affected communities in Southern Palawan particularly in Berong, Quezon and San Isidro, Narra. This study was conducted from April 2010 to April 2011. The existing livelihood and settlement status and the possible opportunities were identified using the descriptive survey method where the researches had personally conducted the interview.

This study had found out that the 90% SDMP of the mining companies will be a great help for the improvement of the livelihood projects in the mining affected communities and the development of the settlement area as a whole.

Keywords: mining, settlement and livelihood opportunities

### **ASSESSMENT OF PLANT SPECIES AND ITS CONSERVATION STATUS IN MOUNT LANTOY, ARGAO, CEBU, PHILIPPINES**

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#### **Abstract**

The study aimed to determine the plant species composition and its conservation status. Nine plots were laid out at 20 x 20meters in different elevation [lower slope (100 – 250m), middle slope (251 – 350) and upper slope (351- above). Vegetation in each plot was studied, classified and identified. Plant species was collected from each plot for taxonomic identification and classification.

Result showed that Mount Lantoy has a total of 120 plant species which included 68 families, and 81 genera. Out of the total species, 88 of them were dicots, 9 were monocots and 23 were ferns and allies. Lower elevation has higher number of species both for dicot, monocot, and fern and allies as compared to middle and upper elevation as well as in the number of Genera and families. There are also fifteen species classified as critically endangered (4), endangered (6), vulnerable (2) and threatened (3) species based on DENR (2007) national list were documented in the area. More species are found common in lower and middle elevation compared to lower and upper elevation which implies that mother trees or source of seeds for species growing particularly in the lower elevation are found in the middle slope. We Filipino people should value, protect, manage and cultivate this resources, being a source and foundation of our country's and our people's security.

Keywords: Mt. Lantoy, Plant species, Cebu

## **THE THREATS OF PLANT GENETIC RESOURCES AND THE STRATEGIES OF MITIGATING MEASURES IN PALAWAN, PHILIPPINES**

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### **Abstract**

The Global Plan of Action (GPA) for the conservation and sustainable utilization of plant genetic resources for food and agriculture (PGRFA) recognizes the critical importance of plant genetic resources for ensuring food security. On the other hand, the devastation expected from climate change within this century is on top of every country's agenda while Palawan suffered from recent typhoons this year and the province is included on the map of areas hit by natural calamities due to climate change. Palawan being the country's rich in biodiversity is not exempted from these natural phenomenon.

This study on the threats of plant genetic resources in Palawan and the strategies of mitigating measures was conducted to determine the threats of Palawan plant genetic resources and document strategies of mitigating measures to these threats. The following are the identified threats to plant genetic resources in Palawan: 1. Natural causes (a) flooding (b) forest fire (c) landslides 2. Anthropogenic causes (a) conversion of forest lands to agricultural production like Kaingin or slash and burn farming, plantation crops i.e. oil palm, rubber, *Jatropha*, abaca and other crops. (b) mining activities (c) conversion to residential areas and; (d) carabao logging.

There are two strategies of mitigating measures being undertaken by Western Philippines University 1. *In-situ* and on farm conservation strategy 2. *ex-situ* conservation strategy (a) field gene banks, (b) seed genebank (c) botanical garden establishment (d) landscaping materials and (e) *in-vitro* conservation.

The government should provide support to these mitigating activities and regulate mining if not stop these activities. Educate more people especially those who are involved in the various threats of plant genetic resources in Palawan.

Keywords: plant genetic, Palawan, threats

## **BIRDS IN THE PROTECTED AREAS OF NORTH COTABATO**

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### **Abstract**

The study was conducted to present data on the avifaunal species from protected areas in North Cotabato namely Balabag conservation area, Balabag, Kidapawan city and Amas reforestation area, Amas, Kidapawan. A total of 200 mist net days were employed wherein a total of 43 species representing 27 families were recorded in the two sites. Of these 13 (30.23%) are endemic to the Philippines: namely *Alcedo argentata*, *Batrachostomus septimus*, *Dicaeum australe*, *Dicaeum hypoleucum*, *Ficedula crypta*, *Harpactes ardens*, *Ixos philippinus*, *Loriculus philippensis*, *Macronous striaticeps*, *Otus megalotis*, *Pachycephala philippinensis*, *Phapitreron leucotis*, *Phapitreron amythystina* and *Prioniturus discurus*. One threatened species was recorded, *Alcedo argentata*, and identified as vulnerable by the IUCN redlist. The high species richness and the presence of endemic species in both areas indicates that conservation through reforestation and protecting the area is a good way in preserving species of avifauna but existing fragmentation of habitats, logging, conversion to agricultural lands and poaching can be a threat to the fauna present, thus urgency of more extensive conservation programs is needed.

Keywords: Birds, Protected Area, *Alcedo argentata*, Mt. Apo, North Cotabato

## **iMMSU Hydrous Bioethanol for a Greener Philippines**

**S.C. Agrupis, R. A. Ulep, M. B. Birginias, M. A. Valencia, and F. B. Abenes**

### **Abstract**

Novel technologies were developed by adapting fermentation and distillation techniques to produce the *MMSU 95 hBE* bioethanol and the *MMSU hBE-20* gasohol fuel blend.

The 95% fuel-grade hydrous ethanol, *MMSU 95 hBE*, was produced from sweet sorghum and sugarcane and was subsequently used to formulate a unique hydrous gasohol blend: the *MMSU hBE-20*. The blend consists of 20% *MMSU 95 hBE*, 79.41% anhydrous E-10 gasoline and 0.59%

water. Unlike other hydrous ethanol fuel blends formulated in other countries, our formulation does not need a dispersant, nor a co-solvent and uses the commercially available anhydrous E-10 gasohol blend. The *MMSU hBE 20* was stable at ambient temperature and did not show phase separation even at refrigerated conditions. Preliminary tests of the gasohol, when used in stationary 4-stroke engines, motorcycles and motor vehicles, revealed no discernible problems. Further tests indicate the *MMSU 95 hBE* can also be used up to E-85, indicating the possibility that it can be suitable for use in modern Flex Fuel Vehicles (FFV) when they become available in the Philippines.

The *MMSU hBE 20* is a promising fuel for gas powered engines and vehicles that is more economical and environmentally sustainable than blends using anhydrous ethanol. More important, these technologies are scale-adaptable and easily adoptable at the village level to create an enterprise that is economically viable. Current forecast indicate an average production cost of PHP 30 using feedstocks from sugarcane and sweet sorghum which, when compared to the prevailing cost of gasoline, can result in a profit margin of about 67%.

Commercialization of these technologies will open opportunities for village level ethanol production and would be a significant contribution towards the implementation of several Republic Acts: the RA 9637- the Philippine Biofuels Act, RA 9003- Philippines’ Ecological Solid Waste Management Act, RA 9513- The Philippines Renewable Energy Act, and the RA 8749- The Philippine Air Act, all towards a greener Philippines.

Keywords: village-scale ethanol production, MMSU 95 hBE, MMSU hBE-20, hydrous ethanol, reflux distillation, biofuel

## **INTEGRATING CULTURE AND ENVIRONMENT: THE CASE OF PAHIYAS FESTIVAL IN LUCBAN, QUEZON**

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### **Abstract**

Pahiyas is a tagalog verb meaning “to adorn”, derived from the noun “hiyas” which means ornament or to the materials used in adorning the houses during the festival. It is also popularly refer to the May 15 festival of Lucban and other towns of Quezon province. The results of the survey shows that some of the materials used to adorn the houses are from the

agricultural farms. Examples of these materials are corn, beans, bamboo, buri and coconut among others.

The pahiyas festival of Lucban, Quezon is not motivated by religious activities alone, but also by its cultural value as recognized by various institutions in the province. It also inculcates the importance of resource conservation among the Lucbanin, and the re-use and recycling of materials for decorations.

Keywords: Pahiyas, Quezon, culture, environment

**MICROBIOLOGICAL ENUMERATION AND DETECTION OF *Staphylococcus aureus* FROM THE SELECTED DRIED FISH AND SQUID DISTRIBUTED IN THE TABOAN MARKET, CEBU CITY, PHILIPPINES**

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**Abstract**

Taboan Market in Cebu City, Philippines is the most famous source of dried *danggit*, *pusit* and *mangsi* which served as *pasalubong* for local and foreign tourists in Cebu City. The Cebu Technological University researchers visited the dried processing firms located near the coastal areas of Cebu City and Talisay City, Cebu. The study revealed that the processors were not aware of good manufacturing practices for fish drying. Samples of the top three best seller dried products at Taboan Market were analyzed as to bacterial and fungal total plate count with the detection of *Staphylococcus aureus*, in colony forming unit, using 3M-Petrifilm and pour plate method. The pH and water activity levels of the products were determined. The dried *danggit*, *pusit* and *mangsi* had bacterial total plate count of  $1.0 \times 10^4$  cfu/g,  $2.5 \times 10^4$  cfu/g and  $5.0 \times 10^4$  cfu/g, respectively; mold count of  $2.3 \times 10^1$  cfu/g,  $2.0 \times 10^1$  cfu/g and  $1.5 \times 10^1$  cfu/g. The *Staphylococcus aureus* count of 30, 50 and 100 cfu/g sample for dried *danggit*, *pusit* and *mangsi*, were within the acceptable standards of Bureau of Food and Drug Administration. The pH level of dried fish samples was within 6.1 to 6.5, while the water activity of the dried products is 0.98 based on Lupin's water activity mathematical calculation. Continuing studies on packaging and good manufacturing practices of dried fish products will be conducted to ensure microbial reduction.

Keywords: dried products, microbial enumeration, *Staph aureus* detection

**ETHNOBOTANICAL PRACTICES AMONG RESIDENTS IN BARANGAY MAGTANGALE, SAN FRANCISCO, SURIGAO DEL NORTE**

**Prof. Carlos H. Donoso<sup>1</sup>, Venchita B. Gomez<sup>2</sup>, and Ruel T. Buba<sup>2</sup>**

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**Abstract**

This study aimed to find out the ethnobotanical practices of the residents in Barangay Magtangale, Anao-aon, Surigao del Norte and its implication to the promotion of the community health care. Data were analyzed and interpreted using appropriate statistical tools like frequency count and percentage, mean and ordinal rank, Pearson Product-Moment Correlation Coefficient or  $r$ , Point-Biserial Correlation, Spearman  $R$ ,  $\eta^2$ , t-test and One-Way Analysis of Variance were used. There is a significant relationship between the perceived extent of effectiveness of the herbal medicines to various ailments and the perceived contribution of the herbal medicines to the well-being of the respondents. The higher the income of the resident the less he believes that herbal medicines are effective in medicating various ailments. Also, the more that the resident practice ethnobotanical medications, the more he believes that these are effective. The more that the respondents believe that the herbal medicines are effective, the more he believes that they have very high contribution to their well-being.

Keywords: Ethnobotanical practices, herbal medicines, medications, community health care

**SCHOOL-BASED VECTOR SURVEILLANCE AGAINST DENGUE INFESTATION**

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**Abstract**

This research was achieved through the conduct of vector (entomological) surveillance to consequently trace the geographical distribution of dengue mosquito vector – *Aedes* species within University of Mindanao, Matina Campus, Davao City. Since the study was campus-based, the collaborative efforts among BSN students, Faculty, and volunteering employees were necessary, and in the end traced the geographical distribution and breeding grounds of *Aedes* species, which are found concentrated in areas of: Munting Paaralan, elementary and high

school grounds, golf courses, comfort rooms, second floor of GET and DPT buildings, mini-garden of DPT, parking lots fronting DPT and GET buildings. These species were found inhabiting coconut husks, plants, flower pots, flower vases, stock rooms, plastic cups and containers, used tires and bird cages. Majority of the vectors noted were *Aedes aegypti*, *Aedes albopictus*, and *Culex species*.

Although UM Matina campus is uncluttered and well-maintained, relevant recommendations were given, and include the following: modification of the physical set-up of the campus environment such as improvement of water supply and storage, elimination of potential *Aedes* breeding sites, expansion of collaboration among other stakeholders, and proper solid waste management and intensive health teachings for UM Matina community.

Keywords: vector surveillance, dengue, dengue infestation, *Aedes aegypti*

#### **DEVELOPMENT OF SEaweEDS PRODUCTS IN SALCEDO, EASTERN SAMAR**

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#### **Abstract**

The paper will present practical lessons derived from the development of seaweeds products with emphasis on the processes and results. The information was gathered through recollection of experiences during the development of cottage level seaweeds delicacies. Financial assistance from NEDA KR2 project & DTI facilitated the acquisition of technical support in the production, processing and marketing of seaweeds.

The technology developed includes seaweeds pickles, candies and noodles. The technology has been shared to various stakeholders through trainings and product exhibits within in the provinces of Samar including national technology expo organized by NEDA. The process of technology development has employed action research process, until the product has been brought to the market.

Keywords: Seaweeds candies, seaweeds pickles, homemade product

## **BIODIVERSITY OF CHIROPTERA (BATS) IN SELECTED CEBU CAVES**

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### **Abstract**

Karst limestone habitats particularly caves are ecologically important ecosystems which serve as habitats for unique species. Chiroptera (bats) is one of the generally unseen faunal wealth in caves. An ongoing study investigating bat biodiversity in limestone caves on the island of Cebu was conducted and presents its partial results. Balay sa Agta Cave in Conalum, Argao was assessed from July 22-25, 2011 while Tangub and Timobo caves in Poro and San Francisco Camotes Islands respectively were simultaneously assessed from September 16-19, 2011. The biodiversity of these cave study sites are presented as part of a cave database development initiative of the Commission on Higher Education (CHED). Initial and preliminary results documented a total of 10 species, mostly insect bats across study sites, namely: *Chaerephon plicatus*, *Eonycteris spelaea*, *Hipposideros diadema*, *Megaderma spasma*, *Miniopterus australis*, *Miniopterus schreibersii*, *Rhinolophus inops*, *Rhinolophus philippinensis*, *Rhinolophus virgo*, and *Rousettus amplexicaudatus*. Likewise, *M. australis* would possibly be added as a new record on Cebu Island. This species was recorded in Balay sa Agta and Tangub caves. The Balay sa Agta Cave had the most number of species (7 sp.). Both Balay sa Agta and Timobo Caves were predominantly inhabited by the insect bat *H. diadema* while Tangub cave is dominated by the fruit bat *R. amplexicaudatus*. One threatened species, *C. plicatus* (IUCN status) was also found in Balay sa Agta cave. Further results of the study are expected to generate information which will be developed into a database.

Keywords: Chiroptera (Bats), karst limestone, Cebu caves

**GERMINATIVE CAPACITY OF CRITICALLY ENDANGERED CEBU CINNAMON TREE  
(*CINNAMOMON CEBUENSE*)**

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**Abstract**

The study aimed to determine the germinative capacity viability of the critically endangered Cebu Cinnamon species. The collected seeds were air dried and stored in a closed container. The stored seeds were sowed in the seed box at an interval of one week. This study consists of 9 treatments and 3 replications and analyzed under complete Randomized design (CRD).

Results show that there is a highly significant difference among the treatment. Treatment control (To) be the seeds sowed directly after collecting was considered more viable compared to other treatment. This result emphasized that Cebu Cinnamon seeds should be sowed directly to the soil medium right after drying to have a higher percentage of germination and seed viability rather than storing it in a container for a longer period of time. Cebu cinnamon was very sensitive to temperature changes.

The seeds of Cebu Cinnamon species should be collected once it becomes matured to have a higher possibility of germination and viability. Conservation and protection of the Cebu Cinnamon must be prioritized by the government.

Keywords: Cebu cinnamon, germinative capacity, critically endangered

**VISIBILITY OF ENVIRONMENTAL FEATURES IN METRO MANILA MUSEUMS: A STUDY ON THE INTERPLAY BETWEEN HISTORY AND THE PHYSICAL SETTING**

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**Abstract**

Museum visits have become integrated to the curriculum as valid activities meant to enhance classroom instruction in the field of history. Recently published textbooks on Philippine History have incorporated in their framework the importance of geography, geology, and the environment in the understanding of the historical process. The environmental shift in historical studies is gaining ground. This paper will highlight facets of the history-environment interplay as perceived by History 1 students of UP Los Baños in fieldtrips held during the first semester, 2009-2010. The research problem is focused on the visibility of selected features of the environment, namely: lake, mountain, river, sea, forests and plains. The museums involved in the study were the Veterans Federation of the Philippines' Museum, Library, Archives and Theatre (VFPMLAT), the Ayala Museum (AM), the Museo ng Katipunan (MK), the Manuel Quezon Memorial Shrine (MQMS), and the Bantayog ng mga Bayani/Heroes Monument (BNMB).

Majority of the participants acknowledged the efforts of the museums in providing links between history and the physical environment. Of the 265 students, 131 or 49.4% of the participants found the museums successful in showing the connection between history and the environment; 103 (38.9%) very successful; 27 (10.2%) moderately successful; and 1 (0.4%) slightly and not successful. They also evaluated the importance of the environment in shaping historical events as highly important in both Ayala Museum and Veterans Museum; important for Katipunan Museum; slightly important for Quezon Memorial Museum; and not important for the Bantayog Museum. Furthermore, the students made an assessment that the off-campus undertaking was a successful pedagogical strategy.

Keywords: museum, fieldtrip, environment, history

**ESTIMATION AND ECONOMIC VALUATION OF CARBON DIOXIDE STORAGE OF MAHOGANY TREES IN GREGORIO DEL PILAR, ILOCOS SUR**

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**Abstract**

This study was conducted to determine the above-ground and below-ground biomass properties, biomass proportion of trunk and foliage, total carbon dioxide stored per tree and the economic value of the functional benefit of carbon dioxide storage offered by this tree species. The study was conducted from December 2010 – February 2011 at Gregorio Del Pilar, Ilocos Sur.

The findings showed that about 83.77% - 86% of the dry matter is organic matter with a mean value of 85%. From the fresh weight, dry matter is likely to comprise 60.02% - 63% (mean of 61.77%) and moisture content ranging 36.82%-40% (mean of 40.28%). Having an above-ground biomass of 0.021Mg, its estimated value for below-ground biomass is 0.004Mg.

The number of leaves per tree on the average was derived from linear regression model with  $R^2$  value of 0.963 ( $R = 0.981$  or very high correlation) with the equation: leaf number =  $305.6 (DBH) - 1839$ . Biomass proportion between the trunk and foliage was calculated to be **11.34** (trunk): **1** (foliage) or about 91.8% : 8.2%.

The approximate amount of carbon dioxide stored by the tree species for five (5) hectares has a total of 1,049.26 Mg or approximately 209.85 Mg/ha. The quantity of carbon dioxide with 152 trees is 10,492,624g ( $\approx 10.49$ Mg). with the latter amount of carbon dioxide, it would be \$32.79 = (Php. 1,682.57 at 2006 exchange rate) and €188.87 = (Php. 11,042.03 at 2010 levels).

Keywords: economic valuation, carbon dioxide storage, mahogany trees, Ilocos Sur

## **INFLUENCE OF ENZYME TREATMENT ON THE QUALITY OF CEBU TECHNOLOGICAL UNIVERSITY DEEPWELL WATER**

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### **Abstract**

This is an experimental study using the randomized complete block design using four variables, which are **0% Organic Enzymes Treatment (Control); 0.1% Organic Enzymes Treatment; 0.2% Organic Enzymes Treatment and 0.3 % Organic Enzymes Treatment**, to determine its influence on water quality based on physico-chemical and microbiological parameters. Out of the four (4) treatments of CTU deep-well water, treatment 2, **0.2% Organic Enzymes Treatment** obtained the results near acceptable level of potable water, based on its physical parameters, particularly **7.25 pH, 30.45 degrees Celcius** temperature, **less than 0.1 mg/li** total suspended solid, **4.2 parts per thousand (ppt)** salinity and microbiological parameters like  **$1.95 \times 10^2$  cfu/g** for total plate count in colony forming unit per gram (cfu/g) and **1.1 Most Probable Number (MPN)** per 100 ml for *Escherichia coli*. After a series of analyses on the influence of organic enzymes on the quality of CTU deep-well water as revealed from the data gathered from the laboratory analyses, only **“0.2% Organic Enzymes”** concentration are appropriate to be added to CTU deep-well water.

Keywords: deepwell water, organic enzymes

## **WILDLIFE CROP DAMAGE IN A SELECTED BARANGAY IN VILLASIS, PANGASINAN**

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### **Abstract**

This study aimed to study wildlife crop damage in selected farmlands in Barangay Tombod, Villasis, Pangasinan. Specifically the study investigated on the crops commonly planted in the area; wildlife commonly causing damage to crops; amount and timing of damage; impacts of damage on yield; farmer practices particularly on the methods they use in controlling pest. It was revealed that the most commonly planted crop is rice and corn. In terms of pests or

wildlife causing damage to plants, rice plants seem to be damaged commonly by rodents and snails. Insects and worms were the more common pests infesting corn plants, eggplant, and tomatoes. Pest seems to attack crops before and during the crops' fruiting season, and just after watering the crops or just after raining. Water seems to promote growth and proliferation of some pests like insects, worms, and snails. Pests usually destroy less than 25% of farmers' farmland area, amounting to less than five thousand (P5,000.00) pesos worth of damage. In terms of pest control, majority of the farmers prefer using pesticides and insecticides, while there are some who perform regular cleaning in their farms and fencing. Information campaign about hazards of using chemicals in controlling pests should therefore be conducted in the barangay to avoid potential harms of using pesticides and insecticides among the barangay residents.

Keywords: wildlife, crop damage, pests, pest control

#### **PRELIMINARY ASSESSMENT OF UNDERSTORY BIRDS IN ARGAO WATERSHED ARGAO, CEBU, PHILIPPINES**

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#### **Abstract**

Primary data were collected to assess the understory bird composition of selected sites on Argao River Watershed Reserve for better understanding and management of these critical resources. Using point count circular method, a total of 535 individuals were encountered and are represented by 15 families and 18 species. Of which 11 species classified as resident, five were Philippine endemics, and one migrant. Among the bird species recorded Philippine Bulbul *Hypsipetes philippinus* ranked the highest and followed by rCebu Black Shama *Copsychus cebuensis* which is endangered (IUCN) and native to Cebu island, Magpie Robin *Copsychus saularis* and Black-naped Monarch *Hypothymis azurea* ranked third and fourth respectively.

Base on the findings, the watershed contained some bird species which are endangered and given the condition of the forest habitat which is continuously under threat by various forms of forest destruction the need for strict protection and conservation efforts is of paramount

consideration. Further research assessment is highly recommended in order to establish the real nature and number of the avian understory species within the study area.

Keywords: Argao watershed, understory birds, endemic species, resident species, introduced species or exotic species, migrant species.

## **LOCATING THE HYBRIDICITY AND THE HISTORICITY OF NATURE CONSERVATION IN A FARMER'S NARRATIVE**

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### **Abstract**

The paper aims to share an organization study in sustainable agriculture and natural resource management that was framed within the view that structure is a network of actions to see the hybridicity (human and non human agents acting) and the historicity (past action lending weight to the present) of collective action.

To surface organization, the study assumed that organizing and narrating are isomorphic processes since “people literally organize their universe by mobilizing narrative structures” (Cooren and Fairhurst, 2002, p.86). Anchoring on the Greimas' Semio-Narrative Theory that conceives narrative structure as consisting of four phases, namely, mission, competence, performance and sanction, the study listened to the story of a farmer who practices nature conservation as told in conversations with the researcher. The conversations were recorded in both audio and video formats and transcribed resulting in 100 pages of transcripts. The data were analyzed iteratively reading through the whole transcripts allowing to emerge the narrative elements and the narrative structure.

In the farmer's narrative, nature conservation was traced to the upstream agency of the Creator as giver of the stewardship mandate/mission and the future generation as beneficiary of good stewardship and to the downstream agency of the providers of knowledge on sustainable farming and the partner farming family. The downstream action of balancing income and conservation were performed by hybrid agencies of human (the farming family), physical/biological (farm), and technological (agroforestry studies) and was linked to the training in sustainable development provided by various scientific and development entities.

The narrative analysis provides explanation for what contributes to and constrains the accomplishment of nature conservation.

Keywords: Narrative, Agency, Historicity

## **BAMBOO CHARCOAL AS WATER FILTER**

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### **Abstract**

The quality of Cebu Technological University (CTU) water particularly on its biological aspect needs to be reduced in order to improve its quality and maximize its usage. Crushed bamboo charcoal filter was designed to improve CTU water quality based on biological parameters particularly total bacterial count in colony forming unit per ml, and total coliform count in most probable number per hundred milliliter, and physico-chemical parameters including pH, temperature in degrees celcius, density in gram per milliliter, alkalinity in milligram per liter, salinity at 15°C in parts per thousand and calcium hardness in milligram per liter sample. The water sample filtered using Crushed Bamboo Charcoal Filter had the least bacterial count in colony forming unit per milliliter sample and total coliform in most probable number per hundred milliliter sample compared to the CTU water samples before filtering, water samples filtered using powdered bamboo charcoal and commercial filter. The electrometric method for pH and temperature tests revealed that the water filtered using crushed bamboo charcoal is within the range with proper pH levels at ambient temperature. The alkalinity level and calcium hardness in mg/liter of filtered water increases compared to the rest of the research samples including unfiltered CTU water which contained least level using Titrimetric method and EDTA-Titrimetric method, respectively. The desalination of water was done since there was decreasing trend of salinity at 15°C level, in parts per thousand of the filtered water.

Keywords: bamboo, charcoal, filter

**SOCIAL BENEFITS DERIVED FROM CPAR ON CASSAVA CHIPS PROCESSING IN SALCEDO  
EASTERN SAMAR**

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**Abstract**

The paper will present the experiences of the project Community Participatory Action Research (CPAR) on cassava chips processing in Salcedo, Eastern Samar. The data was based on the results during the first year of project implementation.

CPAR framework was applied to commercialize matured technologies in root crop processing. The first year of implementation was geared to enhance the knowledge and skills of stakeholders on the processing of cassava chips; to improve marketing strategies and to showcase a demonstration area on the production of sustainable raw materials for cassava chips.

The social benefit analysis was conducted through focus group discussion. Result shows, the famers had compared the efficiency of technologies introduced. They had broadened their experiences on value adding, practiced towards hygienic production flow, improved packaging and labeling, expanded market outlets. Moreover, there was an increased in the production of cassava tubers fertilized with animal manures. Consequently, the institutions implementing the project had strengthened linkages for support & convergence of services.

Keywords: Action Research, Community based livelihood and sustainable production

**ACCEPTABILITY OF COOKIES USING JACKFRUIT *Artocarpus heterophyllus* Linn SEEDS FLOUR**

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**Abstract**

Jackfruit seed cookies are newly formulated product that contains jackfruit seed flour, wheat flour, margarine, egg, sugar and baking soda. This is an experimental study using the randomized complete block design using five variables to determine its acceptability. Based on the Analysis of Variance and Duncan Multiple Range Test at 5% level of significance, out of the five (5) varying concentrations of jackfruit seeds flour, treatment with “**75% jackfruit seeds flour**” was the preferred mixture based on its weighted mean in color, flavor and texture and had significant mean difference from the control treatment with an insignificant result as to odor attributes based on descriptive and preference sensory evaluation using 20 trained and 50 consumer panelists, respectively. The product had a **yellow brown** color, **moderately jackfruit** flavor, **slightly jackfruit** odor and **slightly crunchy** texture with an acceptability ratings of “**like moderately**” in color and flavor and “**like slightly**” in odor and texture. The jackfruit seed cookies with 75% jackfruit seeds flour and 25% wheat flour composed of 6.57% crude protein, 15.75% crude fat, 18.48% moisture and 1.50% ash contents. After a series of analyses on the acceptability of jackfruit seeds cookies as revealed from the data gathered from the perceptions of the experienced panelists, only “**75% jackfruit seeds flour**” concentration are appropriate to be added to cookies with margarine, egg, baking soda, flour and sugar.

Keywords: jackfruit, seed, flour, cookies, acceptability

**DEVELOPMENT OF FOOD PRODUCTS FROM MILLET**

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**Abstract**

The study generally seeks to develop food products utilizing millet grain and millet flour. This millet grain/flour served as the main ingredient in preparing the food products and as a partial substitute to the all-purpose and/or cake flour. Specifically, it aims to utilize millet in baking pastries, cookies, and cakes, and cooking pastillas; to evaluate these food products in terms of

consumer acceptability; and to produce a techno-pack on the developed food products for extension service.

The experimental method was used in this study to develop products like millet tart, millet (chiffon) cake, millet cookies, and millet pastillas from millet grain and flour. The formulation employed was based on the basic procedure in the preparation and processing for standard recipes. The 9-point Hedonic rating scale was used to evaluate the first and second phase of the product acceptability testing.

Millet can be utilized as main or added ingredient in baking pastries, cookies and cakes, and cooking pastillas. Specifically, millet flour can be used as added ingredient in baking cookies and cakes, while millet grain can be utilized as main ingredient in cooking tart fillings and pastillas.

Assessment on consumer acceptability reveals that millet tart, millet cake, millet cookies and millet pastillas can be considered as possible processed products that utilized millet. A techno-pack for each of the developed products can be produced for extension services. Among the four recipes formulated, millet pastillas has higher consumer acceptability as “like very much” compared to only “like moderately” for the rest of the millet recipes developed.

Keywords: millet, food, pastillas

#### **WEB-BUILDING OPERATIONS AND FEEDING BEHAVIOUR OF *GASTERCANTHA JANOPOL* IN IMPASUG-ONG, MALAYBALAY, BUKIDNON**

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#### **Abstract**

The web construction and feeding behaviour of *Gasteracantha janopol* (Barrion, 1979) commonly called as the Spiny Back Orb-Weaving spider in Impasug-ong, Bukidnon were observed on February 2010. This study is essential since informations about its behaviour are limited. Results from the study can later be used as bases for further study of its ecology. There were seven spiders directly observed in the wild with researchers carefully documenting any activity executed by the spiders. *G. janopol* builds its web at dawn starting from one silk left from the previous web and consumes it during nightfall as an act of keeping the web and builds

a new web every morning. Roughly, about three hours of web-building was observed. A “Y” figure starts the web-building that follows a non-sticky silk to form radial parts of the web from anterolateral to posterolateral or vice versa. The spiral part of sticky silk starts at the center with a counterclockwise direction of few spirals and finishes from the outside to the inside with a clockwise direction. The web has no stabillimentum, and if damaged, the spider doesn’t make any repairs. The spiral sticky silk helps the spider to capture its prey. A single disturbance in the web created by the trapped insects sends signals for the spider to respond immediately on the captured prey. Usually small insects are trapped and only the liquid part is consumed leaving an empty husk of the prey.

Keywords: *Gasteracantha janopol*, Web-building Operations, Feeding Behaviour

### **SPECIES RICHNESS OF BATS FROM TWO DIFFERENT VEGETATIONS IN NORTH COTABATO**

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#### **Abstract**

A study on the bats from two different vegetation types in North Cotabato namely: conservation area in Balabag, Kidapawan and Oil Palm Plantation in Tulunan, was conducted from April to May 2010. It aimed to determine the effect of vegetations on the species richness of bats in selected sites in the province. A total of 200 mist net nights were employed in both study areas, wherein a total of 337 individuals with 11 species were recorded. There were six species recorded in oil palm plantation including the two endemics (*Ptenochirus jagori* and *Rhinolophus cf. inops*). Protected forest had eight species, including the four endemics (*Haplonycteris fisheri*, *P. jagori*, *Ptenochirus sp.* and *R. cf. inops*) and one vulnerable species (*Megaerops wetmorei*). The high species richness in conservation areas compared from oil palm plantations indicate that diverse vegetation would determine the diversity of bats and conservation by protecting the area is a good way to preserve it, thus urgency of more extensive conservation programs is needed.

Keywords: Bats, Protected Area, Oil Palm Plantation, Mt. Apo, North Cotabato

**WOODY PLANT SPECIES OF MOUNT DATA NATIONAL PARK, MOUNTAIN PROVINCE,  
PHILIPPINES**

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**Abstract**

The quadrat method was used in sampling the vegetation in valleys and ridges of Mount Data National Park. Parameters such as basal area, density, height, frequency and Shannon index of diversity were analysed. There were 108 woody plant species belonging to 40 families and 63 genera. Generally, results of the vegetation analysis showed that the park is still highly diverse despite problems and threats to biodiversity. *Lithocarpus* species from the family Fagaceae were the most dominant and diverse among other woody plant species. Forest conversion into permanent gardens and human settlements or squatting were prevalent. Hence, it was recommended that policies relevant to the park as a protected area be reviewed and strengthened for strict implementation.

Keywords: biodiversity, Cordillera mountain range, national park, woody species

**SEEDLING PROPAGATION OF TWO JAPANESE PERSIMMON ACCESSIONS AS AFFECTED BY  
DIFFERENT SOURCES OF PLANTING MATERIALS**

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**Abstract**

The study generally aimed to mass produce Japanese persimmon planting stocks for integration in Agroforestry farms and specifically aimed to determine the growth performance and survival of Japanese persimmon as affected by different propagation techniques and to determine the best propagation techniques for rapid multiplication. The study was further classified into three sub-studies by using root runners, stem cuttings, and seeds. The main reason for assigning sub-studies was due to the different calendar of propagation and the separate statistical analysis of data. There were two Japanese persimmon accessions selected for the study. There were three

(3) treatments designed in each sub-study which was replicated three times and having ten (10) pots per replicate.

Growth performance and survival of Japanese persimmon root runners and stem cuttings were determined based on the number of days to emergence of buds, number of buds emerged per plant, survival of the plant from observed emergence of buds up to 150 days lifespan, non-emergence of buds, average height of buds at 150 days lifespan, pest and diseases, and percent mortality. In seeds, similar data were gathered except number of buds emerged per plant because it is understood that a seed have one shoot.

The experimental design used was completely randomized design (CRD) while the data were analyzed through analysis of variance (ANOVA) in order to determine the significance of treatments. Wherein, the treatments used are not significant in the growth performance and survival of the root runners and stem cuttings while treatments used to determine the survival of the seeds from observed foliage of shoots up to 150 days lifespan and non-emergence of shoots are highly significant. Seeds that were air dried is still preferred basing it from emergence of shoots and good foliage.

Common pests and diseases infested the propagated persimmon were leaf rust and wilting which were observed root runners. Unfortunately, wilting was observed to be prevalent in the stem cuttings. Generally, all of the treatments used are feasible in trying to increase planting materials for the propagation of persimmon. However, with the observations made, the propagated seeds performed well. Seeds are still best source of planting materials to change the old growth because leaf rust in the root runners may have originated from the source. There shall be continuous and regular monitoring or maintenance such as irrigation, weeding and fertilization of the persimmon especially after planting.

Keywords: Propagation, Japanese persimmon accessions, agroforestry farms

## **ACCEPTABILITY OF SARDINES, *Sardinella longiceps* FISH LUMPIA**

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### **Abstract**

Sardines Fish Lumpia, is a value added product from *Sardinella longiceps* combined with carrots, sinkamas and other spices. The sardine technology uses the following procedures: fish lumpia preparation, sensory evaluation, statistical analysis, composition and cost analysis. The

gathered data were treated using the average and average weighted mean. Based on chemical laboratory analysis, the product contained 2.83 per cent ash, 57.70 per cent moisture, 1.24 per cent fat; and 10.40 per cent protein; thus promote acceptability of the product. Results revealed that the product had light brown in color, very much pleasant odor and moderately smooth texture. Because of the high potential of sardines as food stuff, and if this is properly utilized, it can be an alternative livelihood for fishermen and their families and can help the government’s campaign on poverty alleviation. It can be good source of income generating project and extension program of the University.

Keywords: Sardinella longiceps, fish lumpia, processing

## **ALCOHOL FROM ACACIA FRUITS**

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### **Abstract**

This study was conducted In PSU Binmaley to determine to possibility to obtain alcohol from Acacia Fruits. Specifically, the study ) sought to determine the excellence of alcohol produce from acacia fruits in terms of (a) appearance, (b) coolness (c) volatility and (d) flammability .

The results or findings of the study shows that alcohol produced from acacia fruits is excellent in terms of appearance, it is clear when it is being distilled from the original fermented substrate of fruits being pounded, boiled with tap water, cooled and added with little of yeast as starter. After a month of fermentation the alcohol content is being extracted through simple distillation process.

Through to its coolness effect when it is used is good. Compared to Casino ethyl alcohol, a commercial one, the product is not far to it in terms of its quality.

Towards to its volatility and flammability, the product is rated good for which it is volatile or easily vaporizes or escapes to the atmosphere when the container left behind unstoppered. It is also flammable, as same with Casino Ethyl alcohol, as its flame lasted almost the same with it thereby claimed that there is no significant difference between the two product treated using t-test.

It is been concluded that base on the t-test for comparison, there is no significant difference between the (a) quality of ethyl alcohol from acacia fruits and Casino Ethyl Alcohol in terms of appearance, odor and coolness, (b) volatility of the two products in terms of length of time of volatilization and (c) the flammability of Casino Ethyl Alcohol and alcohol from acacia fruits in terms of ignition, intensity and length of time.

Keywords: Alcohol, Acacia Fruits, Volatility and flammability of Alcohol

### **TYPES OF FUEL AND ITS IMPACT TO THE SOCIO-ECONOMIC AND ENVIRONMENTAL ASPECTS OF JEEPNEY DRIVERS IN CABADBARAN CITY**

**Prof. Carlos H. Donoso<sup>1</sup>, Marlon B. Cuyag<sup>2</sup>, and Ruel T. Buba<sup>3</sup>**

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#### **Abstract**

This study explored the effects of the utilization of automobile fuels as perceived by the jeepney and multicab drivers of Cabadbaran City, Caraga Region. Fifty drivers were the respondents of the study. Kruskal – Wallis Analysis of Variance (ANOVA) by Ranks was used to determine the significant difference on the perceptions of the respondents when grouped according to their profile variables. The drivers agree that utilization of fuels has an effect on the economic aspect and implication to environmental impact. It was found further that there is a significant difference on the perceptions of the effects of the utilization of automobile fuels to economic aspect, environmental impact, and engine longevity when grouped according to the type of fuel used. The drivers are aware that their occupation contributes to the pollution in the atmosphere and to the environment in general yet they continue to work for it is a necessary mode of public transportation. On the other hand, the drivers in Cabadbaran believe that automobile fuels do not shorten the life of the engine. However, they believe that kind of fuel used would affect in the longevity of the engine. As perceived by the drivers in Cabadbaran City, LPG as a fuel is more economical, environment friendly, and engine life saver. With these, the support from sectors concerned on the income of the drivers, the welfare of the environment, and the durability of automobiles are needed by the jeepney and multicab drivers.

Keywords: Types of fuel, socio-economic, environmental aspects, jeepney drivers, pollution

**MICROBIAL STABILITY OF FLAVORED FISH SAUCE FROM ANCHOVIES *Stolephorus spp***

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**Abstract**

Flavored fish sauce is a value-added product from fermented anchovies *Stolephorus spp*, locally known as “patis”, with natural additives such as calamansi, chili pepper and carrageenan. The microbial stability was based on the aerobic plate count and detection of pathogens specifically *Escherichia coli*, *Staphylococcus aureus*, *Salmonella* and *Shigella* after three months of investigation. Based on laboratory analyses, the products’ aerobic plate count had less than 2,500 cfu/g on its first two months of storage and reduced to less than of 100 cfu/g after three months. The *Escherichia coli* and *Staphylococcus aureus* were detected with months of storage with less than of 1.8 and less than 10, respectively, with absence of *Salmonella* and *Shigella*. Thus, the shelf life of the product is within six months based on microbial analyses results, which meets the microbiological standard requirement for fish and fishery products.

Keywords: flavored fish sauce, shelflife, six months

**ENVIRONMENTAL DIMENSIONS AND LIVELIHOOD PRACTICES OF BADJAO OF SURIGAO CITY,  
PHILIPPINES**

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**Abstract**

This study aimed to determine the environmental dimensions and the livelihood practices of the Badjaos in Surigao City. This also determined the profile of the respondents, and measured the significant difference on the practices of the respondents when grouped according to their profiled variables. Data were collected from 82 respondents using a researcher-made questionnaire. Results were analyzed and interpreted using appropriate statistical tools like Frequency Count and Percentage, Mean, One-Way Analysis of Variance (ANOVA), and Scheffe' Test.

Most of the Badjaos in Surigao City are uneducated, do not have large family because their sources of income or living are unstable. They have no capacity to own a house, no toilets for waste disposal and less concerned about the environment. They have a stable culture like performing rituals asking permission from the spirits but do not give offerings to the them. They fish, dive for coins, excavate, extract corals and other seashells but refrain from illegal use of dynamites. They do not practice reforestation nor participate in social gatherings. They respect the rights of other people, do away from using deadly weapons, and avoid abusive language.

Educated Badjaos are more concerned with environment and their sanitation. Those who are living near the sea have good health because of improved sanitation practices. Those who graduated in Elementary only have more stable cultural and spiritual practices and more concerned with peace and order than those who are much educated or less educated. Also, those who do not have a house are perpetuating their culture better than those living in junk materials. Those who are living farther the sea are concerned of their cultures better than others.

Keywords: Environmental dimension, Livelihood practices, Badjao, Environment, Coastal

**INTERACTIONS OF SUPREMA DELA IGLESIA DEL CIUDAD MISTICA DE DIOS, INC. TO MT. BANAHAW, QUEZON, PHILIPPINES**

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**Abstract**

The interaction between different institutions and the environment can be based on the nature of the institution itself. Factors like tradition, culture, practices, and religion are just some factors that can be used to determine the relationship.

This case study aims to determine and provide information on how does a new religion group, namely Suprema dela Iglesia del Ciudad Mistica de Dios, Inc. (CMD) interacts with the Sacred Mountain known as “Mt. Banahaw”. By conducting actual site visits and key person interviews, a number of points were determined together with a number of verifications regarding CMD and their practices.

CMD also teaches there members to love and respect nature because it is a gift from God. Furthermore, their environment is also connected to their beliefs as reflected by the *Santong Lugar* (Sacred Places) that they visit and pray during their sacrifices for faith.

A number of issues and concerns were also expressed by CMD as well as the Protected Area Management Board (PAMB) towards the management of Mt. Banahaw. Problems involving illegal settlers, disrespectful climbers and even treasure hunters were enumerated by CMD and PAMB.

Keywords: Suprema dela Iglesia, del Ciudad Mistica de Dios, Mt. Banahaw, Quezon,

## **MICROBIAL DENSITIES OF FERMENTED ANCHOVIES *Stolephorus spp***

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### **Abstract**

Fermented fish sauce, locally known as *ginamos*, with 15% salt is the stock solution for fish sauce extraction in the Cebu Technological University, Cebu, Philippines. The product was found to have shorter fermentation rate with high quality fish sauce, however the presence of bacteria and pathogenic microbes should be monitored to determine its safety. In this study, the fermented anchovies were subjected to microbiological analyses particularly aerobic plate count, and pathogen detection specifically *Escherichia coli*, *Staphylococcus aureus*, *Salmonella* and *Shigella* using 3M-Petrifilm and pour plate method. The fermented anchovies had an estimated total plate count of  $2.6 \times 10^5$  cfu/g, on its first month of fermentation, while on its 3<sup>rd</sup> month as last month of fermentation, the count dropped to less than  $2.5 \times 10^3$  cfu/g. Pathogen detection of the fermented anchovies during its first month of fermentation revealed a total coliform count of  $5.0 \times 10^1$  cfu/g; *Escherichia coli* of 10 MPN and *Staphylococcus aureus* load of  $5.0 \times 10^1$  cfu/g; which reduced to less than 1.8 MPN *Escherichia coli* and less than 100 *Staphylococcus aureus*. Based on the findings, the product meets the microbiological standard requirement for fish and fishery product with the absence of *Salmonella* and *Shigella*.

Keywords: microbial density, fermented anchovies, fermentation

## **PRODUCTION OF A FERMENTED MILK ENRICHED WITH BIOACTIVE MILK FAT GLOBULE MEMBRANE MATERIAL**

**Anthón Pascual**

### **Abstract**

The study on the potential applications of milk fat globule membrane (MFGM) material as an ingredient in the processed food has become a great interest in the dairy industry today due to the functional and bioactive properties it possesses.

The objective of this research was to investigate the effects of supplementing MFGM materials as bioactive components in yoghurt on its various physical and rheological properties such as

WHC, color, flow behavior, thixotropy, and gel formation. Two major experiments were conducted in this study. The first was to determine the effects of different concentrations of MFGM material isolated from butter milk on the rheological properties of yoghurt. Experiment on the physical and rheological properties of yoghurt using different MFGM materials isolated from butter serum, buttermilk and butter milk whey was carried out on the second one.

The enrichment of MFGM materials significantly affected the physical and rheological properties of yoghurt. Yoghurts enriched with buttermilk MFGM materials showed shear thinning behavior. In addition, they exhibited a thixotropic behavior, where as the viscosity of yoghurts enriched with buttermilk MFGM material decreased as subjected to increasing shear rate. Gel formed from yoghurt enriched with 1% MFGM was weaker than the one enriched with 3% MFGM. The enrichment of higher concentrations of MFGM material isolated from buttermilk and butter serum powder produced a gel with high initial apparent viscosity but collapsed rapidly when shear was applied but still their final viscosity is higher than control. The addition of MFGM materials basically increased the water holding capacity of yoghurt however, was not significantly different from the control. The brightness of yoghurts enriched with MFGM isolated from buttermilk and butter serum is not significantly different from the control.

Further investigation should be done of the effects of MFGM materials on the properties of yoghurt. An oxidative stability study on the MFGM enriched yoghurt should be conducted. Duration of experimental conduct such as on the storage time can be lengthen to provide a clearer picture on the evolution of yoghurt gel during storage. Study on the effects of MFGM materials at various pasteurization temperature-time, and different incubation temperature-time combinations should be looked into.

Keywords: fermented milk, bioactive milk fat

**THIRD DAY (MAY 27, 2011)..**

**Institute of Biological Sciences  
University of the Philippines Los Baños**

**PLENARY SPEECH**  
**e-ENVIRONMENT**

**GRACE JAVIER ALFONSO, Ph.D.**

*Chancellor*

University of the Philippines Open University

**PLENARY SPEECH**  
**AQUATIC BIODIVERSITY STUDIES**

**NICOLAS BAILLY, Ph.D.**

Scientific Director

*FishBase Information and Research Group, Inc. (FIN)*

Scientist

*WorldFish Center*

**THE ROLE OF THE BIODIVERSITY INFORMATION SYSTEMS IN THE ENVIRONMENT AND  
NATURAL RESOURCES MANAGEMENT**

**Abstract**

The sustainable management of natural resources and their environment, both for exploitation and conservation purposes, requires much data and information which forms the basis of all knowledge. Before the exploitation industrialization, natural resources were managed on the basis of local, indigenous or traditional knowledge, which accumulated for generations and orally transmitted from one to another. The development of science with written monographs in pre-Christian era, and the rapid acceleration of the exploitation during the industrialization period in the 19<sup>th</sup> and 20<sup>th</sup> centuries led to the accumulation of a huge amount of information as published documents. The trend is exponentially increasing since the mid-20<sup>th</sup> century with the development (sometimes the excesses) of the “publish or perish” attitude in research.

The goal that FishBase Information and Research Group, Inc. (FIN) chose to target is to gather key data, information and knowledge on aquatic biodiversity to serve the research and development communities. It aims to set up more quickly efficient and knowledge-based practices, policies, and regulations to make our aquatic environment exploitable in a sustainable way, both in marine and freshwaters.

Previously under the WorldFish Center, the teams now in FIN, a Philippine NGO, have accumulated a unique experience in the world in creating and maintaining biodiversity information systems for 20 years with FishBase, 17 years for Catalogue of Life, and 6 years for SeaLifeBase, and through many collaborations with Philippine and international partners.

However, accumulating knowledge is not enough, so FIN is resolutely open to collaboration that will use its biodiversity information systems in development projects.

Keywords: database, biodiversity information system, natural resources management

## PAPERS

### **INTEROPERABILITY OF GLOBAL SPECIES DATABASES: STANDARDS AND USAGE FOR AQUATIC BIODIVERSITY MANAGEMENT**

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#### **Abstract**

The names of organisms are the main components of the taxonomic backbone for all biodiversity information systems. An enormous amount of information on aquatic biodiversity, scientific and common names included, has been published, documented and collected in numerous publications and museum collections. And recently, web-based information systems facilitate their dissemination for research and biodiversity management.. Though the internet provides easy access to information, the validity and reliability of such information is hard to determine. The Catalogue of Life, FishBase and SeaLifeBase are online information systems that facilitate digitization and integration of data from multiple sources and different formats. By adopting to open standards and protocols, these databases provide a high degree of interoperability among databases that can be shared to multiple users, and ensure data integrity. These databases can be of help to decision-makers, scientists, students and environmental managers by providing available information when and where it is needed.

Keywords: Global Species Database, biodiversity information, species

**COLLECTIONS MANAGEMENT OF THE NATURAL HISTORY REFERENCE COLLECTIONS AND  
DATABASE IN THE NATIONAL MUSEUM**

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Museum Curator I

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**Abstract**

The natural history collections in the National Museum of the Philippines (NMP) represent the country's extant and extinct flora and fauna. They have played a significant position in the saga of science and have motivated the growth of scientific information. For more than ten decades, the National Museum of the Philippines (NMP) has tried to maintain the reliability of the specimens and their related data in the best possible functional condition and made the specimens utilizable for a suitable purpose. A chronological catalogue that lists each individual specimen or lot along with pertinent data is hand-written in a Catalogue or Accession Book or registers. But with the advent of computers, these registers were transferred to an electronic database. This practice started with a grant from the John D. and Catherine T. MacArthur Foundation in the year 2000. Since more and more specimens are added in the collection by way of the museum's research, joint expeditions, or by donations, updating of the database is slowly but continuously being done. Although electronic database is easily manipulated and facilitates research, the NMP still maintains the traditional practice of hand-writing entries in a Catalog or Accession Book. Museum curators believe that recording data on a 100% acid free paper using a black india ink is more stable and lasting. Allegedly, storing of specimen data in a digitized form can be precisely and correctly transferred from one generation of electronic storage to the next. Nevertheless, the brief saga of museum computerization has established that software and hardware restraints constantly end in some damage or distortion of data if not managed professionally.

Keywords: Natural history, Zoology, Botany, Catalog Book, Accession Book

**THE IMPORTANCE OF FISHBASE AND SEALIFEBASE IN REGIONAL AND NATIONAL IUCN RED LIST ASSESSMENT OF MARINE SPECIES**

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**Abstract**

Global marine conservation measures are driven by factors affecting the optimal status of the environment. Unfortunately, incomplete information on many marine species which could be threatened prohibits decision makers to determine which organism has the highest importance in terms of protection. Biodiversity information systems, such as FishBase (on finfish, [www.fishbase.org](http://www.fishbase.org)) and SeaLifeBase (on non-finfish, [www.sealifebase.org](http://www.sealifebase.org)), can be used to provide the needed information for this purpose. The IUCN Red List has used these databases as information support for focused species assessments on global, regional and national scales. This contribution discusses this process particularly in Southeast Asia and the Philippines for marine vertebrate species.

Keywords: FishBase; SeaLifeBase; IUCN Red List; database; Southeast Asia; Philippines; fish; marine mammal

## **DNA BARCODING OF FISHES OF THE PHILIPPINES**

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### **Abstract**

The Philippines has a very rich and diverse ichthyofauna with over 3,000 species. Despite the importance and diversity of our ichthyofauna, there is a scarcity of information on the current status of most of these species. Some endemic species were reported to be critically endangered and some are facing the risk of extinction due to habitat alteration, pollution, introduction of invasive species, and other anthropogenic causes. There is therefore an urgent need to protect and conserve our finfish biodiversity. Taxonomy plays a fundamental role in establishing conservation priorities since accurate identification of species is a basic requirement for their proper management. DNA barcoding is a powerful tool for the rapid and accurate identification of species. As soon as a reference collection of DNA barcodes becomes available, an unknown individual at any of its life history stage or even fragments of the individual could be assigned to species. DNA barcoding could also facilitate the discovery of new species and flag certain species for further taxonomic investigation. This technique makes use of a small section of a standardized region of the genome to identify species. In animals, the 650-bp fragment of the 5' end of the cytochrome *c* oxidase subunit I (COI) mitochondrial gene has been designated as the barcode region. To date, we have barcoded 400 individuals of 90 species belonging to 12 orders and 36 fish families. Preliminary analysis of our data, some interesting findings, their implications for fish biodiversity conservation, and future research directions will be discussed.

Keywords: biodiversity, COI, DNA barcoding, fishes, taxonomy

**PHILBATIS: AN INFORMATION SYSTEM ON THE PHILIPPINE FRESHWATER BIODIVERSITY**

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**Abstract**

The Philippine freshwater biodiversity is poorly known. Despite the presence of myriad freshwater environments in the country that serves as critical habitat to several faunal and floral communities, a lack of information on the freshwater species is recognized. Data integration centralized on all species occurring in the freshwater ecosystems in the Philippines through PhilBatIS is hereby proposed. It is an online Biodiversity Information System that aims to deliver information on species, distribution, biology and ecology. PhilBatIS locates national freshwater information and resources, collates and makes them accessible to our local government and national agencies to help in the implementation of a more sound environmental management of our freshwater resources. An encoder's interface is being developed to house freshwater information initially from the five Zonal Centers in the Philippines. Ongoing coordination with the National Museum and various National Aquatic Resources offices poses a better Philippine freshwater databank. The software is designed from the premier databases, FishBase and National Aquatic Ecosystems Information System (NAEIS). PhilBatIS is a national database initiative that will be a portal to other existing databases, published and grey literature, and international sources. It presents a strategy to fill the information gap on Philippine freshwater species and ecosystems.

Keywords: Freshwater, biodiversity, information system, databases

## **THE CORAL TRIANGLE INITIATIVE IN THE PHILIPPINES: STATUS AND UPDATES**

### **Norma M. Molinyawe**

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### **Abstract**

The Coral Triangle is a geographical term referring to the marine waters of Indonesia, Malaysia, Papua New Guinea, Philippines, Solomon Islands, and Timor Leste which covers about 5.4 million square kms. of rich marine life. It is believed to be the richest marine area of the world and the Philippines is located at the apex of the Coral Triangle. Due to the economic and ecological importance of the Coral Triangle, the 6 countries joined hands in pursuing the sustainable management and development of marine and coastal biodiversity resources of the Region through the Coral Triangle Initiative on Coral Reefs, Fisheries, and Food Security or shortly known as the CTI.

The CTI was formally launched on 15 May 2009 during the 1<sup>st</sup> CTI Leaders' Summit in Manado, Indonesia. At the said event, the CTI Regional Plan of Action (RPOA) was officially adopted with the following Goals: Priority Seascapes designated and effectively; Ecosystem approach to management of fisheries and other marine resources fully applied; Marine Protected Areas established and effectively managed; climate change adaptation measures achieved; and Threatened species status improving. A parallel effort on the implementation of the RPOA is currently being done through the effort of the 6 CT countries. In the Philippines, the National Plan of Action was officially adopted with the issuance of Executive Order No. 797. The EO also provides the mechanism for coordination among national agencies, non-government organizations, academe, and local government units to effectively implement the NPOA. The paper also presents the highlights of accomplishments of the NPOA Goals.

Keywords: Coral triangle; Coral Triangle Initiative; marine biodiversity, conservation; priority seascapes; Ecosystem-based fishery, management; threatened species; marine protected areas

## **LESSONS ON RESILIENCE BUILDING FROM SENTINEL ECOSYSTEMS OF OUR ARCHIPELAGIC SEAS**

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Resilient SEAS (Resilient Sentinel Ecosystems of our Archipelagic Seas – [SEAS])

### **Abstract**

The first 2 years of the Integrated Coastal Enhancement: Coastal Research Evaluation and Adaptive Management (ICE CREAM) program has derived important insights on the vulnerabilities of the coastal and marine areas of the Philippine Archipelago. Ten new marine based derived climate typologies were derived by David et al. 2009 primarily based on sea surface temperature and monsoon variation over 20 year remotely sense satellite images. Sea Level Rise (SLR) and Wave Surge (WS) analyses by Siringan et al (in prep) and Villanoy (in prep) provide potential exposure scenarios for various coastal ecosystems like coral reef, seagrass and mangrove habitats. Some criteria for scoring sensitivity and exposure conditions together with the parameter estimations from modeling simulations afford analytical insights on the opportunities to build resiliencies to cope with impending climate change challenge.

Keywords: resilience, sentinel, ecosystem, archipelagic seas

## **REINTRODUCING LOCALLY EXTINCT CORAL SPECIES TO REEF AREAS DEGRADED BY EPISODIC DISTURBANCES**

**Romeo M. Dizon<sup>1\*</sup>, Ronald D. Villanueva<sup>2</sup>, Dexter W. dela Cruz<sup>2</sup>, and Maria Vanessa V. Baria<sup>2</sup>**

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<sup>2</sup> The Marine Science Institute, University of the Philippines, Diliman, 1101 Quezon City

### **Abstract**

Degraded reef areas that show little or no sign of natural recovery require a more active intervention, such as coral transplantation, in order to jumpstart the recovery process. Anecdotal accounts from local fishermen and early scientific studies indicate that the reef flat areas of Barangay Lucero in Bolinao, Pangasinan used to be covered with thickets of staghorn *Acropora* species. However, after years of unregulated blast fishing and major coral bleaching episodes, what remains of the reef flat are barren areas of unconsolidated sand and coral

rubble. With the help of local inhabitants, 450 fragments of 2 staghorn corals, namely, *Acropora intermedia* and *A. pulchra*, taken from a healthy source reef, were transplanted to the Lucero reef flat in 4x4 m plots in July 2010. Two density treatments were applied: Low (25 fragments of each species/plot) and High density (50 fragments of each species/plot) while 3 replicate plots were established for each density treatment. Nine months since the active intervention, all of the plots continue to exhibit >90% survival rates indicating early signs of success in the reintroduction of the 2 species. This paper will highlight the importance of sound scientific bases in carrying out restoration work as well as the need to develop restoration techniques that are both cost-effective and transferable.

Keywords: coral, reef areas, episodic disturbances

### **SIZE STRUCTURE OF *ACANTHASTER PLANCI* POPULATIONS IN TUBBATAHA REEFS NATURAL PARKS, SULU SEA, PHILIPPINES\***

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\*Contribution published in Fisheries Centre Research Report 18(3):70-77.

#### **Abstract**

Since 2007, *Acanthaster planci* (COT) outbreaks in Tubbataha Reefs Natural Park (TRNP, Sulu Sea, Philippines), one of UNESCO's World Heritage Site, has prompted the Tubbataha Marine Office (TMO) to conduct COT clean-up activities and invite initiatives on COT studies. This study, invited by the TMO, identified outbreak areas within the TRNP, measured density of COTs within these areas and conducted size-frequency surveys using bucket view and SCUBA methods on six identified sites where outbreaks were reported in three islets, i.e., North Atoll, South Atoll and Jessie Beazley Reef. Total diameter and number of arms for 425 COTs were measured from 18 belt transects (30x5 m) and a COT clean-up activity. The largest individuals measured had a total diameter of 56 cm (with 15 arms) while a 43 cm individual had the most number of arms at 20 arms. Asymptotic length ( $L_{\infty}$ =52.6 cm) and growth coefficient ( $K=0.0367$ ) was estimated using the Powell-Wetherall Plot and the average growth performance index ( $\theta'$ ) from growth parameters of COT populations in the Western Pacific region. COT starfishes were

not widespread in the area but were observed to aggregate, average density being 0.011 ind·m<sup>-2</sup> (maximum observed density of 0.547 ind·m<sup>-2</sup>). This is lower compared to reported densities in similar ecosystems but is higher than the maximum sustainable density of 0.002 ind·m<sup>-2</sup> estimated for a coral reef ecosystem, since most individuals sampled (98%) were adults, and may be enough to produce another outbreak within 2-4 years. Therefore, further monitoring of COT populations in the area is highly recommended.

Keywords: *Acanthaster planci*; crown-of-thorns; COT; size structure; Tubbataha Natural Parks; Sulu Sea; Philippines

## **MARINE NON-INDIGENOUS SPECIES IN THE PHILIPPINES: A SERIOUS THREAT TO MARINE BIODIVERSITY**

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### **Abstract**

I present a review and current status of marine non-indigenous species (MNIS) in the Philippines. While research in terrestrial and freshwater non-indigenous species has been made in the past, there has not been much research done on their marine counterparts. However the Philippines are at risk from the introduction of MNIS because of a growing aquaculture and aquarium fish industry and its location as an international shipping hub. Our preliminary studies suggest that MNIS are present in Manila Bay, the country's biggest international port. There are at least 20 species that are suspected to be MNIS with one bivalve *Mytilopsis sallei*, already documented as a serious pest in Singapore and Thailand. The likely route of introduction is through ballast water exchange. This species may threaten port works, navigation, defence operations and mariculture in the bay. The other potential route of MNIS introduction is through aquaculture and the aquarium trade. In Manila Bay, seawater tolerant *Oreochromis niloticus* is now considered as an invasive. While there have been no reports of aquarium fish MNIS introductions, a growing demand for imported marine fish may be a serious risk for accidental introductions. A proposal for reducing risks is presented.

Keywords: marine non-indigenous species, invasive species, Manila Bay, ballast water, aquaculture, aquarium trade

## **FRESHWATER FISHES OF THE PHILIPPINES: DIVERSITY, THREATS AND INFORMATION GAPS**

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### **Abstract**

The freshwater fish fauna of the Philippines comprises 286 native and endemic species, representing over 130 genera and belonging to 50 families. Data on status, importance and threats are presented herein. Biological information gaps on all species listed in the 2010 IUCN Red List of Threatened Species are analyzed using FishBase ([www.fishbase.org](http://www.fishbase.org)), a large database and information system on fish containing over 32,000 species and subspecies. Research priorities and possible collaborations to bridge these gaps for conservation and management of Philippine freshwater fishes are identified and discussed.

Keywords: freshwater fishes, FishBase, Philippine fishes

## **ENVIRONMENTAL MANAGEMENT OF THE CULTURE OF INTRODUCED AQUATIC SPECIES IN THE PHILIPPINES**

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### **Abstract**

Aquaculture production has dramatically increased in the past decades and has at present contributed to more than a third of the world's fish supply. In the Philippines, aquaculture has achieved significant production growth of 10% annually for the period of 2000-2005 representing about 41% of the country's fish production. Although aquaculture is becoming an important food production sector that provides food security for the growing population, its impacts on the environment may outweigh benefits if left unregulated. Such negative impacts include pollution, habitat loss and modification and threats to aquatic biodiversity, among others, which affect surrounding environment and ecosystem. Pollution issues arise as a result of aquaculture effluents brought about by intensification in the culture system, overfeeding and misuse of chemicals which results to associated problems such as eutrophication, oxygen depletion and fish kills. Non-native farmed species may escape to the wild and alter ecological balance or introduce pests, disease and other unwanted organisms. Among these issues, farming of introduced species is one of the primary concern due to its effects on the aquatic

biodiversity. Displacement of many native species in inland waters had been correlated to the introduction of these non-native species. To manage aquaculture and mitigate its impact to the environment, national agencies like BFAR and DENR and the local government units play key roles and responsibilities in the proper planning of aquaculture zones and implementation of laws and policies. This paper presents the different culture practices that affect aquatic biodiversity in the Philippines and how national government and local government units share responsibilities to manage aquaculture and mitigate negative impacts to the environment.

Keywords: introduced aquatic species; aquatic biodiversity; environmental impacts of aquaculture

### **LEAD CONCENTRATION IN THE WATER, SEDIMENT AND CATFISH (*CLARIAS MACROCEPHALUS*) FROM BUTUANON RIVER, MANDAUE CITY, CENTRAL PHILIPPINES**

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#### **Abstract**

Lead (Pb) contamination is a serious environmental and health hazard thus the concentration of this non-essential trace element was determined in the water, sediment and muscle, liver and gills of catfish (*Clarias macrocephalus*) from Butuanon River, Mandaue City, Central Philippines. Samples were collected from three stations, upstream, midstream and downstream. Water results showed neither station exceeded the DAO 34 Series of 1990 (Class C) standard at 0.05ppm although the trend is increasing from upstream to downstream. Pb concentration in sediments increased from upstream to downstream station but neither exceeded the Kloke's Maximum Allowable Limit (M.A.L.) at 100ppm. All stations though exceeded Kloke's Natural Background Levels for Pb at 0.1- 20ppm. Only the catfishes (*C. macrocephalus*) from downstream station exceeded European M.A.L. for trace metals in fishes at 2ppm. Pb concentration in the organs were in this order liver>gills>muscle. Considering the number of industries directly contributing wastewater to the Butuanon River, Pb origin in the river is more of anthropogenic than natural.

Keywords: Lead, water, sediment, catfish

**SPATIAL AND TEMPORAL PATTERN OF AQUATIC MACROINVERTEBRATES IN DETERMINING WATER QUALITY OF SURIGAO RIVER, PHILIPPINES**

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**Abstract**

Surigao River is one of the major rivers in the province of Surigao del Norte which is now affected, in some way, by pollution at alarming rate. Hence this study aimed to determine the spatial temporal distribution of the macroinvertebrates as pollution indicator along Surigao River, Surigao City Philippines. Space and time are of central importance in every ecological investigation. It induces changes in aquatic macroinvertebrates which concern faunal composition and water quality. Three water samplings were conducted in different areas namely Kinabutan bridge, Navalca bridge and Friendship bridge from 2007-2010. A total of 175 species, 17 genera, 13 families were found in the three stations. The biotic index of Station One is 25, Station Two is 33, and Station Three is 26 and based on the biotic index table the water quality is poor. The compositional change of the biotic communities can be related to hydrological changes, anthropogenic, and biotic interactions. Considering the obtained results, it seems necessary to conduct monitoring studies and formulate policies for the conservation and management of the river resources. Therefore, it needs a serious safeguard of mankind and protection of the law.

Keywords: biotic index, macroinvertebrates, physico-chemical parameters, water quality

**SOCIO-ECONOMICS AND MANAGEMENT PRACTICES OF LUMUT (*Chaetomorpha Linum*) FARMING IN BRACKISHWATER PONDS OF BINMALEY, PANGASINAN**

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### **Abstract**

A total of 23 *lumut* growers were surveyed from 20 coastal barangays of Binmaley, Pangasinan to determine their socio-demographic and socio-economic profiles, their methods and practices of pond preparation, culture and marketing practices/technologies employed, and profits gained in *lumut* farming, and to identify solutions to solve their problems encountered in *lumut* production. Almost all of the *lumut* growers are males with an average age of 48.98 years. The youngest was below 20 years old and the oldest was 70 years of age. They had low educational qualification with an average number of children of 4. Milkfish farming was their main source of income with a monthly average household income of PhP8,000. The *lumut* growers operated and managed less than five hectares of brackishwater ponds where production is three months per cropping period. They cultured *lumut* at an average water depth of 40 to 70 cm.

Keywords: *Lumut* Farming, Brackishwater Ponds, Socio-Economics

### **MARINE INFAUNAL COMMUNITIES IN AL SOWWAH ISLAND DEVELOPMENT, ABU DHABI, UAE**

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### **Abstract**

Monitoring of marine infaunal organisms was undertaken in the light of the on-going construction works in Al Sowwah Island in Abu Dhabi, UAE. Samples were collected from nine (9) marine infaunal monitoring stations and analyzed on a quarterly basis from January to December 2010. Results of the monitoring showed that in general, marine infaunal communities were fairly uniform over depth, substrate and season. The average raw count of marine infaunal organisms was 232. The highest species richness was 2.57, species evenness was 0.88 and species diversity was  $H' = 1.86$ . These results were compared with similar monitoring studies undertaken in the Philippines. In Mauban, Quezon (Lamon Bay), the highest monthly species diversity of  $H' = 1.88$  was found during June 2001 and 2002. Whilst, in Subic Bay the highest diversity index ( $H'$ ) of 3.06 was recorded in February 2008 since the onset of monitoring works in September 2004. The low infaunal diversity indicates highly stressful environment and certain degree of selectivity among the animals on the choice of areas where their population could survive. Less stressful environment promotes high diversity. As stresses in the particular area increased, benthic infauna communities may be dominated only by few kinds.

Keywords: infaunal communities, Abu Dhabi

## **SPECIES DENSITY AND DIVERSITY OF DINOFLAGELLATES IN THE COASTAL WATERS OF BOLINAO, PANGASINAN**

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### **Abstract**

The occurrence of harmful algal bloom caused by dinoflagellates has become a serious problem in the coastal waters of Bolinao, Pangasinan. Hence, this study was conducted to determine the density and diversity of dinoflagellates in the four coastal zones of Bolinao coastal waters, namely: Ecotourism Zone, Multiple-Use Zone, Fishery Management Zone and Trade and Navigation Zone. Phytoplankton samples were collected in the four coastal zones using an 80- $\mu$ m plankton net and were subjected to qualitative and quantitative analysis using a Sedgewick Rafter Counting Chamber.

Results of the study showed that there were two groups of phytoplankton identified in the four coastal zones of Bolinao, namely: dinoflagellates (Phylum Pyrrophyta) and diatoms (Class Bacillariophceae: Phylum Chrysophyta). The calculated mean density was 71.9 organisms/ml. Of the 71.9 phytoplankton, 17.94% was dinoflagellates and 82.06% was diatoms. In terms of Shannon's index of diversity (H), the Multiple-Use Zone has the most diverse species of dinoflagellates (H=0.67), followed by the Ecotourism Zone (H=0.56), Fisheries Management Zone (H=0.54) and Trade and Navigation Zone (H=0.45). The same trend was observed in the Pielou's index of evenness (E). The highest index of evenness was observed in the Multiple-Use Zone (E=0.86), followed by the Ecotourism Zone (E=0.71), Fisheries Management Zone (E=0.69) and Trade and Navigation Zone (E=0.58). Among the six species of dinoflagellates, *Ceratium furca*, *Protoperidinium oceanicum* and *Noctiluca scintillans* obtained a higher index of dominance (C) of 0.58, compared to *Pyrodinium bahamense*, *Ceratium incisum* and *Prorocentrum micans* with index of dominance (C) of 0.37, 0.26 and 0.26, respectively.

Keywords: Dinoflagellates, Coastal Zone, Species Density and Diversity

## **WATER QUALITY STATUS OF BINMALEY RIVERINE SYSTEMS AFTER THE DISMANTLING OF FISH PENS**

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### **Abstract**

The study was conducted to determine the impact of the dismantling of fishpens to the water quality of Binmaley Rivers. Specifically, it aimed to: (1) determine the socio-demographic and socio-economic profile of the respondents of the study; (2) determine the physico-chemical characteristics of the water quality of Binmaley river after the dismantling of fish pens, in terms of water depth, salinity, temperature, total suspended solid, pH, dissolved oxygen, turbidity, biological oxygen demand (BOD); (3) determine nutrients concentrations of the river water in terms of phosphate, ammonia, nitrite; (4) determine the plankton density and composition in the study area; (5) compare the water quality condition of the river water before and after the dismantling of fish pens; and (6) compare the amount of fish species caught before and after the dismantling of fishpen. Water quality analyses were done from October to December 2007 in the designated eight brackishwater rivers of Binmaley. The fisherfolks who served as the respondents had age bracket of 14 to 76 with an average of 39 years

Results of the study showed that Binmaley rivers had a depth of 4.42 m, temperature of 28.3 °C., turbidity of 1.84 m., total suspended solids concentration of 0.85 mg/l., Ph of 7.65, salinity of 8.08 ppt., dissolved oxygen concentration of 4.77 mg/l., nitrate concentration of 0.0963 mg/l, 0 mg/l ammonia concentration and phosphate concentration of 0.7075 mg/l. Binmaley Rivers have phytoplankton mean density of 110 organisms/L. Statistical analysis shows that water depth, pH, and dissolved oxygen, nitrite and phosphate concentrations were not significantly affected by the dismantling of fishpens in Binmaley Rivers. There is a decreased catch of the following species: *Scathopagus argus*, *Chanos chanos*, *Glossogobius giurus*, *Scylla serrata*, *Oreochromis sp* and *Alpheaus euprosyn*.

Keywords: Water Quality, Fishpens, Brackishwater Rivers

## **POLLUTERS AND WATER QUALITY OF CEBU CITY RIVERS**

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### **Abstract**

The study was conducted to determine the water quality of the Palma river in Cebu City and the main causes of the river's severe water pollution. Laboratory technique and Contingent Valuation Method (CVM) were used in this study, with the Barangay officials and purok leaders as trained respondents. The findings revealed that the waters of the river had opaque to black color emitting bad odor; a pH value of 7.4; Dissolved Oxygen at zero (0); BOD at 150 mg/L; TSS at 27 mg/L; temperature at 29°C. Soil of the river bed is black. Waste disposal practices of riverbank residents (95%) and industries and commercial establishments (5%) within the runoff area were the causes of pollution of river water. The major source of waste water discharges that directly drains into the river were residential, commercial, and industrial effluence. Sickness occurrence per year per were fever (22% of the households); cough and colds (27%); allergies (9%); asthma (8%). Respondents were not aware (80%) on what a waste treatment facility is. Respondents were willing to pay an amount of PhP50.00 a month as charge per household for wastewater treatment fee based on the volume of water consumption gauged on Metropolitan Cebu Water District meter system. Policy for the tariff system shall be necessary.

Keywords: pollutants, environment, contingent valuation method

**PHYSICOCHEMICAL PROFILING OF BAY-WATER AND SEDIMENT IN CANSAGA BAY, CEBU, PHILIPPINES**

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**Abstract**

Physicochemical profiling of Cansaga Bay, Cebu, Philippines has been carried to assess bay water and sediment for potential biological contamination. Determined site include outflow bay area (Site 1: 10°20'56.44"N/123°58'10.32"E), inner bay area (Site 2: 10°22'00.67"N/123°58'21.56"E), and control (Site 3: 10°22'15.19"N/124°00'41.03"E). Assessed parameters include dissolved oxygen (DO), pH, salinity, temperature, phosphates (PO<sub>4</sub><sup>3-</sup>-P), ammonia (NH<sub>3</sub>-N), and heavy metals (chromium (Cr), lead (Pb), and cadmium (Cd)). Phosphates were found not to differ significantly (p>0.05) however with higher concentration in Site 2 (0.388047 mg/L). Ammonia were found to differ significantly (p<0.05) with elevated concentration in Site 1 (0.444308 mg/L). Metals found in bay-water showed variability among study sites and can be ranked in the following order: Cd>Cr>Pb. Concentrations of Cd in all sites and Pb in Site 2 failed to meet the DENR-Class SC national regulation. Likewise, determined metals in sediments can also be ranked in the following order: Cr>Cd>Pb with notable levels in Site 1. Other parameters showed potential pollution load in Site 1 brought by anthropogenic factors. It is, however, recommended to conduct further monitoring to ensure environmental quality in the area.

Keywords: bay-water, sediment, and physicochemical

**CUSTOMIZED AQUATIC INFORMATION SYSTEMS: THE EXAMPLE OF NAEIS AND OTHER SITE-SPECIFIC DATABASES**

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**Abstract**

In fisheries resources management, there exists a demand for site-specific databases that compile a comprehensive set of information specific to aquatic ecosystems, and likewise take advantage of internet-based developments such as online information systems. We introduce the National Aquatic Ecosystems Information System (NAEIS), a prototype site-specific fisheries resources-oriented information system. The NAEIS features an encoding interface that allows the organization of biological-, ecological-, socioeconomic and governmental information and consolidates these into thematic reports in the form of listings and profiles of ecosystems, species and projects. These reports are scalable from a specific aquatic ecosystem to different geopolitical levels. The NAEIS also shows the benefit of linking to other databases and information systems to improve access, coverage and quality of information. In particular, the need for fish-related information makes use of FishBase ([www.fishbase.org](http://www.fishbase.org)). The NAEIS offers the opportunity to generate new information or make useful correlations from the compiled data, made possible because of the wide range of information consolidated within the NAEIS. The NAEIS was developed as a proof-of-concept to show that complementary sources and types of information can be organized in a customized and modular format appropriate to local fisheries situation so that fishing communities, along with their resource managers or planners, can use these to their geographic area of management responsibility. It also used to demonstrate the capacities of the FishBase Information and Research Group (FIN) in developing aquatic information systems. Other customized information systems developed based on the concept of the NAEIS are also presented.

Keywords: Information systems, databases, aquatic ecosystems, FishBase

## **FISHBASE TOOL FOR ESTIMATING LIFE-HISTORY PARAMETERS**

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### **Abstract**

Life-history parameters such as growth, maturity and mortality are important for the management of fish populations. However, estimates for these parameters are lacking for the majority of fish species known to be used by humans for various purposes and those indirectly impacted by human activities. The FishBase website ([www.fishbase.org](http://www.fishbase.org)) provides a tool for estimating life-history parameters using the ‘best’ available data in the database as default values for various equations. This tool could be especially useful in species-rich but data-poor situations such as the case with many tropical countries like the Philippines.

Keywords: Life-history parameters, FishBase, estimation

## **AQUAMAPS: PREDICTIVE MAPS FOR MODELLING THE NATURAL RANGE OF MARINE SPECIES**

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### **Abstract**

We introduce AquaMaps, an ecological approach to modelling the native distribution of aquatic species based on their environmental tolerances. For marine species in particular, estimates of environmental tolerances (environmental envelopes) are derived from the integration of species habitat usage information in FishBase and SeaLifeBase, species occurrence data from GBIF, and global environmental data sets for bathymetry, sea temperature, salinity, primary production and distance to land. The environmental envelopes are used to identify areas within the known range of a species where conditions are suitable for it occur, and to compute the relative probabilities of species occurrence in an area. These probabilities are rendered in color-coded species distribution maps with 0.5° latitude x 0.5° longitude cell resolution. AquaMaps also handles cross-species mapping to produce biodiversity maps. The model uses observed and modelled environmental conditions to generate maps that predict current and future (IPCC SRES A1B) scenarios of species distributions. Such maps are useful in understanding patterns in

species distributions, in identifying marine biodiversity hotspots, and in characterizing potential shifts in marine biodiversity in relation to global climate change. We present examples for such applications based on our analysis of AquaMaps predictions for marine species in Southeast Asia.

Keywords: AquaMaps, FishBase, SeaLifeBase, ecological modelling, climate change

## **IDENTIFYING CURRENT AND POTENTIAL THREATS TO AQUATIC BIODIVERSITY USING FISHBASE, SEALIFEBASE AND AQUAMAPS**

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### **Abstract**

Species introductions is one of the major causes of species extinction, although, some intentionally introduced species have become important in global food security and the ornamental industry among others. Some unintentionally introduced species have also adversely impacted ecosystems before being noticed. Species introductions, coupled with the emerging threat of climate change will dramatically magnify the problem.

Science-based, quantitative and user friendly risk assessments are therefore very important in controlling species entering the country and our ecosystems, as well as in watching for probable problem species. The development of risk assessment tools for aquatic species within FishBase, SeaLifeBase and AquaMaps are therefore contributions to addressing the issue of invasive alien species in freshwater and marine ecosystems before they become problems.

The paper will show the data behind several decision-support tools regarding invasive species using information from FishBase and SeaLifeBase as well as some species distribution maps (using AquaMaps) of emerging potential threats. This also serves as call to participants for information on new entrants into ecosystems.

Keywords: Invasive species, risk assessment, FishBase, SeaLifeBase

**CRYPTOSPORIDIUM SPP. OOCYST CONTAMINATION IN ASIAN CLAM (*CORBICULA FLUMINEA*, MÜLLER) FROM THE SOUTH BAY OF LAGUNA DE BAY.**

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**Abstract**

*Cryptosporidium* spp. is an ubiquitous water-borne parasite that has caused considerable morbidity among human and animal hosts. It is one of the pathogens causing diarrheal diseases in both developed and developing countries. *Corbicula fluminea* collected from the south bay of Laguna de Bay were examined for contamination of *Cryptosporidium* spp. using sucrose flotation and Kinyoun acid fast staining technique. Areas along the south bay of Laguna de Bay which were designated as industrial (Calamba), residential (Los Baños) and agricultural (Bay) were sampled. Prevalence of *Cryptosporidium* spp. oocysts was high in residential and agricultural (44.40%) compared to industrial areas (11.10%) around the south bay. Mean intensity was high in agricultural ( $41 \pm 33.90$ ) compared to residential ( $2 \pm 0.41$ ) and industrial ( $1 \pm 0$ ) areas. Prevalence during the wet and dry seasons were 25.93% and 11.11%, respectively. The mean intensity was also higher during wet season ( $25 \pm 19.77$ ) compared to dry season ( $2 \pm 1$ ). A principal component correlation analysis showed that *C. fluminea* with high contamination of *Cryptosporidium* spp., were found in areas that were slightly alkaline ( $7.80 \pm 0.02$ ), had lower temperatures ( $31.16^{\circ}\text{C} \pm 0.03$ ), with a dissolved oxygen level of  $5.14 \pm 0.42$  mg/L O<sub>2</sub>, and turbidity of  $55.10$  cm  $\pm 0.03$ . More oocysts were also found in agricultural areas with high population of cattle. This study revealed that contamination of *C. fluminea* by *Cryptosporidium* spp. was high during wet or rainy seasons and more prevalent in agricultural and residential areas along the south bay of Laguna de Bay. This study is the first record of *Cryptosporidium* spp. contamination in *Corbicula fluminea* from the south bay of Laguna de Bay.

Keywords: *Cryptosporidium*, Laguna de bay, Asian clam

**POSTER ABSTRACTS..**

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## SPATIAL DISTRIBUTION OF INVASIVE PLANTS IN MANGROVETUM OF DAVAO GULF

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### Abstract

An investigation on the spatial distribution of invasive plants in mangrove forests of Davao Gulf, namely, Bgy. Madaum mangrovetum and Bgy. Tambo mangrovetum was undertaken. Invasive plants were categorized as potentially invasive, moderately invasive and highly invasive based on their density and frequency distribution while intensity of invasiveness was recorded for climber species. Coordinates of the invasive species were recorded using a handheld GPS and analyzed using the ARC GIS software.

Thirteen (13) invasive plants were identified from the two mangrove forests of Davao Gulf. The four highly invasive plants are *Chromolaena odorata*, *Cuscuta spp.*, *Helianthus cucumerifolius* and *Nephrolepis cordifolia*; moderately invasive plants are *Canavalia maritima*, *Chromolaena odorata*, *Derris trifoliata*, *Ipomea pes-caprae*, *Wedelia lobata* while *Acrostichum aureum L.*, *Acanthus ilicifolius*, *Ficus sp.*, *Hibiscus tiliatus*, *Lantana camara*, was found to be potentially invasive in mangrove forests. In both sampling areas, the following species are spatially distributed, namely, *Acrostichum aureum L.*, *Derris trifoliata*, *Ipomea pe-caprae*, *Helianthus cucumerifolius* and *Wedelia trilobata*. On the other hand, *Canavalia*, *Cuscuta sp.* and *Hibiscus tiliatus* dominate in Bgy. Madaum mangrove forest while *Acanthus*, *Chromolaena*, *Lantana*, *Ficus* and *Nephrolepis cordifolia* are found in Bgy. Tambo.

Four climber species were found to infest its host mangrove trees and associated species wherein *Cuscuta spp.* severely affected its host followed by *Canavalia maritima*, *Ipomea pes-caprae*, *Derris trifoliata* moderately affected its host.

Keywords: invasive plants, mangrovetum, spatial distribution

**SOCIO-ECONOMIC, ENVIRONMENTAL, AND LIVELIHOOD PRACTICES OF INDIGENOUS PEOPLE  
RESIDING IN THE VICINITY OF PARANG-PARANG WATERSHED, SURIGAO CITY,  
PHILIPPINES**

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**Abstract**

This study aimed to determine the environmental and livelihood practices of the indigenous people in the vicinity of Parang-Parang Watershed, Surigao City. This also endeavored to determine the profile of the respondents. The significant difference on the practices of the respondents when grouped according to their profile variables was also measured. There were 166 indigenous people in the vicinity of Parang-Parang Watershed, Surigao City who served as the respondents of the study. A researcher-made questionnaire was utilized to gather data from them. Results were analyzed and interpreted using appropriate statistical tools like Frequency Count and Percentage, Mean, One-Way Analysis of Variance (ANOVA), and Scheffe' Test.

It was found out as revealed from their profile that the most respondents are living in the vicinity of Parang-Parang Watershed, Surigao City for less than 11 years, non – elementary graduate or uneducated, engaged in farming and making charcoal, have 2 or more members in the family, with unstable shelter. The respondents describes as Much Practiced their engaging in desirable activities for their health and sanitation, culture and religion, livelihood and peace and order. The indigenous people in the vicinity of Parang-Parang Watershed, Surigao City have settled in the place for quite a long time, do farming and make charcoal for a living, but they do not have stable shelter, uneducated, and have big family size. They have healthy and hygienic living. They also have rich culture and are religious people. They are entrepreneurs in small-scale, used fertilizer for farming, and sorted trees that were down but they less engaged in reforestation, gold mining, and tree cutting. Farmers and beggars have better health and sanitation practices than those who do nothing for a living. Also, those who make charcoal are more inclined to observe their culture and religion than others; they also have better livelihood practices and peace and order practices than those who were engaged in doing small scale business. Those who are living along the watershed are less concerned to health and sanitation, culture and religion.

Keywords: Socio-economic, environmental, livelihood practices, indigenous people, watershed

**DISTRIBUTION OF FERNS (*Pteridophyta*) IN MANGROVE FOREST OF BRGY. MADAUM, TAGUM CITY, DAVAO DEL NORTE**

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**Abstract**

A study was conducted on ferns that inhabit mangrove forest of Brgy. Madaum, Tagum City. Ferns species on the said barangay were identified. Sampling station was laid across the shoreline landward and seaward in 300 meter transect of 15 quadrats, 20mx20m each with no interval. Coordinates of the sampling area were also recorded. Its diversity was determined by Simpson’s Index, population density, relative density, frequency and relative frequency. The species were also classified as highly invasive (HI), moderately invasive (MI), potentially invasive (PI), and naturally occurring (NO) through its frequency and density.

Six ferns species were identified, namely, *Drynaria quercifolia*, *Acrostichum aureum*, *Nephrolepis exaltata*, *Microsorium diversifolium*, *Microsorium scandens*, *Pyrosia sp.*. There were no species that are highly invasive; moderately invasive was *Nephrolepis sp.*; potentially invasive were *Acrostichum aureum* and *Drynaria quercifolia*; and there were three (3) species that are naturally occurring, *Microscum diversifolia*, *Microscum scandens*, and *Pyrosia sp.*. The species having the highest density was *Nephrolepis s.p* with density value of 0.29 followed by *Acrostichum aureum* with 0.06 density value, while *Pyrosia sp.* got the lowest density of 0.0005. In terms of frequency, *Nephrolepis sp.* and *Drynaria quercifolia* got the highest value of 0.53 and 0.47 respectively and both *Microsorium diversifolium* and *Microsorium scandens* got the lowest value of 0.067. The most diverse in the area was *Nephrolepis exaltata* (0.65) followed by *Acrostichum aureum* (0.028). In the totality, based on Simpson’s Index, *Pteridophytes* has a low rate when it comes to its diversity.

Keywords: Ferns, Pteridophytes, invasive plants, mangrove associate species.

**MEIOTIC CHROMOSOMES AND SEXUAL DIMORPHISM OF THE GIANT PHILIPPINE FROG  
*LIMNONECTES MAGNUS* IN MARAWI CITY, MINDANAO ISLAND, PHILIPPINES**

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**Abstract**

*Limnonectes magnus* has been classified as a near threatened species, and the scientific name as applied to both Philippine and Sulawesi taxa is a taxonomic arrangement that is being considered for revision. Unfortunately, information about the karyology and phenotypic variation of the surviving *L. magnus* populations in the Philippines is scarce. Samples were collected from the grounds of the Mindanao State University in Marawi City, Lanao del Sur, and then sexed based on the presence of vocal sacs in males. Chromosome spreads from the testes of ten males were prepared using squash technique, stained with acetoorcein, and analyzed microscopically. An abundant sample of metaphase I spreads were obtained but chromosome spreads from spermatogonia and secondary spermatocytes were few and unanalyzable. A modal number of 12 bivalents was observed in primary spermatocytes, and two terminal chiasmata were observed in most of the bivalents. The results indicated that the diploid karyotype of the examined frogs consists of 24 chromosomes. Ten male and ten female samples were compared with regard to snout-vent length (SVL), width of lower jaw, interorbital distance, head length, width of tympanum, circumference of thickest part of the foreleg, length of the inner finger, skin color pattern, dorsal skin texture, and nuptial pad texture. A t-test of the absolute sizes of the measured features, and of relative sizes (relative to SVL), revealed that males have relatively wider lower jaw and interorbital distance than females. No differences were noted about dorsal skin and nuptial pad texture, but females have a characteristic dark brown color on the lateral sides of the trunk from the shoulders to the hips that is absent in males.

Keywords: *Limnonectes magnus*, Giant Philippine frog, meiosis, karyotype, sexual dimorphism

## THE INDIGENOUS KNOWLEDGE OF WILD PLANTS USED AS VEGETABLES BY PALAW’AN AND TAGBANUA TRIBES IN PALAWAN, PHILIPPINES

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### Abstract

Indigenous vegetables have a definite role in extenuating hunger, micronutrient deficiencies, preventing many ailments, as well as leading to less seasonality in vegetable production. They provide an additive or complementary asset that allows farmers to diversify into new business areas and consumers to increase their choice of healthy food. Research and development activities have to be initiated for the conservation and utilization of these important natural treasures to alleviate hunger and malnutrition. Thus, this initial study was initiated to document the indigenous vegetables utilized by the Palaw’an and Tagbanua tribes in Palawan and the common menu prepared for these indigenous vegetables.

Results showed the following indigenous vegetables utilized by these tribes: *Achyranthes aspera* L., *Dioscorea species*, *Hibiscus sabdarifa* L., *Talinum triangulare*, *Celosia argentea*, *Abelmoschos manihot*, *Glycosmis pentaphylla*, *Micromelum compressum*, *Amaranthus spinosus*, *Gnetum gnemon*, *Zingiber zerumbet*, *Daemonorops curanii*, *Bauhinnia malabarica* Roxb. *Sesbania grandiflora*, *Diplazium esculentum* (Retz.) SW, *Barringtonia racemosa* L. *Arenga ambong* Becc. *Capsicum frutescens*, *Ceiba pentandra*, The common plant parts utilized are the leaves, stem flower, rhizome, tuber, shoots, and pith among others. While the common preparation of food are: mixed with other vegetables in preparation of Mungbean, stewed with fish or meat. boiled, and steamed among others

Keywords: indigenous knowledge, Palaw’an, Tagbanua

## **SURVEY OF JATROPHA SPECIES IN PALAWAN AS AN ALTERNATIVE SOURCES OF ENERGY**

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### **Abstract**

Palawan is endowed with rich phyto-diversity that includes the introduced plants of *Jatropha* species. There are about 160 species reported in the tropics of both hemispheres and 5 in the Philippines. These are the species of *Jatropha podagrica*, *J. hastata*, *J. gossyfolia*, *J. multifida* and *Jatropha curcas*. This study was conducted to determine the *Jatropha* species present in Palawan and to determine their potential if these can be a good source of energy and find out their geographical location in Southern, Palawan.

The study revealed that the five species of *Jatropha* in the Philippines are all present in Palawan. *Jatropha podagrica* commonly sold in the ‘tabuan’ which are mistakenly identified as ginseng. It is commonly cultivated as ornamental while others used it as medicinal plant. *Jatropha hastata* an ornamental plant used in landscaping in homes, in Puerto Princesa City Airport and even along highways. *Jatropha gossyfolia* are commonly found in wastes places. *Jatropha multifida* is cultivated as ornamental and at the same time as medicinal. Others claimed it is a seven finger *Cannabis sativa*. Lastly, *J. curcas* commonly planted as plantation crop in Southern, Palawan because of its oil content, as fence and for medicinal purposes.

Keywords: *Jatropha*, Palawan, alternative source of energy

## **A GIFT OF NATURE ... JOB’S TEAR IS ... A GOLDEN TREASURE**

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### **Abstract**

Job’s tear (*Coix lacryma-jobi* Linn.) which folks in Benguet, Philippines call in various local names as “adlay”, “ag-gey”, “tigbi”, “takay-an”, “takjan”, etc’. was found dwindling in population and now, rarely seen growing in the wild. Interviews with the rural folks would always get

comments “that before there are still many of this plant, but now it’s almost gone” The reasons include: farmers would weed out especially when they find the plant growing in their rice paddies, and that they would gain more if they plant other valuable crops. Belonging to the same family where rice, corn, barley, sorghum, and oat belong, i.e. Family Poaceae, job’s tears (the plant’s English name) is known to have a wide array of uses, but the economic potential has been poorly addressed, thus its value is confined mostly to traditional or local uses only. This study conducted from September 2008 – October 2010 documented two types of job’s tear- the cultivated and wild type. The former is used as food (e.g. cooked as porridge, as coffee, or as wine), or cure to ailments like wounds, blisters, urinary tract infections, etc., while the latter is made into ornaments (e.g. earrings, bracelets, rosaries, bags, curtains). A recent novel finding was that the roots of *Coix* are so durable that these can also be made into rope or bags. Also found to be nutritious, job’s tears can be used as a supplement or even a reliable substitute to rice which is the staple food of many people in the world. Livelihood trainings taught mostly women attendees, on making eco-friendly novel products and their products were showcased during fairs and exhibits. Food products made from the university bakery such as biscuits, and variants of bread made from *Coix* flour were subjected to taste tests, after which the most liked product was analyzed for nutritional contents. These activities intend to increase awareness on the importance of the plant; policy initiatives just like what was did with rice, sorghum, or that of the popular *jatropha* are deemed necessary to enhance productivity and sustainable development of job’s tears, necessary in empowering and helping people bolt out of poverty and hunger. It would then be subsequently inherent to protect and conserve job’s tear because people know that their livelihood and survival depend on the plant.

Keywords: Job’s tear, Benguet Philippines, food security, economic empowerment

### **INFLUENCE OF SALT CONCENTRATION ON THE FERMENTATION RATE OF FISH SAUCE FROM ANCHOVIES, *Stolephorus spp***

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#### **Abstract**

Good quality fish sauce produce from anchovies (*Stolephorus spp*, Family *Engraulidae*) that had

been allowed to ferment with 15% salt concentration at room temperature for two months with the application of low temperature processing during the preparation process. Fish sauce from anchovies with 15% salt concentration has 60 days of fermentation period to attain the percent solids of 32% (FDA standards) based on simple linear regression analysis. This product was significantly different from fish sauce with 30% salt concentration based on t-test at 5% level of significance. It contained 82.2% moisture, 0.94 Aw, 15.1% protein, 0.4% fat and 1.40% ash content. The results of the descriptive and preference tests of fish sauce with 15% salt concentration gave the significant difference results as to its flavor for descriptive tests and acceptability test based on t-test at 5% level of significance. The product has a light brown color, moderately salty flavor, fishy odor and soft texture. The bacterial count was  $1.04 \times 10^4$  cfu/g, figure not greater than and falls within the range of  $10^4$ - $10^6$  cfu/g for the total number of organisms. Thus, fish sauce with 15% salt concentration is safe for human consumption.

Keywords: Fish sauce, Fermentation, Fisheries

#### **PROCESSING OF FRIGATE MACKEREL *Auxis thazard* : GENDER ROLE ON PRODUCT SAFETY**

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#### **Abstract**

*Tinap-anan* from *Auxis thazard* served as main livelihood of the Danao City fish ports vendors. This is a hot smoked frigate mackerel with a very tasty and juicy foodstuff with a shelflife of 3 days at ambient temperature and 5 days in a refrigerating condition. In 1985, the Cebu Technological University Carmen Campus faculty-researcher tried to innovate another hot smoking process of this commodity however the traditional process still prevail due to its high cost of equipment. Thus the researcher monitors the safety of the *tinap-anan* in terms of histamine content. In 1995 research on histamine content level with time of processing, the researchers found out that the product, which was processed based on traditional processing were safe for human consumption. These products were processed by approximately 30 Danao City processors. The study investigated the gender role on product safety, since the present processors are already the children of the traditional processors. Eighty two percent (82%) of the processors are female and 18% are male. The female processors are the one who market the product through retail store and direct selling basis, while the male processor are the one who purchased the raw materials from the fish ports. The Cebu Technological University technology researchers aim to refresh the results of the histamine level with time of processing

to the new processors’ generation and observe the good manufacturing practices since the Local Government Unit of Danao City, Philippines provides the new state of the art preparation and smoking area to the new processors that are adjacent to the new established fish port.

Key words: *Auxis thazard*, Cebu Technological University, fish postharvest

### **PRODUCT SAFETY IN PROCESSING OF FRIGATE MACKEREL *Auxis thazard***

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#### **Abstract**

*Tinap-anan* from *Auxis thazard* served as main livelihood of the fish port vendors in Danao City, Philippines. This is a hot-smoked frigate mackerel highly acceptable to the Filipino palate which has a shelf-life of 3 days at ambient temperature and 5 days in a refrigerated condition. In 1985, the Cebu Technological University Carmen Campus faculty-researcher tried to innovate another hot smoking process of this commodity however the traditional process still prevail due to former’s high equipment cost. Thus, the researcher monitored the safety of the *tinap-anan* in terms of histamine content. In 1995, research on histamine content level relative to stock-time prior to processing was conducted. The researchers found out that the *tinap-anan*, which was processed by 30 respondents based on traditional method, were safe for human consumption. The study also investigated the gender role on product safety, since the present processors are already the children of the traditional processors. Eighty two percent (82%) of the processors were female and 18% were male. The female processors marketed the *tinap-anan* through retail stores and direct sales basis, while the male processors purchased the raw materials from the fish ports. The CTU technology researchers aimed to refresh the results of the study on histamine level relative to stock-time prior to processing with the new generation processors and observed the good manufacturing practices since the Local Government Unit of Danao City, Philippines provided a new state-of-the-art preparation and smoking area to the new processors that is adjacent to the new established fish port. The study revealed that good manufacturing practices were fully observed by the processors due to the assistance of the local government unit.

Keywords: *Auxis thazard*, Cebu Technological University, fish postharvest

### **CLEAN TECHNOLOGY OF *Cocos nucifera* MEAT**

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#### **Abstract**

Clean technology applies to the complete utilization of a particular material like coconut *Cocos nucifera* meat. *Cocos nucifera* meat is a source of virgin coconut oil using cold process, as food supplement, personal care products emulsifier and biodiesel, an alternative fuel. The water component extracted during virgin coconut oil extraction process were utilized into vinegar and “sapal” was processed into dessicated coconut, which is used as one of the ingredients for culinary products particularly cookies and pastries. The coconut meat weighing five kilograms of coconut meat yielded 15% virgin coconut oil as food supplement, the first extract; 15% virgin coconut oil intended for personal care products, second extract, which is utilized as one of the reagents in commercialized liquid hand wash, transparent shampoo and VCO cream; and 1% virgin coconut oil as third extract which is for an alternative fuel, biodiesel which is colorless, moderate biodiesel odor and free from lead content as per laboratory analyses. The virgin coconut oil by by-products such as water and “sapal” are utilized into vinegar with 50% rate of production and crumbs for “calamares” and chicken lollipop containing 50% dessicated coconut added to all purpose flour.

Keywords: clean technology, coconut, virgin oil, hand wash, vinegar, crumbs

### **EFFECTS OF MAYONAISE CONCENTRATION ON THE ACCEPTABILITY OF HYBRID TILAPIA *Oreochromis spp* AND FLYING FISH *Parexocoetus mento* SPREAD**

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#### **Abstract**

Fish spread is a convenience product from hybrid tilapia, *Oreochromis spp.* and flying fish, *Parexocoetus mento*, V. with calamansi, mayonnaise, sugar, salt, pemiento and pickle relish. The newly processed tilapia spread is composed of 38.0% moisture, 17.1% protein, 18.66% fat, 1.00% ash and 25.24%

carbohydrate content, while flying fish spread contains 33.0% moisture, 18.7% protein, 13.00% fat, 2.50% ash and 32.80% carbohydrate content. The distinct flavor of hybrid tilapia and flying fish is removed by dehydrating the fish flakes with calamansi extract, then mixed with 40% mayonnaise content to produce fish spreads with the required fat content level of bottled products. The most preferred hybrid tilapia spread has a light brown color, slightly sweet flavor, fishy odor and very tender texture. Hybrid tilapia spread contains bacterial count of  $1.64 \times 10^3$  cfu/g for the total number of organisms which meets the microbiological standards. The newly formulated flying fish spread has the same acceptability to that of commercial tuna spread and formulated milkfish and tilapia spread. The insignificant results of the product's sensory scores both in descriptive and preference tests to 5% level of significance using Analysis of Variance (ANOVA) revealed that flying fish is a potential raw material for fish spread production. The flying fish spread contain standard plate count of  $9.01 \times 10^2$  cfu/g that meets the microbiological standards.

Keywords: Fish spread, Cebu Technological University, Postharvest

### **SPATIAL DISTRIBUTION OF EPIPHYTES IN MANGROVE FOREST OF BARANGAY TAMBO, BABAK, ISLAND GARDEN CITY OF SAMAL (IGACOS)**

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#### **Abstract**

Epiphytes as well as their orientation and spatial distribution were studied in the mangrove forest of Brgy. Tambo, Babak, Island Garden City Of Samal (IGACOS). Presence of invasive species in the area was also determined. For random sampling, three imaginary lines were followed and every other five (5) mangrove tree (*Sonneratia alba*) was observed for the presence of epiphytes. Epiphytes observed were taken a photograph for species identification. Coordinates of mangrove tree hosting epiphytes were also recorded to determine epiphyte spatial distribution in the forest. The coordinates were plotted and analyzed using ARC-GIS software to present the spatial distribution of epiphytes on the research area map. Results showed that Pteridophytes (ferns) such as *Nephrolepis cordifolia*, *Nephrolepis biserrata*, *Microsorium scolopendria*, *Pyrrosia adnacens* C. Presl., *Davallia hymenophylloides* and *Drynaria quercifolia*, were the most prominent epiphytes in the mangrove forest. Other epiphytes found were mosses, fungi, *Ficus sp.* (hemi-epiphyte) and *Angraecum sp.* (an orchid) which is a significant find of the study. Presence of epiphytes on mangrove trees was observed at the height of 1m up to 6m (understory area). Of the epiphytes present in the mangrove forest, *Nephrolepis cordifolia*, was identified to be invasive.

Keywords: Epiphyte, spatial distribution, mangrove

**COASTAL FOREST PATCH IN RASA ISLAND: A CRITICAL SUPPORT OF THE ENDANGERED PHILIPPINE COCKATOO (*CACATUA HAEMATUROPYGIA*)\***

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**Abstract**

Being the home of the critically endangered Philippine cockatoo (*Cacatua haematuropygia*), Rasa Island in Narra, Palawan is one of the most important sites for conservation. The mangrove and the coastal forests therein serve a critical support of the wildlife inhabitants in the island. A survey was done in the coastal forest of Rasa Island to document the plant species in the area.

At least 68 plant species, believed to be the primary food of the Philippine cockatoo and other wildlife in the island are found in the coastal forest area. There were huge stands of *Garuga floribunda* Decne var. *floribunda* which served as the primary nesting trees of the critically endangered bird. At least 1 Palawan and 1 Philippine endemic species are encountered and 2 and 4 species are included in the different threatened categories of the 2007 IUCN Red List and in *Fernando et al. (2008)* and *Sopsop & Buot (2009)* lists, respectively.

Keywords: Coastal forest patch, Critical support, Rasa Island, Plant species, Philippine cockatoo, Palawan

**INTRODUCED MARINE INVERTEBRATE SPECIES OF THE SOUTH CHINA SEA: A NEED FOR  
INFORMATION**

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**Abstract**

The South China Sea is a highly diverse ecosystem situated between countries such as China, Malaysia, Philippines and Vietnam. With its numerous ports and busy ship traffic, this region is suspected to be a major source of invasive species and highly susceptible to biological invasions. Our records in SeaLifeBase ([www.sealifebase.org](http://www.sealifebase.org)) however, show very little data for this region. This paper focuses on the introduction of non-fish marine organisms to the South China Sea and aims to identify if there are indeed gaps in invasion information for countries in this region. Factors such as number of researches, social and economic well-being and GDP among others will be studied. A comparison between these factors and the density of introduced species for each country will help establish whether or not there is a lack of information for the said region.

Keywords: South China Sea, SeaLifeBase, marine introductions

**ISDA.MOBI: A MOBILE PHONE INTERFACE FOR SMALL-SCALE FISHERS TO ACCESS FISHERIES-RELATED INFORMATION**

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**Abstract**

One of the goals of this project was to empower fishing communities comprising the base of the pyramid by disseminating fisheries management and conservation information and capturing traditional knowledge and occurrence data from the field. The innovative strategy by which this goal was achieved was done through the use of the mobile phone technology.

Eight fisherfolks belonging to the Bantay-Dagat group in San Juan, Batangas, Philippines were trained to use the mobile phone to access fisheries-related information in FishBase ([www.fishbase.org](http://www.fishbase.org)) through an interface developed for the mobile phone. The concept of fish size at maturity was used as a springboard to illustrate and instruct fish conservation and management methods to a pool of fisherfolks. Taking pictures of fishes using the mobile phone produced significant social impact as well as valuable scientific data, e.g. total length (cm) and common name of each fish.

Knowledge shared to the fisherfolks gave them a wider understanding of the social issues surrounding fishing policies and practices, e.g. catching juvenile fishes. Improved self-esteem and increased self-confidence were observed among the participants as they became aware of the role they played in fisheries conservation and management through what is known as Citizen Science.

The use of the mobile phone as a means to educate and empower those who lack training is clear evidence that technology is not preferential. Innovation done on the mobile phone pushes information access to a new level and translates conservation science into conservation practice (Robinson 2006).

Keywords: innovation, technology, conservation

**THE CATALOGUE OF LIFE: BIODIVERSITY INFORMATION AT THE CLICK OF A MOUSE.**

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**Abstract**

The Catalogue of Life is the most comprehensive and authoritative available global index of species. It consists of a single integrated species checklist and taxonomic hierarchy published quarterly on the web, annually on DVD and as electronic web-services. The content of the Catalogue is supplied by an array of about 100 expert taxonomic databases worldwide with contributions from over 3,000 taxonomic specialists.

The creation of the Catalogue of Life is co-ordinated by the Species2000 Secretariat at University of reading, UK, working closely with the Integrated Taxonomic Information System in the US, the Royal Botanic Gardens Kew (Plants), the World Register of Marine Species (Marine), FADA (freshwater); the SpeciesFile Cluster, Species Dipterorum, NHM London, MNHM Paris, CSIC Madrid (Insects), the Fungi cluster, AlgaeBase, as well as many individual global species databases including FishBase. Software development is being led by the University of Cardiff and ETI Bioinformatics while data assembly and compilation is being done in the Philippines since 1998.

The 2011 Annual Checklist contains 1,347, 224 species, 92,306 infraspecies, 895, 441 synonyms and 366, 401 common names covering plants, animals, fungi and micro organisms. This is probably just 2/3 of the world’s known species. This means that for many groups it continues to be deficient. Albeit the gaps, the catalogue can still be a valuable tool for the management of species and ecosystem information in megadiverse countries like the Philippines. Constant efforts to complete the list are ongoing and collaboration from all over the world is encouraged.

Keywords: database, biodiversity information, catalogue

## **SOUTH CHINA SEA SPONGES IN SEALIFEBASE: A REVIEW<sup>1</sup>**

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### **Abstract**

SeaLifeBase, an information system for marine invertebrates, presents 792 sponge species occurring in the South China Sea ecosystem. Making use of available published literature, including expedition reports published in the late 19th century, SeaLifeBase was able to come up with the an extensive taxonomically-checked South China Sea sponge checklist to date. Information gaps among the listed species were determined to identify the amount of information SeaLifeBase currently contains. Completing species lists in a given region, in this case the South China sea, would be valuable in future ecosystem modelling and management plans.

Keywords: South China Sea, SeaLifeBase, Porifera, sponges

## **MOLLUSKS IN THE MANGROVE REHABILITATION AREAS IN WESTERN PANGASINAN, PHILIPPINES**

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### **Abstract**

Mollusks are predominantly found in mangrove ecosystems. Nowadays, however, mollusks are declining due to habitat disturbances particularly in western Pangasinan by dams, pollutions and indirectly from the abuse of terrestrial habitats. This study on mollusks was conducted in Western, Pangasinan, the coastal part of the province with mangrove rehabilitation projects under Community Based Forest Management Agreement. Four mangrove rehabilitation areas were looked into: Pilar and Victory, Bolinao; and Awile and Tori-tori, Anda, Pangasinan. Purposive sampling was done in selecting the mangrove rehabilitation areas and ten percent sampling of the said areas using the belt transect quadrat method was employed. Within the 10m x 10m quadrat, three 1m x 1m quadrat equally distributed were established as mollusks plots. A field guide to the identification of Philippine mollusks was brought and unidentified ones were referred to the fisherfolk. Diversity, dominance, richness and

evenness indices for mollusks were determined. Mann whitney test at 0.05 level was used in comparing mollusks diversity between two study sites (Awile and Pilar) with less than 30 sample plots. Student’s t-test at 0.05 level was employed in comparing mollusks diversity between two study sites with more than 30 sample plots. Moreover, Kruskal wallis test was used in comparing mollusks diversity among four study sites. A total of fourteen kinds of mollusks species were identified. The species were *Tectus fenestratus* (fenestrate top), *Terebralia sulcata* (Sulcate swamp perith), *Haliotis ovina gemelin* (oval abalone), *Nerita planospira anton* (flat spired nerite), *Clithion oualensis* (dubious nerite), *Fasciolaria trapezium* (trapezium horse conch), *Nasarius pullus* (ribbed dog whelk), *Trochus maculatus* (maculated top), *Rhinoclavis vertagus* (Common vertagus), *Telescopium telescopium* (Telescope Snail), *Isognomon ephippium* (saddle tree oyster) *Crassostrea iredali* (slipper oyster), *Strombus labiatus* (Plicate conch) and *Polymesoda expansa* (Yellowish mangrove clam). The highest mollusks species diversity and richness indeces were observed in Victory, Bolinao. Mollusks species dominance and evenness indeces were highest in Pilar, Bolinao and Tori-tori, Anda, respectively. The study revealed a significant difference in the probability of gathering mollusks species in the four mangrove rehabilitation areas. It is recommended that fisherfolk be educated about the need for mollusks conservation and habitat protection. Identification of the mollusks species under threat and survey should be intensified to determine the distribution of species, population, communities, their economic potentials and categorization.

Keywords: species diversity, dominance, richness and evenness