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		<p>Philippines ⁴Associate Professor, Graduate School of Humanities and Sociology, University of Tokyo, Japan *noelbatz62@yahoo.com</p>
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ABSTRACTS

ABUNDANCE AND COMPOSITION OF FISH LARVAE CAUGHT BY LIGHT TRAP AND PLANKTON NET ALONG THE BONGAO CHANNEL, BONGAO, TAWI-TAWI

**Anina Haslee A. Julkanain*, Chrysa Camille B. De Leon,
Richard N. Muallil, Ahalnida M. Tambihasan, Jamrun H. Ebbah**

Mindanao State University Tawi-Tawi College of Technology and Oceanography
Sanga-Sanga, Bongao, Tawi-Tawi, Philippines, 7500
*Rnmuallil2017@gmail.com

Bony fishes generally have pelagic larvae which are carried by ocean currents and settled as far tens of kilometers away from their natal home. Understanding this mechanism is important for successful coastal resource management. In this study, we determined the abundance of fish larvae along the Bongao Channel in Bongao, Tawi-Tawi. For a month, larval fish samples were collected at the Bongao Channel, Tawi-Tawi, using two gears: the light trap and the plankton net. There were 549 larval fishes belonging to at least 15 families. The most abundant family was *Clupeinae* followed by *Pomacentridae*, *Monacanthidae*, *Labridae*, *Apogonidae*, *Pomacanthidae*, *Engraulidae*, *Pempheridae*, *Hemiramphidae*, *Syngnathidae*, *Bleniidae*, *Antennariidae*, *Serranidae*, *Carangidae* and *Leptobramidae*. Catches between the two gears and during different moon phases vary significantly. Fewest larvae were caught during full moon using light trap but catches did not differ significantly among different moon phases using plankton net. Our study showed that the Bongao Channel is a potential settlement area or “sink” of fish larvae. It further shows that artificial light attracts more fish during new moon and coincides with fishing operations of light-assisted fishing gears such as bag nets and purse seines.

Keywords: *Fish Larvae, Bongao Channel, Light Trap and Plankton Net*

AGUSAN MARSH FINFISH: CURRENT TREND, THREATS AND SUSTAINABLE MANAGEMENT

**Geralyn D. Dela Peña^{1*}, Proserpina Gomez-Roxas²,
Rodrigo E. Acuña³ and Renoir A. Abrea²**

¹Institute of Fisheries Research and Development,
Mindanao State University-Naawan, Naawan, Misamis Oriental, Philippines

²College of Science and Environment, Mindanao State University-Naawan,
Naawan, Misamis Oriental, Philippines

³School of Marine Fisheries and Technology,
Mindanao State University-Naawan, Naawan, Misamis Oriental, Philippines
*geralyndd@gmail.com

Agusan marsh is considered as one of the last frontiers in the Philippines due to its unique characteristics. The marsh is used as fishing ground which produces fishes that served as the major source of income and food. Thus, a survey of finfish in Agusan marsh was conducted on November 2012 and January, 2013 through different data gathering strategies such as actual collection of samples, ocular inspection of the fish being sold and key informant interview to determine the status of finfish in the marsh. Collections of samples in the marshy areas of the three municipalities namely, Talacogon, La Paz and Loreto were done using locally-employed methods. Results reveal a total of 34 species; showing an increasing number of fish species present in the marsh. Of these, 15 species are native that have scarce population status and 9 species found only in the present study including *Pangasius sp.*, *Cestraeus plicatilis*, *Yoneichthys criniger*, *Helostoma temminckii*, *Helostoma sp.*, *Mugil cephalus*, *Clarias meladerma* and *Puntius aurotaeniatus*. The resource and its habitat are threatened by the on-going illegal logging and fishing, domestic waste, and agricultural activities in the area. Overall, the Agusan marsh finfishes call for an effective management plan that should encourage the involvement of the community and the government.

Keywords: *Agusan marsh, finfish, native, conservation*

ANTHROPOGENIC ACTIVITIES IN MANDULOG AND ILIGAN CITY RIVER SYSTEMS

Annielyn D. Tampus*¹, Ermelinda G. Tobias¹, Ruben F. Amparado¹, Lydia Bajo², and Astrid L. Sinco³

¹Department of Biological Sciences, MSU-Iligan Institute of Technology, Iligan, Philippines

²Department of Chemistry, MSU-Iligan Institute of Technology, Iligan, Philippines

³Department of Biology, Xavier University, Cagayan de Oro, Philippines

*nyleinnaster@gmail.com

This study encompasses the anthropogenic activities of the Iligan City Riverine systems. Cluster analysis was used to determine the similarity of the sampling sites. Results showed that Bayug and Tambacan formed a cluster and linked Tubod and Pindugangan sampling sites to form the first cluster. These results imply that these areas share similar activities. The cluster formed between Caluda and Abuno sites were connected to another cluster linking Tipanoy, Mandulog, Kapay and Kabangahan to for the second bigger cluster.

Keywords: *Anthropogenic, Cluster Analysis, Mandulog River, Iligan City River*

ARSENIC IMMOBILIZATION IN SECONDARY MINERAL PHASES DURING ACID MINE DRAINAGE FORMATION

**Mylah Villacorte-Tabelin^{*1}, Carlito Baltazar Tabelin², Ryan Corpuz³
and Toshifumi Igarashi²**

¹Department of Biological Sciences, College of Science and Mathematics, Mindanao State University – Iligan Institute of Technology, Iligan City 9200, Philippines

²Division of Sustainable Resources Engineering, Faculty of Engineering, Hokkaido University, Sapporo 060-8628, Japan

³Department of Ceramics, Chemical and Metallurgical Engineering, College of Engineering and Technology, Mindanao State University – Iligan Institute of Technology, Iligan City 9200, Philippines

*mylah.tabelin@g.msuiit.edu.ph

Arsenic (As) is a ubiquitous element in nature whose compounds are toxic even in minute concentrations. It is found at exceptionally high amounts in ore deposits formed by hydrothermal processes where the element is concentrated in arsenopyrite, its primary sulfide mineral, and pyrite, the most common sulfide mineral in nature. Many gold and copper deposits found in the Philippines were formed by hydrothermal alteration closely associated with Late Miocene to Pliocene subaerial volcanism, which means that wastes from medium- to large-scale mining operations have high risks of generating acid mine drainage laden with As. In this study, we investigated the effects of secondary soluble phases and oxides, commonly found in partially weathered mine wastes, on the release of As into solution using batch leaching experiments and the detailed characterization of leaching residues by high-resolution 3D microscopy, scanning electron microscopy with energy dispersive X-ray spectroscopy (SEM-EDX), and diffuse reflectance infrared Fourier transform (DRIFT) spectroscopy. The results suggest that the release of As was suppressed via co-precipitation with ferric arsenate and scorodite as well as adsorption to hematite and iron oxyhydroxide phases formed from pyrite oxidation. These results suggest that the release of As from mine wastes could be suppressed via the introduction of materials rich in iron oxides like lateritic soils that are ubiquitous in the Philippines.

Keywords: *Arsenic, Acid Mine Drainage, Mine Wastes, Pyrite, Arsenopyrite*

ASSESSMENT OF CORAL REEF FISHES FROM MARKETS OF BONGAO, TAWI-TAWI

Yunadzmal Ong, Marylyn S. Enojario, Ahalnida M. Tambihasan, and Richard N. Muallil*

Mindanao State University -Tawi-Tawi College of Technology and Oceanography,
Sanga-Sanga, Bongao, Tawi-Tawi, 7500 Philippines
*Rnmuallil2017@gmail.com

Tawi-Tawi is the southernmost province of the Philippines with vast coral reefs that are teeming with marine flora and fauna. This study documented the nine major commercially important coral reef fish families in Tawi-Tawi, namely Serranidae (subfamily Epinephelinae only, or Grouper), Lutjanidae (Snapper), Scaridae (Parrotfish), Acanthuridae (Surgeonfish), Lethrinidae (Emperor), Mullidae (Goatfish), Haemulidae (Sweetlip), Balistidae (Triggerfish) and Siganidae (Rabbitfish). Surveys were conducted at the public market and fish warehouses (*bodega*) in Bongao, Tawi-Tawi from November 2015 to September 2017. The study found a total of 184 coral reef species in Tawi-Tawi, comprising about 70.5% of the 261 species recorded for the 9 major reef fish families in Tawi-Tawi, Palawan and Panay island. Fishes recorded in Palawan and Panay island constituted only about 54.4% and 48.7%, respectively, of all the species found in the three locations. Tawi-Tawi had consistently higher proportion of species recorded for all the 9 studied reef fish families. The abundance of species and the highest proportion of unique species recorded in Tawi-Tawi, despite the preliminary nature of the study, showed Tawi-Tawi as critical refuge for coral reef biodiversity. Future studies should consider all the fishes in the markets of Tawi-Tawi and expand the study sites to other island municipalities in the province. Genetic studies should be done for more accurate identification of the species. Conservation efforts, which are currently limited, must be strengthened to preserve the relatively pristine reefs of Tawi-Tawi which are increasingly threatened by IUU (Illegal, Unregulated and Unreported) fishing and other anthropogenic disturbances.

Keywords: *Tawi-Tawi, Coral Reef Fishes, Species Richness, Marine Biodiversity*

ASSESSMENT ON DISASTER PREPAREDNESS OF STUDENTS AND TEACHERS OF ZAMBOANGA DEL NORTE DIVISION

Grabein Son G. Abe* and Rhivee Mae H. Conol

J.H Cerilles State College Zamboanga Del Sur, Philippines
*grabeinabe2016@gmail.com

This study aimed to assess the disaster preparedness of students & teachers in secondary schools in a municipality of Zamboanga del Norte. Disaster preparedness activities were conducted to 500 students and 165 teachers for purposes of increasing their level of awareness towards disaster. The research design used was the descriptive survey method using the checklist-questionnaire in gathering the necessary data which assessed respondents' profiles and perceived benefits of disaster preparedness. The study revealed that majority of the student-respondents attended school base orientations while teacher-respondents attended trainings in the school/district level. For commonly experienced disasters, many student-respondents experienced earthquakes, storms and floods while many teacher-respondents experienced landslides, storms and floods. Earthquake drill, fire safety management, and security drill and these activities are conducted once every year. The benefits derived include: minimize personal injuries and loss of life, protect property against adverse effects of a calamity, helps students and personnel to be prepared in case of disasters and emergencies, and saves one's life or health. The researcher recommends that school administrators should upgrade disaster preparedness trainings that involved the teachers, school personnel and students not just on school/district level but at national level. Top list of recommended activities are earthquake drill and other activities that target the objectives such as "personal safety and prevention of damage", "execution of preparation in case of emergencies and disasters" and perceived safe evacuation areas. Finally, the study recommends establishing disaster preparedness assessment on other stakeholders.

Keywords: *Disaster Preparedness, Activities, Benefits Derived, Assessment, Secondary Schools*

BACTERIAL FUNCTIONAL GROUPS IN THE SEDIMENTS OF A REHABILITATED MANGROVE SITE IN ILIGAN CITY, PHILIPPINES

**Madeleine D. Soriño, Karyl Marie F. Dagoc, Buenaflor D. Jimenez
and Angeli V. Mag-aso***

Department of Biological Sciences, College of Science and Mathematics,
Mindanao State University – Iligan Institute of Technology
*angeli.valera@g.msuiit.edu.ph

Mangrove ecosystems play a crucial role in the transfer of organic matter and energy, the carbon budget and sustaining nutrient regeneration. Microbes play a key role in maintaining this productivity. The presence of functional groups of bacteria such as heterotrophs, Sulphur reducers, Nitrogen reducers and Lactose fermenters in the sediments of mangrove areas located in the coastal parts of Bayug, Iligan City was examined in this study. Two sites were selected with site A having newly-established mangroves from rehabilitation and site B with few mature or old-growth mangroves. Results showed a higher concentration of heterotrophic bacteria in Site A than in Site B. A Sulphur-reducing bacteria (SRB) was isolated from Site B suggesting the bacterial succession of the SRB in mature mangroves. Nitrate reducers were also isolated in both sites implying the denitrifying roles of microbes in the nitrogen cycle. Both sites have no Lactose-fermenting bacterial isolates, indicating the lack of coliforms in the area. Moreover, based on the Canonical correspondence analysis, there is a correlation between abiotic factors temperature and pH and the bacterial count in Site A and the participation of biotic factors in site B being an area with mature mangrove trees. The presence of these heterotrophic bacteria, Sulphur reducers and Nitrate reducers in the sediments of the mangrove areas of Bayug, Iligan City, together with the abiotic factors and presence of other biological components play important roles in the ecological function of the mangrove ecosystem and can provide basis for proper ecosystem management.

Keywords: *Ecological Function, Mangrove, Microbial Biogeochemical Cycling, Rehabilitation, Sediment*

CITIZEN SATISFACTION ON THE DELIVERY OF SERVICES FOR ENVIRONMENTAL CONSERVATION: THE CASE OF IMELDA

**Norhanie S. Domato-Macaraol*, Omar Bryan Hampong,
Halid S. Domato, & Norodin Kabirun**

Mindanao State University Buug-Campus, Buug Zamboanga Sibugay, Philippines
*norhaniedomato@gmail.com

Aiming to identify gaps in the service delivery performance of LGUs; determine citizens' awareness, availment, and satisfaction along the various areas of local governance; and provide the basis for appropriate policy recommendations and positive interventions to enhance local service delivery, the Department of Interior and Local Governance (DILG) devised the Citizen Satisfaction Index System (CSIS), a system that serves as a mechanism that gathers feedback from citizens who utilize public services. CSIS is intended to bring together and generate citizens' feedback on LGUs' service delivery performance in different service areas including governance and response, public works and infrastructure, environmental management, agricultural management and tourism support services among others. MSU Buug Campus was identified as a Local Resource Institute (LRI) to be part of the 2016 pilot testing implementation of the CSIS in Zamboanga Peninsula particularly Imelda, a third-class municipality in Zamboanga Sibugay. This implementation utilized a multi-stage probability sampling in selecting the 150 respondents who were interviewed. This sample size has a margin of error of $\pm 8\%$ at 95% confidence level. Findings reveal that the LGU of Imelda has conducted several activities for the different service areas that address environmental conservation of the locality, however, there is a low awareness score among the citizen on these services rendered in general. Furthermore, citizens are satisfied with the services that are being provided across the different areas however all these have a high need for action rating which signifies that all the service areas need more extra efforts to work on for improvement from the LGU.

Keywords: *Citizen Satisfaction, Local Governance, Public Administration, Public Opinion, Service Delivery Performance*

COMPARATIVE ASSESSMENT OF BEACH FORESTS IN ILIGAN CITY AND MISAMIS ORIENTAL

Janina Erika S. Bayron*, Alexandria Ayessa L. Gandamra, and Jane R. Saga

Philippine Science High School – Central Mindanao Campus, Nangka,
Balo-I, Lanao Del Norte, Philippines
*janerikabayron@gmail.com

Beach forests offer a lot of benefits for the environment and the economy including source for food, livelihood and income for some people in the community. Detrital matter and leaf litters essential for nutrient cycling and support for many species of fauna are also produced. However, beach forests in the Philippines are understudied. Studies related to beach forests are common only in the Visayan group of islands and in Mindanao, only 33% of the 2,492 ha of mangrove and beach forests have been studied. If the benefits of beach forests continue to be neglected, continuous destruction of beach forests will not be stopped which will eventually lead to coastal erosion and deforestation. In this study, three beach forests in Dalipuga, Iligan City, Biga, Lugait and Manticao were selected as sampling areas. Three transect lines with dimensions 2 meters by 30 meters were set up in each location. All the plant species inside the transect lines were quantified and characterized. Results showed that Biga, Lugait has the most number of plants counted amounting to 881 plants while Dalipuga, Iligan City only have 306 plants. As for Manticao, a number of 515 plants were counted. The plants that are identified to be common in all the sampling areas are *Terminalia catappa*, *Lantana camara* and *Chromolaena odorata* while the species that were identified as most abundant are *Wedelia biflora* and *Ipomea pes-caprae* with a population of 1,004 and 195, respectively. Based on the data gathered, it was concluded that the size of land area and the severity of human population nearby do not necessarily pose an effect on the growth and diversity of plants and this was observed in Biga, Lugait and Manticao. Moreover, it was also concluded that although Biga, Lugait has the most number of plants, this does not necessarily imply that it also has the most plant diversity. In fact, Manticao has the most number of plant species, 43 while Biga, Lugait has the least plant species with only 12. Some of the plant species were found to possess medicinal value. For instance, *Ipomea pes-caprae* is an identified treatment for different skin problems and can also mitigate soil erosion. *Wedelia biflora* also show anti-inflammatory, antimicrobial and analgesic effects. *Terminalia catappa* also show diverse medicinal values and the different parts of the tree have different medicinal values. The plant was also declared as a promising species in reforestation efforts while *Lantana camara* also exhibit antimicrobial, fungicidal, nematicidal and insecticidal activity. In conclusion, the small number of plant species in the sampling areas is alarming considering the benefits that these plants possess. It is recommended that conservation efforts should be emphasized and local residents should be educated regarding the benefits of beach forests.

Keywords: *plant species, biodiversity, beach forest*

COMPARISON OF GERMINATION EFFICIENCY OF SUNFLOWER SEEDS USING THREE MIXTURES OF SEED BALLS

Amparado, Beverly B.^{*1}, Amparado, Art Benhur B.²
Unabia, Lucian Khyll G.², Tingcang, Jobelle J.²

¹Mindanao State University, Marawi City, ²Tambo Central School, Iligan City
*amparadobevs@yahoo.com

Reforestation and greening are topmost priority considering that only less than 24% of the original forest cover remains. The cost of reforestation and tillage, however, are both costly and maybe destructive to the soil structure. Thus, this study was conducted to introduce the use of seed balls as cheaper alternative and to determine which among the three seed ball mixtures could best support seed germination and growth of seedlings of sunflower (*Helianthus annuus*). Seed balls were made and sun-dried before sowing. Results show that a combination of 5 parts red clay, 3 parts cow manure, 1 part seeds (Treatment 1) was the best growth medium for *H. annuus*. Another combination of 3 parts clay, 3 parts shredded paper, 2 parts manure, 1 part seeds (Treatment 2) could support germination stage of sunflower seeds similar to the first mixture. However, growth and development of the seedlings from two-leaf to four-leaf stages were not as efficient as compared to the first seed ball mixture. The third seed ball mixture (Treatment 3) composed of 3 parts clay, 3 parts wood charcoal, 2 parts manure, 1 part seeds was the growth medium with the least number of seed germination as well as two-leaf to four-leaf seedlings of *H. annuus*. Thus, it is recommended that seed ball preparations using 5 parts red clay, 3 parts cow manure, and 1 part seeds of tree species be used and field tested for reforestation and urban greening.

Keywords: *Environmental Science, Seed Balls, Seed Germination, Seedlings, Sunflower*

**COMPOSITION OF BENTHIC MOLLUSKS ASSOCIATED WITH THE SEAGRASS
BED IN A MARINE PROTECTED AREA (MPA) IN BARANGAY TAG-ULO, DAPITAN
CITY, ZAMBOANGA DEL NORTE, PHILIPPINES**

Nicky Marie Q. Limpangog* and Maria Lourdes Dorothy G. Lacuna

Department of Biological Sciences, College of Science and Mathematics,
Mindanao State University-Iligan Institute of Technology
*nickymarie.limpangog@g.msuiit.edu.ph

Mollusks are considered excellent ecological indicators; their status provides a window into the health of the entire ecosystem. The current study was performed to have sufficient information on the benthic mollusk composition within the seagrass bed in a Marine Protected Area (MPA) in the intertidal zone of Barangay Tag-ulo, Dapitan City, Zamboanga del Norte, Philippines. On June 12-14, 2018, the field samplings were done during spring low tides only to avoid biased results. Sampling and assessment were made in the three (3) transect lines with five (5) quadrats per transect in a 50m² area of seagrass beds. Thirty-three (33) mollusks species were encountered, of which two (2) species belonged to Class Bivalvia and thirty-one (31) species belonged to Class Gastropoda. Thirty (30) species are considered edible, while the rest are non-edible. Images of all mollusks are presented.

Keywords: *Benthic Mollusks, Seagrass, Ecological Indicator, Bivalvia, Gastropoda*

DIVERSITY AND DISTRIBUTION OF VASCULAR PLANTS IN MT. SIBUTU, SIBUTU, TAWI-TAWI, PHILIPPINES

Sheriffa T. Andas

Mindanao State University-Tawi-Tawi College of Technology and Oceanography,
Bongao, Tawi-Tawi Philippines
Rnmualil2017@gmail.com

Mt Sibutu, Sibutu, Tawi-Tawi is rich in vascular plants. However, limited studies have been conducted to document the floral composition, structure, and diversity. Thus, this study is aimed to determine the diversity and distribution of vascular plants in this site by looking at its species richness, diversity status, and distribution as well as assess its conservation status. A transect walk method with 200-m strip was established at opposite side of the mountain. Within its strip, 32 non-contiguous plots with dimension of 20m x 20m were established for tree inventory, and 5 m x 5 m nested plot for shrubs and herbs diversity studies. Samples documented and collected were preserved using the wet-mount method. Assessment of conservation status were determined based on the criteria set by the International Union of Conservation of Nature (Fernando, et al., (2008). The study found a total of 98 species, 72 genera and 40 families of trees, shrubs, herbs and pteridophytes. There were 5 species identified to the genus level only and 2 unidentified species of angiosperms. Of the 98 species identified species, 9.19% (9) species need protection due to their threatened conservation status. Three species, namely, *Mangifera odorata*, *Instia bijuga* and *Rhodocarpus costalis* were Endangered; 3 species (*Drynaria quercifolia*, *Microsorium punctatum* and *Ficus ulmifolia*), Vulnerable; 1 species, *Hopea basilinica*, Critically Endangered and 2 species; *Instia bijuga* and *Ixora philippinensis*, Endemic. The Shannon Diversity (H) indices is small: 1.43 for trees and and 1.25 for shrubs and herbs. The unequitable distribution of these flora suggests a necessity for their conservation and protection.

Keywords: *Vascular Plants, Diversity, Shannon Index, Species, Flora*

EFFECT OF GRAFTING ON THE GROWTH AND DEVELOPMENT OF PERUVIAN APPLE CACTUS (*Cereus repandus*) AND ITS IMPLICATION TO CONSERVATION

Liza A. Adamat

Department of Biological Sciences, College of Science and Mathematics,
Mindanao State University-Iligan Institute of Technology
liza.adamat@g.msuiit.edu.ph

In grafting, the rootstock furnishes the food for scion's growth. In this study, a Randomized Complete Block Design was used to determine the effect of grafting on the growth and development of *C. repandus* (scion). Two groups of scions were used: one-month-old and one-year-old seedlings. Six different rootstocks with ten replications each were used, all of which were planted in pots with homogeneous soil medium. A 1.0 + 0.25 cm tip cutting was used as scion and as control (planted in potted soil). Due to size constraint, one-month-old seedlings were only grafted on *Pereskiaopsis spathulata* (*Pereskiaopsis*). Parameters such as percentage growth increase in length, diameter and number of areoles were recorded after six and nine months. After six months, scions on *Hylocereus undatus* (Dragon Fruit) exhibited the highest growth increase on length (2,800.00%), *Myrtillocactus geometrizans* (Blue boy) on diameter (130.7%) and on number of areoles (550.00%). Scions on *Stenocereus griseus* (Chichipe) showed the least growth increase on length (483.33%), diameter (80.00%), and number of areoles (200.00%). After nine months, scions on *M. geometrizans* exhibited the highest growth increase on length (3,733.33%), on diameter (269.23%), and on number of areoles (733.33%) compared to scions grafted on *Harissia* sp (*Harissia*), *S. griseus* and *C. repandus* respectively. The un-grafted consistently grew slower compared to grafted. Moreover, no significant difference between un-grafted and grafted among one-month-old seedlings, however, 90% of them produced offset. The results showed that grafting technique can be used to rapidly increase a population of cacti specially those highly threatened species.

Keywords: *Scion, Rootstock, Percent Growth Increase, C. repandus, Conservation, Stenocereus griseus, Pereskiaopsis spathulata, Harissia* sp., *Myrtillocactus geometrizans*

ENDEMISM, DISTRIBUTION, AND CONSERVATION OF INVERTEBRATE FAUNA IN MT. MIMBILISAN PROTECTED LANDSCAPE, MISAMIS ORIENTAL, PHILIPPINES

Olga M. Nuñez*, Don Mark E. Guadalquiver and Kate Anne M. Ramos

Department of Biological Sciences, College of Science and Mathematics, Mindanao State University-
Iligan Institute of Technology, Tibanga, Iligan City, Philippines
*olgamnuneza@yahoo.com

Mt. Mimbilisan, a protected landscape in Misamis Oriental, serves as an important watershed and hosts important flora and fauna of the Philippines. In order to assess the endemism, distribution, and conservation of invertebrate fauna like lepidoptera (butterflies and moths) and odonata (dragonflies and damselflies), fieldwork was conducted on July to August 2017 in two forested sites and one riparian site in Mt. Mimbilisan. A combination of sweep netting and hand-picking methods was used. Ninety-two species of Lepidoptera were documented comprising 62 butterflies and 30 moths. Twenty-two species of butterflies are endemic (35% endemism) of which five occur exclusively in Mindanao. A higher endemism (63%) was recorded for Odonata where 17 out of the 27 species including five species exclusive to Mindanao Island are endemic. No species of vulnerable or endangered conservation status was recorded. In terms of species distribution in the sampling sites, the riparian area was found to host the highest species richness and diversity. However, the full utilization of the spring water in Mt. Mimbilisan as source of the water system of the adjacent communities has affected the riparian area as the stream has started to dry up even during rainy season. The presence of endemic species indicates a healthy ecosystem and the need for stronger conservation measures. Moreover, there is a need to retain at least 30% of the water in the protected area to sustain the health of the flora and fauna in the area.

Keywords: *Butterflies, Damselflies, Dragonflies, Lepidoptera, Odonata*

ENHANCING THE CAPABILITIES OF HOG RAISERS THROUGH COMMUNITY-BASED ENTREPRENEURSHIP: AN ALTERNATIVE LIVELIHOOD FOR WOMEN

Wilson Nabua*¹, Maria Pia Sison² and Annibelle Joy Mendoza¹

¹Northwestern Mindanao State College of Science and Technology, Philippines

²Mindanao State University-Iligan Institute of Technology, Iligan City, Philippines

*wilson.nabua@g.msuiit.edu.ph

Value addition of a traditionally produced farm products is among the sustainable strategies to minimize if not eradicate poverty in the depressed communities. This study aimed to determine the feasibility of food processing project as an alternative livelihood of the backyard hog raisers. One hundred ten (110) hog raisers in the 17 barangays in Tangub City were interviewed as a baseline information of the hog raising practices of the farmers. Another 70 household mothers were interviewed as to the demand for the processed products. With the help of the experts in the Food Technology Department of the Northwestern Mindanao State College of Science and Technology, the Return on Investment of the processed products was determined. The results revealed that 68 or 62% percent of the respondents were involved in the traditional way of hog fattening. Three of every four hog raisers were women. Piglets for fattening were available from other hog raisers who were involved in breeding, and other were purchased during market days. Housing facilities for the hogs were not complete. On the other hand, almost all of the hog raisers sold their produce to the assemblers or comprador live. However, the study found out that a higher Return of Investment (ROI) will be derived from the processing of the product. Thus, the result of this study will be the basis for an extension services of the College through organizing the women into a cooperative or an association.

Keyword: *Hog Raisers, Community-Based Entrepreneurship, Alternative Livelihood*

FIRST REPORT ON THE FISHERY AND ECOLOGY OF THRESHER SHARKS IN TAWI-TAWI, PHILIPPINES

Richard N. Muallil^{*}, Mohammad Gafor N. Hapid

Mindanao State University Tawi-Tawi College of Technology and Oceanography
Sanga-Sanga, Bongao, Tawi-Tawi, Philippines, 7500
^{*}Rnmuallil2017@gmail.com

Thresher sharks (family Alopiidae) are highly migratory pelagic predators. Their populations have been drastically declining mostly due to extensive fishing for their fins for international market. In 2007, the International Union for Conservation of Species (IUCN) listed all the three species of thresher sharks as vulnerable to extinction. The three species were further listed in Appendix 2 by the Convention on the International Trade in Endangered Species (CITES) of Wild Flora and Fauna during their 17th Conference of Parties (CoP17) meeting in Johannesburg, South Africa in 2016. In Tawi-Tawi, in the southernmost waters of the Philippines, thresher shark fishing has been existing for decades. This study is the first attempt to describe the fishery and ecology of thresher sharks in Tawi-Tawi based on landing surveys and key informant interviews. The fishery is generally small-scale (e.g. involves small number of municipal fishers), highly seasonal (i.e. less than a month in a year) and the fishing grounds are exclusively along the Sibutu passage, which connects the Sulawesi (Celebes) Sea to the Sulu Sea. Thresher sharks are generally hunted for their fins which are sold to buyers in Bongao, Tawi although the meat is also locally consumed for food. This study is the first scientific reports about thresher sharks in Tawi-Tawi and therefore provides valuable insights for effective conservation of these protected species.

Keywords: *Thresher Shark, Conservation, Shark Fishery, Tawi-Tawi*

GENDER PARTICIPATION OF MSU-MAIGO SCHOOL OF ARTS AND TRADES IN MANGROVE PLANTING ACTIVITY IN TUBOD, LANA DEL NORTE

Myla Carmen E. Oguis*¹ and Maridette E. Molina²

¹Mindanao State University-Maigo School of Arts and Trades, Maigo, Lanao del Norte

²Mindanao State University-Iligan Institute of Technology, Iligan City, Philippines

*myla.oguis@gmail.com

The severe tropical storm “Vinta” brought heavy rains in Lanao del Norte last December 22, 2017, leaving 32 dead and 12 missing. The mangroves in the area were likewise devastated. Thus, the Mindanao State University- Maigo School of Arts and Trades (MSU-MSAT) conducted a mangrove planting activity. The said activity was part of the school’s team building activity which aimed at rehabilitating the bald mangroves in Lanao del Norte. The mangrove planting activity was participated in by both male and female faculty and staff of the said school. This study then was conducted to describe the extent of men and women’s participation in the mangrove planting activity. A Likert Scale was used to measure the level of participation of the participants in the said activity and the Chi-square was likewise employed to measure the significant relationship of the participant’s gender and attitude towards the activity. The findings revealed that women had a high participation in all phases of the mangrove planting activity. Most of the participants agreed that the activity was timely scheduled, that there was a proper coordination with the local officials relative to the activity, that there were enough mangrove seedlings provided for planting activity, and that there is a cooperative and enjoyable atmosphere when the activity was conducted. The overall results emphasized that the respondents’ participation should be taken into consideration in carrying out future development plans.

Keywords: *Mangrove, Activity, Rehabilitation, Women, Planting*

GROWTH AND SURVIVAL RATE OF *Kappaphycus alvarezii* VAR. TAMBALANG BROWN MICROPROPAGULES CULTURED IN DIFFERENT MEDIA

Karen Joy B. Serag^{*1}, Jumelita B. Romero² and Sitti Sarah U. Ratag²

¹Institute of Oceanography and Environmental Science, Mindanao State University-Tawi-Tawi,
College of Technology and Oceanography, Bongao Tawi-Tawi, Philippines

²College of Fisheries, Mindanao State University-Tawi-Tawi College of Technology
and Oceanography, Bongao Tawi-Tawi, Philippines

*kjsr85@gmail.com

Micropropagation is considered one of the tools for sustainable utilization and conservation of populations of seaweeds. It has proven to be one of the ways to address the current dwindling supply of quality seedstocks. This study investigated the growth and survival rate of micropropagated (5mm) *Kappaphycus alvarezii* var *tambalang brown* using different culture media. This was undertaken in order to develop management tools and best practice recommendations for the mass production of new seedlings for industry, nursery, and out-planting purposes in Tawi-Tawi, Philippines. The micropropagules were cultured for 63 days at Seaweed Cultivars Laboratory using five different culture media such as sterile seawater with Von Stosch, 10ppm NaNO₃ in 1ml/L and 2ml/L, and 10ppm Acadian Marine Plant Extract Powders (AMPEP) and dipped in AMPEP for 30 minutes. Growth rate in terms of shoot length of *K. alvarezii* was highest using AMPEP dipped for 30 mins ($3.4 \pm 0.5\% \text{ day}^{-1}$), followed by medium using AMPEP ($2.6 \pm 1.35\% \text{ day}^{-1}$), NaNO₃ (1ml/L) at $2.5 \pm 0.79\% \text{ day}^{-1}$, Von Stosch with $2.3 \pm 0.67\% \text{ day}^{-1}$, and lowest using NaNO₃ (2ml/L) at $2.2 \pm 1.22\% \text{ day}^{-1}$. However, the highest survival rate of micropropagules was observed in the medium using NaNO₃ (1ml/L and 2ml/L) with 83.3 % and 80% respectively, followed by VS (73.3%) and lowest using AMPEP (60%) and dipped in AMPEP (57%). Both growth and survival rates of micropropagules using 5 different culture media showed no significant differences. Use of AMPEP in laboratory culture is recommended for higher growth rate but for mass and inexpensive production NaNO₃ (10ppm) may be employed due to high survival rate.

Keywords: *Kappaphycus alvarezii*, Micropropagation, Culture Media

HARD CORAL COVER IN BONGAO, TAWI-TAWI

**Aldimar S. Bara¹, Alimar J. Sakilan¹, Dahlia P. Burias¹,
Nurizna T. Jumaide¹, and Sitti Zayda B. Halun*^{1,2}**

¹Office of Research, Mindanao State University - Tawi-Tawi College of
Technology and Oceanography, Sanga-Sanga, Bongao, Tawi-Tawi

²Institute of Oceanography and Environmental Science, Mindanao State University –
Tawi-Tawi College of Technology and Oceanography, Sanga-Sanga, Bongao, Tawi-Tawi
*shalu002@fiu.edu

Being located inside the Sulu Sulawesi marine ecoregion, Tawi-Tawi is very rich in natural resources and part of the global center of marine biodiversity. Unfortunately, the reefs of Tawi-Tawi are not well studied. This study assessed the hard coral cover and generic diversity of Coral Reefs in Bongao, Tawi-Tawi using the Photo-Transect Method of Van Woesik et al. (2009). The images from the survey were processed using Coral Point Count with Excel extensions. We identified 45 genera in Kubbong Reef at Barangay Simandagit, and 36 genera identified in Mussah Reef at Barangay Sanga-Sanga. The top ten coral taxonomic amalgamation units in Kubbong Reef are *Galaxea*, *Echinopora*, *Montipora* foliose, *Porites* branching, *Acropora* branching, *Fungia*, *Favites*, *Isopora*, *Seriatopora*, and *Mycedium*. For Mussah Reef, there are *Porites* branching, *Galaxea*, *Porites* massive, *Favia*, *Favites*, *Platygyra*, *Isopora*, *Diploastrea heliopora*, *Goniastrea*, and *Goniopora*. The average percentage cover of hard coral in two stations surveyed is 41.76%. This number greatly exceeds the national average of 24% and would be classified as “Good (>33-44)”.

Keywords: *Coral Reefs, Sulu Sulawesi, Biodiversity, Photo-Transect Method*

**INTERTIDAL MOLLUSKS IN A MARINE PROTECTED AREA OF BARANGAY
DUMANGGAS NUEVO, KALAMANSIG SULTAN KUDARAT, SOUTHERN
MINDANAO, PHILIPPINES**

Shaina C. Jaylo* and Maria Lourdes Dorothy G. Lacuna

Department of Biological Sciences, College of Science and Mathematics,
Mindanao State University-Iligan Institute of Technology
*ayajaylo1104@gmail.com

Molluscan group is one of the abundant communities on the intertidal shores that are often collected by people either as additional supply of food or income without really considering the negative impact they produce to this group of fauna. This study was conducted in order to generate useful knowledge to be used for future monitoring in the said area. The main purpose of this current work is to know the different mollusks present in a marine protected area of Barangay Dumanggass Nuevo, Kalamansig Sultan Kudarat. A transect-quadrat method was employed during the spring low tides of July 28-29, 2018. Three (3) transect lines were laid down on the intertidal shore of the area, with five (5) quadrats measuring 0.50mx0.50m positioned along the transect. A total of sixty-two (62) mollusk species were noted in the area, of which ten (10) species were categorized as Class Bivalvia and fifty-two (52) were classified under Class Gastropoda. Furthermore, eighteen (18) species were considered as edible, while the remaining species were considered as non-edible. Images of all mollusks are presented.

Keywords: *Intertidal Shore, Mollusk, Marine Protected Area (MPA)*

LAKE MARAGANG DEVELOPMENT: SOCIO-ECONOMIC IMPACT IN BRGY. LIMAS, TIGBAO, ZAMBOANGA DEL SUR, PHILIPPINES

Bryan L. Bitantos*, Sarah Mae Rivera, Jeralen Compacion, Anna Mae S. Albor, Aisha Lizza R. Dablo, Cherry Love T. Lutas, Mae Princess I. Palma, Kiara R. Lapuhapo, Liezel Mae Aranador, Melmar E. Rosalem, Ronnel Jhon A. Panoy

Environmental Science Department, College of Forestry and Environmental Studies,
Mindanao State University-Buug Campus, Buug, Zamboanga Sibugay, Philippines

*bitantosbryan@gmail.com

Maragang is a lake located within Mt. Timolan Protected Landscape in Zamboanga del Sur, Philippines. The development of the lake on year 2012 has attracted thousands of tourists from different places to visit the area. Barangay Limas in the municipality of Tigbao is the host barangay going to the lake. No available information exists on the socio-economic impact of the lake development on the people of Brgy Limas. Through this information gap, future management and development plans on Barangay Limas in the municipality of Tigbao will lead to unsuitable future management measures. This study was done to determine the socio-economic impact of the lake development on the people of Brgy. Limas, Tigbao, Zamboanga de Sur, Philippines. The result of the study would serve as basis for policy formulation in the barangay and municipal local government unit and updating of the development plan of the lake. The research design was descriptive using a case study approach employing different methods like survey, key informant interviews, focus group discussions, direct observation and secondary data gathering. The data gathering was done on January 14 to February 14, 2018. The positive impacts of the lake as communicated by the respondents include increase in income, employment opportunities, road network developments, opportunity to meet new friends and protection of flora and fauna. It has also some negative impacts such as improper solid waste disposal. Attitude toward tourist visit in the lake among the residents were very happy from the start of the lake development to the present. Updating of solid waste management plan in the local government units and its incorporation in the development plan of the lake is recommended. Moreover, government agencies like DENR and LGU and other concerned non-government agencies should provide alternative livelihood programs and trainings among residents in Barangay Limas to enhance entrepreneurial skills and come up with business to increase further the residents' income.

Keywords: *Lake Maragang, socio-economic, protected area, Mt. Timolan Protected Landscape, Zamboanga del Sur*

MACROINVERTEBRATES AS BIO-INDICATORS IN THREE DIFFERENT STREAM SITES OF BAYUGAN, AGUSAN DEL SUR, MINDANAO

Christalyn A. Jawadil and Annielyn D. Tampus*

Department of Biological Sciences, CSM, MSU-Iligan Institute of Technology
*nyleinna@yahoo.com

The study was conducted to assess the water quality of three different streams in Bayugan, Agusan del Sur using the macroinvertebrates as bio-indicators of water quality. Macroinvertebrates belonging to nine orders namely; Decapoda, Ephemeroptera, Hemiptera, Plecoptera, Coleoptera, Megaloptera, Trichoptera, Gastropoda and Diptera were recorded during the entire sampling. Calaitan and Maygatasan stream sites were within the range of healthy habitat due to the presence of five good water quality indicators (stonefly, mayfly, toe bitter and riffle beetle). Calaitan stream obtained a water quality index of 6.7 and Maygatasan stream with a water quality index of 6.25. Bayugan City stream obtained the lowest water quality index of 4. For physico-chemical parameters, the city stream recorded the highest value for temperature and the lowest values for DO and pH in which the macroinvertebrates are most sensitive and they cannot survive in low oxygen level. Bayugan City stream is within the range of moderate pollution due to low water quality attributed to disturbance caused by human activities.

Keywords: *Aquatic Macroinvertebrates Bio-Monitoring, Physico-Chemical Parameters, Water Quality Index*

MATURITY AND FRUIT CHARACTERISTICS OF MANGOSTEEN SPRAYED WITH UREA AND MURIATE OF POTASH UNDER SULU CONDITIONS

Nursima K. Arakama

Graduate School, University of Southern Mindanao, Kabacan, Cotabato
College of Agriculture, Mindanao State University-Sulu
nursagridean@yahoo.com

Mangosteen (*Garcinia mangostana* Linn) is often regarded as one of the four most delicious and best flavoured fruits in the world. It is an important seasonal fruit and esteemed in tropical Asia. Mangosteen is one of the top priorities of the farmers and government because of its potential in manufactured product such as food supplements, beauty products and medicine. Mangosteen culture has not flourished anywhere because of its strict climatic requirements, short seed viability, absence of rapid method of propagation, slow plant growth and delayed maturity thus resulting to its very low production. The study therefore aimed to determine the effect of foliar application of urea and muriate of potash on the precocity of mangosteen trees, specifically on tree growth, fruiting and yield, and the effect of these fertilizer on these parameters when applied once or twice monthly under Sulu climatic conditions having dry and wet seasons equally distributed throughout the year. Results indicate that application of foliar solutions of urea or muriate of potash twice a month markedly promoted the growth of Mangosteens in terms of length and circumference of shoots. Muriate of potash at 200 and 300 g per 16 liters of water produced more flowers, high flowering intensity, and gave high fruit set and retention in mangosteens. Moreover, it enhanced the development stages resulting in higher yield per tree with good quality of fruits. Result clearly demonstrated lesser disease reaction which is another trait of trees that is attributed to the improved nutrient status of crops. No physiological disorders of some common diseases were found.

Keywords: *Foliar Fertilizer, Muriate of Potash, Urea, Garcinia mangostana* Linn

MEDICINAL PLANTS AND HEALTH PRACTICES OF THE SUBANENS IN MT. TIMOLAN, TIGBAO, ZAMBOANGA DEL SUR

Rosienie D. Gallardo ^{*1}, Norjanah S. Domato, RPh² & Norhanie S. Domato- Macarao¹

¹Mindanao State University Buug Campus, Zamboanga Sibugay, Philippines

²Adventist Medical Center College, Iligan City, Philippines

*rosieniegallardo@gmail.com

The documentation of traditional medicinal practices of the Subanen Tribe was conducted in Mt. Timolan, Tigbao, Zamboanga del Sur. This study was conducted to document and identify ethnomedicinal plants used, as well as the preparation and application practices for treating illnesses among the Subanen. Data were collected through informal, semi-structured and walk through interviews and a group discussion was conducted among *balyan*, *timuay* and selected healers of the tribe. The interviews were transcribed and analyzed. Interviewees independently reported the same traditions for preparation and consumption of Subanen traditional medicines. Findings revealed that there were 55 medicinal plants species documented belonging to 48 genera and 30 families presently available and used by the natives. Leaves, roots and fruits of the plants were usually utilized for traditional medicines and are mostly taken orally and prepared through decoction, pounding and preheating. The study enhanced understanding of ethnic Subanens' perception and continued use of traditional medicines within the household. Moreover, the study also concluded that Subanen communities have a wide variety of resources of traditional medicinal plants and have retained using these plants due to traditional beliefs despite the availability of modern synthetic medicine.

Keywords: *Subanen, Herbalism, Mt. Timolan, Health practices, Ethnomedicine*

**MERCURY CONCENTRATION OF OYSTER (*SACCOSTREA MALABONENSIS*) IN
SIBUGUEY BAY, BARANGAY CONCEPCION, MUNICIPALITY OF KABASALAN,
ZAMBOANGA SIBUGAY**

Habagat G. Mariano*, Romeo M. Lomoljo

Mindanao State University, Marawi City

*habagat.mariano@g.msuit.edu.ph

Oyster (*Saccostrea malabonensis*) is one of the major economic boosters of the province but this food source is threatened because of the presence of illegal small-scale gold mining that is operating in the nearby municipality of Kabasalan. This study was conducted to determine if the oyster is contaminated with mercury (Hg); to determine if the concentration of mercury accumulated in oyster exceeded the allowable limit; to know if there is significant difference in the concentration of mercury in oyster among different stations; and to know if there is significant difference in the concentration of mercury in oyster during the two sampling periods. All the samples were brought to First Analytical Services and Technical (F.A.S.T) Cooperative Laboratories for mercury concentration analysis using Atomic Absorption Spectrophotometry (AAS). Results show that the concentration of mercury (Hg) in the oyster meat ranges from 0.002-0.004 ppm, which did not statistically vary among the three stations. Mercury concentration was higher during the first sampling on December 6, 2015 as compared to the second sampling on March 1, 2016 with 0.004 ppm and 0.002 ppm, respectively. With the result of this study showing the presence of mercury in the oyster meat, it is therefore recommended that the community must refrain from consuming this food source. Although mercury concentration did not surpass the standard limit in food (0.5 mg/kg) set by the World Health Organization (WHO), Food and Drug Administration (FDA), Canadian Standard, European Commission (EU), and Food Standards Australia New Zealand (FSANZ) but the tendency of mercury for bioaccumulation in the higher food chain may still pose risk to humans due to mercury poisoning.

Keywords: *Mercury Concentration, Oyster, Saccostrea malabonensis, Mercury accumulation, Sibuguey bay*

MICRONUCLEUS TEST IN EXFOLIATED BUCCAL CELLS OF BARBECUE GRILLERS OF MARAWI CITY

Abdul Baari' M. Guma-os¹, Annabella G. Villarino*²

¹College of Medicine, ²Department of Biology, College of Natural Sciences and Mathematics,
Mindanao State University-Marawi City, Philippines
*bellegorospe@yahoo.com

Exposure to fumes when grilling meat predisposes human to a significant level of cancer-causing compounds called PAHs (Polycyclic Aromatic Hydrocarbons). The DNA damaging capacity of PAHs can be rapidly and inexpensively evaluated by measuring and counting the micronuclei in various human cells. In this study, the frequency of micronucleation (MN) in exfoliated buccal epithelial cells of thirty (N=30) barbecue grillers (exposed group) in Marawi City was compared with thirty (N=30) office workers and students of Mindanao State University (control). A total of 1000 buccal epithelial cells per individual were scored for MN frequency. Results revealed a significant increase ($p < 0.05$) in the MN frequency of barbecue grillers (18.97 ± 3.77) compared with the control (12.6 ± 3.58). In addition, the possible effect of the established confounders which include smoking, drinking habits, age, gender and number of years of exposure to PAHs on the frequency of micronucleation was further analyzed. Confounding factors that could have caused higher MN frequency in the exposed group are age ($p = 0.000$) and length of exposure to grilling fumes ($P = 0.002$). The current study confirms that chronic exposure to grilling fumes increases micronucleation, hence the necessity of biological monitoring and appropriate health interventions are recommended.

Keywords: *Micronucleus, Buccal cells, Polycyclic Aromatic Hydrocarbons (PAHs), Barbecue Grillers, Cancer*

MOLLUSCAN (BIVALVIA AND GASTROPODA) COMPOSITION IN SEAGRASS BED OF A NON-PROTECTED AREA OF BARANGAY ORO, SITIO MALIBAGO, DAPITAN CITY, ZAMBOANGA DEL NORTE, MINDANAO, PHILIPPINES

Kris Lorraine R. Yap* and Maria Lourdes Dorothy G. Lacuna

Department of Biological Sciences, College of Science and Mathematics,
Mindanao State University-Iligan Institute of Technology, Philippines
*krslrrnyp1030@gmail.com

The wide stretch coastline of Dapitan City provides a variety of commercially important and edible marine mollusks which makes it a major source of revenue for the residents. Which is why this study was conducted to assess the composition of mollusks in a non-protected area in the intertidal zone of Barangay Oro, Sitio Malibago, Dapitan City, Zamboanga del Norte. Field sampling were done during spring low tides on June 12-14, 2018 following random sampling using transect-quadrat method. A total of fourteen (14) mollusks species were identified, of which thirteen (13) species belong to Class Gastropoda under eight (8) families and one (1) species were categorized under Family Cardiidae, Class Bivalvia. Further, four (4) species were considered as commercially important or edible, while the rest are non-edible. Images of all mollusks are presented.

Keywords: *Seagrass Bed, Intertidal Zone, Non-Marine Protected Area, Mollusks*

MOLLUSK COMMUNITY ON A ROCKY INTERTIDAL SHORE IN A NON-MARINE PROTECTED AREA OF BARANGAY CADIZ, KALAMANSIG, SULTAN KUDARAT, SOUTHERN MINDANAO, PHILIPPINES

Emilie L. Don* and Maria Lourdes Dorothy G. Lacuna

Department of Biological Sciences, College of Science and Mathematics,
Mindanao State University – Iligan Institute of Technology, Philippines
*donemilie.ed@gmail.com

Mollusks have always been important in the day to day living among Filipinos because these organisms are often harvested as food, used as a source of extra income and are even utilized to make different ornaments. Considering the vital importance of this invertebrate group, this study was conducted to assess the different species of mollusks present on the intertidal rocky shore in a non-marine protected area of Barangay Cadiz, Kalamansig, Sultan Kudarat. The field assessments were done during spring low tides on July 28-29, 2018 following the transect-quadrat method. A total of thirty-one (31) mollusks species were recorded, of which ten (10) species were classified under Class Bivalvia and the rest of the twenty (21) species belonged to Class Gastropoda. Among these identified molluscan assemblages, nineteen (19) species were categorized as edible, while twelve (12) species were non-edible. Images of all the encountered mollusks in the study area are presented.

Keywords: *Non-Marine Protected Area, Rocky Shore, Benthic Mollusks*

**MORPHOLOGY OF *GLOSSOGOBIOUS GIURIS* (HAMILTON 1882) IN LAKE MAINIT,
NORTHEASTERN MINDANAO: WAY FORWARD TO BIODIVERSITY
CONSERVATION AND CLIMATIC VARIABILITY CONCERNS**

**Sonnie A. Vedra*, Elnor C. Roa, Marissa Y. Salarda, Ruth D. Gaid, Rey L. Roa, Jeanette
J. Samson, Rustan C. Eballe, Geralyn D. Dela Peña, Michael James O. Baclayon,
and Melchor R. Rigor**

Institute of Fisheries Research and Development, Mindanao State University at Naawan
9023 Naawan, Misamis Oriental, Philippines
*vedrasonnie@gmail.com

This study is conducted to determine the morphological (i.e. sexual dimorphism and body proportionality) aspects of *Glossogobius giuris* or *pijanga* in Lake Mainit Northeastern Mindanao as presumed to be affected by environmental and anthropogenic stressors. Collection of specimens was conducted in four municipalities of Jabonga and Kitcharao in Agusan del Norte, and in Mainit and Alegria in Surigao del Norte using *laya/laja* and other fishing gears like traps and spear guns. Results showed that male *pijanga* (mean TL 147.99 ± 10.67 to 149.30 ± 7.93 mm) were relatively bigger in Lake Mainit than females (mean TL 144.33 ± 14.62 to 145.92 ± 18.18 mm). Morphometric and meristic characters measured were not significantly different (p value > 0.05), in turn, signified a relatively similar stock of *pijanga* inhabiting the Lake. Male and female *pijanga* did not exhibit sexual dimorphism (p value > 0.05) that signified no signs of habitat restrictions and geographic isolation. Males and females had well-proportioned body structures (p value < 0.05) that assumed to be a function of food availability and favourable habitat. *Pijanga* are observed to be present in all parts of the Lake either in shallow or in deep portions. Therefore, the presumed adverse impacts of environmental and anthropogenic stressors did not mainly influence the biology and ecology of *pijanga* as justified by having no sexual dimorphism and well-proportioned body structure. The relatively good condition of *pijanga* in Lake Mainit should command proactive participatory initiatives on conservation and management to prevent further issues on overfishing and exploitation of *pijanga*.

Keywords: *Lake Mainit, Pijanga, Morphology, Sexual Dimorphism, Body Proportionality*

PARADE OF PROTOZOAN CILIATES IN LAKE LANAOK, LANAOK DEL SUR, BEFORE MARAWI SIEGE

Fema Abamo*^{1,2}, Camar Ameril¹, Labebah Abu-tier¹ Nabel Edres¹ *et al.*

¹Biology Dept., ²MSRTC, MSU Marawi, Mindanao State University-Main Campus,
Marawi City, Lanao del Sur, Philippines
*yadfem@yahoo.com

Protozoan ciliates are one-celled animal-like organisms characterized by the presence of hair-like structures called cilia. They have been utilized as bio-indicators of organic pollution to monitor the health of aquatic ecosystem. But there were scant studies on ciliates in Lake Lanao, Lanao del Sur, the second largest lake in the Philippines and one of the ancient lakes in the world. Hence this study was conducted to make inventory of ciliated protozoans in the lake at the littoral and pelagic zones of Marawi City, Ditsaan-Ramain, Binidayan, Balindong, Taraka, Masiu, Marantao, and Buadipuso by using a conical plankton net from February 2015 to November 2016. A total of 35 ciliate species were accounted for and they were distributed across 30 genera namely; *Aspidisca*, *Blepharisma*, *Chilodonella*, *Cinetochilum*, *Cohnelembus*, *Coleps*, *Colpidium*, *Cothurnia*, *Cyclidium*, *Didinium*, *Euplotes*, *Glaucoma*, *Litonotus*, *Loxodes*, *Metacineta*, *Opercularia*, *Opisthonecta*, *Oxytricha*, *Paramecium*, *Podophrya*, *Spirostumum*, *Stentor*, *Strombidium*, *Stylonychia Tetrahymena*, *Tokophrya*, *Trachelius*, *Urocentrum*, *Halteria*, and *Vorticella*. Photomicrographs of the ciliates are presented. *Paramecium*, *Tetrahymena* and *Vorticella* were widely distributed among the ciliates. Their spatial and seasonal variations, their abundance and distribution are presented in other papers. The molecular identification and post-siege inventory of the same are underway.

Keywords: *Protozoans, Ciliates, Lake Lanao, Paramecium*

RHIZOSPHERE – ASSOCIATED HETEROTROPHIC BACTERIA FROM *RHIZOPHORA* SP. IN A NEWLY REHABILITATED MANGROVE ECOSYSTEM

**Leira Jim V. Tangian, Karyl Marie F. Dagoc, Buenaflor D. Jimenez
and Angeli V. Mag-aso***

Department of Biological Sciences, College of Science and Mathematics, Mindanao State University-
Iligan Institute of Technology, Iligan City, Philippines
*angeli.valera@g.msuiit.edu.ph

Studies on microbial communities in mangrove ecosystems can aid in understanding their role in ecosystem functioning and remediation. Heterotrophic bacteria were isolated from the rhizosphere of *Rhizophora sp.* growing in a newly-established mangrove rehabilitation site in Iligan City, Northern Mindanao. Two areas were chosen as sampling sites based on mangrove growth and disturbance: newly-established mangrove plantation and disturbed area (site A); and old-growth trees with less disturbance (site B). Isolates were characterized based on their morphological and biochemical properties. A total of thirteen (13) isolates were obtained from Site A and twenty-six (26) isolates from Site B. Sixteen (16) of the isolates from both sites were nitrate reducers implying significant roles in nitrogen cycling. One bacterial isolate also reacted to the iron in TSI test, giving off H₂S and consequently liberating sulfides. Shannon-Weiner Diversity index showed moderate diversity, distribution, and evenness for both sites. Physico-chemical parameters gathered had greater effect on isolates from site A as shown by the Canonical Correspondence Analysis. The presence of these bacterial groups has implications in the biogeochemical processes needed for the development of the mangrove vegetation. On the other hand, physico-chemical parameters are not only crucial to the bacterial communities in the rhizosphere but also to the plant since these are responsible for most of the plant's nutrient uptake. Further investigation into this bacteria and mangrove ecosystem interaction can help in the proper management and rehabilitation of such complex and threatened ecosystems.

Keywords: *Biogeochemical Cycling, Ecosystem Functioning, Mangrove Forest, Microbial Communities, Rehabilitation*

SCREENING AND IDENTIFICATION OF CELLULOLYTIC FUNGI ISOLATED FROM SURFACE SEDIMENTS OF LAKE LANA O ALONG TAMPARAN, LANA O DEL SUR, PHILIPPINES

Amantiad, Sittie Shamim B.¹, Barosa, Nourshamsia C.¹, Kabirun, Mariam C.*¹
Sirad, Naima R.¹, Caralde, Merimee D.^{1,2}, Amparado, Beverly B¹

¹Biology Department, College of Natural Sciences and Mathematics,
Mindanao State University, Marawi City 9700

²Department of Biological Science, College of Science and Mathematics,
Mindanao State University – Iligan Institute of Technology, Iligan City 9200 Philippines
*mariam_kabirun@yahoo.com

Cellulose comprises the main bulk of plant wastes, which only microorganisms can degrade. Among the microorganisms, fungi are known to be the most aggressive decomposers, and these natural resources in Lake Lanao were never tapped yet in the previous studies. Thus, this study was conducted to isolate fungi with cellulose-degrading activity to help solve problem on waste disposal. Fungi were isolated from water and surface sediments of Lake Lanao along Tamparan, Lanao del Sur using Serial Dilution Spread Plate method, grown and maintained in potato dextrose agar. These fungal isolates were screened for their cellulolytic activity using Cellulose Congo red agar medium, a selective culture medium that allows growth of cellulase-producing microorganisms only. Cellulolytic activity of each isolate was evident by the clearing zone around its colony, which was used as index of cellulose-degrading activity. In this study, there were 14 types of fungal colonies isolated; four of them exhibited cellulolytic activity after two days of incubation with their diameter of clearing and most probable species namely TPF5⁻¹D (1.28 mm, *Aspergillus niger*), TPF1R2- 12 (1.21 mm, *Aspergillus terreus*), TPF5R1-32 (0.8 mm, *Fusarium oxysporum*), and TMF-77 (0.76 mm, *Penicillium oxalicum*). Growth and cellulolytic activity of TPF5R1-32 and TPF1R2-12 started to decline on the 4th and 13th day of incubation, respectively. At the end of the 14 days of incubation, TPF5⁻¹D (*A. niger*) remained to have the superior ability to degrade cellulose in the medium, followed by TMF-77 (*P. oxalicum*). The above four fungal isolates can be used to hasten composting and be potential sources of genes for cellulase production.

Keywords: *Cellulolytic Fungi, Surface Sediments, Lake Lanao, Aspergillus, Penicillium, Fusarium, Aspergillus*

SEXUAL REPRODUCTION OF BROADCAST SPAWNING CORALS IN SOUTHWESTERN PHILIPPINES

Alimar J. Sakilan*¹, Zayda B. Halun¹, Filemon G. Romero¹, Ronald D. Villanueva² and Patrick Cabaitan²

¹Institute of Oceanography and Environmental Science, MSU-TCTO, Bongao, Tawi-Tawi, Philippines

²Marine Science Institute, University of the Philippines, Diliman, Quezon City, Philippines

*sakilanalimar@yahoo.com

Knowledge of the spatial and temporal patterns of coral reproduction gives us a better understanding of coral population dynamics and recruitment patterns. Reproductive phenology in corals has been correlated to tidal cycles, lunar phases, photoperiod, and sea surface temperatures. We documented reproduction of broadcast spawning corals in Bongao, Tawi-Tawi using rapid sampling method, ex situ spawning observations and histological analyses. Colonies of *Favites abdita*, *Acropora muricata*, *A. humilis* and *A. millepora* have an annual gametogenic cycle that ends in a spawning event around the last quarter moon of April or May. *A. valida* colonies spawn twice a year around the last quarter moon of April or May and August or September. Our findings on spawning phenology will facilitate expanded research and conservation of corals.

Keywords: *Reproduction, Broadcast Spawning, Corals*

SOCIO-ECONOMIC AND ENVIRONMENTAL IMPACTS OF A COAL PLANT IN BARANGAY MANDANGO, BALINGASAG, MISAMIS ORIENTAL

Hermenio B. Cabusog, Jr.

Mindanao State University-Iligan Institute of Technology, Iligan City, Philippines
*hermeniocabusogjr@gmail.com

This study attempts to document the impacts of Minergy Power Corporation (MPC) - a Coal Fired Power Plant located in Mandangao, Balingasag, Misamis Oriental, Philippines on the socio-economic and environmental conditions of the directly affected residents in the area. Using phenomenological research approach involving key informants and focus group discussion participants, the results show that the barangay local government unit is supportive of the plant because of the huge revenue it contributed to the barangay. The plant also offers employment to the locals. On the other hand, the data also indicate some contradicting findings regarding the environmental conditions of the community. While it was reported that the plant does not adversely affect the quantity of the marine catch of the fisherfolks in the nearby shores, the coal fly ash contributes to air pollution and challenged the health condition of the residents. By implication, MPC brings a long-term threat to public health and sound environmental quality of the locality.

Keywords: *Coal Plant, Fly Ash, Environment, Health, Economic Condition*

SOLID WASTE SEGREGATION AND DISPOSAL PRACTICES AMONG THE RESIDENTS OF ILIGAN CITY

Noraimen B. Abdel Jalil, Norhaynie D. Ali, Edna N. Nabua and Monera A. Salic-Hairulla*

Department of Science and Mathematics Education, College of Education, Mindanao State University-
Iligan Institute of Technology, Iligan City, Philippines
*monera.salic@g.msuiit.edu.ph

The main purpose of this study is to determine the solid waste management practices among the residents of Barangay Mahayahay, Iligan City. The data were gathered from 280 Mahayahay residents using purposive sampling. They were selected according to their willingness to cooperate in answering the research instrument. To obtain accurate information about the solid waste management practices among the residents of Barangay Mahayahay, Iligan City, modified questionnaire was used. Furthermore, the study found out that all respondents segregate biodegradable from non-biodegradable wastes for the main reason that it is the Barangay's policy that must be followed. Moreover, findings showed that most of the respondents dispose of their segregated waste products twice a week based on Barangay's garbage collection schedule. Most of the respondents are contented with the Barangay's waste disposal system. A few suggested Barangay Material Recovery Facility (BMRF) site relocation, bigger garbage truck and use of microphone while collecting. Also, results reveal that the weight of biodegradable waste products is not significantly higher than the weight of non-biodegradable waste products. The government may provide funds and enough budget to the community so that there will be bigger trucks and appropriate tools to use when collecting and segregating garbage

Keywords: *Disposal Practices, Garbage, Segregation, Solid waste, Waste Management*

SPATIO-TEMPORAL PROFILE OF WATER QUALITY OF LAKE MAINIT, NORTHEASTERN MINDANAO, PHILIPPINES

**Elnor C. Roa^{*}, Sonnie A. Vedra, Ruth D. Gaid, Rey L. Roa, Rustan C. Eballe, Geralyn D. Dela Peña, Marissa Y Salarda, Jeanette J. Samson, Michael James O. Baclayon,
and Melchor R. Rigor**

Institute of Fisheries Research and Development
Mindanao State University at Naawan, Naawan, Misamis Oriental
^{*}elnorcroa@gmail.com

Lake Mainit is one of the deepest and most productive lakes in the country. Lake Mainit Development Alliance reported a fish kill in the area that urges the local government to check the quality of the water as it is cited as the cause for the incident. Thus, this study was undertaken to answer the call. Collection of data for temperature ($^{\circ}\text{C}$), Dissolved Oxygen (ppm), pH, nitrate ($\text{NO}_3\text{-N}$, ppm), ammonia ($\text{NH}_3\text{-N}$, ppm), nitrite ($\text{NO}_2\text{-N}$, ppm), phosphate ($\text{PO}_4\text{-N}$, ppm) and light intensity (Lum/ft^2), were done monthly from December 2016 to March 2018 from the seven (7) established sampling stations within the lake. Results were then compared to the DENR standards for freshwater water bodies. Results showed that the water quality of the lake were still within the desirable range for Class A and Class C waters signifying that the occurrence of fish kills was due to other factors. Notable increase of 0.9°C of surface and vertical temperatures in Lake Mainit over a decade showed an alarming state of global warming. Based on the 16 months monitoring, turnover occurred once in the lake particularly during northeast monsoon, indicating that Lake Mainit is a “monomictic lake.”

Keywords: *Lake Mainit, Water Quality, Season, Monomictic Lake*

SPECIES COMPOSITION OF MARINE MOLLUSKS IN THE INTERTIDAL FLATS OF SIAY, ZAMBOANGA SIBUGAY, WESTERN MINDANAO, PHILIPPINES

Algen Mari B. Castañeto* and Maria Lourdes Dorothy G. Lacuna

Department of Biological Sciences, College of Science and Mathematics,
Mindanao State University-Iligan Institute of Technology, Iligan City, Philippines
*algenmari.castaneto@g.msuiit.edu.ph

To be able to know more about molluscan ecology, this study was conducted to obtain relevant information regarding the species composition of mollusks in the intertidal flats of Siay, Zamboanga Sibugay, Philippines. Field samplings were done in three (3) selected stations of Siay during low tides on March 8 and 15, 2018 using the modified transect-quadrat technique. Three (200m) transects were deployed parallel to the shore that were separated by a 50-m distance from each other. Each transect consisted of twenty quadrats (0.5m x 0.5m) along the transect line. Alive epifaunal mollusks found on the sediment surface were obtained by hand-picking and scraping the surface of rocks and crevices. On the other hand, infaunal mollusks were collected by excavating sediments at each quadrat using a digging tool down to approximately 20cm deep. All collected live mollusks were placed in labeled plastic containers and then preserved with 70% ethanol solution and were brought to the laboratory for analysis. A total of sixteen (16) mollusk species were found, where nine (9) species belong to seven (7) families under Class Bivalvia, 7 species belong to five (5) families under Class Gastropoda, and one (1) species of brachiopod belonging to 1 family under Class Lingulata. Moreover, 9 species of the identified bivalves and gastropods including the identified species of brachiopod were edible and were commercially important. Photographs of these mollusk and brachiopod species are presented.

Keywords: *Edible mollusks, Intertidal Shore, Mindanao*

STRUCTURE OF MANGROVE COMMUNITIES IN SELECTED BARANGAYS ALONG THE COAST OF ILIGAN BAY, PHILIPPINES

Ma. Lotus E. Patiluna*¹ and Cesar G. Demayo²

¹Western Philippines University, Palawan, Philippines

²Mindanao State University-Iligan Institute of Technology, Iligan City, Philippines

*mlepatiluna@gmail.com

This study was conducted to assess the community structure of mangroves in selected areas along the coast of Iligan Bay using the transect-line plot method. Forty-three (43) coastal barangays were mapped based on their remaining mangrove forest. Mangrove areas were observed to be in “fair” to “poor” condition. The western coast of Iligan Bay showed extensive cover than the eastern side. Closer evaluation of nine (9) coastal barangays revealed that mangrove communities in these areas showed a total of sixteen (16) identified, four (4) unidentified, and four (4) associate species. Species found in almost all stations were *Rhizophora mucronata*, *Rhizophora 47acemose*⁴⁷, *Sonneritia alba*, *Avicenia marina*, *Avicenna lanata* and *Lumnitzera 47acemose*. *Nypa froticans* was observed to have the highest average density of trees/ha followed by *Rhizophora mucronata* and *avicennia lanata*. The mean height of all mangrove species was 5.3 m. The variance (S^2) over mean (X) ratio values in most stations indicates that the spatial distribution of mangrove species was aggregated or clumped. Some mangrove species and growth stages specifically sapling are randomly distributed. Low diversity (H' and D_s) values were observed in nine (9) stations. Variation in species composition and vegetation characteristic between communities were being investigated using cluster analysis. Status and implication of the results in mangrove and fishery management were discussed.

Keywords: *Community structure, Variation, Cluster analysis, Spatial distribution, Diversity*

TAXONOMIC IDENTIFICATION AND CLASSIFICATION OF MARINE GASTROPODS AND BIVALVES FROM MC SAFFANAH BEACH, LINAMON, LANA O DEL NORTE

Ma. Eula D. Monteras, Reysel Rose A. Patoc*, Ericka Faith P. Ruizal and Marilou V. Cabili

Philippine Science High School-Central Mindanao Campus, Nangka, Balo-i,
Lanao del Norte, 9217Philippines
*reyselpatoc@gmail.com

Gastropoda is one of the most diverse groups of animals, in shapes, habits, and habitats. They are by far the largest group of mollusks and are characterized by a single protective shell. Bivalvia is the second largest group of mollusks and is characterized by two valves connected at a hinge. Shells of gastropods and bivalves are used in the taxonomic classification studies. This study was conducted to examine the qualitative morphological description of shells in order to classify the species of marine gastropods and bivalves in MC Saffanah beach, Linamon, Lanao del Norte. Proper species identification is important for ecological, evolutionary, systematic, and biodiversity studies, many of which contribute to the development of conservation. Along a 75-m transect line, samples of shells were collected cleaned, photographed, and individually measured using a digital caliper. Finally, the size, shape, color, and banding pattern of each shell were observed. A total of 56 shells were collected and only 40% were classified up to species level, while the rest of the shells were classified up to the genus level only. Gastropods shells were classified into 14 genera belonging to 11 families while bivalve shells were classified into 7 genera belonging to 7 families. The bivalves included *Semipallum tigris* (tiger scallop) and *Cardium sp.* while gastropods included *Cypraea annulus* (gold ring cowry) and *Nassarius sp.*

Keywords: *Gastropoda, Bivalves, Conservation, Mollusks, Shells, Linamon Lanao del Norte*

TECHNOLOGY, STATISTICS AND ENVIRONMENTAL CONNECTIONS: REAL-WORLD LEARNING THROUGH SOLVING IMPROPER WASTE DISPOSAL

Generie Mae G. San Pablo^{1*} Mary Cris J. Go^{2*} Amelia T. Buan³

College of Education - Department of Science and Mathematics Education, Mindanao State University -
Iligan Institute of Technology, Iligan City, Philippines
*generiemae.sanpablo@g.msuiit.edu.ph

The purpose of this action research is to integrate environmental education in teaching Mathematics. It is a one week lesson designed to address the low interpretation skills of the students by allowing them to have a real-life situation in the learning of statistics, specifically data analysis and interpretation. To do this, the researchers made some interventions like exposing them in their campus through conducting a questionnaire survey regarding the improper waste disposal of the students of MSU-IIT National Cooperative Academy and introducing some tools for interpretation. This process starts with introducing a problem, continues with collecting and organizing the data needed to solve the problem and presenting such data with appropriate representations, followed with interpreting and associating such data and ends with making an infographic that would serve as an awareness campaign for their school. Likewise, this research exhibits how student-teacher interaction and student-student interaction are emerging during the discussion and the different perceptions of the students toward the entire activity. The researchers collect data using voice and video recordings, reports of the students, learning activity, assessment, and reflections of the students.

Keywords: *Improper Waste Disposal, Environmental Education, Interpreting Skills, Waste Management*

THE MOBILE MUSEUM BOXES

Emerito B. Batara^{*1}, Ayumi Terada², Luisito T. Evangelista³ And Akira Matsuda⁴

¹Officer-In-Charge, Natural Science Museum, Mindanao State University-Iligan Institute of Technology, Iligan City, Philippines

²Affiliate Assistant Professor, Intermediatheque Department of The University Museum, The University of Tokyo, Japan

³Curator 1, Botany and National Herbarium, National Museum, Manila,

⁴Associate Professor, Graduate School of Humanities and Sociology, University of Tokyo, Japan
**noelbatz62@yahoo.com*

The Mobile Museum Boxes Project seeks to produce mounted exhibition content whose effects transcends and extends beyond the walls of the museum, thereby offering, at each exhibition venue, object – based educational opportunities for a variety of audiences, including, and most especially, the young. The Mobile Museum Boxes Project is the result of an International collaborative research effort entitled “Research on the Utilization of Museum Activities for Education for the Young Generation in the Philippines.” The project is organized in association with the National Museum of the Philippines, the Mindanao State University Iligan Institute of Technology, and the University Museum, University of Tokyo. It is undertaken by Filipino and Japanese researchers interested in exploring innovative uses of museum collections and supported by the Toyota Foundation.

Keywords: *Boxes, Museum, Collections, Mounted Exhibition*

UNDERWATER ASSESSMENT OF CORAL REEF FISHES OF TAWI-TAWI, PHILIPPINES

Akkil S. Injani, Yunadzmal Ong, Richard N. Muallil*

Mindanao State University Tawi-Tawi College of Technology and Oceanography
Sanga-Sanga, Bongao, Tawi-Tawi, Philippines, 7500
*Rnmuallil2017@gmail.com

Tawi-Tawi is an island province found in the southern portion of the Sulu Archipelago which is considered a marine key biodiversity area. It harbors some of the most pristine coral reefs in the country as many of these reefs are remote and inaccessible to fishers. In this study, we conducted underwater fish visual census (fvc) surveys by scuba diving to assess the condition of coral reef fishes in four municipalities (Sibutu, Bongao, Simunul and Panglima Sugala). Surveys were conducted from April to November 2018 during daytime from 8:00 to 16:00 hours. In areas where there are marine protected areas (MPAs), surveys were conducted both inside and outside MPAs. Preliminary results showed that reef fish biomass on the reefs of Tawi-Tawi is generally from good to very good condition based on Nanola et al., 2007 categories. Other details of the results including the implication to coral reef conservation are presented.

Keywords: *Tawi-Tawi, coral reef fish, marine protected area, marine biodiversity*

VISUAL HABITAT ASSESSMENT (VHA) OF TALABAAN RIVER IN BRGY. TAGBALOGO, NAAWAN, MISAMIS ORIENTAL

Urlie G. Anino*^{1,2}, Annielyn D. Tampus

¹Caraga State University-Cabadbaran Campus, Agusan del Norte, Philippines

²Mindanao State University-Iligan Institute of Technology, Iligan City, Philippines

*urlie.anino@g.msuiit.edu.ph

Talabaan River at Tagbalogo is one of the main channels of Talabaan Watershed located in the municipality of Naawan, Misamis Oriental, Philippines. Residential development and farming activities nearby and along riparian areas are causing this river to deteriorate fast. The study was conducted to assess the physical condition of the river using visual-based habitat assessment method extracted directly from the USEPA (2004). The results showed that the perennial stream which in fact the major source of the drinking water in the area originated as spring-fed with cold water spring type. The riparian vegetation is dominated by Yemani (*Gmelina arborea*) and coconut (*Cocos nucifera*) trees. Visually, the epifaunal substrate covers 40-70% of the habitat that is well-suited for full colonization potential. It has a presence of gravel, cobble, and boulder particles ranging from 0-25% surrounded by fine sediment, with all velocity/regimes present that covers 5-30% of the bottom affected and slight deposition in pools. Channelization or dredging was absent or minimal and occurrences of riffles relatively frequent. Evidence of bank failure is minimal. Trees poaching for construction and firewood, and farming are among the anthropogenic-related activities that produce harm and wastes on the river.

Keywords: *Habitat Assessment, Perennial Stream, High-Gradient, Talabaan River*

**WASTE ANALYSIS, CHARACTERIZATION AND DISPOSAL PRACTICES:
A CASE OF BRGY 15, CAGAYAN DE ORO CITY, PHILIPPINES**

Pemenorejoan M. Calumpang^{*1}, Wilson C. Nabua², Ruben Amparado³, Rachel Catherine M. Asuncion¹, and Francasio P. Curan¹

¹Pilgrim Christian College, Cagayan de Oro, Philippines

²Northwestern Mindanao State College of Science and Technology, Tangub City, Philippines

³Mindanao State University-Iligan Institute of Technology, Iligan City, Philippines

*pemenorejoan.calumpang@g.msuiit.edu.ph

Household solid waste disposal has been a perennial issue in the country which brought adverse effects to the community and the environment. This study analyzed the wastes generated by the residents of Brgy 15, Cagayan de Oro City. A total of 18 respondents were randomly selected to participate in a 7-day waste characterization activity. The amount of wastes generated was tallied and described. Observation method, informal interview, group discussions and lectures were conducted to validate the information gathered. The results revealed that the Brgy 15 residents generated an average of 1.75 kg/hh/day of which 64% were biodegradable. In addition, lower income group generated the highest amount of wastes. But there is no significant difference on the amount of waste generated among the days of the week. Prior to the activity, a few were already practicing waste segregation as outcome of the barangay ordinance but was not sustained. After the 7-day activity, the participants expressed their positive attitude towards the project and had committed to sustainably segregate the home solid wastes.

Keywords: *Waste Analysis, Solid Waste Disposal, Cagayan de Oro City*