Biodiversity Conservation Society of the Philippines

PAMPANGA STATE AGRICULTURAL UNIVERSITY 1885 PHILIPPINES

The 27th Philippine Biodiversity Symposium

Mainstreaming Biodiversity Conservation: Local, National and International Perspectives

16-20 October 2018
Pampanga State Agricultural University,
Magalang, Pampanga

MESSAGE

Greetings of peace and a warm welcome to the Pampanga State Agricultural University (PSAU)!

Our lives as complex species are entangled with our diverse environment, a mutual dependence we share as we unravel the deeper sense of life. This realization of interconnectedness provides a general idea that we are tremendously adaptable yet, accountable for one another.

As people of science, our work is vital from around our own homes towards and beyond groups and communities. By gathering here, we accept as our mission to raise consciousness on biodiversity conservation and to advocate a collective conscience towards making it a way of life. Biodiversity conservation is neither confined only to the biologists, environmentalists or ecologists nor to the national or international leaders. It is everybody's concern.

With this, PSAU is highly humbled to host the 27th Annual Philippine Biodiversity Symposium and General Assembly of the Biodiversity Conservation Society of the Philippines. Hopefully this event will allow us to leave our footprints as we traverse this delicate path and bequeath a legacy for future generations.

HONORIO M. SORIANO JR., PhD.
President
Pampanga State Agricultural University

MESSAGE

Biodiversity Conservation Society of the Philippines

We are in a tipping point where conservationists are either being called out for not minding the gap between science and the social sciences while at the same time, surmounting evidence show the linkage between biodiversity conservation and key UN Sustainable Development Goals. As the country prepares its 6th National Report to the Convention on Biological Diversity (CBD), it is but timely that the theme of the symposium aims to investigate how we, as a Society, contribute to not only our field of expertise, but to national and global sustainable development as well.

True to its mission, BCSP is creating opportunities for researchers and conservationists to contribute to development; the Philippine Biodiversity Symposium provides a venue for studies and projects to be presented and integrated into local and national agenda and action plans. Moreover, the symposium aims to celebrate the challenges and successes that we have had in mainstreaming biodiversity conservation across various sectors so that we can learn from one another's experiences and embrace our feats as a community.

We have prepared a program that would define and emphasize on the theme of the symposium, "Mainstreaming biodiversity: local, national, and international perspectives". We have plenary speakers defining their approaches to mainstreaming biodiversity in various contexts and sharing their experiences in what works, and what needs to be done to make this happen; high school students defining their own advocacy through an exhibit; workshops and presentations that can strengthen the role of researchers in providing data and strategy that can aid developmental programs and policies; and wildlife artists mainstreaming biodiversity through art.

We thank Pampanga State Agricultural University for graciously hosting the 27th Annual Philippine Biodiversity Symposium and our partners and sponsors for the support. The symposium would not possible without the institutions, workshop facilitators, presenters, and volunteers who contribute their time and expertise in making the symposium happen.

Have a blessed time with us in Magalang, Pampanga!

CYNTHIA ADELINE A. LAYUSA, MSc, MPhil
President
Biodiversity Conservation Society of the Philippines

The 27th Philippine Biodiversity Symposium

'Mainstreaming Biodiversity Conservation: Local, National and International Perspectives'

Pampanga State Agricultural University, Magalang, Pampanga
16–20 October 2018

16 OCTOBER 2018 (TUESDAY)

Venue: Bren. Z. Guiao Memorial Multi-Purpose Center

9:30	Registration

Opening Program
Master of Ceremonies: Dexter Andrew Manalo, Pampanga State Agricultural University

14:00	Doxology and National Anthem
14:10	**Welcome Message,** Honorio M. Soriano, Jr., PhD, President, Pampanga State Agricultural University (PSAU)
14:30	**Opening Remarks,** Cynthia Adeline A. Layusa, President, Biodiversity Conservation Society of the Philippines (BCSP)
14:40	Intermission number by the La Granja Modelo Socio Cultural Group
15:00	**Message**, Crisanta Marlene P. Rodriguez, Director, Biodiversity Management Bureau (BMB)
15:20	**Message**, Engr. Paquito T. Moreno, Jr., Regional Executive Director, DENR III
15:40	Group Photo
16:00	**Opening of Institutional Exhibits** ***Moderator: Apolinario B. Cariño, Biodiversity Conservation Society of the Philippines***
	Recognition of Participants and Institutions
	Snacks to be provided. Sponsored by DENR Region 3
18:00	Welcome dinner hosted by the Pampanga State Agricultural University
	Cultural presentation by the La Granja Modelo Socio Cultural Group

PROGRAM

17 OCTOBER 2018 (WEDNESDAY)

Venue: Bren. Z. Guiao Memorial Multi-Purpose Center

8:00 Registration

Plenary: Case studies in mainstreaming biodiversity conservation
Moderator: Leticia E. Afuang, PhD

8:30 The Biodiversity Conservation Society of the Philippines, Cynthia Adeline A. Layusa

8:50 **Crocodile Population Management for Sustainability—a concept that encourage coexistence,** Rainier I. Manalo, Crocodylus Porosus Philippines, Inc. (CPPI)

9:10 **Exploring Situational Crime Prevention Techniques in deterring wildlife crimes within key biodiversity areas: examples from the Mt Apo KBA,** Jayson Ibanez, PhD, Philippine Eagle Foundation, Inc. (PEFI)

9:30 **Marine Migratory Species: Mainstreaming Conservation Beyond Borders**, Moonyeen Alava, Coastal Conservation and Education Foundation (CCEF)

9:50 Open Forum

10:00 Break

Partners' Session: Mainstreaming biodiversity across sectors
Moderator: Ruth C. Martinez

10:30 **USAID activities related to biodiversity conservation in the Philippines**, Randy Vinluan, USAID Contracts Officer Representative

10:45 **Forest Foundation Philippines Research Grant Program, 2017-2021**, Bryan Joel Mariano, Knowledge Management Specialist, Forest Foundation Philippines (FFP)

11:00 **Mainstreaming biodiversity in business**, Ronald Allan Altamirano, Team Energy Foundation, Inc. (TEFI)

11:15 **Mainstreaming biodiversity in business**, Liezel Salagubang, Energy Development Corporation (EDC)

11:30 **Developing a research action plan for Mindoro**, Leticia E. Afuang, Mindoro Biodiversity Conservation Foundation, Inc. (MBCFI)

11:45 **New biodiversity conservation approaches and the CCI Framework**, Edmund Leo Rico, Center for Conservation Innovations (CCI)

12:00 Lunch

Plenary Session: Exhibits and Pecha Kucha
Moderator: Mae Lowe L. Diesmos

13:30 Introduction to the Session and Instructions for Presenters

13:45 The Philippine Science High School-Central Luzon Campus' biodiversity advocacies: Valuing our biology lessons through action

14:15 Pecha Kucha

16:00 Poster viewing

18:00 Dinner hosted by the United States Agency for International Development (USAID)

PROGRAM

18 OCTOBER 2018 (THURSDAY)

Venue: Bren. Z. Guiao Memorial Multi-Purpose Center

8:00 Registration

Plenary: Approaches to mainstreaming biodiversity: Local, national and international perspectives
Moderator: Moonyeen Nida R. Alava

8:30 Introduction to the Session Speakers

8:40 **Mainstreaming Biodiversity in the ASEAN**, Theresa Mundita S. Lim, DVM, Executive Director, ASEAN Center for Biodiversity

9:10 **Mainstreaming Biodiversity: A People-Centered Perspective,** Rocky Sanchez-Tirona, Vice President, RARE–Philippines

9:40 Open Forum

10:00 Break

Venue: Farmer's Training Center (FTC)

10:30 **Concurrent Sessions (1, 2, 3)**

	Session 1: Conservation Management ***Moderator: Rainier Manalo***	**Session 2: Wildlife Studies** ***Moderator: Willem van de Ven***	**Session 3: Fauna and Flora** ***Moderator: Jacob Aderson Sanchez***
10:30	COIN-SERVATION: Assessing the Impacts of Using Indigenous Flora in the New Philippine Coins on Students' Taxonomic and Conservation Awareness *Soriano, Jezelle Angeline O.*	Population density estimates of two Philippine endemic fruit bats in a tropical lowland forest in Palanan, Isabela, Philippines *Dayapera, Lystra Zyrill A.*	Newly Recorded Species in Mindoro *Cielo, Kathy Lene S.*
10:45	Flying fox conservation in North East Luzon *Balbas, Marites G.*	Population Survey on the Philippine Flat-Headed Frog (*Barbourula busuangensis*) in Busuanga *Flores, Gerrie Mae*	Assassin bugs (Hemiptera: Reduviidae) of Mount Makiling and vicinity *Mercene, Solo Arman P.*
11:00	Busuanga Bantay Dugong: Capacitating fishers on dugong monitoring and conservation *Soniega, Muammar Princess*	Diversity of fruit bats in forest fragments and reforestation areas within limestone quarries in the Philippines *Duco, Renz Angelo J.*	Ethnobotany of traditional medicinal plants at the foothills of Mt. Arayat, Pampanga, Philippines *Totaan, Evelyn V.*
11:15	High Conservation Value Areas in West Mt. Bulanjao, Southern Palawan *Edaño, Jhonny Wyne*	Assessment of the Population of Blood Cockles (Anadara granosa) in the Coastline of Brgy. Punta Mesa, Barangay II and II-A Manapla, Negros Occidental *Malihoc, Agape Grace D.*	Riparian Flora Inventory of Pansipit River in Agoncillo, Batangas *Solomon, Mailyn B.*
11:30	Management and Governance of the largest roosting population of flying foxes in in the Philippines at Siay, Zamboanga Sibugay *Pingkian, Anna Francheska*	Implications of Philippine Eagle expeditions in Central Sierra Madre Mountains *Panopio, J Kahlil B.*	Phytosociological Study in Garantiangan Island, Taklong Island National Marine Reserve (TINMR), Nueva Valencia, Guimaras, Philippines *Calesterio, Krizha Marie C.*
11:45	Open Forum	Open Forum	Open Forum

PROGRAM

Venue: Bren. Z. Guiao Memorial Multi-Purpose Center

12:00 Lunch at the Bren. Z. Guiao Memorial Multi-Purpose Center

Venue: Farmer's Training Center (FTC)

13:30 **Concurrent Sessions (4, 5, 6)**

	Session 4: Wildlife Studies *Moderator: Carmela Espanola, PhD*	**Session 5: Threats and Issues** *Moderator: Ruth Martinez*	**Session 6: Taxonomy and Systematics** *Moderator: Michael Nicdao*
13:30	Tracking the Critically Endangered Philippine Crocodile: an ongoing diet and telemetry study of wild, translocated, and headstart crocodiles *Brown, Joseph*	Assessment and Ecological Niche Modelling of Invasive Alien Plant Species in Quezon Protected Landscape, Southern Luzon, Philippines *Paclibar, Gicel Christine B.*	Species Delineation of the Genus *Diplazium* Swartz Using Leaf Architecture Characters *Conda, Jennifer M.*
13:45	Call characterization of the Philippine Scops Owl *Otus megalotis* population in UP Diliman using spectrograms *Silvestre, Joaquin Rogelio Perez*	Impact of Anthropogenic and Environmental Factors on the Pelagic Trophic Structure of Laguna de Bay *Calleja, Maureen Althea G.*	Updates on the Riparian Philippine *Caccothryptus* SHARP (Coleoptera: Limnichidae: Limnichinae), aiming for a Taxonomic Revision of Species Groups *Delocado, Emmanuel D.*
14:00	A Question on Natural Hybridization between *Crocodylus porosus* and *Crocodylus mindorensis* in the Northeastern Mindanao, Philippines: The Case of "Andeng" *Manalo, Rainier I.*	On Emerging Contaminants as Potential Threats to Philippine Biodiversity: Erythromycin Disrupts *Aedes aegypti* L. Life Cycle *Calma, Mayer L.*	Inventory, Molecular and Phylogenetic Assessment of Herpetofauna Vis-à-vis Ecological Factors at the Riparian Buffer Zone in Mt. Arayat, Pampanga, Philippines *Supan, Nathan*
14:15	Comparative Study of the Bioacoustics of the Philippine Eagle (*Pithecophaga jefferyi* Ogilvie-Grant, 1896) and Other Raptors in Captivity *Gatdula, Jestine Christia V.*	Detection of Newcastle disease virus, Mareks disease virus and infectious Laryngotracheitis virus in cattle egrets (Bubulcus ibis) in Bulacan *Lastica-Ternura, Emilia A.*	Collecting Birds and Mammals While in Captivity *Veluz, Maria Josefa S.*
14:30	Habitat use and geographic distribution of the tamaraw (*Bubalus mindorensis*) at Mounts Iglit-Baco Natural Park, Mindoro *Belmonte, Jackie M.*		The Art and Science of Taxidermy: From the Field into the Museum Gallery *Domingo, Anna Melissa SP*
14:45	Open Forum	Open Forum	Open Forum

15:00 Break

15:30 BCSP General Assembly

18:00 BCSP Fellowship Night

Inspirational Message: Angel C. Alcala, PhD, National Scientist and Executive Director, Silliman University-Angelo King Center for Research and Environmental Management (SUAKCREM)

Book Launching: A Life of Discovery: Danny Balete and His Celebration of Philippine Biodiversity

PROGRAM

19 OCTOBER 2018 (FRIDAY)

Venue: Bren. Z. Guiao Memorial Multi-Purpose Center

8:00 Registration

Plenary: Challenges and successes in mainstreaming biodiversity
Moderator: Evelyn Totaan, PhD, Pampanga State Agricultural University

8:30 Introduction to the Session Speakers

8:40 **Re-Imagining Wildlife Conservation in the Philippines**, Neil Aldrin D. Mallari, PhD, Founder and President, Center for Conservation Innovations

9:10 **Partnerships for Biodiversity Conservation: Mainstreaming Biodiversity in Local Agricultural Landscapes Project**, Grace Tena, Programme Analyst, Inclusive and Sustainable Development (ISD) Team, United Nations Development Programme

9:40 Open Forum

10:00 Break

Venue: Farmer's Training Center (FTC)

10:30 **Concurrent Sessions (7, 8, 9)**

	Session 7: Diversity and Distribution ***Moderator: Marisol Pedregosa***	**Session 8: Conservation Management** ***Moderator: Moonyeen Alava***	**Session 9: Fauna and Floral Assessment** ***Moderator: Nikki Dyanne Realubit***
10:30	How small an island? Speciation by endemic mammals (*Apomys*, Muridae) on an oceanic Philippine island Heaney, Lawrence R.	Carbon stock and potential of a carbon forest site in Alaminos, Laguna *Palomar, Jamila Audrey Go*	A survey on threatened migratory waterbirds at Siay-Kabasalan Wetland, Zamboanga Sibugay, Philippines and its association to the East Asian-Australasian Flyway *Canag, Javica Faye D.*
10:45	A Contribution to the Knowledge on the Wildlife Ectoparasite Fauna of the Philippines: Updates on the Distribution and Diversity of Entomofauna Ectoparasitic on Bats (Mammalia: Chiroptera) *Amarga, Ace Kevin S.*	Assessment of Bud Bongao using Management Effectiveness Tracking Tool (METT) *Dunque, Frank Ivoh C.*	Botanical survey of the three Protected Areas (PAs) in Negros Island, the Philippines *Olimpos, Shiella Mae B.*
11:00	Home range and foraging area of Ptenochirus jagori and Haplonycteris fischeri in a tropical lowland forest *Pueblo, Christopher John A.*	Gaps in Protecting Forest Over Ultramafic Formations in the Philippines *Corpuz, Nancy*	Rapid Assessment of Avifauna in Sibutu Island, Tawi-Tawi *Saddari, Fauriza J.*
11:15	Population and Distribution of Flying Foxes in Zamboanga Peninsula, Philippines *Fernandez, Georgina L.*	Boundary Synchronization: An Important Step for Protected Area Suitability Assessment or in Developing Frameworks for Local Conservation Areas *Adlawon, Jade Carla Jopio*	A preliminary list of the ferns and lycophytes of Central Cebu Protected Landscape (CCPL), Cebu Province, Philippines *Peña, Gabrielle Keisha C.*
11:30	Small mammals in upland urban-forest ecosystem in Northern Luzon, Philippines *Reginaldo, Aris A.*	Collaborative Governance: an Alternative Approach in Policy Making and Implementation Process for Taal Volcano Protected Landscapes *Pangilinan, Josef Renzo*	
11:45	Open Forum	Open Forum	Open Forum

PROGRAM

Venue: Bren. Z. Guiao Memorial Multi-Purpose Center

12:00 Lunch at the Bren. Z. Guiao Memorial Multi-Purpose Center

Venue: Farmer's Training Center (FTC)

13:30 **Concurrent Sessions (10, 11, 12)**

	Session 10: Conservation Management *Moderator: Edmund Leo Rico*	**Session 11: Wildlife Studies** *Moderator: Evelyn Totaan, PhD*	**Session 12: Threats and Issues** *Moderator: Mae Diesmos*
13:30	Enhancing Biodiversity Monitoring System (Hornbill Count): A Citizen Scientist Participation in Monitoring Biodiversity in Three Globally Important Protected Areas in Negros Island, Philippines *Jakosalem, Philip Godfrey*	ATidal Movement of the Indo-Pacific Horned Sea Star (*Protoreaster nodosus* Linnaeus, 1758) in a Seagrass Meadow in Calatagan, Batangas *Manaligod, Hyacinth A.*	Adding insult to injury: combined effects of land cover and climate change on current and future distributions of the Dipterocarpaceae in the Philippines *Pang Eng Howe, Sean*
13:45	Establishing Community Conserved Areas to Complement Protected Areas – Lessons Learned from the Northern Sierra Madre Natural Park *Acay, Joni T.*	The influence of time of day and rice plant growth phases in bird assemblages in rice fields *Tenorio, Frances Mae*	Updates on the Riparian Philippine *Caccothryptus* SHARP (Coleoptera: Limnichidae: Limnichinae), aiming for a Taxonomic Revision of Species Groups *Delocado, Emmanuel D.*
14:00	A community-based approach to conserving the island-endemic Calayan Rail Gallirallus calayanensis *Layusa, Cynthia Adeline A.*	The common palm civet (*Paradoxurus philippinensis* Jourdan, 1837) as a seed-dispersal agent in the Mt. Makiling Forest Reserve, Luzon Island, Philippines *Fernandez, Desamarie Antonette P.*	Initial estimates for extent of occurrence of non-native squirrels in Luzon, Philippines *Torres, Daniel*
14:15	Setting the Conservation Agenda for the Forest Dependent Bleeding-hearts *Masigan, Jennica Paula*	The Gut Microbiota of *Melanoides* sp. and *Neritina* sp. *Siglos, Llara M.*	Habitat Suitability Modelling of Spiked Pepper (*Piper aduncum* L.) in Mindanao, Philippines *Japitana, Rowena A.*
14:30	Conserving the Rufous-headed Hornbill in the Central Panay Mountains Key Biodiversity Area in Panay Island *Quimpo, Josiah David G.*	Comparative study of copper (II) ion accumulation in *Terapon jarbua* (Terapontidae) infected and uninfected with nematode endoparasite *Anisakis* spp. (Anisakidae) from Lingayen Gulf, Pangasinan *Paglingayen, Kimberly P.*	
14:45	Open Forum	Open Forum	Open Forum

PROGRAM

Venue: Farmer's Training Center (FTC)

15:00 Break

15:30 **Workshops**

- **Workshop on Scientific Illustration**. Aissa Domingo, Philippine National Museum of Natural History
- **Intro to Bio(diversity)informatics and Answers to FAQs on Biodiversity Data**. Arman Pili, Mae Lowe Diesmos, Arvi Diesmos, HerpWatch Pilipinas
- **Connected to the Wild: Linking Biodiversity Conservation and Development**. Michelle Pascual, USAID Protect Wildlife Project
- **Basic Ecological Statistics Using R**. Lilian Jenifer Rodriguez, Jelaine Gan, Simeon Gabriel Bejar, Rieziel Ann Bernal, Institute of Biology, University of the Philippines-Diliman
- **The Role of Modern-Day Researchers in the Attainment of UN Sustainable Development Goals (SDGs) 13, 14, and 15**. Raymark Paul T. Rigor, University of the Philippines-Baguio
- **Forest Resources Bill: A New Hope for the Philippine Forests**. Princess del Castillo, Thaddeus Martinez, Maria Belinda de la Paz, Haribon Foundation, Inc.
- **Permaculture Design: Venturing from Ego System to Eco System**. Bert Peeters and Sandino Guinto, Philippine Permaculture Association
- **Consultation Session on the Development of Action Plan for the Flying Fox**, Wildlife Resources Division, Biodiversity Management Bureau

18:00 Closing Dinner and Awarding Ceremonies

19 OCTOBER 2018 (FRIDAY)

Venue: Farmer's Training Center (FTC)

9:00-17:00 **PARALLEL SESSION**: Workshop on Developing Biodiversity Research Agenda for Mindoro, Mindoro Biodiversity Conservation Foundation, Inc. (MBCFI)

20 OCTOBER 2018 (SATURDAY)

Venue: Mt. Arayat

5:300 **Field trip**: Mt. Arayat Challenge (optional)

PLENARY PRESENTATION

Exploring situational crime prevention techniques in deterring wildlife crimes within key biodiversity areas: examples from the Mt Apo KBA

Jayson Ibañez, *Philippine Eagle Foundation*

Good governance of natural resources demands clear decision makers, sound rules or policies on resource uses, and the strong enforcement of these rules. In some key biodiversity areas of the country under some forms of formal protection (e.g. Protected Areas), those who decides over resource use rules are clear (e.g. PAMB) and the rules needing compliance are well in place (NIPAS Law and PA Management Plans). But enforcement remains a challenge and is weak at best so that people's knowledge of rules is not enough incentive to motivate compliance. As a deterrence measure against wildlife offenses at known Philippine eagle nesting sites and hunting areas, we explored the use of Situational Crime Prevention (SCP) techniques to help enforce rules and prevent timber and wildlife poaching, and deforestation and habitat encroachment within the Mt Apo KBA. SCP is directed at changing or managing the contextual environment to block opportunities for offending. It recognizes the possibility that any individual can commit an offense at any time if given the chance. As part of the PEF's culture-based conservation approach, we worked with Indigenous *Bagobo Tagabawa, Bagobo Klata,* and *Obu Manuvu* owners of over 17,000 hectares of ancestral domains at Mt Apo to plan and implement actions that increase the effort, increase the risks, reduce the rewards, reduce provocations and remove excuses in any presented opportunity to commit wildlife crimes inside ancestral forests. Guided by the SCP's theoretical principles, 20 relevant techniques were developed. This paper describes each of those techniques, how it was implemented, and the outcomes that resulted from its implementation as summarized from local forest guard patrol logs and field accomplishment reports. Over-all, the SCP framework turned out to be a practical planning tool that helped reduce opportunities for wildlife crime within the project sites. It is recommended that the use of this framework at other KBAs should be investigated and evaluated. The mandatory use of the SCP techniques in protected area action planning is also explored.

KEYNOTE PRESENTATION

Mainstreaming Biodiversity in the ASEAN

Dr. Theresa Mundita S. Lim, *Executive Director, ASEAN Centre for Biodiversity*

"*The integration of biodiversity concerns into defined sectors and development goals, through a variety of approaches and mechanisms, so as to achieve sustainable biodiversity and development outcomes*" is called biodiversity—development mainstreaming (UNEP-WCMC 2014). According to the WCMC report, they found out that there are several definitions of "mainstreaming biodiversity". However, the common denominator of the definitions highlights three characteristics: a) it is a deliberate process, b) there are multiple routes and or outputs that can be targeted (e.g. policies, plans and legislations), and that c) mainstreaming should take place across multiple levels of government as well as across central government (UNEP-WCMC 2014).

The countries signatory to the UN Convention on Biological Diversity (UN CBD) submit their national biodiversity strategy and action plans (NBSAP) to the secretariat of the CBD. The NBSAP is a policy instrument that incorporates all biodiversity activities of a country into one document. The ASEAN Member States, all being signatory to the UNCBD, submit their respective NBSAPs to the CBD. The NBSAP is the basic document that activities in mainstreaming biodiversity into different sectors are found.

On the other hand, the ASEAN Centre for Biodiversity (ACB), as a regional intergovernmental and international organization, has taken up the cudgel of mainstreaming biodiversity in the ASEAN at the regional level, since there are no regional equivalent of the NBSAP. The NBSAPs are the responsibility of the countries at national and sub-national levels.

Challenges and lessons learned shall be shared during the oral presentation.

Several programs and activities are scheduled in the remaining months of the year. These are: 1) a series of workshops designed to mainstream biodiversity in the various sectors of a country, which will be implemented in ASEAN, namely: a) Climate Change and Biodiversity – Oct 9–12, where the resilience of ecosystems and the role of communities in fostering climate change and integrating them in NDCs of a country will be discussed; b) Mainstreaming Biodiversity into Development Sectors – Oct 15–17 – where not only the mainstreaming of biodiversity into an ASEAN Member State's NBSAP will be discussed but also the opportunities and challenges of integrating biodiversity considerations in the tourism, infrastructure and banking/finance sectors will be taken up; c) Health & Biodiversity – Nov 5–7; 2) ACB has formulated a DRAFT policy guidelines on Mainstreaming Biodiversity Across Relevant Sectors through Biodiversity-based Value Chains – a draft policy instrument that was developed using the CBD COP 13 Decision on Mainstreaming Biodiversity and the experiences of ACB's Biodiversity-based Products (BBP) Project where the value chain approach was applied to enhance the livelihood opportunities of some biodiversity-based products from Cambodia (black ginger and vine), Lao PDR (bamboo furniture and handicraft) and Vietnam (honey, bo khai, giao co lam and medicinal bath herbs) and maintain preservation of biodiversity in ASEAN Heritage Parks; and 3) ACB is working with SEARCA to develop a draft Guidelines on Responsible Investments in Agriculture.

KEYNOTE PRESENTATIONS

Mainstreaming Biodiversity: A People-Centered Perspective

Rocky Sanchez-Tirona, *Vice-President, RARE, Inc*

Biodiversity conservation is a critical juncture. Habitats are being destroyed every day, and thousands of species are threatened or vulnerable. Much of this is due to human activity. The good news is that if people are the problem, they are also the solution. It has become imperative for the conservation community to recognize that we cannot address the challenges facing biodiversity if we are not able to reframe our approaches from the point of view of people---the leaders and policy makers, the consumers and marketers, and most importantly, the communities who live with and depend on our natural resources. We need to look closer at how we design, implement and communicate biodiversity conservation strategies and approaches, to ensure that people respond positively, optimistically and with commitment. We can look to lessons and bright spots in human-centered design, behavioral science, social marketing and community engagement approaches. If done well, perhaps we can look to a world where both people and nature thrive.

Re-Imagining Wildlife Conservation in the Philippines

Neil Aldrin D. Mallari, *Founder and President, Center for Conservation Innovations*

There has been more than 2 decades of protected areas experience in the Philippines. Together with this is the spectacular growth in our body of knowledge, increase in the rate of discovery of new species, rise of many nature conservation groups, and the emergence of OECMs (Other Effective Area-based Conservation Measures). The DENR lists some 244 Protected Areas in the country but only 128 have been judged to have high biodiversity value whilst the remaining 116 do not include biodiversity rich areas and are therefore in need of re-evaluation and reclassification. Despite this seemingly large number of protected areas, their coverage in the Philippines falls short of the international target of 17% of the total land area and 10% marine territories. In general, there are already a very strong legal framework, decentralized and collaborative institutional arrangements, and a multi-sector and participatory approach in protected area planning and management in the Philippines. However, it is apparent there is an absence of a strong, scientifically defensible set of conservation planning tools for many of these protected areas. This gap between management systems/infrastructure and science-based conservation planning clearly undermines the efficacy of protected areas including OECMs. This paper examines the current conditions of these biodiversity rich areas and the solution pathways that we might take.

KEYNOTE PRESENTATION

Partnerships for Biodiversity Conservation: Mainstreaming Biodiversity in Local Agricultural Landscapes Project

Grace Tena, *Programme Analyst, Inclusive and Sustainable Development (ISD) Team, United Nations Development Programme*

The Philippines is considered to be one of the world's most biologically rich countries. It is one of the world's 17 megadiversity countries, which together host 2/3 of the earth's biodiversity and between 70–80% of the world's plant and animal species. However, the country is also one of the global biodiversity hotspots with at least 700 threatened species. Philippines lost 2.1% of its forest cover annually between 2000 and 2005, which is considered the second fastest in the Southeast Asia, next to Myanmar.

The primary government response to protect the country's important biodiversity has been the establishment of a system of protected areas through the National Integrated Protected Areas System (NIPAS). However, the system currently excludes other areas of critical connective habitat and other sites which are significant for biodiversity conservation. These are the Key Biodiversity Areas (KBAs) and the surrounding production landscapes of PAs and KBAs which are important for connectivity of key biodiversity corridors. The result is a highly fragmented landscape, consisting of unsustainable agricultural and natural resources production systems and incompatible land uses which further expose the remaining natural habitats to threats. These are more evident at the level of local government units who are responsible for integrated management of lands under their jurisdiction, including PA/KBA territories, and the production landscape. To arrest fragmentation, the UNDP together with the DENR has implemented a Project entitled "Partnerships for Biodiversity Conservation: Mainstreaming in Local Agricultural Landscapes (Biodiversity Partnerships Project)" which aims to aimed at strengthening enabling policies at the national level; enhancing capacities of LGUs. The main strategy of the project was building partnerships with key national government agencies, LGUs and national and local conservation NGOs, to muster their resources and expertise for biodiversity conservation. Eight (8) KBAs were identified as pilot sites for this project, namely: the Northeastern Cagayan Key Biodiversity Area (NECKBA), Quirino Protected Landscape (QPL), Mt. Siburan Key Biodiversity Area (MSKBA), Malampaya Sound Protected Landscape and Seascape (MSPLS), Central Panay Mountains (CPM), Northern Negros National Park (NNNP), Lake Mainit Key Biodiversity Area (LMKBA) and Mt. Hamiguitan Range Wildlife Sanctuary (MHRWS). The Project was signed in September 2010 and implemented over five (5) years.

What did the project achieve so far? Through the years, BPP has tapped the agencies that were not traditionally associated with biodiversity conservation. The project has managed to integrate biodiversity in the preparation/updating of land-use plans of LGUs with the adoption of the framework and tool by the Housing and Land Use Regulatory Board (HLURB). At least 22 LGUs have integrated biodiversity conservation in their respective CLUPs.

It was also able to partner with the Department of Agriculture in the development of a framework for BD-friendly agricultural practices which resulted to a proposed draft joint memorandum circular which hoped to be passed soon. The partnership forged with DTI has also resulted to the mainstreaming of BD-friendly enterprises in the Investment Priorities of the country. Several LGUs have also integrated BD-friendly enterprises in their Local Investment Code. The Project was instrumental in developing the framework and criteria of BD-friendly enterprises which was used in assisting more than 10 community-based biodiversity-friendly enterprises.

The BPP Project has opened linkages and partnership opportunities with key agencies with which policies and programs are impacting or affecting the state of biodiversity resources in the country. The work has just begun. Continued collaboration with these agencies and stakeholders is needed to ensure that environmental considerations/biodiversity conservation are incorporated in their sectoral development planning processes.

LIST OF ORAL PRESENTATIONS

HIGH SCHOOL

Assessment of the population of blood cockles (*Anadara granosa*) in the coastline of Brgy. Punta Mesa, Barangay II and II-A Manapla, Negros Occidental

Angel R. Abella, Frederene P. Javelona, Agape Grace D. Malihoc, and Princess Nyrah M. Sumpreque

COIN-SERVATION: Assessing the impacts of using indigenous flora in the new Philippine coins on students' taxonomic and conservation awareness

Clarence Gio S. Almoite, Ivan Gabrielle C . Alzula, Donita M. Capili, Jermaine Allen R. Guevarra, Jezelle Angeline O. Soriano, Rey John D. Caballero

UNDERGRADUATE

Adding insult to injury: combined effects of land cover and climate change on current and future distributions of the Dipterocarpaceae in the Philippines

Sean Pang Eng Howe, Jose Don T. De Alban, and Edward L. Webb

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Updates on the riparian Philippine *Caccothryptus* SHARP (Coleoptera: Limnichidae: Limnichinae), aiming for a taxonomic revision of species groups

Emmanuel D. Delocado and Hendrik Freitag

Assessment of the population of blood cockles (*Anadara granosa*) in the coastline of Brgy. Punta Mesa, Barangay II and II-A Manapla, Negros Occidental

Angel R. Abella, Frederene P. Javelona, **Agape Grace D. Malihoc**, and Princess Nyrah M. Sumpreque

Negros Oriental National High School

Fishing is the main source of livelihood for most residents in coastal areas. *Anadara granosa,* locally known as "litub," mussels, and other shellfish are used for food. The main purpose of the study is to assess the population of *A. granosa* blood cockles in the intertidal zones of three selected barangays in Manapla, Negros Occidental in terms of sizes, humidity, temperature of the air and water, air velocity, and the number of blood cockles present. Quadrat sampling was used to determine the population of blood cockles in three barangays (Punta Mesa, Barangay II and II-A). Respectively, an average of 2.67, 1, and 1.67 blood cockles were found. With the results, p-value of the following: sizes = 0.957, humidity = 0.014, air temperature = 0.88, water temperature = 0.880, and number of blood cockles = 0.52 at level of significance α=0.05. The researchers therefore conclude that there is a significant difference between the population of blood cockles in the three barangays in terms of sizes, temperature of the air and water, air velocity, and the number of blood cockles present because the p-value is greater that the α=0.05 and there is no significant difference between the humidity in the three barangays because the p-value is less that the α=0.05.

COIN-SERVATION: Assessing the impacts of using indigenous flora in the new Philippine coins on students' taxonomic and conservation awareness

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Ramon Magsaysay (Cubao) High School

To date, the total number of indigenous Philippine plant species is approximately 6,289. Although very significant to Philippine biodiversity, some do not know that these plants are important and can only be found in our country. With this, basic knowledge about taxonomy is important for conservation of these species. In the newly designed coins of Philippine currency, different indigenous species of plants are engraved which can contribute to our extensive knowledge about Philippine flora. Students of Ramon Magsaysay (Cubao) High School's awareness about taxonomy and conservation of indigenous species was evaluated to determine the effects of new coin designs in their understanding. A survey was conducted after the implementation of these new coins. Results showed that out of 458 students, 56% know about taxonomy, wherein 39% said it talks about the organisms' classification. However, 44% of them are still clueless about what taxonomy is. The new design of these coins was effective in increasing the students' awareness by featuring numerous endemic species of plants. This was proven with the result showing that 52% of the students have noticed the plant species engraved at the back of these coins like waling-waling (*Vanda sanderiana*). Moreover, this also showed that 69% know why it's important to conserve the Philippine flora. Some said that endemic flora symbolizes the Philippines' environmental status. Thus, exposure of these featured organisms in the new coins contribute to students' awareness on our local flora and may be used to reduce our conservation efforts.

PAPER PRESENTATIONS

undergraduate

Adding insult to injury: combined effects of land cover and climate change on current and future distributions of the Dipterocarpaceae in the Philippines

Sean Pang Eng Howe, Jose Don T. De Alban, and Edward L. Webb
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Species distribution modelling has been frequently used to assess the combined threats of climate change and anthropogenic land cover. However, elevation distribution and land cover data have seldom been analyzed and integrated into these models in tandem. This study introduces a novel method of Land Cover Correction (LCC) by incorporating land cover data post-hoc in species distribution modelling to correct habitat suitability to produce more realistic predictions, and to assess its impacts on species distributions; and the use of elevation maps post-hoc to analyze the shifts in elevation distributions. Eighteen Dipterocarpaceae species from the Philippines were modelled using MaxEnt using 19 bioclimatic and 3 biophysical variables, and projected onto two future climate scenarios (RCP 2.6 and RCP 8.5) to assess the effects of climate change. Predictions revealed a severe loss of suitable habitat of 60.8%, 55.9%, and 45.1% due to LCC for current, RCP 2.6, and RCP 8.5 climate scenarios, respectively. This highlights the importance of LCC, especially in regions heavily affected by anthropogenic land cover. Suitable habitat loss was predicted for 15 species, of which, three lost all suitable habitat and three lost >95% of their suitable habitat for both climate scenarios, losses were also observed within protected areas. The elevation distribution of the remaining species shifted towards the higher elevations with the exception of *V. pachyphylla* and *S. negrosensis*. This combination of losses and shifts is a major concern for future Dipterocarpaceae populations in the Philippines, potentially leading to bottom-up cascades as Dipterocarpaceae species composition change.

Assassin bugs (Hemiptera: Reduviidae) of Mount Makiling and vicinity

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The Reduviidae of Mt. Makiling and vicinity was surveyed and examined via field collection and loaned specimens. The specimens were sorted and identified up to the nearest taxa as possible using available published taxonomic literature. The taxonomic treatment of all examined specimens and a checklist of species of Mt. Makiling are presented. Thirty-three species were found to be present in Mt. Makiling Forest Reserve ranging from its agricultural and residential areas to the forested regions to the mountain. These species belong to subfamily Ectrichodiinae, Emesinae, Harpactorinae, Holoptilinae, Peiratinae, Physoderinae, Reduviinae, Saicinae, Salyavatinae, Stenopodainae, and Triatominae. Of the 33 examined species, 13 are endemic to the Philippines: *Ectrychotes haematogaster* (Burmeister), *Scadra rufidens* Stål, *Ploiaria ultima* McAtee & Malloch, *Stenolemus facetus* Wygodzinsky, *Alcmenoides confusa* Miller, *Coranus tagalicus* (Stål), *Epidaus transversus* (Burmeister), *Physoderus minime* Hwang & Weirauch, *Acanthaspis signaticollis* Stål, *Polytoxus fuscovittatus* (Stål), *Lisarda spurca* Stål, *Sastrapada lurida* (Stål), and *Sastrapada diluta* (Stål). Identification keys to the subfamily, genus and species were provided. Photographs of species examined and identified are included. New locality record was documented. This work is the first comprehensive compilation of reduviid species found in Mount Makiling.

PAPER PRESENTATIONS

Assessment of Bud Bongao using Management Effectiveness Tracking Tool (METT)

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The Bud Bongao Forest Park (BBFP) was assessed independently by its Bud Bongao Management Council (BBMC) through the Management Effectiveness Tracking Tool (METT) and a perception study conducted on the locals that live around and far from the protected area (PA) last May 20–July 25, 2018. The assessment was given to 15 members of the council. Context was rated 88.89%. The next was planning (70%) and output for 68%. The bottom three was input (62%), process (61%) and outcome for 60.74%. It provides 68% average. The results were then compared to the results from the perception study. Various critical issues arose. Populations from either around and far from the PA does not know (78.6 %) its reason for protecting which are reflective to the output (IEC's) the BBMC is currently providing. Although less information, it is somehow negated by the Bud's cultural/traditional importance (73.2%) which causes regulation and reduction to threats of Agriculture (42%) and Human Intrusion (50%). The populations nearby (Barangays Nallil and Pasiagan) and far (Simandagit and Pahut) have shown positive attitudes for the conservation instead the reverse way (68%) and 74% respectively. This are reflected to their indirect need for resources as most of them are employed either private or public. All in all, when two separate data are compared, they yield the same extent of positive result (68 %-METT) and 72% for the local residences.

Collaborative governance: an alternative approach in policy making and implementation process for Taal Volcano Protected Landscapes

Josef Renzo Pangilinan, Christofer Sandie Bondao, and Rafael Ked Custodio
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Taal Volcano and its surroundings have numerous ecological, geological and economical value. To ensure that these resources are still available for the next generation, the Philippine government declared Taal Volcano, together with the natural resources around it, to be one of the Protected Areas in the country. The National Integrated Protected Areas System (NIPAS) Act mandates all protected areas to have a governing body that will be responsible in governing and managing the protected area. In Taal's case, the Protected Area Management Board–Taal Volcano Protected Landscapes (PAMB-TVPL) was formed with the collaboration of different stakeholders. The researchers utilized Ansell and Gash's (2007) Model of Collaborative Governance and the Critical Ingredients for Effective Inter-Local Government Unit Cooperation, which was set by the Philippine Development Forum Working Group on Decentralization and Local Government's Sub-Working Group on Inter-Local Cooperation, to analyze the policy making and implementation process of PAMB-TVPL. From the interviews with key informants, it was found out that the collaboration between the public agencies and non-state stakeholders is aligned with the aforementioned model and critical ingredients.

PAPER PRESENTATIONS

undergraduate

Comparative study of the bioacoustics of the Philippine Eagle (*Pithecophaga jefferyi* Ogilvie-Grant, 1896) and other raptors in captivity

Jestine Christia V. Gatdula[1], Juan Carlos T. Gonzalez[1,2], and Leticia M. Espiritu-Afuang[1]

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The Philippine Eagle, *Pithecophaga jefferyi* Ogilvie-Grant, 1896, is a critically endangered raptor continually threatened by habitat degradation and hunting despite the established laws and conservation programs protecting it from extinction. Science-based research is vital in the development of conservation initiatives, and key knowledge gaps needs to be addressed. This study primarily addresses the issue of misidentification of the Philippine Eagle's vocals in comparison with five other raptor species, (a) Pinsker's Hawk Eagle, *Nisaetus pinskeri*, (b) Philippine Serpent Eagle, *Spilornis holospilus*, (c) White-bellied Sea Eagle, *Haliaeetus leucogaster*, (d) Gray-headed Fishing Eagle, *Ichthyophaga ichthyaetus*, and (e) Brahminy Kite, *Haliastur indus*, using bioacoustics analysis. This was done by characterizing the visual differences in the waveform of the vocals of each species. The differences of the vocals were analyzed according to minimum and maximum frequency, peak frequency, duration, and bandwidth using the Raven Pro 1.5 software. Results showed variation in each species' vocals both in visualization of the waveform, the values generated by Raven Pro 1.5 and the effect size computation. A flow chart for the identification of raptors depending on the bioacoustics differences was generated with the help of this data. A comparative study of the bioacoustics in the wild is also recommended.

Impact of anthropogenic and environmental factors on the pelagic trophic structure of Laguna de Bay

Maureen Althea G. Calleja[1], Cybill B. Bacinillo[1], Shaira E. Basmala[1], Jennifer Bea C. Go[1], Elfritzon M. Peralta[2], Jonathan Carlo A. Briones[2,6], Noboru Okuda[3], Takuya Ishida[3], Julie-An N. Gregorio[4], Norman Mendoza[5], Francis S. Magbanua[4], and Rey Donne S. Papa[2,6]

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For the past years, the land use around Laguna de Bay is rampantly shifting that may affect and alter the trophic structure. However, human interventions have negative impact on the water quality and as well as on the ecosystem. This study aims to identify alterations in the trophic level in pelagic food web in freshwater brought about by anthropogenic and environmental factors. Samples were gathered from 30 sites in Laguna de Bay. We observed the dominant land use of the sites and tested the variations among the physico-chemical parameters around Laguna de Bay. We also utilized stable isotope analysis to quantify the trophic level of the pelagic organisms. We found out that there is significant difference among the parameters and are related to the type of land use found in the sampling site. Patterns were observed from these factors that further separated east and south bays from central and west bays. Moreover, patterns were also observed in the plot of δ13C and δ15N signatures wherein fishes in the west and central bays have higher trophic position compared to those found in the south and east bays and that the examined fishes (adult tilapia) do not utilize plankton as a food source. These results point to the role of environmental conditions in the watershed influencing water quality in the near-shore areas of the lake which in turn influences pelagic trophic structure.

PAPER PRESENTATIONS

Phytosociological study in Garantiangan Island, Taklong Island National Marine Reserve (TINMR), Nueva Valencia, Guimaras, Philippines

Krizha Marie C. Calesterio and Resurreccion B. Sadaba
University of the Philippines–Visayas

Owing to their geographical attributes, small islands in the Philippines and the flora present in them face various degradation. Thus, there is a need to document and study them for proper management and conservation purposes. A study was conducted in Garantiangan Island (Taklong Island National Marine Reserve) in Nueva Valencia, Guimaras, Philippines from August 2016 to January 2017 to assess the species composition and community structure of floras present in the island. Seven plots of 10 m x 10 m in size were established. A total of 46 species (38 identified + 8 unidentified) belonging to 25 families were recorded in the island. Rubiaceae is the most dominant family, having five representative species. Invasive species found were *Leucaena leucocephala* and *Lantana camara*. The floras found belong to two types of vegetation, namely: sandy beach vegetation and reef flat mangroves vegetation. For the quantitative measurement of floral community, a total of 36 species were included in the plots. The total seedling density (1,943 individuals ha^{-1}) > total sapling density (1,686 individuals ha^{-1}) > total tree density (1,343 individuals ha^{-1}) suggests "good" regeneration status. Total stand basal area was 16.49 m^2 ha^{-1}. *Tarenna littoralis* had the highest relative density (18.05%) and frequency (7.59 %). *Terminalia foetidissima* had the highest relative dominance (26.70%). Overall, the most important species was *T. foetidissima* (37.04 %). The values recorded for Shannon–Winner diversity index and Simpson evenness index, were 1.33 and 0.89, respectively, which suggest low diversity and evenness in the island.

Rapid assessment of avifauna in Sibutu Island, Tawi-Tawi

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Sibutu Island is one of the eleven municipalities of Tawi-Tawi, the southernmost province of the Philippines. Its geographic location and geologic history has yielded a unique assemblage of avifauna that is more closely related to the Sulus but with some species of Bornean heritage. Sibutu Island hosts one of the largest beach forests in the Philippines, with *Barringtonia*, *Caesalpinia*, and *Terminalia* recorded as dominant species. The objective of the study is to determine bird diversity in Sibutu. Forty-nine 10-minute point count stations following Bibby et al., (2000) were established in three broad habitats categories: secondary growth forest, coastal area and residential area from December 2017 to January 2018. A total of 391 encounters were recorded, comprising 30 species belonging to 20 families and numbering 631 bird individuals. Notably, while the most common species based on relative abundance are the passerines: the newly-split Ridgetop Swiftlet (*Collocalia isonota*) and Olive-backed Sunbird (*Cinnyris jugularis*), five forest-dependent species belonging to the Family Columbidae (doves and pigeons) were also observed. Using the Shannon-Wiener Diversity Index, bird diversity was highest in the forest (H'=2.9, E=0.56), compared to coastal or residential areas. Previously recorded threatened species were not observed in the study. Hunting for consumption and personal pets was observed in the area. This rapid assessment of avifauna serves as an indication of an emerging picture of continuing habitat changes due to the rapid population growth in the island. The study recommends community-based forest management and conservation awareness campaigns to address this issue.

PAPER PRESENTATIONS

undergraduate

Riparian flora inventory of Pansipit River in Agoncillo, Batangas

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Polytechnic University of the Philippines

Anthropogenic disturbances are threats to all ecological communities and may result to the decline in the number of riparian flora and proliferation of invasive plants in these areas. Pansipit River in Batangas was not exempted from these destructions. In line with this, a flora inventory was done in four barangays in Agoncillo, Batangas: Barangays Pansipit, Pook, Bangin and Sta. Cruz. The riparian flora was investigated by identification and tagging of the plant species, and determination of their abundance using Belt-Transect Plot Method. Likewise, soil analysis was done to correlate the effects of the edaphic factor to the riparian vegetation. A 100-meter transect line was established along selected areas in the four barangays. Twenty 5 x 5 m quadrats were placed along marked points in the transect line. Data gathered were analyzed using the PAST3 software. Canonical Correspondence Analysis was used for the ordination of the physico-chemical analysis of the soil and the plant species. A total of 68 species belonging to 58 genera distributed to 30 families were inventoried. About 45% of the species tallied were comprised by herbaceous families followed by the grass families accounting for 22% of the total species. Based on the diversity indices, Brgy. Pook showed the highest diversity among the four riparian areas. Different factors affecting the diversity in the areas observed were the amount of precipitation, soil components and the number of invasive species present. Biodiversity conservation and management in these areas should be conducted.

Tidal Movement of the Indo-Pacific horned sea star (*Protoreaster nodosus* Linnaeus, 1758) in a seagrass meadow in Calatagan, Batangas

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Protoreaster nodosus is an important seagrass grazer that is over-exploited for trade and ornamental use. Yet, very few studies have been conducted on its ecology, particularly its movement in relation to tidal periods. The study investigated the movement of *P. nodosus* as affected by tides and microhabitat types present in a seagrass meadow in Calatagan, Batangas. Two 250 m^2 permanent plots were established and divided into 2 m by 1 m grids. With the grids as the smallest spatial dimension, the benthic habitat of the plots was mapped, and the distribution and feeding frequency of both adult and juvenile sea stars were determined across tidal cycles. Distance covered by randomly selected *P. nodosus* was measured per tidal cycle. Observations were made in a total of 3 diurnal tidal cycles. Results showed that adult *P. nodosus* were more abundant in seagrass beds exposed to wave action, while juvenile *P. nodosus* were found in shallower seagrass beds. *P. nodosus* preferred feeding during low tide and tagged individuals were observed to move southward across two tidal cycles. The study was the first to show that *P. nodosus* displacement was limited and movement is influenced by tide. Discerning movement patterns of *P. nodosus* on shallow reef flats of the country is important in strategizing efforts to sustain its population.

A community-based approach to conserving the island-endemic Calayan Rail *Gallirallus calayanensis*

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Local communities are valuable partners in bird conservation, but also in establishing long-term bird research and monitoring program especially of species in understudied, remote small islands.

To engage the local communities in Calayan Island, northernmost Philippines, we established a community-based conservation program to increase local involvement in biodiversity monitoring and environmental campaigns on the island that nonetheless follows scientific protocols, which would be useful in providing information on the abundance, distribution, range and threats to the Calayan Rail. We trained local volunteers and field guides in conducting the annual population survey of the Calayan Rail, a species endemic to the island presently classified as vulnerable by the IUCN. The surveys, conducted between 2007 and 2017 employed the playback method in established points along existing trails around the island. Survey results estimated the rail's area of occurrence at 83 km^2, while individuals counted ranged from 200–300 individuals per year. The surveys showed a patchy distribution yet moderate relative abundance of the Calayan Rail, showing the vulnerability of the species to hunting and rapid environmental deterioration.

These results have implications to the conservation of the Calayan Rail, and also provides insights to opportunities from our community-based approach. Our community-based model has provided opportunities to further the research agenda on the island, engaged volunteers in locally-led conservation initiatives, and enabled the skills of volunteers in environmental protection and biodiversity monitoring. Our work illustrates the benefits of a community-based conservation program as an effective approach to bird research and conservation in small islands.

A contribution to the knowledge on the wildlife ectoparasite fauna of the Philippines: updates on the distribution and diversity of entomofauna ectoparasitic on bats (Mammalia: Chiroptera)

Ace Kevin S. Amarga[1], Kendra L. Phelps[2], Michale W. Hastritter[3], Michael F. Whiting[4], and Carl W. Dick[5]
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The Philippine archipelago is home to 79 chiropteran species, 27 of which are known to be endemic. Like other mammalian taxa, Chiroptera serves as host to an array of ectoparasitic arthropods from which majority are coevolutionarily confined on them. In the Philippines, a total of 46 species belonging to 20 genera representing six families (Arixeniidae, Cimicidae, Ischnopsyllidae, Nycteribiidae, Polyctenidae, and Streblidae) from the orders Dermaptera, Diptera, Hemiptera, and Siphonaptera constitute the entomofaunal assemblage of insects ectoparasitic on bats. Of these, 19 species and two subspecies (*Leptocyclopodia ferrarii mabuhai* and *L. ferrarii palawanensis*) are known to occur only in the Philippines. Furthermore, distributional evidences suggest that the faunal affinity of the majority of ectoparasitic insects on bats are predominantly Indo-Malayan. This paper presents an overview and updates on the biogeographic distribution and diversity of insects ectoparasitic on bats along with new host and locality records from the islands of Luzon and the Visayas.

PAPER PRESENTATIONS

A preliminary list of the ferns and lycophytes of Central Cebu Protected Landscape (CCPL), Cebu province, Philippines

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Our survey of the ferns and lycophytes of the Central Cebu Protected Landscape (CCPL) resulted in the documentation/collection of an estimated 151 species, five varieties in 64 genera and 24 families. We added more or less 91 new island records for Cebu (total species = ca.180), nearly double its previously known pteridoflora (91 species). A new species record for the Philippines, *Asplenium salignum* Blume is here reported. CCPL is severely degraded, its forests are highly fragmented. Each forest patch has a different combination of species and many species are represented by only a few plants. When compared to the fern and lycophytes in Rajah Sikatuna Protected Landscape (RSPL) in Bohol, 68 species overlap in both Protected Areas (Sørensen Coefficient (SC or CC) = 0.45. The proximity and similarity in mainly karst substrate of both protected areas may explain this. However, more weedy species are recorded in CCPL than in RSPL because of the more open, degraded habitats in the former. Although populations of many species are comprised by only a few plants in CCPL, if given a chance to expand their habitats, they still can proliferate. These results should be interpreted with caution because not all of the parts of CCPL were surveyed and collection intensity was less stringent than in RSPL.

A question on natural hybridization between *Crocodylus porosus* and *Crocodylus mindorensis* in the Northeastern Mindanao, Philippines: The Case of "Andeng"

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The presence of hybrid crocodiles in captivity was first documented in the Philippines in 2010. In June 2015, a crocodile named "Andeng" that was kept as pet by a local in Iligan City, Lanao del Norte was rescued by Born to Be Wild of GMA Network. It was reported as Indo-pacific Crocodile (*Crocodylus porosus*) acquired from the wild in Maranding River, Lanao del Norte. But experts identification based on morphological characteristics showed that "Andeng" belongs to the endemic Philippine Crocodile (*Crocodylus mindorensis*). In July 22, 2018 documentation of GMA Born to Be Wild provided further investigation in the ambiguity of the specimen. "Andeng's" tail scute tissue sample was subjected for DNA analysis using the cytochrome oxidase I (COI) gene and C-mos gene. Results of the COI only showed a *C. porosus* while C-mos gene resulted to overlapping peaks in the sequence chromatogram at 129bp and 138bp which indicates heterozygosity between *C. porosus* x *C. mindorensis*. This is the first incidence record of a crocodile exhibiting intermediate characteristics of both *C. porosus* and *C. mindorensis*. The habitat origin of "Andeng" was characterized, discussed and presented the possibility of natural crocodile hybridization that may affect the conservation management of crocodiles in the country.

PAPER PRESENTATIONS

A survey on threatened migratory waterbirds at Siay-Kabasalan Wetland, Zamboanga Sibugay, Philippines and its association to the East Asian-Australasian Flyway

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The study aimed to identify the waterbird species found in Siay-Kabasalan Wetland in Zamboanga Sibugay, Philippines. Further, it sought to determine their conservation status and distribution throughout the study site. Purposive sampling technique using digital cameras, spotting scopes, binoculars and tablets with Global Positioning System were employed to document the bird species and to assess their population. Results showed 11 threatened waterbirds found foraging in the vast mudflats of Siay-Kabasalan Wetland belonging to Orders Charadriiformes, Anseriformes and Pelicaniformes. Based on the International Union for the Conservation of Nature Red List category and criteria, *Numenius madagascariensis* and *Calidris tenuirostris* are considered as Endangered, *Anas luzonica* and *Egretta eulophotes* are Vulnerable, while *Limosa limosa, Limosa lapponica, Numenius arquata, Tringa brevipes, Calidris canutu, Calidris ferruginea* and *Calidris ruficoll* are Near Threatened. The most dominant species in Stations 1 and 2 was *N. madagascariensis* with 195 and 96 individuals respectively. The least dominant species in Station 1 was *C. ferruginea* while in Station 2 it was *N. arquata*. For Station 3 *C. ruficollis* recorded the highest count at 1,800 while *E. eulophotes* was seen alone. During the first quarter of 2018 six waterbirds were documented with leg flags and bands. The Australia Wader Studies Group confirmed that these birds were banded from Khairusova and Belogovaya Rivers estuary, Russia; Chongming Dao, Shanghai, China; and Bohai Bay, China. These findings make Siay-Kabasalan Wetland an important staging site for migratory waterbirds along the East Asian-Australasian Flyway.

Assessment and ecological niche modelling of invasive alien plant species in Quezon Protected Landscape, Southern Luzon, Philippines

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This study is dedicated to determine the plant diversity and to assess the vulnerability of Quezon Protected Landscape (QPL) to invasive alien plant species (IAPS). Data from 90 10 x 10 m randomly established plots showed that there are 318 plant species wherein 208 are native, 100 are non-native, and 10 are invasive. Results from the association of the physicochemical factors and the presence of IAPS through Spearman rho test revealed that most of the physicochemical factors have significant association except percent slope and hillshade. Soil pH, aspect and number of non-native plants show positive association while soil moisture, leaf litter thickness, elevation, species richness, species evenness, plot species diversity index, and number of native plants signify negative association. Differences between the plots of with and without IAPS in physicochemical factors indicate that most of the physicochemical factors have significant difference between plots of with and without IAPS except percent slope, hillshade, and aspect. Lastly, the MaxEnt model exemplifies that the most suitable predicted conditions for IAPS are at the edges of boundary and buffer zones. This study implies that most of the physicochemical factors are linked to the presence of IAPS and QPL has low vulnerability to IAPS invasion.

PAPER PRESENTATIONS

Botanical survey of the three Protected Areas (PAs) in Negros Island, the Philippines

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Botanical surveys of the three PAs of Negros, namely, Balinsasayao Twin Lakes Natural Park (BTLNP), Mt. Kanlaon Natural Park (MKNP) and Northern Negros Natural Park (NNNP) were carried out from November to December 2017. Data from our survey and historical collections were used in the checklist. New species of mistletoe *(Amyema* sp. nov.) was discovered and a new country record of orchid *Gastrodia sabahensis* (known to occur in Borneo). Ten new island records of plants have also been added. Total of 1697 species of vascular plants, 20 subspecies and 64 varieties in 635 genera and 167 families were reported. Around 24% of the recorded species of vascular plants are endemic to the Philippines. Fourteen species are Critically Endangered; 27 species are Endangered; 56 species are Vulnerable; 25 are Other Threatened Species and 14 are of Least Concern. BTLNP is the most sustainably managed whereas NNNP and MKNP are heavily disturbed due to anthropogenic activities below 800 m. For forests to recover, better enforcement of laws should be implemented. Clear markings on boundaries in PAs may curtail the accidental NGP activities that introduced non-native and invasive species in the SPZs. Addition and better training of forest wardens can prevent further contraction of the forest. There is a need for publicly available scientific data and other biological resources to support conservation management. Producing readily available illustrated field guides should be one of the long-term priorities in park management to help increase awareness of the biological and cultural significance of the parks.

Boundary synchronization: an important step for protected area suitability assessment or in developing frameworks for local conservation areas

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The Protected Area Suitability Assessment (PASA) is a primary process undergone by DENR and stakeholders in screening and potentially establishing a protected area in a locality under the National Integrated Protected Areas System (NIPAS). Through the DENR Memorandum Circular 17, the DENR is guided on how to conduct a PASA. An important input into the PASA is the data gathered on spatial information, e.g., latest vegetation cover, land use, elevation, geology and hydrology. It is also essential to check which barangays or municipalities might be affected by the proposed protected area (PA) so that the appropriate stakeholders are involved in the establishment process.

The development of the Local Area Conservation (LCA) Framework provided an opportunity to gather the necessary information, which can be used later in a process such as the PASA. However, in the present development stages there have been anecdotal accounts of stakeholders claiming their barangays were either outside or inside a proposed LCA boundary. A close review of the boundaries gathered from different sources revealed the use in the framework of data from a global source for the boundary delineation of barangays. We found that if due diligence was done much earlier in delineating the administrative boundaries the confusion on location of barangays might have been avoided. In a process for PASA, we strongly recommend the participation of important offices in the DENR and the LGUs such as the Land Management Bureau, mandated as the information holder on land boundaries, and the planning development and assessor's offices.

PAPER PRESENTATIONS

Busuanga Bantay Dugong: capacitating fishers on dugong monitoring and conservation

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Community Centred Conservation (C3 Philippines)

The Dugong (*Dugong dugon*) is listed as 'vulnerable' on the IUCN Red List and 'threatened with extinction' under CITES Appendix I of the Convention of International Trade and Endangered Species. Conservation of dugong in the Philippines is very challenging considering that our islands are mostly with increasing inhabitants. An innovative conservation program making use of trained local fishers has been organized and established in Busuanga, Palawan starting in 2013. The objective of the program is to capacitate the local fishers in dugong monitoring and conservation around the island thus, referred to as 'Bantay Dugong'. One of the major roles of a Bantay Dugong is to report dugong sightings, including reporting local sightings, stranding, possible threats and the like. To date, there are about 60 local fishers that actively participating as Bantay Dugong. This paper will feature the growth and accomplishments of the Bantay Dugong in Busuanga, Palawan. The Bantay Dugong can be used and adopted by local coastal communities throughout the Philippines, particularly in small islands to instill good stewardship of our natural resources and biodiversity.

Call characterization of the Philippine Scops Owl *Otus megalotis* population in UP Diliman using spectrograms

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Call characterization enables bird identification up to the individual level and is used in various ecological studies. Despite being utilized in population and behavioral studies, the call of the Philippine Scops Owl (*Otus megalotis*, PSO) has not yet been characterized. The study objectives are to characterize the PSO call and to determine the effectiveness of call characterization in individual identification. Four calls were recorded from the Main Library and Albert Hall in UP Diliman between October 2016 and March 2017, while two call recordings were from Mt. Data, Luzon. Adult calls may be described as two loud, whistle-like notes followed by one softer, throaty note, each note descending in tone and separated by short pauses. The frequencies at maximum, minimum, and 10/50/90% of the note length were measured using spectrograms produced with Raven Lite 2.0.0, namely Fmax, Fmin, Fs/10%, Fm/50%, and Fe/90% for syllable1, and F2min and F2max for syllable2, since only the first two syllables were visualized consistently. A Kruskal-Wallis Test and a Dunn-Bonnferroni Test revealed that different combinations of all call characteristics were useful for individual identification, with Fmax, Fs, and Fe producing more significant comparisons than the others. Based on the comparisons of and the differences in call characteristics between recordings, it is highly probable that each location corresponds to one individual, each with calls distinct from one another. Thus, bioacoustics and call characterization are potential tools for further studies on PSO population dynamics, distribution and territory delineation, and habitat loss responses in urban and rural environments.

PAPER PRESENTATIONS

Carbon stock and potential of a Carbon Forest Site in Alaminos, Laguna

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Tropical forests in the Philippines provide critical ecosystem services such as climate regulation, biodiversity protection, water regulation, and recreation. However, forests continue to be threatened by anthropogenic pressures despite its major role in climate change mitigation. Estimates of forest carbon are significant to provide valuation of their environmental and economic importance to support forest conservation and rehabilitation programs. The study estimated the baseline carbon stock and spatial extent of vegetation types using field data collection methods (Hairiah et al., 2011) and remote sensing techniques in a Carbon Forest site in Alaminos, Laguna to support a private sector initiative to achieve carbon neutrality by 2022. The results show that the estimated aboveground carbon (AGC) stored is 1,653 tons of carbon (tC) while its potential AGC sequestered by 2022 will be 8,737 tC if interventions such as forest protection through patrolling, assisted natural regeneration, and enrichment planting are implemented. Implementing the recommended interventions is projected to yield a 1,524 tC increase from a business-as-usual scenario. This initiative supports national and international regulatory frameworks like the *Climate Change Act of 2009* or *National Greening Program (NGP)* of the Philippines and the *Reducing Emissions from Deforestation and Forest Degradation (REDD+)* program of the United Nations Framework Convention on Climate Change (UNFCCC). The information and maps generated from this study can guide site-level forest carbon conservation plans on the basis of estimated rates of natural regeneration from existing literature.

Collecting birds and mammals while in captivity

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There are several places in the Philippines that remain largely unexplored by scientists. One reason for this is the threat of insurgent groups. Lorenzo Vinciguerra, a taxidermist and birdwatcher from Natur Museum in St. Gallen, Switzerland, was held captive by an insurgent group for almost three years in Jolo, Sulu, in extreme southernmost Philippines. Despite the ordeal he went through, Mr. Vinciguerra was able to gather invaluable specimens of mammal skulls and bird feathers through his cleverness and the rapport he established with his captors. Mr. Vinciguerra, owing to his scientific background, turned this unfortunate personal event into an opportunity to collect specimens from this area and he saw the significance of this collection. He turned over the specimens to the National Museum of the Philippines after his release in December 2014, allowing this collection to be identified, well-documented, and made available for scientific study. Here we report on the taxa that comprise this collection. It consists of 133 individual skulls from 3 species of rodents, 21 skulls from the 9 species of chiropterans identified and 4 skulls from 2 species of shrews, as well as bird feathers and skulls yet to be determined. Finally, as if to give poetic justice to his ordeal, his collection includes the first specimen of a native shrew, *Crocidura* from the Sulu Archipelago, which is being examined as a possible new species of mammal.

PAPER PRESENTATIONS

Comparative study of copper (II) ion accumulation in *Terapon jarbua* (Terapontidae) infected and uninfected with nematode endoparasite *Anisakis* spp. (Anisakidae) from Lingayen Gulf, Pangasinan

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Heavy metals as water pollutants have the tendency to also affect areas far from its source. This poses threat on aquatic organisms such as fishes in terms of bioaccumulation. Aside from fishes, there are parasitic nematodes capable of accumulating some amounts of heavy metals. Because several factors may contribute to this ecological phenomenon, this study aimed to focus on the quantification of nematode load, and the determination of the Cu (II) ion accumulation in Terapon jarbua and in its nematode endoparasite, *Anisakis* spp. The concentrations of Cu (II) ions in the microdigested *Anisakis* spp. and in *T. jarbua* gills were determined via UV-Vis Absorption Spectrophotometry. T-test showed that the mean Cu (II) ion accumulation in the gills of the infected *T. jarbua* (15.8638 mg of Cu (II)/ kg of fish) was significantly lower than that of the uninfected *T. jarbua* (21.9281 mg of Cu (II)/ kg of fish). The difference in the accumulation of Cu (II) ions in *T. jarbua* was speculated to be caused by the presence of *Anisakis* spp. L3 larvae in *T. jarbua*. Specifically, there was a nematode prevalence of 29.0% in the immature *T. jarbua* and 34.7% in the mature ones. Possible mechanisms of Cu (II) ion bioaccumulation in *Anisakis* spp. include direct ingestion of this metal by the larvae, absorption through its cuticle, and acquisition from the exudates of eaten organisms.

Conserving the Rufous-headed Hornbill in the Central Panay Mountains Key Biodiversity Area in Panay Island

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Haribon Foundation

The Rufous-headed Hornbill (*Rhabdotorrhinus waldeni*) is one of the rarest hornbills in the world and an IUCN Red List Critically Endangered. It is endemic to Western Visayas biogeographic region and locally known as *dulungan*. The northern part of Central Panay Mountains Key Biodiversity Area is considered as an important site for the remaining populations of the *dulungan*. The Species of Hope Dulungan project aims to generate updated information on the hornbill's populations in Sebaste and Culasi in Antique and generate conservation action for the species and its habitat. From 2017 to 2018 point transect observations and perceptions surveys were conducted. A total of 178 observations were made. During the breeding season observations, 56 individuals were observed in 2017 wherein 4 were females and 60 individuals in 2018 wherein 11 were females. Low densities of females were observed as most were probably in the nests already. Densities at elevation were analyzed. Males were observed between 238 and 1,237 meters above sea level. These may be foraging for food to feed their mates or looking for mates. Females were observed between 636 to 945 meters above sea level. During the perceptions surveys, majority of the interviewees knew the *dulungan* based from personal experience. There was a high level of awareness that the *dulungan* is threatened and of the pressures it faces. A locally managed Critical Habitat was established using the results and a management plan is being developed to protect the Rufous-headed Hornbill and its habitat.

PAPER PRESENTATIONS

Detection of Newcastle Disease virus, Mareks Disease virus and Infectious Laryngotracheitis virus in cattle egrets (*Bubulcus ibis*) in Bulacan

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Serological and molecular detection of Newcastle disease virus (NDV), Mareks Disease virus (MDV) and Infectious Laryngotracheitis virus (ILTV) virus in Cattle Egrets in Central Luzon was conducted after an outbreak of ND occurred in January of 2016. To investigate the role of wild birds in the spread of poultry diseases, 19 Cattle Egrets (Bubulcus ibis) were collected from three municipalities in Bulac-an, Central Luzon from February 24, 2017 to March 4, 2017. All samples were subjected to serology to detect Newcastle disease virus (NDV). Fifteen out of 17 sera (88.24%) were seropositive using He-magglutination Inhibition (HI) test.. To confirm the presence of NDVs, pooled swab and pooled tissue samples were assayed using nested RT-PCR; all samples had a positive reaction (100%). Nested PCR was employed to check for MDV and ILTV and one out of seven (14.3%) total pooled samples were found to be positive for MDV using nested PCR. Five out of seven (71.43%) pooled swab samples were positive for ILTV by yielding a 647-bp product in the nested-PCR assay. Nested-PCR of homogenized pooled tissue samples showed two out of seven (28.57%) pools were also ILTV positive. Results of the study must be taken into account in drafting policies and plans for future actions. This study can help identify challenges that face both farm and wildlife managers so that they may better plan their systems and account for these diseases as direct threats to biodiversity.

Diversity of fruit bats in forest fragments and reforestation areas within limestone quarries in the Philippines

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The impact of reforestation on fruit bats in mining areas was studied. The diversity of fruit bats was surveyed in forest fragments and reforestation areas within limestone quarries in Luzon and Mindanao Islands. Bats were sampled from November 2013 to March 2018 using mist nets set three meters and 10–15 meters above the ground. A total of 15,687 individuals of fruit bats comprised of 10 species were recorded from a total sampling effort of 4,042,958.2 mist-net hours (m2h). The capture rates in sub-canopy and understorey of forest fragments were significantly different (R=0.381, p=0.001) while the same difference was also noted for the capture rates in sub-canopy and understorey of reforestation areas (R=0.553, p=0.001). Capture rates of bats were nine and three times higher in the sub-canopy in forest fragment and reforestation area than the understorey, respectively. The observed difference can be attributed to the complex forest structure in the forest fragment than in reforestation areas and the less cluttered environment in the sub-canopy. Capture rates of small-bodied fruit bats also exhibited positive relationship with increasing forest fragment size (Z =11.48, p=<2e-16) and not with reforestation age. The results underline the importance of maintaining and expanding the forest patches within and adjacent quarry sites and increase diversity of trees planted in reforestation areas. Although most of the fruit bats recorded are not endemics, they are important in the maintenance of biodiversity in these forest patches as these play important roles in facilitating forest regeneration as pollinators and seed disperser agents.

PAPER PRESENTATIONS

Enhancing biodiversity monitoring system (hornbill count): a citizen scientist participation in monitoring biodiversity in three globally important protected areas in Negros Island, Philippines

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Negros Island biodiversity is changing at unprecedented rates. It is important that the general public should be involve in monitoring as citizen scientist. We involved the general public in biodiversity monitoring in three protected areas (PA) in Negros which contribute to gathering of biodiversity data to have a better management of the park.

We provide proper training on Biodiversity Monitoring System (BMS) or Hornbill Count following DENR Administrative Order 2000-13 Pursuant to Republic Act No. 7586 (NIPAS Act). We illustrate how to conduct the BMS with highlight on the importance in identifying indicator species, bird identification, using equipment and collecting habitat parameters.

The citizen science program is a very useful tool in addressing data collected in three protected areas. Based on the results, the involved citizen scientist is commendable in supporting BMS within PA. We further highlight that these programs are very important in developing local perspective, collecting data and educational component for conservation.

Conservation highly requires considerable amounts of data collected over extents of time. Participation of citizen science in BMS or Hornbill Count are highly valuable tool in many aspects. Though, citizen science programmes are increasingly used in our country but we need to strengthened BMS program in each PA and provide incentives to volunteers. The citizen science programmes should be encouraged in our PA as a valuable tool in conservation. This is also a way of promoting our PA and citizen scientist reconnection between nature and promotion people close to science.

Establishing community conserved areas to complement protected areas—lessons learned from the Northern Sierra Madre Natural Park

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The Northern Sierra Madre Natural Park is one of the largest and most biologically diverse protected areas of the Philippines. Unfortunately, NSMNP is threatened by illegal activities such as hunting, logging, agricultural encroachment and land conversion. Environmental law enforcement is weak and not well implemented. Biodiversity conservation remains an abstract concept. The conventional approach with the National Integrated Protected Areas System is that control and administration is placed on the Department of Environment and Natural Resources and a Protected Area Management Board. With decentralizing protected area management, the local governments were urged to take on a larger role—to adopt local action plans. Still, a more localized approach are Community Conserved Areas (CCAs). The fundamental idea behind CCAs is

that indigenous peoples and local communities will voluntarily conserve biodiversity according to tradition, custom or other existing ways that has proven effective. The Mabuwaya Foundation has been working with communities in northeast Luzon to establish CCAs to protect critical habitats for several threatened species and ecosystems. A model has been developed based on experiences on Philippine Crocodile conservation program since 2003. We now present some good practices, lessons learned and challenges to this model as it is employed in several of our case studies in the NSMNP—Flying Fox Roost Site sanctuaries in Divilacan and Dinapigue, Philippine Crocodile sanctuaries in San Mariano, Maconacon and Divilacan, Sea Turtle sanctuary in Divilacan and Dinapigue, proposed cave ecosystems in Palanan and Tumauini, and forest and wildlife sanctuaries in Ilagan and Cabagan.

Ethnobotany of traditional medicinal plants at the foothills of Mt. Arayat, Pampanga, Philippines

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This ethnobotany study documented 165 species of medicinal plants at the foothills of Mt Arayat, Philippines, grouped into 63 families with Lamiaceae dominating. There were 75% herbs and 94% terrestrial. There were 26 ailment categories addressed with these medicinal plants in the area with "gastro-intestinal problems" as rank 1, "Asthma" (Rank 2), "kidney problems" (Rank 3), and "dermatological disorders" (Rank 4). Leaves were the most preferred form of medicinal material, prepared mostly by females, generally through boiling and most of the time taken orally by the patients. Both male and female participated in the administration of the material which can be done through "tapal", "eaten fresh", drinking decoction on recommended amounts or "agua tiempo" The ethno-medicinal knowledge was handed over by the elders/ancestors to the next generations and this knowledge was used mostly by those informants aged 60–65, generally were elementary graduates, and residing in the area for 20 years of more. The quantitative analysis revealed the Factor informant consensus (Fic) for dengue (0.92), asthma (0.89), "superstitions/ withcraft" (0.86), and Cancer (0.75). High Fic values means that a single/common plant was used in treating a particular ailment. The highest RFC in Oregano (0.51) indicated the traditional importance of the plants in reference to the informants who mentioned the species The Fidelity Level (FL) measured the informant's most preferred species in treating certain ailment. A 100% FL was recorded with Saresa (gastro-intestinal), akapulko and sabila (dermatological), and Gumamela (abscesses/boils). "Bacali" (unidentified as of this writing) got 98% FL for kidney disorder, and Guava (95%) for gastro-intestinal disorders.

Flying fox conservation in North East Luzon

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Giant fruit bats or flying foxes have become rare throughout the Philippines as a result of hunting, disturbance of their roost sites and disappearance of their forest habitat. There are three species of flying foxes that we have encountered during our biodiversity surveys in the northern Sierra Madre

Mountains in Cagayan and Isabela provinces. These are the endemic solitary roosting Mottle-winged Flying Fox *Desmolopex leucopterus*, the endemic endangered Golden-crowned Flying Fox *Acerodon jubatus*, and the non-endemic near-threatened Large Flying Fox *Pteropus vampyrus*. We identified three main roosting sites of *A. jubatus* and *P. vampyrus* in Baggao, Cagayan and in Divilacan and Dinapigue in Isabela. These roost sites are under various levels of threat by hunting and development. Flying foxes are also hunted outside roost sites in foraging areas.

The Mabuwaya Foundation is working with local governments, the Protected Area Management Board and communities to protect the flying foxes and their roost sites. Communication, Education and Public Awareness campaigns are implemented in schools and communities to generate support for flying fox conservation. As a result, three local flying fox sanctuaries were declared and local monitoring and protection groups are trained and established. The study of threats to fling foxes and the implementation of local flying fox conservation strategies is now being upscaled to other areas in the Philippines, and to Malaysia and Indonesia by Mabuwaya and partners.

We will present details of the flying fox roost sites, threats to flying foxes and the flying fox conservation strategies in NE Luzon.

Gaps in protecting forest over ultramafic formations in the Philippines

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KBAs are focal areas in locating sites of global significance where threatened species are found and nowhere else. It is yet unknown whether all of the forests over ultramafic formations fall within KBAs or whether they overlap with protected areas. If none are inside nor overlap with KBAs or PAs, how should they be treated in terms of their conservation value, if at all they are valuable. These questions should be answered by this gap study and help resolve the issue of whether these forests over ultramafic formations outside of KBAs and PAs need protection.

The main objective of the study is to identify the gaps in protecting ultramafic forest formations on the whole of the Philippines. Secondary data was used to determine the extent and where the forests over ultramafic rocks thrive. Out of the 316 possible sites of where ultramafic rock formations can be found from geologic map data from the Mines and Geosciences Bureau, only 94 of them overlap under some form of protection under the NIPAS Act. Those 222 not under NIPAS only overlaps with 12 non-protected KBAs and even within these 12 not all of the ultramafic formations are encompassed inside a KBA boundary. It remains to be seen how much of the forests on these ultramafic rock formations are intact or whether or not they hold a forest and any threatened species on top of them at all.

Habitat suitability modelling of Spiked Pepper (*Piper aduncum* L.) in Mindanao, Philippines

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Invasive alien species is the biggest threat to biodiversity next to habitat destruction. In

Mindanao, *Piper aduncum* is considered as the most invasive alien plant species that affects forest ecosystem and agricultural areas. This study provides insights in identifying suitable areas for *P. aduncum* in Mindanao using a novel modelling method known as Maxent. Two models were generated: Full Model which is based on the 25 environmental variables and Final Model which is based on the final set of variables maintained after a series of variable reduction method. The relative predictive performance of the two models were evaluated using Receiver Operating characteristic (ROC)-Area under curve (AUC). Result showed that the Final Model performed best with AUC score of 0.825 compared to the Full model (AUC=0.749). The predicted suitable habitat of *P. aduncum* was heavily influenced by these top five predictors: Soil type, Mean Temp of Warmest Quarter, Mean Diurnal Range, Max Temp of Warmest Month and Precipitation of Seasonality. Overall, this study will contribute to natural resource managers especially in setting priority areas for current management of the species and predict its potential spread in the future.

Habitat use and geographic distribution of the tamaraw (*Bubalus mindorensis*) at Mounts Iglit-Baco Natural Park, Mindoro

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The tamaraw (*Bubalus mindorensis*) is the largest land animal in the Philippines and its national animal. It is considered Critically Endangered by the IUCN and most of its remaining populations are found within Mounts Iglit-Baco Natural Park (MIBNP), an ASEAN Heritage Park. Despite its conservation and cultural significance, we know little on the ecology of the tamaraw in the wild. To further complicate matters, most individuals are currently found within a 2000 ha area within the park, around which local Mangyan communities establish their activities, including kaingin and hunting traps. The aim of this study is to find alternative methods to estimate the remaining tamaraw population to the one currently used by the DENR, to better understand how tamaraw move and use the space within the protected area, how natural landmarks affect this behavior, and if human activities have any impacts on it. Work started in June 2018 and its ongoing, by using 42 1-km randomly stratified transects by habitat with an East to West orientation. The presence of tamaraw and other endemic ungulates, such as Mindoro warty pig (*Sus oliveri*) and Philippine deer (*Rusa philippensis*) is recorded by noting indirect signs of presence, including dung up to three days old, tracks, wallowing areas and resting sites. Current results show that ungulates frequent more densely those areas found further apart from Mangyan populations and activities.

High Conservation Value Areas in West Mt. Bulanjao, Southern Palawan

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Palawan Island is the Philippines' "last ecological frontier" for its high species endemism, however, anthropogenic activities resulted to drastic loss of valuable ecosystems and habitats. High Conservation Value Areas (HCVAs) concept was used to identify natural habitats with inherent conservation values. This can be used for management recommendations that will strengthen existing policies for Palawan conservation initiatives. All six (6) HCVAs are present in West Mt. Bulanjao. HCV1 (Species): A total of 184 species (birds, mammals, amphibians, reptiles, and trees)

were recorded, 24/184 (13%) are Philippine Endemic and 30/184 (16%) are Palawan Endemic species. HCV2 (Landscape-level ecosystem mosaics): It is able to support rare, threatened, and endangered species. HCV3 (Rare and threatened ecosystems and habitats): Forest degradation is evident due to rapid land use changes. HCV4 (Ecosystem services): Canipaan River Basin serve as the main water source for household and domestic use. HCV5 (Community Needs): *Kaingin*, logging, and swidden farming are main sources of income by the Indigenous Cultural Communities. HCV6 (Cultural values): West Mt. Bulanjao is a titled Ancestral Domain of the Pala'wan tribe. Key findings of the identified HCVAs were: 1) all HCVAs are in clear and present danger warranting immediate measure; 2) there is an imminent threat to HCVAs because of approved MPSAs; 3) there is a clear mismatch between the conservation requirements of HCVAs and the conservation prescriptions offered by the Environmentally Critical Areas Network (ECAN) zonation (i.e. designated Core Zone do not safeguard the identified HCVAs).

Home range and foraging area of *Ptenochirus jagori* and *Haplonycteris fischeri* in a tropical lowland forest

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Using radio-telemetry, the home ranges of *Ptenochirus jagori* and *Haplonycteris fischeri* in a primary lowland rainforest in Palanan, Isabela were determined. Home range per species was estimated using 95% Minimum Convex Polygon (MCP) and Kernel Density Estimates (KDE). The mean home range of *P. jagori* was 21.59 ±17.86 hectare (MCP) and 54.28 ±44.00 ha (KDE) while for *H. fischeri*, was 40.60 ±54.52 ha (MCP) and 82.58 ±100.43 ha (KDE) based on 106 and 173 radio tracked locations per species, respectively. The estimated home range size of *P. jagori* was smaller than *H. fischeri* was due to the low detection. Hence, there is a possibility that *P. jagori* most likely could have a larger home range as they could have travelled beyond the range of the receivers. Furthermore, there was higher mark-recapture data for *H. fischeri* than for *P. jagori*, which is another indication that supports the earlier assertion. Home range estimates at 50% KDE was used to compare species foraging areas. Tree density between species foraging area differed significantly but not in the plant diversity and between sexes. The difference could be due to forest structure and bat body size that influence their movement. Both species utilized the same resources such as Meliaceae, Sapindaceae, Lauraceae, Vitaceae, and Moraceae. These families were the most common plant family in their foraging areas. However, the preference of plant species may differ as *P. jagori* is four times larger than *H. fischeri*, and this assumption will be the subject of future analysis.

How small an island? Speciation by endemic mammals (*Apomys*, Muridae) on an oceanic Philippine island

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Species richness anywhere is determined by three primary biological processes: colonization, extinction and speciation. We investigated the influence of oceanic island area on speciation by

small mammals, in the context of other land vertebrates. Extensive field surveys on Mindoro Island (9735 km^2) in the Philippines, followed by sequencing one mitochondrial and three nuclear genes for use in phylogenetic, population genetic, and coalescent-based analyses, and by morphometric analysis of craniodental data, documented an endemic clade of four species of *Apomys* (Muridae). The common ancestor likely arrived from Luzon Island across a narrow sea channel between 2.4 and 1.5 Ma. The four species occur allopatrically, with variation in their elevational ranges. Mindoro is the smallest oceanic island on which speciation by small mammals has been documented. A review of land-living vertebrates suggests that bats and large mammals require the greatest area for speciation, whereas frogs, lizards, birds, and small mammals have lower and similar minimum-area requirements. However, data are limited and research is needed to document the impact of island area on speciation. The existence of a lower limit implies that the biological processes that influence species richness do not operate equivalently along a gradient of island areas: speciation within islands may not contribute to changes in species richness below some limit, unlike colonization and extinction, which operate at all island sizes.

Implications of Philippine Eagle expeditions in Central Sierra Madre Mountains

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Distribution records of Philippine Eagles in the Central Sierra Madre Mountains (CSMM) throughout the 20th century has been sparse. Most of these historical observations were recorded inside Aurora Memorial National Park KBA and Mt. Dingalan KBA. In 2014, a Philippine Eagle pair and their fledgling were discovered in inside CSMM. The rediscovery of the species led to a review the current distribution status of the species in CSMM through a series of Philippine Eagle expeditions organized in partnership with PENRO and CENRO offices at the provinces of Nueva Ecija and Aurora from 2015 to 2017. We were able to record at least two Philippine Eagle breeding pairs and their estimated nesting territories. Overlays of estimated nesting territories and historical Philippine Eagle records onto KBAs, PAs and OECMs show that most of the available Philippine Eagle habitat in CSMM does not have policy instruments for conservation. We recommend the expansion of Aurora Memorial National Park to cover nesting territories and the establishment of additional OECMs for a holistic approach to the conservation of Philippine Eagles in CSMM.

Initial estimates for extent of occurrence of non-native squirrels in Luzon, Philippines

Daniel S. Torres

Studies have indicated that there are no naturally occurring native squirrels in Luzon Island (Philippines). However, directing a search engine (i.e. Google) to crawl the World Wide Web for websites containing sightings of and encounters with free-living squirrels in Luzon reveals squirrel occurrence in at least five locations in Metro Manila and suburbs. These were geolocated using an online satellite imagery program (i.e. Google Earth) and then georeferenced by adding a placemark. Within the rendered constellation of placemarks, 35.8 kilometers separates the northernmost area of occupancy (Avilon Zoo: 14.744675°N, 121.151728°E) from the southernmost area of occupancy (Alabang Hills Village: 14.433861°N, 121.032077°E). The three other areas of occupancy include: (1) La Mesa Dam Ecopark (14.716370°N, 121.072400°E); (2) Ninoy Aquino Park and Wildlife Center/Philippine Science High School-Diliman Campus (14.650944°N, 121.044014°E);

and (3) Dasmariñas Village (14.538339°N, 121.024975°E). Using the 2001 IUCN Red List Categories and Criteria version 3.1 definition of extent of occurrence, the "shortest continuous imaginary boundary" was drawn to delineate these locations. The resulting irregular polygon enclosed about 160 km^2. Within this known extent of occurrence, further systematic documentation, monitoring and information collation is required to confirm negative squirrel-human/ecological interactions. Also, while the squirrel has been identified as an Asian mainland species, *Callosciurus finlaysonii*, possible hybridization needs to be clarified. Developing an information exchange network is one option to detect other areas of occupancy and range expansion in Luzon Island.

Inventory, molecular and phylogenetic assessment of herpetofauna Vis-à-vis ecological factors at the riparian buffer zone in Mt. Arayat, Pampanga, Philippines

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Herpetofauna of the riparian buffer zones of Taqui and Cananaoan creeks of Mt. Arayat, Pampanga, Philippines was explored from August 2017 to January 2018. Nine amphibians and 17 reptile species were initially identified based on their morphological and morphometric characteristics. All the recorded species were categorized as endemic and native to the Philippines. *Occidozyga laevis* and *Eutropis multifasciata* appeared to be the most frequent, most dense, and most dominant among amphibians and reptiles, respectively. Temperature and altitude directly affected the distribution of both amphibians and reptiles, while water parameters and humidity directly influenced the amphibians only. Ten of the initially identified species were validated thru DNA barcoding using the COI primer. And all the sequences produced seemed to be new to the GenBank Database. Neighbor-joining trees of the species were also generated using the MEGA 6. The phylogeny of the molecularly identified species in this study seems to unravel new herpetofaunal species in reference to the current GenBank Database. It is recommended that further studies be made to validate the molecular identification of the species covered in the study.

Island hopping alien anurans in the Philippines: invasion history, updated status, and recommendations for management

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Invasive alien species is the most significant threat to biodiversity conservation in island ecosystems worldwide. By analyzing historical and geographical data, we reconstructed the chronological history of invasion of the alien anurans in the Philippines. We then quantified their rate of spread and updated their invasion status and distribution. Six alien anurans have been introduced in the Philippines: chronologically, the green paddy frog (*Hylarana erythraea*), cane toad (*Rhinella marina*), American bullfrog (*Lithobates catesbeianus*), East Asian bullfrog (*Hoplobatrachus rugulosus*), Asiatic painted narrowmouth frog (*Kaloula pulchra*), and greenhouse frog (*Eleutherodactylus planirsotris*). Our findings demonstrated the paramount importance of the transport-contaminant and transport-stowaway pathways in the introduction and subsequent intra- and inter-island spread of alien anuran species in the Philippines. Invasion curves showed

that the rate of spread varied among species, wherein *H. rugulosus* and *K. pulchra* spread fastest at province and island level, respectively. Moreover, none of the alien anurans has yet reached spatial saturation, suggesting continuous spread. *Lithobates catesbeianus* was released into novel environments, but the status of its establishment is undetermined, whereas the five other alien anuran species are now widespread invasive. *Rhinella marina* is currently the most widespread (occurring in 54 provinces on 36 major islands), whereas *E. planirostris* is the least distributed (occur in eight provinces on seven major islands). We recommend the prioritization and management of invasion pathways, integrated with early detection and rapid eradication schemes focused in susceptible sites (e.g. uninvaded islands), in mitigating current and future alien anuran invasions in the country.

Management and Governance of the largest roosting population of flying foxes in in the Philippines at Siay, Zamboanga Sibugay

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The Siay roosting site in Zamboanga Sibugay hosts the largest roosting population of flying foxes in the country. Its discovery in 2016 led to a series of dialogues and meetings with local officials as well as intensive information dissemination campaign to ensure the survival of the species and prevent further habitat disturbance. From the 5,000 estimated population in 2016 it has significantly increased to 167,400 based on the August 28, 2018 exit count conducted by a composite team from the Provincial Environment and Natural Resources Office of Zamboanga Sibugay, Local Government Unit of Siay and local stakeholders. Monthly population surveys are being conducted by the said composite team. Local policies were enacted by the Local Government Unit of Siay to safeguard the species and its habitat. Congresswoman Dulce Ann K. Hofer sponsored House Bill 5511 declaring the site as an Ecotourism Area. This paper illustrates the joint conservation efforts of the Local Government Units, National Government Agencies, Peoples Organizations and the local communities to provide a safe haven for the *Acerodon jubatus* and *Pteropus vampyrus* roosting in the area.

Newly recorded species in Mindoro

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The recent scientific researches of the Mindoro Biodiversity Conservation Foundation Inc. have contributed in the additional global knowledge on the biological diversity of the island. A total of 27 species was recorded and 1 species was newly discovered in Mindoro, of which three are new records for the Philippines. The three new records in the Philippines are the migratory Asian paradise flycatcher (*Terpsiphone paradise*) and the Black bulbul (*Hypsipetes leucocephalus*), which were recorded in Apo Reef Natural Park in 2013, and the Bronze Tube-nosed Bat (*Murina aenea*) was recorded in Mts. Iglit-Baco National Park in 2017. Of the new records, 16 are birds, seven mammals, three fishes, and one snake. The newly discovered species Sarcostemma malampayae was discovered in Ilin and Ambulong Islands in 2013.

PAPER PRESENTATIONS

The MBCFI continuously conducts field surveys, studies, and researches in various parts of the island. Information generated from these studies are used to develop, implement, monitor and evaluate necessary and appropriate actions toward the conservation of Mindoro's biodiversity. These research findings further affirm and validate the global and national importance of Mindoro on biodiversity.

On emerging contaminants as potential threats to Philippine biodiversity: Erythromycin disrupts *Aedes aegypti* L. life cycle

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Emerging contaminants are natural or synthetic substances present in nature for a time but their effects in the environment and organisms are just being studied recently. One of the most commonly used antibiotics is erythromycin which is now considered an emerging contaminant due to its presence in wastewaters and environmental waters. In this study, aquatic stages of *A. aegypti* were reared in different concentrations of erythromycin which resulted to disruptions in the life cycle including delayed and decreased eclosion of eggs, decreased larval survival, delayed and decreased pupation of larvae and emergence of adults from pupae, and decreased adult female fecundity ($P < 0.05$). Interestingly, second generation eggs obtained from rearing *A. aegypti* in erythromycin-contaminated water did not exhibit reduced eclosion in the presence of erythromycin. Although disruptions were observed in the life cycle, this study demonstrates that *A. aegypti* can rapidly acquire tolerance to the emerging contaminant erythromycin. Further investigations regarding the effects of emerging contaminants on aquatic biodiversity are necessary due to insufficient information.

Population and distribution of Flying Foxes in Zamboanga Peninsula, Philippines

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Documentation of roosting sites of flying foxes on the Zamboanga Peinsula started in 2008 due to requests from local government units. To date, twelve roosting sites have been recorded in the peninsula, a majority of which are located in Zamboanga City and Zamboanga Sibugay Province. Synchronized exit counts as well as photo documentation through the use of digital single-lens reflex (DSLR) cameras and drones were used to account for the population of flying foxes. The endangered and endemic *Acerodon jubatus* were present in two out of the twelve sites, and they all roost in mangroves. *Pteropus vampyrus* are the dominant species in most of the roosting sites while *Pteropus hypomelanus* are present in two sites. Breeding of *P. vampyrus, P. hypomelanus*, and recently of *A. jubatus* were recorded in the different sites. Mixed roost counts ranges from 200 to 79,557. It was noted that populations per roosting site vary from time to time, hence the need for further intensive monitoring to determine the main roosting site as well as the satellite roosting sites. Genetic analysis of fecal samples are being considered in successive monitoring efforts to establish roost relationships.

PAPER PRESENTATIONS

Population density estimates of two Philippine endemic fruit bats in a tropical lowland forest in Palanan, Isabela, Philippines

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Population density estimates are important in wildlife management and conservation as these allow researchers and policy makers to assess species status, impacts of disturbance and conservation efforts. This study provides population density estimates of *Ptenochirus jagori* and *Haplonycteris fischeri* in a tropical lowland forest. Since geographic closure was impossible in a contiguous forest, the modified closed population model developed by Huggins in Program MARK's "density with telemetry" was used. Population closure assumption was validated using Stanley & Burnham closure test with p=value>0.2. The Minimum Convex Polygon (MCP) and Fixed-Kernel density (KDE) per species and between sex generated from the home range study were used as area to calculate the density estimates. The derived estimates (α=0.05) for male Ptenochirus jagori indicate a density of 10×10-10 ±0.52/ha (KDE) or 10×10-1 ±1.17/ha (MCP) and 1.9×10-8±7.43/ha (KDE) or 10×10-10±1.04/ha (MCP) for female. On the other hand, male Haplonycteris fischeri has 0.240±0.41/ha (KDE) while female have 1.381±0.29/ha (MCP). The probability that the tagged individuals is within the estimated home ranges was higher in *H. fischeri* (80.82±4.61% KDE and MCP) than *P. jagori* (0±0.00011% KDE or 0±0.00024% MCP). Population estimates suggest that *P. jagori* have larger home range than *H. fischeri*. This is consistent with the McNab's rule that body mass is directly proportional to range of movement. In terms of conservation, *H. fischeri* was more vulnerable to forest fragmentation, as they tend to limit their movement within the forest while *P. jagori* tend to use a wider area and is not limited to the forest.

Population survey on the Philippine Flat-Headed Frog (*Barbourula busuangensis*) in Busuanga

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A study on the abundance of Philippine flat-headed frog *Barbourula busuangensis* was conducted in barangays New Busuanga and Cheey in the Municipality of Busuanga on 4–10 July 2017. A total of 30 transects were surveyed and a 100m belt transect were lined continuously along streams. Visual encounter survey and hand capture were among the methods conducted and a 5x5 meter plot was used for habitat assessment. A total of 270 individuals of Philippine flat-headed frogs were recorded in New Busuanga (104 individuals) and Cheey (166 individuals). Streams in these two barangays vary greatly in terms of stream width, depth, rate of water flow and turbidity. The surrounding forests of streams in these areas appear to be disturbed with areas of clearings and evidences of illegal cutting activities. All remaining forest patches in the two areas are vulnerable to threats including the people who largely depend on the forests within watersheds for their regular supply of water. Despite the marked differences in abundance and quality of the streams and surrounding forests, both sites still support populations of Philippine flat-headed frog and other threatened and endemic species of wildlife. The result of this survey has contributed greatly to the development of Local Conservation Area for Barangay New Busuanga. Other barangays have also adapted *B. busuangensis* as their flagship species for protection of their remaining forests. Significantly, it has been chosen as an indicator species for monitoring protocols in Caliamanes Group of Islands.

Setting the Conservation Agenda for the Forest Dependent Bleeding-hearts

Jennica Paula Masigan, Clark Jerome Jasmin, Jhonny Wyne Edaño, Quennie Ann Uy, Apolinario Cariño, Edmund Leo Rico, and Neil Aldrin Mallari

Center for Conservation Innovations Ph, Inc.

Bleeding-hearts are excellent ambassador species for highly threatened forest habitats in the Philippines. However, population levels and ecological requirements are poorly known. This study aimed to determine the specific habitat needs and response to changing environmental variables of three *Gallicolumba* species from three provinces: *G. platenae* in Mt. Siburan, Mindoro, *G. keayi* in Mt. Talinis, Negros Occidental, and *G. crinigera* in Mt. Nacolod, Southern Leyte. Analysis was done in three tiers: 1) site-specific to model occupancy (Ψ) and determine species detection (p); 2) comparison of historical data and current extent of remaining forests across the study sites; and 3) predict past and present species distribution. Considering the size, proximity and connectivity of remaining suitable habitats for the three bleeding-hearts, *G. platenae* was perhaps the most threatened and the rarest of the three. Study confirmed that all three bleeding-hearts were lowland forest obligates. Unfortunately, forest cover change analysis showed that forest loss is happening at an alarming rate, from a low annual deforestation rate of 228 ha to 11, 800 ha. Consequently, species distribution models suggested that when lowland forest habitats were highly fragmented, there was an observed shift in the distribution of the species; suitable habitats predicted coincide with remaining forests found at high elevations. Urgent action (e.g. improve protected area management, increase coverage and scope of existing protected areas, address drivers of deforestation and degradation, improve forest governance, declaration of new protected areas, etc.) to address massive deforestation and degradation for all five islands is highly recommended.

Small mammals in upland urban-forest ecosystem in Northern Luzon, Philippines

Aris A. Reginaldo, Karen Claude Q. Soriano, Bernadette B. Iglesia, Ceszie G. Vertudes

University of the Philippines-Baguio

Little research has been conducted on the small mammal ecology in urban areas in the Philippines, especially in high-elevation areas. A previous small mammal study in Baguio City documented six species, three of which are native. We extended the prior survey by sampling in pine stands, residential areas, marketplace and backyard farms, employing similar methodology. We used records of abundance, patterns of occurrence and habitat descriptions to describe the distribution of the species in an urban-forest setting. The 94 individuals captured in 4,711 trap nights consisted of only of three non-native species: *Rattus exulans, Rattus tanezumi,* and *Suncus murinus.* A fourth species, *Mus musculus*, was trapped inside residential buildings but was not otherwise recorded at any of the 13 survey localities. The relative abundance of species varies significantly, and we provided support to show that this may be affected by difference in vegetation structure and the level of disturbance of the different habitats. *Rattus tanezumi* was the most widespread and especially more common in backyard farms and in the public market. Suncus murinus was also widespread but less abundant than *R. tanezumi. Rattus exulans* was uncommon and restricted to certain area of a given habitat, particularly preferring weed-dominated areas. The absence of the native species in the pine stands may have been affected by a number of factors specially the relatively different vegetation structure and more disturbed conditions of habitats compared to the forest fragment where they were previously documented. More thorough studies will help elucidate this in the future.

PAPER PRESENTATIONS

Species delineation of the Genus *Diplazium Sw*artz using Leaf Architecture Characters

Jennifer M. Conda[1] and Inocencio E. Buot, Jr.[2]

[1]Forest Products Research and Developoment Institute; [2]Intitute of Biological Sciences, University of the Philippines Los Baños

Classification of *Diplazium* Swartz species is not yet established, thus, a study was conducted to delineate *Diplazium* species based on leaf architecture. Using PAleontological STatistics (PAST), a cluster and principal component analysis of leaf architecture characters of the 27 selected *Diplazium* species at the Philippine National Herbarium (PNH) was done.

The dendogram (cophenetic correlation= 0.8436) and principal component analysis supported the four clusters of *Diplazium* using leaf architecture characters. At Gower distance of 0.25, *Diplazium* species were categorized as: Cluster 1 (Cladodromous– short-stalked, stout and massive 1º vein); Cluster 2 (Reticulodromous – short stalk – moderate 1º vein); Cluster 3 (Craspedodromous – short-stalked –stout to massive 1º vein); and Cluster 4 (Craspedodromous-short stalked – stout to massive 1º vein). The unifying characters were apex shape, base symmetry and 1º vein category, while the significant differentiating characters were 2o vein angle of divergence and variation in the 2º vein angle of divergence, 3º vein category, 3º vein angle of divergence, variation in 3º vein angle of divergence, 3º vein spacing and lobation.

The successful delineation of *Diplazium* species proved that leaf architecture can be a good taxonomic marker and could be an alternative way of identifying species in the absence of sori.

The art and science of taxidermy: from the field into the museum gallery

Anna Melissa SP. Domingo

National Museum of Natural History

Taxidermy mounts of animal specimens are an integral part of natural history museums. These are showcased either as a centerpiece to highlight the scientific or cultural significance of the individual specimen, or as elements in thematic exhibits that re-create interactions of organisms in the living environment. Taxidermy is not just about preserving skins of animals but to bring back each specimen to life-like state, restore old specimens, and fabricate an exact replica. Taxidermy involves bringing together artists and scientists—two groups of people with different sets of skills and with seemingly mutually exclusive fields. Science-based taxidermy demands the skilled work of artists in order to ensure that taxidermy mounts are scientifically accurate and resemble the appearance of the living self.

In this presentation, I will share with you how we at the Philippine National Museum of Natural History prepare our specimens for exhibition. I will also present some of the challenges that our artists and scientists routinely encounter, and overcome by working closely together. Ultimately, through science-based exhibits, we hope to raise public awareness to our country's rich biodiversity and to stimulate timely actions for its conservation.

PAPER PRESENTATIONS

The common palm civet (*Paradoxurus philippinensis* Jourdan, 1837) as a seed-dispersal agent in the Mt. Makiling Forest Reserve, Luzon Island, Philippines

Anna Pauline O. de Guia, Geneva S. Chavez, **Desamarie Antonette P. Fernandez**
University of the Philippines Los Baños

Seed dispersal is one of the most important ecosystem service attributed to various terrestrial wildlife vertebrates. Medium-sized carnivores, such as the common palm civet (*Paradoxurus philippinensis*) can carry larger seeds often to more distant areas. This study aimed to determine the distribution and diet of common palm civets within the Mt. Makiling Forest Reserve (MMFR), and to investigate its role as a seed disperser. This is the first in-depth study on the common palm civet in the Philippines and will serve to inform management decisions regarding the species and its habitat in MMFR. Night transect walks/spotlighting, trapping and scat collection was conducted during the wet and dry seasons. There was a total of four captures, one juvenile during the Wet Season and three female adults during the Dry Season. Trapping success may have been reduced during the Wet Season due to a landslide that made Transect 5 inaccessible. Transect and trapping data concur with the number of fecal samples collected indicating that more civets occupy the higher elevations of Mt. Makiling. Figs, anahaw, and wild banana were identified as the common food item for civets across the various elevational gradients. Results indicate that the common palm civet is a dispersal agent of important forest plant and tree species.

The gut microbiota of *Melanoides* sp. and *Neritina* sp.

Llara M. Siglos and Crisanto M. Lopez
Ateneo de Manila University

The gut microbiota of freshwater snails plays an important role in their metabolism, growth, and reproductive success in their environment. In this study, the gut bacterial community of freshwater snails, *Melanoides* sp. and *Neritina* sp., from Talipanan River, Puerto Galera, Oriental Mindoro was analyzed using Colony Polymerase Chain Reaction. DNA analysis showed that the bacteria taken from the gut of *Neritina* are related to *Aeromonas allosaccharophila* and *Aeromonas punctata*. On the other hand, bacteria taken from the gut of *Melanoides* are related to *Burkholderia seminalis* and *Burkholderia anthina*. The presence of these intestinal bacteria in *Melanoides* and *Neritina* requires further study to determine their role in freshwater snails.

The influence of time of day and rice plant growth phases in bird assemblages in rice fields

Frances Mae Tenorio and Maria Eleanor Aurellado
University of the Philippines Los Baños

Rice fields are one of the habitats commonly used by many water and land birds. However, there is little information on the bird groups found in Philippine rice fields. Our study aimed to know if the bird assemblages seen in rice fields would differ depending on the time of day and growth phase of rice. We surveyed birds during the morning and afternoon in rice fields at four different growth phases, namely: vegetative, reproductive, ripening, and mixed vegetative and ripening. The data was analyzed using Generalized Linear Mixed Model to determine bird composition

between time of day and among sites. Bray-Curtis was used to calculate dissimilarity from the transformed data using density. BIO-BIO procedure was done to determine which the subset of species whose dissimilarity matrix is maximally correlated with the dissimilarity matrix of the samples while the homogeneity of multivariate group dispersions among rice field types was analyzed using PERMDISP. We found a total of 29 bird species and the variety of birds seen was similar between morning and afternoon. However, bird species differed according to the growth phase of rice. Secretive birds such as the common moorhen and buff-banded rail were often seen in fields which contain reproductive and ripening rice plants for shelter. Perching birds such as barn swallows and Pacific swallows were usually observed in fields at the vegetative phase, i.e., newly planted rice, due to the abundance of stakes which they use to perch. Grain-eating birds like munias were also abundant in rice fields at the reproductive stage where it can feed on rice grains while Eurasian tree sparrows were mainly found in newly planted and mixed rice fields due to presence of their preferred food such as grains and insects. Our study suggests that rice fields, despite its plant homogeneity, is a suitable habitat for a variety of bird species.

Tracking the Critically Endangered Philippine Crocodile: an ongoing diet and telemetry study of wild, translocated, and headstart crocodiles

Joseph Brown[1], Amante Yog-Yog[2], Matthew Shirley[3], Marites Gatan-Balbas[1], Merlijn van Weerd[4,2], Bernard Tarun[2], and Myrna Cauilag-Cureg[5,2]

[1]University of Oklahoma; [2]Mabuwaya Foundation; [3]Florida International University; [4]Leiden University, [5]Isabela State University

Facing threats from habitat loss and unlawful killings, the critically endangered Philippine crocodile (*Crocodylus mindorensis*) is the most threatened crocodylian species in the world. *Crocodylus mindorensis* is now restricted to just two wild, viable populations—one in Mindanao, and the other in San Mariano, Isabela province, Luzon. In 2005, the Mabuwaya Foundation initiated a conservation and hatchling headstart program in San Mariano. This multidimensional program has focused on community-based conservation and increasing hatchling survival rates. Until now, relatively few data exist on the spatial and foraging ecology of Philippine crocodiles, and the long-term success of the Mabuwaya headstart program.

We initiated an in-depth ecology study on wild and headstarted crocodiles of San Mariano. For the first time, we are tracking Philippine crocodiles with GPS and satellite transmitters to better understand habitat selection, dispersal patterns, and survivorship. We are also examining stomach contents for the first-ever diet study on *C. mindorensis*. We have collected data on 30 individuals, 10 (33%) were headstarted by Mabuwaya from 2007–2015. Preliminary stomach content analysis shows a varied and opportunistic diet with consumption of snails (75%), birds (45%), fish (40%), rats (30%), insects (25%), snakes (20%), lizards (10%), turtles (10%), frogs (10%), and crabs (10%). Preliminary tracking results show adult crocodiles in particular range much further than previously thought, and occupying sites thought to be absent of *C. mindorensis*. We will continue monitoring tagged crocodiles over the next year to better support critical management efforts and the long-term success of Mabuwaya's Philippine crocodile conservation program.

PAPER PRESENTATIONS

Updates on the riparian Philippine *Caccothryptus* SHARP (Coleoptera: Limnichidae: Limnichinae), aiming for a taxonomic revision of species groups

Emmanuel D. Delocado and Hendrik Freitag
Ateneo de Manila University

Limnichids are highly pubescent riparian polyphag beetles. The four currently known Philippine *Caccothryptus* SHARP species are among the biggest representatives of the family. From the five *Caccothryptus* species complexes, two are present in the country: *C. zetteli* group in the northern Philippines and *C. jaechi* group on the central and southern islands. This study intends to update the checklist of Philippine *Caccothryptus* and provide annotations on the shared derived characters of the Philippine species. Additional specimens of university collections were dissected and morphologically described. *C. luzonensis* was newly recorded from the island of Mindoro, along with two new species from the same locality. This is the first study to document several limnichid species syntopically present in the Philippines. Moreover, one species was assigned to *C. zetteli* species group while the other was assigned to *C. jaechi* species group due to the presence of denticulate median aedeagal lobe. The findings from this study and previous unpublished data of the authors challenge the previous assumption that species groups exhibit strict geographical boundaries. Additionally, examination of type specimens and newly collected material revealed that the Philippine *Caccothryptus*, regardless of species group, are anatomically unique because of the depression between the fused parameres.

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The antihyperglycemic activity of *Artocarpus heterophyllus* leaves

Nicole Danielle P. Arcilla, Ann Lourdes Anda, Mary Angelique B. Angeles, Byron G. Aguilera, Eugene E. Alfaro, Melvin Art Salonga, Benjamin C. Tobias III, and Bella G. Panlilio
Senior High School Department, Angeles University Foundation–Integrated School

Diabetes is a metabolic disease characterized by hyperglycemia resulting from defects in insulin secretion or action. Chronic hyperglycemia of diabetes is associated with long-term damage, dysfunction, and failure of different organs. Several pathogenic processes are involved in the development of diabetes. These range from autoimmune destruction of the pancreatic b-cells with consequent insulin deficiency to abnormalities that result in resistance to insulin action. Jackfruit is a sweet and exotic fruit that contains many nutrients and benefits, including the ability to enhance immunity, strengthen the level of magnesium, and improve digestion. This study used an experimental research to determine if decocted jackfruit leaves can be effectively used as an antihyperglycemic or blood sugar regulator using mice as the test subjects. The mice were grouped into four. The three groups received the extract while the other group served as the negative control. Three various doses—0.5 ml, 0.75 ml, and 1 ml—of plant extracts were administered to the mice, and no administration of extract to the negative control. Based on the experiment, 0.75 ml of leaf extract appeared to be the most effective dose to turn the mice into hypoglycemic state. All three dosages were shown to be effective in lowering the sugar level of mice. The study showed that the decocted leaves of jackfruit can be used as blood sugar regulator. The researchers recommend this study be used as a future reference in determining plants that are believed to have antihyperglycemic activities. They also recommend this study to those who want to make a further research about the hypoglycemic activity of other parts of the jackfruit tree.

The conventional usage of local Oyster Mushroom (*Pleurotus ostreatus* Jacquin ex Fr.) as a natural decomposer for polymer plastics

Marc Andrie Bermundo, Francis Emmanuel Calaramo, and Ryan Louie Medina
Ramon Magsaysay (Cubao) High School

The lack of decomposition activity by plastic materials became a major problem in keeping the environmental capability of the biosphere intact. Many scientists plan to eliminate this dilemma by introducing different strategies to attack the crisis, in the form of plastic effluence on the surroundings. Only a few of these researches managed to completely abolish the main effects of the trouble that's happening and still more studies pertain to bring to an end in this predicament. The dilemma is perilous as to the extent in which they do corroborate with the international contamination that became a major problem in the 21st Century. This work will analyze the degradability aptitude of White Oyster Mushroom (*Pleurotus ostreatus* Jacquin ex Fr.) in different types of plastics that Philippine citizens mostly use over the course of time. Usually known as packaging plastics, polyethylene comes in three forms that become main sources for plastic pollution. This research has an essential note that oyster mushrooms can degrade High-Density Polyethylene (HDPE) and Low-Density Polyethylene (LDPE) after the specimen turned them as substrates due to their saprophytic nature, given that the substrates will be fit for diverse situational growing state of affairs. The paper concludes that using mushrooms as natural plastic decomposers may be handy in degrading plastic wastes with the purpose of crumbling without problems and a few suggestions in the degradation of plastics using fungi.

POSTER PRESENTATIONS

undergraduate

Avifauna of the northwestern slope of Mt Arayat

Mary Grace D. Guiao
Pampanga State Agricultural University

The study is currently conducted at the northwestern slope of Mt. Arayat. It aims to identify the bird species located at the area and identify how the ecological factors correlate with the species. Based from the preliminary assessment, there were 20 species observed coming from different families such as Laniidae, Corvidae, Alcedinidae, Nectariniidae, Accipitridae, and other bird families. The most commonly observed was the Eurasian Tree Sparrow. Other birds are buzzing flowerpecker, scale-feathered Malkoha, PH Bulbul, yellow vented bulbul, PH Coucal, zebra dove, brown shrike, PH pied fantail, rufous-crown bee-eater,long-tailed shrike, large-billed crow, lowland white-eye, PH tailorbird, chesnut munia, olive-backed sunbird, common kingfisher, golden bellied gerygone, white collared kingfisher, and brahminy kite. The birds will be photographed as well as their calls will be recorded. The results of the study will be used in making a field guide about the avifauna of the northwestern slope of Mt. Arayat.

Diversity of Order Araneae at Malagos Watershed, Baguio District, Calinan, Davao City and Barangay Aliwagwag, Cateel, Davao Oriental, Philippines

Mark Joel A. Gallardo, Amancio M. Lanos,Jr., Mylene Joy S. Lopez, Angelica A. Sumatra, April Jill P. Trinidad, Geonyzl L. Alviola, and Melodie Claire W. Juico
Biology Program, Davao Doctors College

Spiders are abundant predators that play important roles in terrestrial ecosystem and regulate pest insects. This study aimed to determine and compare the diversity and distribution of the species in two protected areas at Barangay Aliwagwag and Malagos Watershed. Opportunistic sampling was conducted in both sampling sites. There were 16 families found in two study sites, 7 in Barangay Aliwagwag and 15 in Malagos Watershed. Family Aranedae, Family Salticidae and Family Oxyopidae where highly observed in the two study sites because these are known as highly adaptive family. Results revealed that Malagos Watershed is more diversed compared to Barangay Aliwagwag due to the factors such as habitat structure, levels of human activities and prey abundance. With regardsto the distribution of species within the two areas, the spiders mostly were aggregated and few were randomly distributed due to habitat preferences. In this study, extended sampling hours should be done in both areas to further explore sites.

Evaluation of the antioxidant activity of the ethanolic extract of *Erythrina crista-galli* flowers

Junica Arbotante, Zhajil Coronel, Gabrielle Musñgi, Andrhea Narvasa, Chassel Paras, Jenz Paz, Bella Panlilio, Annabelle Nacpil, Jezrel Cortez, Forteza Canlas, Valeria Mariano, Carolyn Arbotante
Angeles University Foundation

The aim of the study was to investigate the antioxidant activity of the ethanolic extract of *Erythrina crista-galli* flowers. Antioxidant activity was evaluated by using the DPPH assay and ferric chloride test. The antioxidant activity of the ethanolic extract of the *E. crista-galli* flowers that was observed was compared to a standard antioxidant such as ascorbic acid. The ethanolic extract showed effective free radical scavenging activity and decrease of DPPH absorbance which

indicates that it has antioxidant property. Also, through Ferric chloride test, it showed evident results that it contains a phenolic compound by producing black color reaction confirming presence of antioxidant activity of the ethanolic extract. The results obtained through this study revealed that the flowers of the *Erythrina crista-galli* have antioxidant capacity therefore recommended to further undergo other antioxidant tests.

Motivations of hunters to engage in hunting of Flying Foxes in Northern Sierra Madre

Jessa D. Macapallag[1], Joni T. Acay[2], Leonalyn C. Tumaliuan[2], Myrna C. Cureg[1], Marites G. Balbas[2], Merlijn van Weerd[2], and Jouel B. Taggueg[1]

[1]Isabela State University–Cabagan Campus; [2]Mabuwaya Foundation, Inc.

The Northern Sierra Madre has three species of giant fruit bats or flying foxes: the endemic solitary roosting Mottle-winged Flying Fox *Pteropus leucopterus*, the endemic and endangered Golden-crowned Flying Fox *Acerodon jubatus*, and the non-endemic near-threatened Large Flying Fox *Pteropus vampyrus*. Three main roost sites with *A. jubatus* and *P. vampyrus* are present in Baggao, Cagayan and in Divilacan and Dinapigue in Isabela. Flying Foxes are threatened by roost disturbance and by hunting, both in the roost and in foraging areas. This research aimed to determine the attitudes of hunters towards Flying Foxes and their motivations to engage in hunting. We used the theory of planned behavior as the conceptual framework for this. This framework assesses behavior of people as a result of a combination of attitudes, subjective norms and perceived behavioral control. A questionnaire was developed and administered in Divilacan, Dinapigue and Baggao. Here we present the results of these interviews with details on Flying Fox hunting practices, intensity, use and trade and an initial attempt to understand why people are hunting flying foxes as a basis for targeted conservation action.

Sea Turtles of the Northern Sierra Madre Natural Park – Local Knowledge, Threats and Characterization of Nesting Beaches

Julius Rae R. Allam[1], Joni T. Acay[2], Bernard A. Tarun[2], Leonalyn C. Tumaliuan[2], Mario Pedrablanca[2], Jr., Marites G. Balbas[2], Merlijn van Weerd[2], and Jouel B. Taggueg[1]

[1]Isabela State University–Cabagan Campus; [2]Mabuwaya Foundation, Inc.

Of the seven species of sea turtles in the world, three are known to occur along the coast of Northern Sierra Madre Natural Park in Isabela province. These are Green Turtle (*Chelonia mydas*), Hawksbill Turtle (*Eretmochelys imbricata*) and Loggerhead Turtle (*Caretta caretta*). All three are globally threatened. This study aimed to identify local knowledge on and threats to sea turtles in NSMNP, particularly in Maconacon, Divilacan, Palanan and Dinapigue. Visual observations, structured interviews and focused group discussions were conducted from May to August 2018. Our interviews suggest that there may be two other species present in the park, Olive Ridley (*Lepidochelys olivacea*) and Leatherback (*Dermochelys coriacea*)—the latter, reportedly seen after making a nest in Palanan. Hunting of turtles and poaching of eggs by indigenous people, legal migrants and visiting fishermen are a serious threat to sea turtles of NSMNP. Most people we interviewed know it is illegal to hunt them but law enforcement is lacking. The meat is sold for 40–80 PhP per kilo, the eggs for 5 PhP per piece, and a whole animal for 250–1,500 PhP. We also found three raided nests during the course of the study. Carapaces of Green Turtles were seen displayed on walls in houses. Beach development and quarrying were observed on some of the

nesting beaches as well. Characterization of five nesting beaches was done to establish baseline information on these critically important habitats. The data gathered will be used as basis for local actions for the protection of sea turtles and their nesting beaches in NSMNP.

Species diversity of Anurans in the Watershed Area of Barangay Plaridel, Province of Dinagat Island, Philippines

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[1]Mindanao State University, Iligan-Institute of Technology; [2]Department of Environment and Natural Resources (PENRO), Dinagat Island

This study was conducted to determine the species diversity of anurans in the watershed area of Barangay Plaridel, Libjo, Province of Dinagat Islands, Philippines. Cruising technique was used to sample anurans. Nine species were recorded of which five are Philippine endemic and one near threatened. Highest species richness (S=5) and diversity (H'=1.271) were recorded in the upstream site. Threats to anuran population in the watershed area include developmental disturbances like impounding of water in a dam at the midstream, mining operation at the upper part which is adjacent to the watershed area of the sampling site, and human disturbances. The presence of endemic, and vulnerable species (*Megophrys stejnegeri*), indicates the need to protect this area as an important habitat for anuran species.

Taxonomic listing of marine rhodophytes in Sorsogon, Philippines

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Sorsogon harbors approximately 27% (201 spp.) of the entire Philippine rhodophyte flora (751 spp.). A species accumulation curve of all known taxa from previous collections (1969-present), mostly from Bulusan, showed that more species are likely still to be encountered. As such, the diversity of rhodophytes in two coastal regions of Sorsogon, namely, Bulusan and Sta. Magdalena, were reassessed using morphological examination. A total of six trips between December 2016 and June 2018 resulted in a collection of 612 individuals, constituting 132 species under 70 genera, 33 families, and 13 orders. Of the 132 species, 35 were novel records (20 for Sorsogon, and 15 for the entire Philippines), raising the rhodophyte species count to 236 species for Sorsogon. The species compositions in both sites were compared and discussed. Rhodophyte diversity in Bulusan was lower than that of Sta. Magdalena due to a number of highly observable anthropogenic factors. It is hoped that through this study, further efforts will be made to document and conserve the marine rhodophytes of Sorsogon.

POSTER PRESENTATIONS

Tree vegetation profile of eastern and western sides of Naujan Lake, Naujan, Oriental Mindoro

Reymart M. Delos Santos, Rommel D. Justiniano, Mark Arlan D. Lloren, Jerwin M. Mayor, **Jaesma A. Asinas**, and Mervin L. Icalla

Mindoro State College of Agriculture and Technology

Forest plays a vital role in sustaining life forms and atmosphere of the planet and provides habitats for all types of living things. Aquatic bodies are supported by forest ecosystems in sustaining its biodiversity and thus can be a vital component of Naujan Lake National Park. The study was conducted in Barangay Montelago, Naujan, Oriental Mindoro along the eastern (facing the ocean) and western (facing the lake) side of the eastern highlands of the lake. The western side is part of the Naujan Lake National Park but are titled while the eastern side is not. Both, however, constitute titled lands and are utilized by planting horticultural crops. Quadrat method was used for sampling and STAR (Statistical Tool for Agricultural Research) was used for the analysis. There is no significant difference between diversity index and location, site, quadrat, light intensity, temperature and humidity of the sides as wells as the dominance index with location, elevation, quadrat, light intensity, temperature and humidity. There is, however, significant correlation on the number of species and light intensity and humidity. Several endemic species were also documented from the sites indicating the need for preserving the sites

Tree vegetation profile of Villa Cerveza, Victoria, Oriental Mindoro

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Mindoro State College of Agriculture and Technology

Mindoro is a biogeographic region on its own because of its high biodiversity. However, anthropogenic threats are present including a proposed mining project.

This study aimed to determine the diversity of tree vegetation of Villa Cerveza, Victoria, Oriental Mindoro to see its appropriateness as a conservation site. Specifically, this study aimed to know the species richness of trees found in the area and to understand the diversity differences of trees in terms of site, to understand the relationship of species diversity with temperature and humidity.

A 50-meter transect line was used for diversity in each site, while quadrats were used to gather data on trees. Regression of indexes with environmental variables was done through STAR.

Dominance index was low and diversity index was high in all sites. Endemic species include *Artocarpus blancoi* (Antipolo), *Dillenia philippinensis* (Katmon), *Shorea nigronensis* (Red Lauan), and *Shorea polysperma* (Tanguile), the last two being critically endangered. This emphasizes the area's significance to conservation. Tree heights as well as diameter-at-breast height significantly vary between quadrats, foliage cover significantly vary by temperature.

POSTER PRESENTATIONS

regular

A partial recensus of the Mt. Apo Permanent Forest Dynamics Plot

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Biodiversity Research Laboratory, Institute of Biology

A recensus was conducted in half of the 2-ha Mt. Apo Permanent Forest Dynamics Plot in the Mindanao Geothermal Production Field operated by the Energy Development Corporation (EDC) in Mt. Apo, Kidapawan, North Cotabato. Since its establishment in 2010, the tropical montane forest plot showed signs of disturbance and subsequent regeneration, with an increase in the number of individuals in the lowest diameter class and a slight drop in basal area and biomass following the death of several big trees. Growth rates were computed as mean dbh increment per year and generally increased in each diameter class. Growth was highest for Dicksoniaceae (1.21 cm yr^{-1}) and Cyatheaceae (0.88 cm yr^{-1}) among smaller stems and highest for Podocarpaceae (0.86 cm yr^{-1}), Salicaceae (0.69 cm yr^{-1}), and Fagaceae (0.61 cm yr^{-1}) among larger individuals. Recruitment and mortality rates were computed as well, with taxa divided into classes based on their abundance (rare, uncommon, and common). Among taxa categorized as common, stem mortality was highest for the families Escalloniaceae (2.89% yr^{-1}) and Primulaceae (2.84% yr^{-1}); recruitment, on the other hand, was reported to be highest for the families Rosaceae (10.54% yr^{-1}) and Euphorbiaceae (7.74% yr^{-1}). For the family Hydrangeaceae, both mortality and recruitment were particularly high (2.80% yr^{-1} and 7.65% yr^{-1}, respectively). Recruits generally clustered on the western side of the plot, and new records for *Begonia*, *Callicarpa*, and *Pipturus* were noted. Results showed the temporal and spatial dynamics in a tropical montane forest.

A putative new species of parasitic copepod in the wild abalone *Haliotis asinina* in the Philippines

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Western Philippines University-Puerto Princesa Campus

Aquaculture of abalone has expanded in a global scale over the last two decades making it one of the most expensive seafood worldwide. But despite its enormous expansion, problems on mass mortality and low production yield still remain. This may be due to the parasite infestation which may have detrimental effects on the population of the cultured species. The abalone *Haliotis asinina* is one of the highly valued commodities in the Philippines. However, no study on the parasites of *H. asinina* has been conducted until now. Thus, this present work investigated the macroparasites found on *H. asinina*. Abalone samples were collected from different sites of Palawan, Philippines. The abalone samples were preserved in 95% ethanol and were transported in the laboratory for morphological examination and dissection using a stereomicroscope. A putative new species of parasitic copepod was detected infesting the esophagus, radula and mouth of the wild abalone. Female and male samples were examined and described. Bodies are modified and elongated. The female body comprises 4-segmented prosomal trunk and a 5-segmented urosome. The smaller male body is roughly as in female. This species were found to be closely related to the genus *Ozmana* from the family Ozmanidae. Molecular phylogenetic study is recommended to verify its taxonomic status and determine its evolutionary relationship with closely related species. The ecological relationship between the copepod and the abalone needs to be further assessed to determine the effects of the parasite to its host.

POSTER PRESENTATIONS

A rapid assessment of coral reef habitats in the Calamianes Group of Islands, Palawan

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Community Centred Conservation

The Calamianes Group of Islands, located in the northern portion of the province of Palawan, hosts a diversity of life in its coral reefs, mangroves, seagrasses and iconic limestone cliffs and caves. Although fisheries still remain the primary source of livelihood, several other sectors now depend on marine resources, particularly the coral reef ecosystem, including coral reef and shipwreck diving and pearl farm development. Marine Protected Areas (MPAs) are being established for tourism, fish stock recovery and biodiversity conservation. However, several studies have shown the continued degradation of the coral reefs in the Calamianes affecting fish abundance, richness and diversity due to overexploitation of these resources mainly by anthropogenic activities. The Department of Environment and Natural Resources Coastal and Marine Ecosystem Management Program aims to update the current status of the coral reef ecosystem in Calamianes to evaluate ecotourism potential and livelihood opportunities for local communities. In June 2017, a total of 36 survey stations in 18 sites covering 3,142 hectares underwent rapid coral reef assessment through a photo transect method processed using Coral Point Count with excel extension (CPCe) software. Overall results showed 28.25 % live coral cover, categorized as 'fair' coral reef status. Dead corals accounted for 20 % coverage, and algae accounted for 23 %. Coron has the highest live coral cover and is categorized as having 'good' coral reef status. All municipalities are dominated by non-*Acropora* coral out of the major benthic lifeform categories. However, live coral cover continues to follow a declining trend. Threats identified in earlier studies continue to bombard the area such as illegal fishing methods, uncontrolled and unregulated coastal development, and poor solid waste and waste water management. Main recommendations include: more effective enforcement of marine protected areas, better spatial planning at the municipal level, and provision of alternative livelihoods that reduce dependence on the marine resources.

Aboveground biomass output of Rhizophoraceae in Bongabong, Oriental Mindoro

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Representative mangrove species of Rhizophoraceae family were assessed in order to determine its biomass output at aboveground level. Coastal barangays of the Municipality of Bongabong were selected as study sites namely, Brgy. Masagusi and Brgy. Ipil. Using random plot method, five plots per station with a size of 100 m^2 were established to facilitate sampling and girth measurement. Trunk diameter of *Rhizophora* species were measured 30 cm about the most prominent root, while the other species were measured at breast height. Using the allometric equation developed by Komiyama et al (2008), the aboveground biomass of the mangrove stand was determined. The study showed that total aboveground biomass output of R*hizophora apiculata, Bruguiera sexangula,* and *Rhizophora mucronata* was 217.4 tons/ha, 118.53 tons/ha, and 101.19 tons/ha respectively. Lesser biomass production were accounted to *Bruguiera parviflora* (6.65 tons/ha), *Bruguiera gymnorrhiza* (11.24 tons/ha), and *Bruguiera cylindrica* (23.11 tons/ha). Species specific determination of aboveground biomass measures the productivity of individual tree. The mangroves stand of Bongabong, particularly the mangroves from Rhizophoraceae family suggests its potential as blue carbon sink.

POSTER PRESENTATIONS

An assessment of native tree species at Central Park Station, Puerto Princesa Subterranean River National Park, Palawan, Philippines

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De La Salle University – Manila

The Philippines is one of the most diverse countries in terms of floral and faunal species due to its location. However due to human activities such as deforestation, many species are in danger of being extinct. To solve this problem, many reforestation efforts are being done but are deemed unsuccessful due to the incorrect selection of tree species for planting. Native trees, however, which are unfamiliar to most people are good for forest restoration because these are the basic foundation of the country's forest ecosystem and most endangered wildlife species prefer to nest on these species. This study focused on the identification and assessment of native tree species in Puerto Princesa, Palawan through transect and quadrat sampling methods. A total of 281 individuals classified to 30 families and 49 species were identified. Assessment of plant diversity status was also assessed using parameters such as density, frequency, abundance, and importance value. The provinces where these species are found were also identified. These results indicate that these species can be used for restoring the forests throughout the country.

An overview of the amphibians and reptiles of the Bicol Faunal Sub-region and the conservation of its endemic species

Jake Wilson B. Binaday
Crocodylus Porosus Philippines, Inc.

Bicol Peninsula has been known to possess unique faunal species from the rest of the Luzon Faunal Region, thus it was dubbed as the Bicol Faunal Sub-region. Most of its remaining intact forests are situated along the slopes of its volcanic mountains which houses several endemic amphibian and reptile species. Based from recent herpetofaunal surveys and existing literatures, a total of 26 species of anurans, 41 species of lizards, 33 species of non-marine snakes, and two species of non-marine turtles can be found in the Bicol Faunal Sub-region. Out of these, 17 are Bicol endemics, many of which are threatened by the continuous loss of lowland forests. The threats, conservation status, and possible conservation management strategies of these endemic amphibians and reptiles are presented and discussed in this paper.

Assessment of waterbirds at Ipil Wetland, Zamboanga Sibugay, Philippines

Krystal Dianne R. Dapiton, Javica Faye D. Canag, Georgina L. Fernandez, **Vanessa Joy G. Dael**, Michael F. dela Cruz, and Dante A. Oporto
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The study wanted to identify and classify the different species of waterbirds found at Ipil Wetland, Zamboanga Sibugay as well as determine the number of species present in the 755.13 hectares study site. Purposive Sampling Method was used in this study. Documentations and observations were done through digi-scoping, use of digital single-lens reflex cameras, binoculars and spotting scopes. From 2016–2018, a total of thirty-eight waterbird species were recorded in the wetland. Twenty of these species belongs to Order Charadriiformes, namely: *Himantopus himantopus, Himantopus leucocephalus, Pluvialis fulva, Pluvialis squatarola, Charadrius alexandrinus,*

Charadrius dubius, Charadrius leschenaultii, Xenus cinereus, Numenius phaeopus, Numenius arquata, Tringa totanus, Tringa nebularia, Tringa stagnatilis, Tringa glareola, Actitis hypoleucos, Calidris ruficollis, Chlidonias hybridus, Limnodromus semipalmatus, Gelochelidon nilotica, and *Heteroscelus brevipes*; seven under Order Gruiformes: *Rallus torquatus, Rallus philippensis, Rallus* striatu), *Gallinula chloropus, Amaurornis olivacea, Amaurornis phoenicurus* and *Porzana fusca*; eight in Order Pelicaniformes: *Egretta eulophotes, Egretta garzetta, Egretta intermedia, Egretta alba, Bubulcus ibis, Ardea purpurea, Ardeola speciosa,* and *Butorides striatus*; two with order Ansertiformes: *Anas luzonica* and *Dendrocygna arcuata*; and *Tachybaptus ruficolli* was the lone species observed under Order Podicipediformes. Twenty of the 38 documented waterbirds are migratory species whose breeding sites range from Russia, Mongolia, China, Northern and Eastern Asia. The dominant species for both Stations 1 and 2 was *Egretta garzetta* with 791 and 140 individuals respectively. The least dominant species recorded were *Amaurornis olivacea* and *Rallus philippensis* for Station 1 and *Porzana fusca* and *Rallus striatus* for Station 2.

Avifaunal and Amphibian Diversity in the Habitat Mosaics of Candaba Wetlands, Philippines

Gerald M. Salas

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The physicochemical and biological features of the Candaba Wetlands are important in formulating long-term conservation strategies in the area. This study aims to describe the biophysical component of the Candaba Wetlands particularly the birds and amphibian diversity. The study site was classified into three habitat mosaics where biodiversity and water quality assessment were conducted. In each survey site, ten sampling points was plotted and surveyed. For avifaunal diversity, point counts and MacKinnon lists were the methods. On the other hand, opportunistic sampling was done for the amphibian biodiversity. The results revealed that there were 60 avian species belonging to 27 families have been recorded from the three survey sites. Of 60 species, only four endemic bird species were encountered. These are the Philippine coucal (*Centropus viridis*), Philippine duck (*Anas luzonica*), Pied fantail (*Rhipidura nigritorquis*), and Purple swamphen (*Porphyrio pulverulentus*). It was also observed that there is an increase of bird diversity as the habitat is becoming more heterogenous. There were only four amphibian species recorded in the site dominated by *R. marina*. Results also revealed that the avifauna and amphibians in the Candaba Wetlands are correlated with the environmental variables such as turbidity, water and ambient temperature, and vegetation cover.

Botanical habitat assessment at Mounts Iglit-Baco Natural Park, Occidental Mindoro

Gener Fantuyaw[1], Jackie M. Belmonte[2], Emmanuel Schütz[2], and Alvaro Gonzalez Monge[2]

[1]Tamaraw Conservation Program; [2]D'Aboville Foundation

Mounts Iglit Baco Natural Park (MIBNP) is an ASEAN Heritage Park and the world's stronghold for the Critically Endangered tamaraw, the Philippines national animal. Despite its conservation importance, and the fact that large swaths of it were heavily degraded as it used to be a cattle station, little work has been undertaken to study the botanical diversity of the Park and the structure and state of conservation of its forest and grassland habitats, which are key to

conserving numerous Mindoro endemic flora and fauna. This study focuses on the botanical composition and habitat structure of those areas where tamaraw are currently found or used to be found until recent years. Work started on June 2018, involving 150 botanical quadrats of 10x10 meters randomly stratified by habitat type and burning frequency. Quadrat cover was used to quantify each species' dominance within a plot. Plants were identified to the lowest possible taxon with the help of local Mangyan knowledge and Co's Digital Flora of the Philippines. The ongoing work has identified more than 200 species of flora. Grasslands were dominated by cogon *(Imperata cylindrica*), talahib (*Saccharum spontaneum*) and bungarngar (*Chromolaena odorata*); Secondary forests were dominated by bulso (*Dioscorea hispida*) and labnog (*Ficus septica*). These results show the importance of controlling bungarngar in protected areas and the potential for natural restoration in protected areas. Old-growth forests remain to be analysed due to Mangyan cultural practices.

Cytotoxicity of crude extracts eerived from the body wall and cuvierian tubules of *Pearsonothuria graeffei* Semper (Black-Spotted Sea Cucumber)

John Raymund M. Torres and Victoria N. Malaya
Don Mariano Marcos State University

Maximizing the use of our natural resources is not through overexploitation but on its effective utilization while having no or the least possible damage on the environment. Marine bioprospecting is one of the effective ways to provide insights on sea cucumber species' biological properties. This will open an opportunity for more option values to this natural resource hence, for establishing concrete management efforts because of their more significant status. In this study, *Pearsonothuria graeffei* were collected from Poro Point, City of San Fernando, La Union under BFAR RF01 Gratuitous Permit No. 01-14. The sea cucumber body wall and cuvierian tubule crude extracts are found to have potential cytotoxic and/or genotoxic properties at concentrations of 500, 1000, and 1500 µg/ml using Allium test. Also, a significant ($p < 0.05$) growth inhibition in both the length and number of roots occurred at higher concentrations of 1000 and 1500 µg/ml of the crude extracts. Finally, a low mitotic index was observed ($p < 0.05$) in onions treated with the crude extracts.

Distribution, ecology and comparative analysis of morphometric structures of Asian Box Turtle (*Cuora amboinensis*) found in Cagayan Valley

Mari Len B. Cangas and Jane G. Cabauatan
Isabela State University—Cabagan Campus

Freshwater turtles were classified as vulnerable under the International Union Conservation of Nature (IUCN) due to pet trade its use as gourmet in oriental foods. The main focus of this study is to determine the distribution, ecology and comparative analysis of morphometric structures of Asian Box Turtle (*Cuora amboinensis*) in Cagayan Valley. Its basic approach was capture-release and walkthrough method in collecting Asian Box Turtles.

Findings revealed that there were 42 Asian Box Turtles collected at Barangay Dicamay, San Mariano, Isabela; 29 Asian Box Turtles in Barangay Simannu Norte, San Pablo, Isabela and 13 Asian Box Turtle in Barangay Bical, Peñablanca, Cagayan in three months. The physico-chemical characteristics such as Water depth, Dissolved Oxygen, Total Dissolves Solids, Water Current, Temperature, Turbidity, Chloride and Iron were attributed to the population distribution of the *C.*

amboinensis. Likewise a survey was conducted cognizant on the presence of Asian Box Turtle in their area, and revealed that this species of freshwater turtles were rarely seen in the areas, if captured, they served as immediate source of income and pet on their respective houses.

Hence, it is highly recommended that RA 9147, known as "An Act Providing For The Conservation and Protection of Wildlife Resources and their Habitats, Appropriating Funds Therefor and for other Purposes" be strictly implemented. Awareness programs on the ecological status of this Asian Box Turtles (*Cuora amboinensis*) must be launched by the concerned department so as to educate the public on the presence and importance in the ecosystem.

Documenting early biofouling communities in Bauan Port, Batangas, Philippines

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University of the Philippines—Los Baños

The proliferation of non-indigenous species in the marine ecosystem is a global issue that threatens biodiversity and its conservation. Multiple studies have shown that trade, aquaculture, and sea transport activities are the common vectors of these non-indigenous species that potentially become invasive. To document the occurrence of such species in Philippine nearshore waters, a short-term experiment was conducted in Bauan Port, Batangas, where the initial development of biofouling communities were followed for two to eight weeks. The early recruits were mostly diatoms, followed by microalgae, *Amphibalanus amphitrite*, and sessile molluscs. The composition of these biofouling communities is common in the SE Asian region, and the succession sequence observed is similar to the initial phase of biofouling.

Eco Rangers and Eco Guardians: Biodiversity Champions of Oriental Mindoro

Shalimar G. Ilejay and Noel A. Resurreccion

Haribon Foundation for the Conservtion of Natural Resources, Inc.

The Eco-Guardians and Eco-Rangers Program is designed to increase capacity of selected high school science teachers as Eco-Guardians and students as Eco-Rangers on biodiversity conservation and watershed management leading to the development and implementation of a specific site conservation plan of action. The program complements the K-12 curriculum, where science teachers are required to mainstream biodiversity conservation, watershed governance and include native species such as, Mindoro Bleeding-heart (*Gallicolumba platenea*), Tufted duck (*Aythya fuligula*), White Lauan (*Shorea contorta)*, Mindoro island frog (*Philautus schmacke*), and Mindoro warty pig (piglet) (*Sus oliveri*), in their lesson plans for Grade 8 students. A total of 17 teachers were trained as Eco Guardians and 44 students as Eco Rangers. Conservation projects were proposed, developed and implemented by the students such as: enforcing proper waste segregation through trash bins made of recycled plastic bottles, intensifying advocacy on the ban of plastic use ban in schools, establishment of native tree nursery, establishment of an eco-park, rehabilitation of a riverbank, among others. The projects were implemented in close coordination with DepEd, partner LGUs and local communities. It developed their sense of community and heightened their knowledge about conservation and environmental issues. From the onset of the project, Haribon forged a memorandum of agreement with DepEd to develop and finalize the module, training guides, and harmonize the training materials with the DepEd K-12 science curriculum.

POSTER PRESENTATIONS

Engaging the youth in conserving the biodiversity of Northern Sierra Madre Natural Park

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The Northern Sierra Madre Natural Park in Isabela province is one of the largest and most biologically diverse protected areas of the Philippines. Home to about 25,000 people, it is imperative that there is active involvement of locals in environmental protection. We present here Mabuwaya's new program in engaging high school students in biodiversity conservation in NSMNP. It aimed to raise awareness among the youth about the park and its unique features, shape the students into ambassadors of nature, and create camaraderie amongst them as protectors of their home. About 170 students and seven teachers from Maconacon, Divilacan and San Mariano were engaged in the communication, education and public awareness campaigns jointly organized with the schools, DENR and the respective local governments from 2017 to 2018. An orientation workshop was first held for 150 students. We then selected 80 top-performing ones. These were actively involved in organizing the first Philippine Crocodile Festival in San Mariano and a mini-festival in Maconacon and Divilacan to celebrate Save Sierra Madre Day and International Coastal Clean-up. Nature walks in mangroves and lowland forests were also organized to generate appreciation for biodiversity. Finally, the students themselves led an information drive in schools and communities. We further present the impact of these activities to students, teachers and community members and showcase the close collaboration with the DENR and LGUs. It is hoped that this set of experiences will spark a new wave of environmentally-conscious youth and create opportunities for stronger local partnerships.

Ex situ micropropagation of *Alocasia atropurpurea* Engler, an endemic and critically endangered species in the Cordillera

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Alocasia atropurpurea Engler or upright elephant ear is an endemic species in the Cordillera, found in a disturbed mossy forest in Mount Polis, Ifugao. However, due to habitat destruction, this species is now considered as critically endangered by the IUCN. Thus, this study aims to establish baseline information for the ex situ micropropagation of this plant, which will lay groundwork for further studies on the potentials of this plant. In this study, rhizome bud explants were cultured into Murashige and Skoog (MS) medium supplemented with several plant growth regulator concentrations for eight weeks. The effects of the phytohormones, napthaleneacetic acid (NAA) with gibberellic acid (GA) for the establishment of culture, and indole-3-acetic acid (IAA) with benzylaminopurine (BAP) for the shoot and root proliferation, were observed and statistical analyses (Chi-square and ANOVA) were used to determine whether the observed effects vary among treatments. High concentration (10 mgL^{-1}) of the cytokinin, BAP, countered and controlled by the effect of lower level (6 mgL^{-1}) ofthe auxin, IAA, were found to induce maximum shoot proliferation, (mean shoot number=6.33; highest shoot height=7.37 cm; number of leaves=2) and root formation (mean root number=8.67).

POSTER PRESENTATIONS

Hiding in plain sight: vicarious collection of Odonaspidine Armored Scale Insects (Diaspididae: Odonaspidini) from specimens of bamboos deposited at a Natural History Museum

Normandy M. Barbecho[1], Michelle Alejado-San Pascual[2], Annalee S. Hadsall[2,3], and Ireneo L. Lit, Jr.[2,3]

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As a collection method for entomological studies, vicarious collection is herein defined as the examination of herbarium specimens that are curated and deposited in a natural history museum for the specific purpose of searching for the presence of insects—primarily of herbivores with various degrees of association with their host plants—that had been inadvertently (or unavoidably) collected along with the plant specimens. Odonaspidine armored scale insects (Hemiptera: Diaspididae: Odonaspidini) are difficult to detect owing to their cryptic habit as sessile plant parasites, occupying concealed plant parts such as under the leaf sheath. Moreover, most members of this tribe are specific to graminaceous plants. For these reasons, odonaspidines are amenable to vicarious collection. In this study, vicarious collection of odonaspidines was performed on bamboo specimens deposited at the botanical herbarium of the University of the Philippines—Museum of Natural History for about two weeks. Materials of eight species of odonaspidines belonging to three genera were vicariously collected from bamboo herbarium specimens gathered between 1981 and 1989. This collection resulted in new host records for five species and new locality records for all described species. Furthermore, specimens of an odonaspidine species that is possibly new to science were also vicariously collected. This study shows that vicarious collection is a useful entomological collection method that may complement standard insect sampling techniques for conducting an inventory of local and regional insect fauna. Finally, this study further highlights the importance of collecting voucher specimens and depositing them in a natural history museum to make them available for scientific study.

Inventory assessment of orchids in selected barangays of Palapag, Northern Samar

Regina O. Belga and **Manuela Cecille G. Vicencio**

University of Eastern Philippines

An orchid is one of the plants with high ornamental value, thus it has more often been over-exploited. The aim of this study was to determine the species composition of orchids in Palapag, Northern Samar, utilizing the purposive technique. A total of 29 orchids species were found in four sampling sites. Barangay Sangay had the highest number represented by seven species: Barangay Maragano with six species: Barangay Magsaysay with four species; and Barangay Pangpang with three species. Of the specimens recorded, identification of nine unidentified species were undetermined due to the unavailability of the inflorescence during the survey. This findings provided evidence that Palapag harbors a number of endemic and understudied species of orchids. Thus, this study will serve as a baseline for conservation and starting point for orchid research in this municipality as well as in the province of Northern Samar, Philippines.

POSTER PRESENTATIONS

Mapping forest formation types using pixel-based classification methods on medium resolution satellite imagery

Angelica Kristina V. Monzon[1], Oliver G. Coroza[1], Septher Ian Salcedo[2], Michelle Aplan[2], Harold Centeno[1], John Floyd Porras[1], Pastor L. Malabrigo Jr.[3], Arthur Glenn A. Umali[3], and Adriane B. Tobias[3]

[1]Center for Conservation Innovations Ph Foundation; [2]Biodiversity Management Bureau, DENR; [3]Forest Biological Sciences, College of Forestry and Natural Resources, UPLB

The Biodiversity Management Bureau (BMB) of the Department of Environment and Natural Resources (DENR) has expressed its interest in developing a forest cover map derived from satellite imagery. This map aims to reflect the characteristics and role of the ecosystems and forested habitats, covering broader landscapes that contains protected areas and/or key biodiversity areas.

The Philippine Biodiversity Strategy and Action Plan, one of the agency's enabling program intervention, has highlighted the need to determine the natural forest habitat types and be reflected in DENR's forest classification system. The forest formation classification emerges as a pragmatic approach to identify natural forest habitat types.

The main objective of this study was to address the problem of a lack of methodology in classifying forest formation types interpreted from satellite imagery. Landsat 8 satellite imagery was processed and analyzed using Remote Sensing principles and techniques. Free open source software packages were used to implement a decision-tree algorithm for the automated classification of image pixels.

The combination of pixel-based classification approach and statistics showed better results than the use of maximum likelihood classification approach. The ability to input other independent variables such as elevation, NDVI, and aspect increases the likelihood of detecting forest formation types. However, some of these variables equivocally influence the result and force forest formation types to be misclassified. The study showed a very promising method in detecting forest formation types from satellite imagery at lower cost and will need to be further tested for other formation types.

Modernizing the Philippine National Museum of Natural History: challenges and lessons learned

Maria Josefa S. Veluz[1], Susan M. Tsang[1,2], Anna Melissa Domingo[1]

[1]Zoology Division, Philippine National Museum of Natural History; [2]Department of Mammalogy, American Museum of Natural History, New York

The National Museum of the Philippines was created in 1901 with the passage of Act No. 284 establishing the Insular Museum of Ethnology, Natural History and Commerce, and it was later transferred to the Bureau of Science in 1904. World War II destroyed the infrastructure of the Bureau of Science, including valuable type specimens in the reference collections. Post-war reconstruction of the National Museum was made possible by the move of the Natural History Division to the Legislative Building (now the National Museum of Fine Arts) and through collaborations with foreign researchers. However, this space could not sufficiently serve the needs of a modern museum enterprise. By virtue of the National Museum Act No. 8492 of 1998, the former Agriculture Building (later the Department of Tourism Building) was officially transformed into the National Museum of Natural History in 2012 and 2013, almost two decades after the passage of the law.. Under the current leadership, the National Museum has been able to revitalize and modernize its infrastructure and research capabilities. Here, we show the changes that the public

exhibition galleries and collections have undergone over the past five years in order to address the public need for science communication and the scientific need for modern research facilities. These improvements position the National Museum as an important institution for creating new scientific knowledge in collaboration with both foreign and domestic partners with the primary aim of addressing present and future conservation and research challenges that are of both national and global concern.

New distribution records for insectivorous bats in the Philippines

Jay S. Fidelino, Mariano Roy M. Duya, Melizar V. Duya, and Perry S. Ong
Biodiversity Research Laboratory, Institute of Biology, University of the Philippines—Diliman

Seed dispersal is one of the most important ecosystem service attributed to various terrestrial wildlife vertebrates. Medium-sized carnivores, such as the common palm civet (*Paradoxurus philippinensis*) can carry larger seeds often to more distant areas. This study aimed to determine the distribution and diet of common palm civets within the Mt. Makiling Forest Reserve (MMFR), and to investigate its role as a seed disperser. This is the first in-depth study on the common palm civet in the Philippines and will serve to inform management decisions regarding the species and its habitat in MMFR. Night transect walks/spotlighting, trapping and scat collection was conducted during the wet and dry seasons. There was a total of four captures, one juvenile during the Wet Season and three female adults during the Dry Season. Trapping success may have been reduced during the Wet Season due to a landslide that made Transect 5 inaccessible. Transect and trapping data concur with the number of fecal samples collected indicating that more civets occupy the higher elevations of Mt. Makiling. Figs, anahaw and wild banana were identified as the common food item for civets across the various elevational gradients. Results indicate that the common palm civet is a dispersal agent of important forest plant and tree species.

New Records and New Species of *Byrrhinus* MOTSCHULSKY (Coleoptera: Limnichidae: Limnichinae) from Greater Luzon and Mindoro

Emmanuel D. Delocado and Hendrik Freitag
Ateneo de Manila University

Byrrhinus MOTSCHULSKY, 1858, is the most widely distributed and most diverse genus of family Limnichidae (minute marsh-loving beetles) with 90 described species. Approximately 25% of the known limnichid species belong to the genus *Byrrhinus*. Currently, five species of genus *Byrrhinus* are listed from the biogeographical regions of Greater Luzon, Mindanao, Mindoro, Palawan, Greater Mindanao, and Tawi-Tawi Island. Undetermined university collections were examined for this study. Aedeagi were dissected and cleared using lactic acid and the morphological characters were compared with published literature. *B. tarawakanus* was newly recorded from Mindoro, while *B. ferax* was recorded from Mindanao (Cagayan de Oro). Upon examination of the aedeagi, three species new to science were discovered from Laguna, Oriental Mindoro, and Bulacan, respectively. It is the first study to document limnichid species in Bulacan. Specimens were classified under *Byrrhinus* because of their elongate oval habitus, and deeply sinuate pronotum and elytral base, yet the median lobe and parameres of the male genitalia distinctly vary from the known species. It is likely that there are more undocumented new *Byrrhinus* species in the Philippines. Therefore, additional sampling efforts are recommended, especially in underexplored Intra-Philippine biogeographic regions.

POSTER PRESENTATIONS

Phytoplankton community structure as trophic status indicator of selected tributaries of the Pampanga River, Philippines

Lorenz J. Fajardo

College of Fisheries, Central Luzon State University

The study assessed the species composition, diversity, abundance and evenness of phytoplankton community, and water quality of selected river tributaries in Minalin, Pampanga. It aimed to provide baseline information on the health status of the Pampanga River, the primary source of water for aquaculture and site of wastewater disposal.

A total of 35 taxa were identified and classified into four divisions: Bacillariophyta (diatoms), Cyanophyta (blue-green algae), Chlorophyta (green algae), and Euglenophyta (euglenoids). Chlorophyta had the highest representation by genera (20) while Euglenophyta had the least (3). However, Cyanophyta recorded the highest relative abundance among the divisions. Spirulina and Oscillatoria, filamentous cyanobacteria reported as indicators of organically polluted waters, were the most abundant of the cyanophytes. Diversity indices (Shannon-Wiener and Simpson index) were relatively high. The mean value of dominance indicates that no taxa dominated the community. Mean evenness index signifies that there is uniform distribution of phytoplankters in the sites.

Physico-chemical parameters (temperature, visibility, salinity, pH, nitrite and alkalinity) were at optimum levels. However, total dissolved solids (TDS), dissolved oxygen (DO), total ammonia nitrogen (TAN) and phosphorous (P) values did not conform to the Class C category of Pampanga River based on beneficial use. Abundance of filamentous cyanobacteria and depleted levels of significant water quality parameters may indicate increased level of organic pollutants in the river.

Propagation and conservation of *Amorphophallus campanulatus* (Pongapong) in Barangay Pooc II, Silang, Cavite, Philippines

Jane A. Manarpiis

Cavite State University

The study was conducted in Barangay Pooc II, Silang Cavite to find ways on how to propagate *Amorphophallus* campanulatus (*pongapong*) in the said area and conduct a conservation action to preserve the said plant species. It aimed to find out the different ways to propagate *pongapong*; determine the conservation actions that can help safeguard the plant in the area; and determine the threats to the conservation and propagation of *pongapong*. Exploratory research was used in the study where ocular visits, documentations, and *pongapong* hunting were made. Surveys were done to gather pertinent data and survey questionnaires were distributed to the locals to find out salient details about the said plant under study. Based from the results gathered, there is very little study about this plant species. Their emergence is unpredictable and the duration of their growth and development takes a long time. The plant is edible, has pain-killing, anti-inflammatory, anti-flatulence, digestive, aphrodisiac, rejuvenating and tonic properties. Other than this, the barangay folks are still unaware of some other uses of *pongapong*. The plant is on the verge of being endangered. Different ways to propagate the plant include stem cutting, seed planting and corm planting. In conserving the plant, the researcher and her team did captive breeding having found *pongapong* in deep forest of the barangay.

POSTER PRESENTATIONS

Taxonomic inventory of fishes in Bongabong River, Bongabong, Oriental Mindoro

Mailen Mae B. Yadao, Angielyn C. Briñosa, Eunice M. Crusit, Nixau E. delos Santos, Jerremy V. Zapata

Mindoro State College of Agriculture and Technology—Bongabong Campus

A taxonomic inventory was conducted to determine the fish stock of Bongabong River, Bongabong, Oriental Mindoro. Studies on fish stock assessment of rivers in the province are lacking, as well as records of other aquatic resources were deficient. Field study survey was done twice a month from August to October 2017. Fish sampling was done through direct interaction and participatory observation with the fisherfolks. Several fishing gears were used for fish collection such as push net (*sakag*), cast net (*dala*), spear gun (*pana*), gill net (*pante*), fish pot (*bubo*), and pole and line (*pangawil*). Results had shown that the river contains 24 species of fishes which represents 18 families. One island endemic species were recorded which is *Puntius hemictenus*. Four introduced species were also present in the river, which includes *Tilapia zilli, Oreochromis niloticus, Gambusia affinis, Channa striata,* and *Clarias batrachus*. The variability of fish species in Bongabong River signifies its importance and productivity as a major river system in the province of Oriental Mindoro. Understanding its fish and aquatic resources may serve as baseline information for management purposes.

Taxonomy and uses of Genus *Dioscorea* L. (Dioscoreaceae) in Nepal

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Central Department of Botany, Kathmandu, Nepal

Dioscoreaceae is the monogeneric family for Nepal and represent by *Dioscorea* L. Fifteen species of *Dioscorea* L. were found in Nepal, out of these two are new to Nepal. It is monocotyledonous tuber plants of family and reported to be an old species native to South East Asia. *Dioscorea* is a genus of twinning herb, climber with underground part tubers or rhizomes, simple or compound leaf. *Dioscorea* is known as 'Tarul' in Nepali language. One species *D. deltoidea* is included in CITES Appendix II. Common species D. *alata, D. bulbifera, D. hamiltonii, D. hispida* and *D. pentaphylla* were found throughout the country. Among these bulbils and tubers of *D. alata, D. hamiltonii, D. hispida* and *D. bulbifera* were popularly used as food in Nepal. Plant specimens were collecting from different parts of country and by gathering information from herbarium specimens of *Dioscorea* L. which were kept in different herbaria of Nepal and out of country. *Dioscorea* species were found in the elevation range from 130–3100 m and high species diversity at 600–1600 masl. Morphology of the vegetative parts were studied by using morpho-geographical methods and found vary greatly, depends upon the environmental condition of their habitats and geographical distribution. Two species, *Dioscorea depauperata* and *D. exalata* were new records for Nepal Flora. The cluster analysis (dendrogram) of *Dioscorea* is help to generate the basic idea on the relationship among species.

POSTER PRESENTATIONS

The community structure of mosses in the DENR-ERDS XI Experimental Forest in Nabunturan, Compostela Valley Province

Melanie M. Garcia[1] and Tamsi Jasmin D. Gervacio[2]

[1]Davao Doctors College; [2]University of Southeastern Philippines

There were 15 families identified, namely: Calymperaceae, Bryaceae, Hookeriaceae, Fissidentaceae, Pottiaceae, Meteoriaceae, Dicranaceae, Sematophyllaceae, Hypopterygiaceae, Erpodiaceae, Thuidiaceae, Polytrichaceae, Daltoniaceae, Neckeraceae, and Hypnaceae. In terms of morphological characteristics of the collected moss samples, 25 species and three genera were putatively identified. However, four moss samples were not identified.

Among the 15 families identified, Calymperaceae represented by Exodictyon blumii (Nees ex Hampe) Fleisch dominated the DENR-ERDS XI Experimental Forest in terms of species composition which was 13 in frequency and 0.17 in relative frequency and in the 25 moss species identified the Shannon-Wiener Diversity Index got the value of 2.9137 with an 18 in its effective number of species which means that there were 18 species evenly distributed in the study site.

In the physico-chemical parameters, the transect 2 had the highest mean value of air temperature with the value of 31.9 degree Celsius, in soil temperature at 5 inches deep, transects 6 got the highest value of 27 degrees Celsius and in 10 inches deep, transects 4, 6, and 7 had the same results on their soil temperature of 27 0 C. Transect 8 had the highest mean value of 5.9 in soil pH and lastly in relative humidity, Transect 7 and 8 had the highest percentage values of 96 percent, since the result were high in which those gave a great effect on the diversity of the identified moss species in the said study site.

The Tungtong River Conservation Project—forming today's elementary and high school students into tomorrow's biodiversity conservationists

Henry G. Calilung and Nikki Dyanne Realubit

Holistic Education and Development Center

The Tungtong River is a 13-km inlet of Laguna Bay. The elementary and high school students of the Holistic Education and Development Center have been conducting studies in the Tungtong River headwaters since 2004 via a student-organization called the Tungtong River Conservation Project. We have documented 70 bird species, 35% of which are endemic (*Bubo philippensis* is listed by IUCN as Vulnerable); four bat species (one endemic, *Ptenochirus jagori* and two natives—*Rosettus amplexicaudatus, Myotis muricola*); six frog species (one Luzon endemic—*Limnonectes macrocephalus* listed by IUCN as Near Threatened and two natives—*Polypedates leucomystax* and *Occidozyga laevis*); one native goby (*Awaous melanocephalus*); two forest mammals (one native—*Paradoxurus hermaphroditus*); and three reptiles (two of which are endemics—*Draco spilopterus, Bronchocela marmorata*). We have classified the river as Class II (US EPA water quality criteria) based on diel physico-chemical readings and macrobenthos bioindicators. We have also been conducting regular river clean-up and tree-planting activities. We planted saplings of critically endangered dipterocarps (*Shorea almon, S. guiso, S. contorta, Dipterocarpus grandiflorus* and *Hopea plagata*) and other native trees. We have shared our research results in seminars at the University of the Philippines Diliman and in other biodiversity conservation symposia in the country. These endeavors have all contributed to the formation of HEDCen students into more environmentally-aware individuals who will hopefully carry on the work as they pursue their own career paths. We intend this presentation as a call for collaboration as we seek to do more and be more at TRCP.

WORKSHOPS

Basic Ecological Statistics using R

Facilitators:

Lilian Jenifer Rodriguez, Jelaine Gan, Simeon Gabriel Bejar, *Institute of Biology, University of the Philippines—Diliman;* **Rieziel Ann Bernal**, *Philippine Science High School*

Ecological studies in the Philippines usually gather huge amounts of data that only end up in terminal reports. This is very unfortunate because we miss the opportunity to tell others of the interesting (and sometimes depressing) patterns that we see in nature. This problem is partly due to the fact that we have a poor background in applied statistics. Having a good grasp of statistics allows one to detect real patterns and be able to communicate and publish these patterns. This workshop will try to address this problem by providing the participants basic knowledge on ecological statistics. We will use R because it is free and a very powerful statistical language. During the workshop, the facilitators will help the participants figure out the best way to analyze their datasets. Ideally, the datasets should represent real data, but in cases where participants have no data at hand, they can analyze "made-up" data. We will cover univariate models, including Analysis of Variance (ANOVA), linear regression and Analysis of Co-variance (ANCOVA) models. If applicable to their datasets, we will also cover multivariate methods, such as Principal Components Analysis (PCA), Cluster analysis, multiple regression and multivariate analysis of co-variance (MANOVA). At the end of the workshop, the participants should have analyzed their own datasets using appropriate statistical models and written down one or two paragraphs describing these models.

Connected to the Wild: Linking Biodiversity Conservation and Development

Facilitators:

Michelle Pascual, *USAID Protect Wldlife Project*

It is a presentation of the Protect Wildlife Project, the approach in changing the behavior of people towards biodiversity and environment conservation through Behavior Change Campaign. One objective is to reduce threats to biodiversity, reduce illegal use of illegally harvested wildlife and wildlife products, and enhance ecosystems goods and services for improved biodiversity conservation and human well-being.

The workshop seeks to solicit contributions from the participants on enhancing this implementation approach of the Project.

WORKSHOPS

Developing Biodiversity Research Agenda for Mindoro

Facilitators:

Grace Diamante, Errol Gatumbato, Don Geoff Tabaranza, Kathy Lene Cielo, Mindoro Biodiversity Conservation Foundation, Inc., *Mindoro Biodiversity Conservation Foundation, Inc.*

The island of Mindoro has several areas identified as Key Biodiversity Areas of the Philippines, as recognized by the Biodiversity Management Bureau of the Department of Environment and Natural Resources and other local and international institutions. It has enormous number of floral and faunal species that are only restricted in the island due to diverse habitats and ecosystems present in Mindoro. Some of these sites have been declared as protected areas, particularly the Mounts Iglit-Baco Natural Park, Mount Calavite Wildlife Sanctuary, and Apo Reef Natural Park in Oriental Mindoro province, and the Naujan Lake National Park in Occidental Mindoro province. Other KBAs in the island have no clear institutional arrangements for their management.

The identification of these KBAs has been possible with the availability of data from various researches conducted in the island by several institutions and individuals. The Mindoro Biodiversity Conservation Foundation, Inc. has started to compile these researches so as to assess the wealth of information, thereby updating the biodiversity profile of the island. It is also aimed to identify research gaps and needs to further provide updated and scientific bases in developing conservation actions and strategies to be implemented in Mindoro.

Objectives of the Workshop

- To serve as a platform for sharing of information on biodiversity researches conducted in Mindoro by various institutions and individuals;
- To assess the current knowledge on Mindoro's biodiversity and identify gaps and needs;
- To develop biodiversity research agenda and research action plan for Mindoro;
- To identify areas of cooperation and collaboration among interested groups and individuals in conducting biodiversity researches in Mindoro.

The Forest Resources Bill: A New Hope for the Philippine Forests

Facilitators:

Princess del Castillo, Thaddeus Martinez, Maria Belinda de la Paz, *Haribon Foundation*

Background

Currently, the forest cover data of the Philippines is at 22.8%* down from 70% during the American Occupation. Other figures reveal far lower figures.

Forests provide ecological services to counter imbalances from extreme climate change, but the rate of overexploitation and denudation makes it vulnerable. Imbalances may have reached a tipping point leading to loss and damages from depleting ecological services. Existing policies, laws and their implementation have not increased forest cover of the country.

The demand for updating the Revised Forestry Code of the Philippines began as early as 1990. Twenty eight years passed and with entry into the age of extreme climate change, policy changes are urgently needed to address the country's survival and adaptation. Currently, several proposed bills reached congress proposing to sustainably manage forest resources.

A network of civil society organizations have filed the Forest Resources Bill (FRB) at the House of Representatives during the 15th Congress. The FRB revolves on the principles of using the functional definition of forest, protecting all remaining natural forests, implementing watershed continuum management approach, and promoting multi-sectoral governance. These are the remaining contentious issues needing resolution for the ratification of an updated and responsive forest resources management law.

**Department of Environment and Natural Resources (DENR) 2012 Forest Facts and Figures*

Objectives

1. Orient participants on the basic provisions of the FRB.
2. Provide updates on the status of the FRB.
3. Identify campaign activities to support the bill.

Method and Expected Outputs

The mini-symposium will present the basic provisions of the Forest Resources Bill and hope to generate inputs and support in moving the bill forward. This will be done in a plenary discussion with a presenter and facilitators. The activity will take an hour composed of 30 minutes each for the presentation and open forum. Documentation of act and action plan are expected at the end of the activity.

WORKSHOPS

Intro to bio(diversity)informatics and answers to FAQs on biodiversity data

Facilitators:

Arman Pili, Mae Lowe Diesmos, Arvin Diesmos, *HerpWatch Pilipinas*

Biodiversity informatics is a relatively young science that deals with the application of informatics techniques to biodiversity information for improved capture, cleaning, management, improvement, analysis, and interpretation. The Global Biodiversity Information Facility (GBIF) is an international open data infrastructure funded by governments that allow anyone, anywhere to access data on all types of life on Earth, shared across national boundaries via the Internet. As of August 2018, the GBIF database contains about 1.1M occurrence data available for species in the Philippines; of which, only about 10% are contributed by publishers from the Philippines. This workshop aims to provide a brief introduction to biodiversity informatics and the general process of biodiversity data mobilization; discuss the status and promote biodiversity data use and mobilization in the Philippines; explore how to use the website www.gbif.org, particularly how to obtain and visualize biodiversity data; explore research topics that utilizes biodiversity data; introduce the GBIF-BIFA project alien amphibians and reptiles of the Philippines (https://www.gbif.org/project/2xGhurLsn0mI0Qgo8iYu2A/alien-reptiles-and-amphibians-of-the-philippines) and future training workshops on biodiversity data mobilization facilitated by HerpWatch Pilipinas, Inc. This workshop will be particularly useful for anyone working on taxonomy, biogeography, and conservation biology.

Permaculture Design: Venturing from Ego System to Eco System

Facilitators:

Bert Peeters and Sandino Guinto, *Philippine Permaculture Association*

Permaculture Design is crafting or modifying systems based on how nature works. We take nature as our teacher. It is guided by the three ethics of caring for the earth, caring for people and fair share. The thought processes, decisions, systems and activities executed to come up with a Permaculture Design are guided by these concepts.

Most of the systems in place in our society cater to personal wants and needs, leaving out the natural way of communities working together. Those systems alienate us from the environment that houses and nurtures us. Permaculture Design aims to craft systems that protect and restore the ecological landscape. Along with that, we are to strengthen relationships with our collaborators in protecting this earth.

Permaculture may appear to be a huge concept but it is practiced through small and efficient initiatives. One concrete demonstration is through establishment of food forests. Food forests are small patches of biodiversed tree guilds. In the workshop, you will learn how to put the three Permaculture ethics in action by improving a small area and moving from the Ego system to Eco system.

The workshop has three parts:
1. Introductory lecture
2. Permaculture Designing
3. Food Forest Establishment

WORKSHOPS

The Role of Modern-day Researchers in the Attainment of UN Sustainable Development Goals (SDGs) 13, 14 and 15

Facilitators:

Raymark Paul T. Rigor, *University of the Philippines—Baguio*

The pursuit in the realization of the United Nations' Sustainable Development Goals (SDGs) in now the highlight of the activities of the several civic groups. However, the aims of the SDGs are not yet fully addressed in the academic and scientific community, especially the ones related to environmental and biodiversity conservation. This talk aims to inform the modern-day researchers on how we can help in the attainment of SDG 13 – Climate Action, SDG 14 – Life Below Water, and SDG 15 – Life on Land, through our research, academic and scientific works.

Through collaborations from academicians concerned with biodiversity conservation, the UN SDGs are now one step closer in its realization. By accumulating more researchers to take the call in addressing the possible impacts of the combination of scientific research work and civic involvement, we can elevate not only the current status of biodiversity and conservation research in the Philippines, but also the awareness of the scientific community in the potential fulfilment of SDGs 13, 14 and 15. After all, the cry of UN for SDGs is Leave No One Behind.

Workshop on Scientific Illustration

Facilitators:

Anna Melissa SP. Domingo, *Philippine National Museum of Natural History*

The first part of the workshop is a brief lecture on the relevance of scientific illustration and what makes it unique from fine arts. The lecture will also cover the techniques used in scientific illustration, and how we can use technology to our advantage.

The second part will be hands-on training applying the techniques introduced during the lecture. The artist will walk you through the process of scientific illustration, while emphasizing how collaboration, reference materials and accuracy can affect the overall outcome

SPECIAL EXHIBIT

Philippine Science High School—Central Luzon Campus' biodiversity advocacies: Valuing our biology lessons through action

This exhibit aims to help the students of Philippine Science High School Central Luzon taking up Biology 3 (Exploring Biodiversity) to value of lessons about the importance of biodiversity and its conservation through poster exhibits. The PSHS CLC students will present 12 posters; each with its respective advocacy. Others will show videos and interactive activities to attract audiences.

Participants:

Teachers:

- Lani M. Suyom
- Paul Jhon P. Diezon

Students:

- Jade Derrick E. Quizon
- Kijian Dangan
- Aryana Lopez
- Francesca Eunice A. Manalang
- Nicky Mariele M. Paguio Room
- Paulyn Jamaima Faith B. Alonzo
- Naomi Paingan
- Anne Yssabelle Ordanez
- Sadao Mejares
- Adrian Zapata
- Reiwin Campo
- Ysabel Lyka F. Lacbayen
- Neil Joshua F. Patiag
- Bridget Anne C. Caraig
- Jovelle Adizas
- Kyle Louie C. Vitug
- Rafael Angelo Taracatac
- Keryll Bastien Sison
- Krisna Sawali
- Noor Mikaela Izha A. Cancio
- Fheonna L. Izon

USAID PROTECT WILDLIFE

PHILIPPINES: BIODIVERSITY ON THE BRINK

While considered as one of the world's megadiverse countries, the Philippines remains to be a biodiversity hotspot. Wildlife species and their habitats continue to be at risk due to various threats, such as wildlife trafficking, irresponsible mining, illegal fishing, conversion of forests to settlements and agricultural lands, limited resources and capacities for conservation at the local level, and indifference of various stakeholders. The continuing deterioration of these biodiversity assets poses negative impacts on ecological processes and undermines the sustainable provision of beneficial ecosystem goods and services.

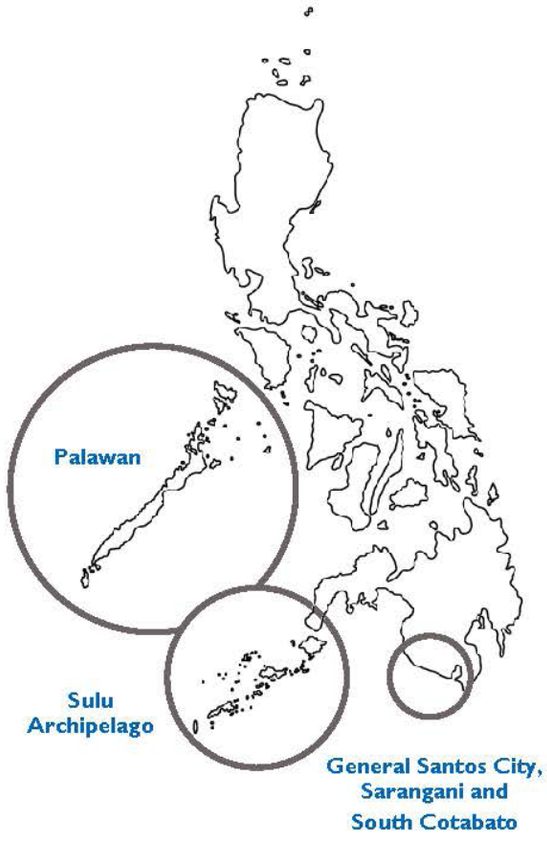
THE CHALLENGE

Limited capacities and resources for on-site management and regulation of wildlife habitats and species are key challenges in protecting biodiversity in the Philippines. Conservation and development agendas are not being communicated effectively at the local level. Local communities that depend on terrestrial and coastal and marine wildlife habitats for their livelihoods do not clearly understand the direct and indirect benefits of conservation and environmental management. Investments in biodiversity conservation and the generation of scientific knowledge and best practices and their application to conservation are extremely low. Communities and local governments are not adequately incentivized to invest their resources to conserve wildlife habitats and species or to enforce anti-wildlife trafficking laws.

USAID PROTECT WILDLIFE'S APPROACH

Through the Protect Wildlife project, USAID is working to reduce threats to Philippine biodiversity, such as poaching and illegal trade of wildlife and wildlife products, and to improve ecosystem goods and services. USAID works with partners in the government and different sectors to strengthen conservation policies and improve habitat management and on-site and off-site enforcement systems.

USAID works in two pilot areas—the province of Palawan and the Sulu Archipelago, including Zamboanga City and Tawi-Tawi province—and will soon expand to General Santos City and Sarangani and South Cotabato provinces in southern Mindanao. USAID's strategy for achieving success and ensuring that the project's impact is sustained is built on an ecosystem approach. This approach seeks to address threats to biodiversity while enabling rigorous integration of conservation outcomes with development objectives, supporting strong local ownership and ensuring that lessons learned are applied at scale.



Guided by this approach, USAID aims to achieve results through five strategic approaches:

1. **Improve attitudes and behavior toward biodiversity and its conservation in target areas at a statistically significant level**
2. **Intensify financing from private and public sectors and internally generated revenues for biodiversity conservation**
3. **Improve biodiversity conservation competencies of local government units, governance bodies, civil society organizations, and land and resource management units**
4. **Enhance capacities of universities to advance biodiversity conservation education, research, monitoring and innovation**
5. **Enhance competencies of national government agencies in enforcing biodiversity conservation-related laws and policies**

For more information, contact:

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USAID PROTECT WILDLIFE

Electrification

Beyond the business of providing reliable power, TeaM Energy recognizes its role in nation-building of providing sustainable energy to communities.

Environment

We contribute to sustainable development by protecting the biodiversity in areas where we operate, supporting the national agenda of preserving the remaining forests, and at the same time, minimizing the impact of our business to society.

TEAM ENERGY®
FOUNDATION

TeaM Energy puts great value on programs that seek to improve the quality of education in the country and make Filipinos more competitive globally.

Education

Just like the long stretch of power lines that connect communities, TeaM Energy believes in connecting people through collaborative partnerships.

Engagement

Partner with us ● www.teamenergy.ph ● (02) 5528000

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