



10th Asian Wetland Symposium

"Wetland-based Solutions"

The 10th Asian Wetland Symposium

"Wetland-based Solutions"

25-28 November 2024

Manila - Philippines



Hosts and Organizers:



Co-Organizers:



10th Asian Wetland Symposium

— *Wetland-based Solutions* —

25-28 November 2024, Manila, Philippines

PROCEEDINGS



RRC-EA
Ramsar Regional Center East Asia



November 2024

10th Asian Wetland Symposium 2024 Proceedings

Prepared by:

Society for the Conservation of Philippine Wetlands, Inc

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Organization of AWS2024

Title

10th Asian Wetland Symposium (AWS2024) —*Wetland-based Solutions*—

Date

25–28 November 2024

Venue

Crowne Plaza Manila Galleria, Metro Manila, Philippines

Organizers

Society for the Conservation of Philippines Wetlands, Inc.
Ramsar Regional Center – East Asia
Ramsar Center Japan

Co-organizers

Japan Wetland Society
Wetlands International Japan

Sponsors and Partners

Foundation for the Philippine Environment
Department of Environment and Natural Resources - National Capital Region / Las Piñas – Parañaque Wetland
Park
ASEAN Centre for Biodiversity
International Climate Initiative
Living Lakes Biodiversity and Climate Project
Global Nature Fund
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Wetlands International – Philippines
Wildbird Club of the Philippines
Local Government Unit of Pangil, Laguna and the Pangil River Eco-park
Pamahalaang Barangay ng Paligui, Candaba, Pampanga
Macagatal Irrigators Association
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Preface

I. Introduction

The Asian Wetland Symposium (AWS) was conceptualized and first held in 1992 as a regional platform for wetland stakeholders. Since then, the AWS had been held every three years, providing opportunities to diverse target groups such as decision and policy makers, academicians, researchers, wetland managers and practitioners, the youth, and non-governmental organizations to share and learn from mutual knowledge and practical experiences on the conservation, sustainable management, and wise use of wetlands in Asia.

Ramsar Resolution IX.19 (2005) further recognized the role of AWS in supporting regional cooperation and networking of wetland stakeholders, which included national and local governments, NGOs, experts, local communities, and the general public in Asia.

Over the last 25 years, the symposium had stood as a platform for diverse wetland stakeholders to convene and share knowledge and experiences on wetland conservation and wise use, including scientific studies and CEPA activities.

On 25-28 November 2024, the Society for the Conservation of Philippine Wetlands Inc. (SCPW), Ramsar Regional Center – East Asia (RRC-EA), and Ramsar Center Japan (RCJ) organized the 10th Asian Wetland Symposium (AWS10) with the theme “Wetland-based Solutions” in Manila, Philippines, in collaboration with the Japan Wetland Society and Wetlands International – Japan.

II. Objectives

AWS10 aimed to mainstream wetland conservation and wise use across all sectors of society as a contribution to the implementation of the Ramsar Convention on Wetlands and its strategic plan, the achievement of the Sustainable Development Goals (SDGs), and the action-oriented global targets of the Kunming-Montreal Global Biodiversity Framework. Specifically, the symposium:

- shared knowledge, skills, techniques, methods, good practices, and lessons learned from the conservation and wise use of wetlands in Asia;
- raised awareness, understanding, and appreciation of Nature-based Solutions, particularly those specific to wetlands;
- identified the major components of a strategy on Wetland-based Solutions in Asia; and
- expanded networks and enhanced international cooperation and partnerships on wetland conservation among Ramsar Sites, other important wetlands, and wetland managers and stakeholders in Asia.

III. Target Participants

The symposium welcomed participants from all sectors of society engaged in wetland management and conservation, including policymakers; regional, national, and local government authorities; civil society organizations; academic institutions; indigenous and local communities; and the business sector.

IV. Venue

AWS10 was held at the Crowne Plaza Manila Galleria Hotel on Ortigas Ave. corner ADB Ave., Quezon City, Metro Manila, Philippines.

V. Meeting structure

AWS10 was a four-day event that featured keynote presentations, plenary sessions, parallel sessions, side events, poster sessions, and a field trip to three wetlands in the Philippines: the Candaba Wetlands, Panguil River Eco-Park in Laguna de Bay, and the Las Piñas-Parañaque Wetland Park – a Ramsar Wetland of International Importance in Manila Bay. Side events were open to partners who intended to promote and discuss activities with focused themes.

VI. Type of presentations

- **Oral presentation:** Authors had opportunities to present their work and research activities in the sessions with 20-minute time slots.
- **Poster presentation:** Poster sessions were arranged within a designated area, allowing authors to display their work and research activities through posters on panels.

VII. Topics

1. Wetlands and climate change adaptation and mitigation
2. Wetland restoration
3. Wetland biodiversity
4. Conservation and wise use of wetlands
5. Carbon-rich wetlands
6. Wetland education in the formal education sector (wetland schools)
7. Innovations in CEPA approaches
8. Wetlands, Nature-positive economy, and SDGs
10. Wetlands and sustainable built environment
11. Wetlands and disaster risk reduction management
12. Wetlands and ethnobiological knowledge
13. Wetlands International Philippines

VIII. Field trip

The organizers arranged 3 courses of field trip for registered participants. The registration will be on a first-come, first-served basis. The field trip sites are as follows:

- Candaba Wetlands (Barangay Paligui, Candaba, Pampanga)
- Pangil River Eco-Park (Pangil, Laguna)
- Las Piñas – Parañaque Wetland Park (Cities of Las Piñas and Parañaque along Manila Bay)

Details on the field trip program are posted in the AWS10 website (<http://www.wetlands/AWS10.ph>) and in SCPW social media platforms.

IX. Side events

Side events were held during the lunch break of AWS10. Participants were encouraged to check the side events topics in the Provisional Program. Please note that registration might have been required for some sessions.

X. Poster Session and Exhibition

The poster session and exhibition were held at Meeting Rooms Opal A, B and C.

Manila Statement

Asian Wetland Symposium
Manila, Philippines
25 to 28 November 2024

Introduction

1. RECOGNIZING the continuous organization of Asian Wetland Symposiums (AWS) in Japan, Malaysia, India, Vietnam, China, Cambodia and the online platform during the difficult time of pandemic, which have contributed to understanding wetlands in Asia, influencing national and international wetland policies and plans, and promoting conservation and wise use of wetlands. Additionally, ACKNOWLEDGING the statements from the previous nine AWS and the publication of the history of the AWS in the period 1992-2021;
2. ACKNOWLEDGING the importance of the 10th AWS in Manila, Philippines from 25th to 28th November 2024, with the theme “Wetland-based Solutions”, with the overall objective to mainstream wetland conservation and wise use across all sectors of the society as a contribution to the implementation of the Ramsar Convention on Wetlands and its strategic plan. The 10th AWS hosted 280 participants from 19 countries and regions;
3. NOTING that the Philippines has extensive wetlands, including 10 Wetlands of International Importance with two newly designated Ramsar Sites that were officially announced at the 10th AWS which provide various ecosystem services that benefit both nature and communities but are vulnerable to threats to their ecological integrity, thus the need for an overarching national policy for their wise use and conservation;
4. RECALLING the Sustainable Development Goals (SDGs), Kunming-Montreal Global Biodiversity Framework, Baku Climate Unity Pact and other relevant international treaties such as the Convention on Wetlands, the Convention on Biological Diversity, the Paris Agreement of the United Nations Framework Convention on Climate Change;
5. AWARE OF the keynote presentations, twelve oral sessions, poster sessions and field visits to Candaba Wetlands, Pangul River Eco-Park and Las Piñas – Parañaque Wetland Park. The featured sessions are wetland schools, nature positive economy and SDGs, which highlighted the necessity of transformative change through proactive communication among different stakeholders and strengthening “Communication, Capacity Building, Education, Participation and Awareness” (CEPA) for future generations.

We, the participants of this symposium, declare as follows;

1. Combat Climate Change through Wetland-based Adaptation and Mitigation

We recognize the importance of wetland-based solutions in accelerating climate change adaptation and mitigation. Conservation and restoration of peatlands, mangroves, seagrass and development of green infrastructure should be promoted through collaboration with a wide range of stakeholders, in a way that can achieve biodiversity conservation objectives.

2. Conserve and Utilize Coastal Ecosystems for Disaster Risk Reduction

We highlight that wetlands, particularly coastal ecosystems such as mangroves and seagrasses, play a significant role in ecosystem-based disaster risk reduction (Eco-DRR), while it also contributes to carbon sequestration, food security, biodiversity conservation, and livelihood improvement. These ecosystems are crucial for climate change adaptation and should be prioritized for restoration and protection.

3. Ensure Science-based Decision Making for Wetland Biodiversity and Conservation

We acknowledge the significance of systematic research and continuous monitoring of Asian wetland ecosystems, with a particular emphasis on carbon sequestration and biodiversity, avoiding negative impacts within the wetland ecosystems.

4. Promote Citizen Science to Facilitate Community Engagement for Wetland Conservation

We recognize that citizen science not only contributes to monitoring the latest status of wetlands, but also raises public awareness and can contribute to facilitate community engagement for wetland conservation

activities. Providing opportunities for trainings and field experiences can enable non-experts to play a similar role as researchers.

5. Promote Ethnobiological Knowledge related to Wetlands

We recognize that systematic documentation of ethnobiological knowledge related to wetlands is essential. Developing policies that recognize the cultural importance of wetland flora and fauna species and incorporating this knowledge in education can support conservation and wise use of wetlands and its biodiversity.

6. Encourage Collaboration and Knowledge Sharing through CEPA

We acknowledge that effective wetland conservation and restoration require collaboration among various stakeholders, including governments, private companies, NGOs/CSOs, researchers, and local communities through CEPA. Shared learning and capacity building are essential. Wetland schools involving children and students play an important role in disseminating and mainstreaming wetland conservation activities.

7. Establish Networks within the Asian Region to Facilitate International Cooperation and Shared Learning

We recognize that sharing of knowledge and experiences among partners in similar socio- economic and ecological regions can contribute to promote conservation and wise use of wetlands. Regional networks can create an environment for international cooperation, shared learning, and integrating different voices into decision-making processes, which would further accelerate practices for wetland-based solutions in the Asian region.

8. Facilitate Community-Driven Conservation

We recognize that successful wetland conservation efforts are often driven by local communities, enabling sustainable livelihoods that achieve both socio-economic and ecological benefits. Community engagement is critical for long-term conservation success.

9. Promote Sustainable Built Environments

We recognize the importance of mainstreaming biodiversity and wetland conservation in the design and development of the built environment through appropriate planning, construction, operations and employing innovative solutions such as constructed wetlands, restoration of abandoned fishponds, and green infrastructure.

We urge all Contracting Parties to the Convention on Wetlands, organizations, participants and concerned citizens to build upon the first 32 years of the AWS to ensure that the AWS continues to fill its vital role into the future. On the other hand, we are also aware that there are still several Asian countries that have not yet participated in AWS and strongly hope that such countries will also participate in the near future.

Lastly, we thank the Government of the Philippines, the Society for the Conservation of Philippine Wetlands, Ramsar Regional Center-East Asia, the Ramsar Center Japan and all sponsors and supporters for their generosity and hospitality in successfully hosting the 10th AWS in Manila, from 25th to 28th November 2024.

And we hope that the organizers seek the support and assistance of the Government of Philippines to convey this statement to the forthcoming Asian Regional Meeting on the Convention on Wetlands, the 15th Meeting of the Conference of the Contracting Parties to the Convention to be held in Zimbabwe in 2025.

Manila, 28 November 2024

Program (25-28 November 2024)

Day 1 (25 November, Monday)					
Date/Time	Plenary		Sapphire A	Sapphire B	Opal
	Ruby A	Ruby B			
8:30-16:00	Registration				
9:00-9:30					Exhibition Poster
9:30-12:00	Opening Program				
12:00-13:30	Lunch				
12:00-13:20			Side event	Side event	
13:30-14:50	Session 1-1 Wetlands and climate change adaptation and mitigation	Session 2-1 Wetland restoration	Session 3-1 Wetland biodiversity	Session 4-1 Conservation and wise use of wetlands	
14:50-15:00	Coffee and tea break				
15:00-16:20	Session 1-2	Session 2-2	Session 3-2	Session 4-2	
17:30-19:00	Welcome dinner (registered participants)				

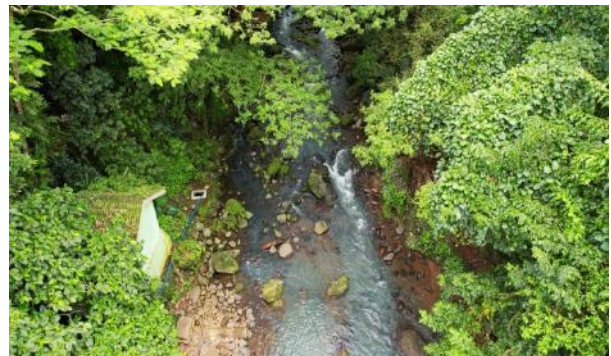
Day 2 (26 November, Tuesday)					
Date/Time	Plenary		Sapphire A	Sapphire B	Opal
	Ruby A	Ruby B			
8:30-16:00	Registration				
9:00-10:20			Session 3-3	Session 6-1 Wetland education	Exhibition Poster
10:20-10:30	Coffee and tea break				
10:30-11:50			Session 3-4	Session 6-2	
11:50-15:30	Lunch				
11:50-12:50		Side event	Side event	Side event	Core time (13:00-13:30)
13:30-14:50			Session 7-1 Innovations in CEPA approaches	Session 8-1 Wetlands, Nature- positive economy, and SDGs	
14:50-15:00	Coffee and tea break				
15:00-16:40			Session 7-2 (15:00-16:00)	Session 8-2	
16:00-17:00			Session 12-1 Wetlands and ethnobiological knowledge		

Field Trip

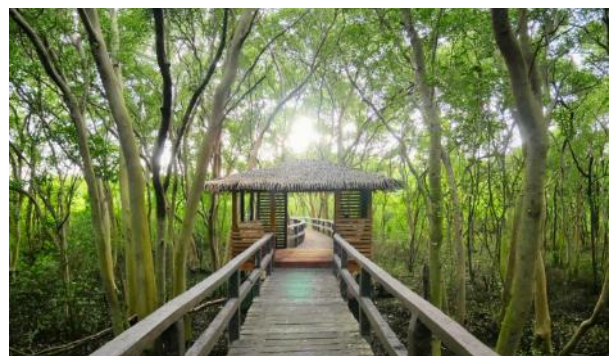
Course 1: Paligui Wetlands, Candaba, Pampanga



Course 2: Panguil River Ecopark, Pangil, Laguna



Course 3: Las Piñas-Paranaque Wetland Park



Day 4 (28 November, Thursday)					
Date/Time	Plenary		Sapphire A	Sapphire B	Opal
	Ruby A	Ruby B			
8:30-10:30	Registration				
9:00-10:20	Session 10 Wetlands and sustainable built environment	Session 11 Wetlands and disaster risk reduction management	Session 12-2 Wetlands and ethnobiological knowledge	Session 5 Carbon-rich wetlands	Exhibition Poster
10:20-10:30	Coffee and tea break				
10:30-11:30	Special Session: Meeting of the Living Lakes Network		Session 12-3	Session 13 Wetlands International Philippines	
11:30-13:00	Lunch				
11:30-12:30			Side event	Side event	
13:00-13:30	Closing program				

Opening Program

25 November 2024, Monday

Ruby AB

Time	Activity
9:30-10:00	Opening program (ceremonial speeches)
	• Dr. Musonda Mumba, Secretary General, Ramsar Convention on Wetlands • Dr. Maria Antonia Yulo-Loyzaga, Secretary, Department of Environment and Natural Resources, Philippines • Mr. Suh Seung Oh, Executive Director, Ramsar Regional Center – East Asia • Prof. Shimpei Iwasaki, President, Ramsar Center Japan • Arch. Celestino B. Ulep, President, Society for the Conservation of Philippine Wetlands, Inc.
10:00-10:10	Photo opportunity
10:10-11:10	Keynote presentations: Wetland-based Solutions for Wetland and People
	• Wetland-based Solutions in the Philippines Dr. Carlos Primo David, Undersecretary for Integrated Environmental Science, Department of Environment and Natural Resources, Philippines • Wet RASC, Rapid Assessment of Sequestered Carbon for wetlands (virtual presentation) Prof. Max Finlayson, Charles Sturt Gulbali Institute of Agriculture, Water and Environment, Australia • Society of Wetland Scientists Professional Certification Programme: Opportunity for wetland experts (pre-recorded) Dr. Matthew Simpson, Globalization Committee Chair, Society of Wetland Scientists Professional Certification Programme
11:10-12:00	Panel discussion: Wetland-based Solutions, from Idea to Action
	Moderator: Dr. Ma. Catriona E. Devanadera, SCPW and University of Philippines Panelists: • Hon. John Jack T. Raymond, Jr., Mayor, Bayawan City, Negros Oriental, Philippines • Mr. Yoshihiro Natori, Advisor, Wetlands International Japan • Dr. Perlie Velasco, Society for the Conservation of Philippine Wetlands, Inc. and University of the Philippines Los Banos • Mr. Norman Ramirez, Program Officer, Ramsar Regional Center - East Asia

Day 1: 25 November, Monday

Parallel session: Ruby A

Session 1-1: Wetlands and climate change adaptation and mitigation

Chair: Prof. Ji Yoon Kim, Kunsan National University

Co-chair: Mr. Asaduzzaman Miah, Bangladesh POUSH

Rapporteur: Ms. Emiko Nagakura, Wetlands International Japan

13:30-14:50	S1-1: Tubbataha Wetlands in the Face of Climate Change Angelique M. Songco, Tubbataha Management Office S1-2: Carbon Stock Assessment of Leyte Sab-a Peatland, Philippines Dorina Espenilla, DENR-Ecosystems Research and Development Bureau S1-3: Estimation of Blue Carbon Stocks in Unawatuna Mangrove Forest for future Carbon trading in Sri Lanka Indika Rohan Palihakkara, University of Ruhuna S1-4: Japan's Policy of Disaster Resilience Based on River Basin Mai Kemmochi, Kanto-Gakuin University
14:50-15:00	Coffee and tea break

Session 1-2: Wetlands and climate change adaptation and mitigation

Chair: Mr. Asaduzzaman Miah, Bangladesh POUSH

Co-chair: Prof. Ji Yoon Kim, Kunsan National University

Rapporteur: Ms. Emiko Nagakura, Wetlands International Japan

15:00-16:20	S1-5: Metabolic Dynamics of Restored Seagrass Meadows: Implications for Blue Carbon Potential Mariche Natividad, National Taiwan Ocean University S1-7: Restoration of the Sago (Metroxylon sagu Roett.) Ecobelt for Disaster Risk Reduction and Climate Change Adaptation in Butuan City, Philippines Rowena Varela, Caraga State University S1-8: Ecosystem based Approaches towards Adaptation and Disaster Risk Reduction in Coastal Bangladesh Tapas Ranjan Chakraborty, Bangladesh POUSH
17:30-20:00	Welcome dinner: Hosted by Hon. Cynthia A. Villar, Senator - Republic of the Philippines

Day 1: 25 November, Monday

Parallel session: Ruby B

Session 2-1 Wetland restoration

Chair: Prof. Gea-Jae Joo, Pusan National University

Co-chair: Prof. Yuki Arai, Japan Wetland Society, Ramsar Center Japan

Rapporteur: Dr. Tanabe Atsushi, Ramsar Center Japan

13:30-14:50	S2-1: Peat Soil Profile and Water Quality Characteristics in Differing Land Uses of Leyte Sab-A Peatland, Philippines Criskim Parian, DENR-Ecosystems Research and Development Bureau S2-2: Nakaikemi-shicchi: A Case Study of Mitigation Measures for Environmental Protection during Shinkansen Construction Hea-Jin Park, Wetlands International Japan S2-3: Philippine Mangroves – History, Management and Conservation J.H. Primavera, Zoological Society of London
14:50-15:00	Coffee and tea break

Session 2-2 Wetland restoration

Chair: Prof. Yuki Arai, Japan Wetland Society, Ramsar Center Japan

Co-chair: Prof. Gea-Jae Joo, Pusan National University

Rapporteur: Dr. Tanabe Atsushi, Ramsar Center Japan

15:00-16:20	S2-6: Reexamine of the Legal Role of Sister Wetland Agreements: The Case of Sister Wetlands in Japan and Australia Shiina Suzuki, Seigakuin University S2-8: Building with Nature Indonesia: Restoring coastline and inspiring action at scale Yus Rusila Noor, Wetlands International Indonesia
17:30-20:00	Welcome dinner: Hosted by Hon. Cynthia A. Villar, Senator - Republic of the Philippines

Day 1: 25 November, Monday

Parallel session: Sapphire A

Session 3-1: Wetland biodiversity

Chair: Prof. Woo Shin Lee, Seoul National University

Co-chair: Prof. Indika Palihakkara, University of Ruhuna

Rapporteur: Mr. Pyae Phyo Aung, Nature Conservation Society

13:30-14:50	S3-1: Species Abundance and Diversity of Avifauna in the Pasig River, Philippines Alon Velasquez, DENR-Ecosystems Research and Development Bureau S3-2: Community-Based Monitoring of Bird Species Diversity in Dagatan Lake, Tayabas City, Philippines Angelica Olar, City Government of Tayabas-Environment and Natural Resources Office S3-3: Activity Patterns of Small Carnivores in Peat Swamp Forest Sites at the Kampar Peninsula and Pulau Padang, Sumatra Dian Syahputra, Restorasi Ekosistem Riau S3-4: Biodiversity of the New Ramsar Site Menipo Nature Recreational Park Elisa Iswandono, East Nusa Tenggara Natural Resources Conservation Center
14:50-15:00	Coffee and tea break

Session 3-2: Wetland biodiversity

Chair: Prof. Indika Palihakkara, University of Ruhuna

Co-chair: Prof. Woo Shin Lee, Seoul National University

Rapporteur: Mr. Pyae Phyo Aung, Nature Conservation Society

15:00-16:20	S3-5: Flora and Fauna Composition of Leyte Sab-a Basin Peatland: Basis for Sustainable Ecosystem Management and Conservation Planning Janice Otana, DENR-Ecosystems Research and Development Bureau S3-6: The Katunggan it Ibajay (KII) STORY: Twenty-five Years of Mangrove Biodiversity Conservation in Aklan, Panay Is., Central Philippines Dax Dequito, Zoological Society of London S3-7: Mangrove Community Structure within the Proposed Reclamation Site in Cansaga Bay, Consolacion, Cebu, Philippines Kevin Johns C. Edis, Sacred Heart School - Ateneo de Cebu, Cebu Normal University
17:30-20:00	Welcome dinner: Hosted by Hon. Cynthia A. Villar, Senator - Republic of the Philippines

Day 1: 25 November, Monday

Parallel session: Sapphire B

Session 4-1: Conservation and wise use of wetlands

Chair: Dr. Sonam Choden, Wetland Specialist

Rapporteur: Ms. Ahrum Hyung, RRC-EA

13:30-14:50	S4-1: Building with Nature Approach in Mangrove Ecosystem Restoration for Coastal Resilience Awzani Sahibu, Wetlands International Malaysia S4-2: The Wise-Use Checklist as a Science–Policy Interface – the Interaction of Science and Policy in Taiwanese Wetland Conservation Policy Chen-Guang Lee, National Taiwan University S4-3: Toward Sustainable Management of Nonglom Wetlands, Attapeu, Lao PDR Kosal Mam, World Fish S4-4: Assessment of Water Surface Area Changes in Inle Lake, Myanmar: Remote Sensing Approach La Minn Ko Ko, Saitama University
14:50-15:00	Coffee and tea break

Session 4-2: Conservation and wise use of wetlands

Chair: Dr. Sonam Choden, Wetland Specialist

Rapporteur: Ms. Ahrum Hyung, RRC-EA

15:00-16:20	S4-5: Rapid Assessment of Ecosystem Services in Small Agricultural Reservoirs: A case Study from Gunsan City, ROK Migyeong Jung, Kunsan National University S4-6: Wetlands: The Life Support of Zamboanga City, Philippines Vanessa Joy Dael, DENR-IX CENRO Zamboanga City S4-7: Proposal for Wise Use of Crab Resources in Sundarbans Reserve Forest and its periphery areas Yuki Ozaki, INTEM Consulting S4-8: Enhancing Wetland Conservation and Sustainable Livelihoods through Integrated Rotational Salt and Fish Farming in Cox's Bazar Tapan Kumar Ghosal, FiLEP, JICA
17:30-20:00	Welcome dinner: Hosted by Hon. Cynthia A. Villar, Senator - Republic of the Philippines

Day 2: 26 November, Tuesday

Parallel session: Sapphire A

Session 3-3: Wetland biodiversity

Chair: Prof. Gea-Jae Joo, Pusan National University

Co-chair: Mr. Yus Rusila Noor, Wetlands International Indonesia

Rapporteur: Mr. Tapas Ranjan Chakraborty, Bangladesh POUSH

9:20-10:20	S3-9: Migration Studies of Cinereous Vulture (<i>Aegypius monachus</i>) between South Korea and Mongolia Seung-Kook Kwak, Hwapocheon wetland Eco-park
	S3-10: Analysis of Population Changes, Habitat Requirements, and Feeding Characteristics of Wintering Populations of Cinereous Vulture (<i>Aegypius monachus</i>) at Vulture Restaurants in Goseong, South Korea Minjun, Kwak, Pukyong National University
	S3-11: Changes in Breeding Phenology of Terns in Tubbataha Reefs, the Philippines Maria Retchie Alaba, Tubbataha Management Office, Puerto Princesa City, Philippines
	S3-12: Diversity of Mangrove-associated Gastropods in Siargao Island Protected Landscape and Seascape, Philippines Marlon V. Elvira, Caraga State University

10:20-10:30 Coffee and tea break

Session 1-2: Wetlands and climate change adaptation and mitigation

Chair: Mr. Yus Rusila Noor, Wetlands International Indonesia

Co-chair: Prof. Gea-Jae Joo, Pusan National University

Rapporteur: Mr. Tapas Ranjan Chakraborty, Bangladesh POUSH

10:30-11:50	S3-13: 16s rRNA Gene Metabarcoding Reveals Insights Relating Soil Bacterial Communities to Plant Species and Peat Properties of the Leyte Sabal Basin Peatland – a degraded tropical peatland in Northeastern Leyte, Philippines Reynaldo P. Peja Jr., Visayas State University
	S3-14: Foraging Microhabitat Selection of Spoon-billed Sandpiper in the Upper Gulf of Mottama, Myanmar Pyae Phyoe Aung, Nature Conservation Society-Myanmar
	S3-15: Mangrove Community Structure within the Proposed Reclamation Site in Cansaga Bay, Consolacion, Cebu, Philippines Kevin Johns C. Edis, Sacred Heart School - Ateneo de Cebu, Cebu Normal University
	S3-16: Composition, Abundance, and Diversity of Rotifers in Pasig River – a vulnerable wetland in the Philippines

	Yves Christian L. Cabillon, DENR-Ecosystems Research and Development Bureau
11:50-13:30	Lunch/Side Events (11:50-12:50)

Day 2: 26 November, Tuesday	
Parallel session: <u>Sapphire B</u>	
Session 6-1: Wetland education in the formal education sector (wetland schools)	
Chair: Dr. Chen Kelin, International Wetland and River Beijing Co-chair: Mr. Suh Seung Oh, Ramsar Regional Center - East Asia (RRC-EA) Rapporteur: Ms. Seong-Bo, RRC-EA	
9:20-10:20	S6-1: How to Exert Social Function of Natural Education in Nature Protected Areas: take Jiangsu Yancheng Wetland Rare Birds National Nature Chen Yaqin, China Wetland School Committee S6-2: Conservation of Dafeng's Père David's deer (<i>Elaphurus davidianus</i>) and Wetlands Ding Yuhua, China Wetland School Committee S6-3: Exploration of Wetland Education in Primary and Secondary Schools and Practice in Jiangnan District of Wuhan City, Hubei Province, China He Lu, Education and Training Center, Wuhan City S6-4: Exploration and Practice of Sustainable Development Pattern of Chinese Horseshoe Crab Conservation Community in Fujian, China Li Yuhong, Huaqiao University
10:20-10:30	Coffee and tea break
Session 6-2: Wetland education in the formal education sector (wetland schools)	
Chair: Mr. Suh Seung Oh, RRC-EA Co-chair: Dr. Chen Kelin, International Wetland and River Beijing Rapporteur: Ms. Seong-Bo, RRC-EA	
10:30-11:50	S6-5: China Wetlands School Wei Zhilin, China Wetland School Committee S6-6: Design and Implementation of Geographical Interdisciplinary Thematic Teaching Marine Shellfish Culture for Junior Middle School Xuliang Zhang, Qingdao University S6-7: Using Ecological Research Base to Explore a New Model of Nature Education Taking Zhangye Wetland Museum as an Example Yang Fuhui, Zhangye Wetland Museum
11:50-13:30	Lunch/Side Events (11:50-12:50)

Day 2: 26 November, Tuesday

Parallel session: Sapphire A

Session 7-1: Innovations in CEPA approaches

Chair: Mr. Bernard O'Callaghan, Nature Advisory

Co-chair: Prof. Shiina Suzuki, Japan Wetland Society

Rapporteur: Ms. Jade O'Callaghan, Melbourne University

13:30-14:50	S7-1: The SCPW Wetland Center Design Competitions: 20 years of CEPA for Wetland Centers in the Philippines Aaron Julius Lecciones, University of the Philippines, Diliman
	S7-2: Connecting People, Nature, and Society: The East Asia Black-faced Spoonbill Flyway Children's Exchange Project Akane Tokorodani, Hea-Jin Park, Team SPOON
	S7-4: Empowering Conservation through Community Knowledge: Mangrove Assessments and Education in Del Carmen, Siargao Islands Cecilia Moran, University of Santo Tomas
14:50-15:00	Coffee and tea break

Session 7-2: Innovations in CEPA approaches

Chair: Prof. Shiina Suzuki, Japan Wetland Society

Co-chair: Mr. Bernard O'Callaghan, Nature Advisory

Rapporteur: Ms. Jade O'Callaghan, Melbourne University

15:00-16:20	S7-5: Empowering Community-Driven Wetland Conservation: The Development and Impact of the Gamified Mobile Data Collection App (Wetland Journey) Prasad Jayasinghe, Emotional Intelligence and Life Skills Training Team (Gte) Ltd
	S7-6: Preliminary Assessment of Aquatic Plants Monitoring in Urban Reservoirs Using Citizen Science Program Seong Min Lee, Kunsan National University
	S7-7: Promoting Grassroots-level Wetland Cooperation Network in the Bay of Bengal Region: A Case of Crab Bank Initiative Shimpei Iwasaki, Fukuoka Women's University, and Ramsar Center Japan

Day 2: 26 November, Tuesday

Parallel session: Sapphire B

Session 8-1: Wetlands, Nature-positive economy, and SDGs

Chair: Prof. Sansanee Choowaew, Mahidol University

Co-chair: Mr. Yoshihiro Natori, Wetlands International Japan

Rapporteur: Ms. Ahrum Hyung, RRC-EA

13:30-14:50	S8-1: Del Carmen Mangrove Forest Reserve: From Illegal Mangrove Cutting and Illegal Fishing to DENR Nominee to the UN Ramsar List of Wetlands of International Importance Alfredo Matugas Coro II, Municipality of Del Carmen S8-2: Evaluation of 5-Year Coastal Resources Management (CRM) Plan: Highlighting the Importance of Wetland in the Coastal Area of Balanga City King James Dela Rosa, Local Government of Balanga City S8-3: Integrating Agriculture and Tourism with Mangrove Conservation through Development of Ecological Structure in Nasugbu, Batangas Selena Balbino Santos, University of the Philippines S8-4: Realizing Transformative Change Towards Nature-Positive Economy in Wetlands: Experiences from Ramsar Sites in Japan Yuki Arai, Matsuyama University
14:50-15:00	Coffee and tea break

Session 8-2: Wetlands, Nature-positive economy, and SDGs

Chair: Mr. Yoshihiro Natori, Wetlands International Japan

Co-Chair: Prof. Sansanee Choowaew, Mahidol University

Rapporteur: Ms. Ahrum Hyung, RRC-EA

15:00-16:20	S8-5: Piloting Business Opportunities through Sustainable Livelihoods: Gelam Conservation and Small-Scale Enterprises Chik Maslinda Omar, WWF-Malaysia S8-6: Navigating Uncertainties: Livelihood Development Strategies for COVID- Affected Fisher's Community of the Bay of Bengal Md. Asaduzzaman Miah, Bangladesh POUSH S8-8: Laying the Foundation for a Crab Bank in Merbok, Kedah: Insights from a Pilot Project Rabiatul-Adawiah Ahmad Rashid, University Sains Malaysia S8-9: Sustainable Crab Bank Development through Community Engagement and Traditional Management Practices in Banda Aceh Alfi Rahman, Research Center for Social and Cultural Studies
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Day 2: 26 November, Tuesday

Parallel session: Sapphire A

Session 12-1 : Wetlands and ethnobiological knowledge

Chair: Prof. Shimpei Iwasaki, Ramsar Center Japan

Co-chair: Dr. Bishnu Bhandari, Nepal Wetland Society

Rapporteur: Ms. Yuki Ozaki, Ramsar Center Japan

16:00-17:00

S12-1: Crabs in Human Culture

Bishnu Bhandari, Nepal Wetlands Society

S12-3: Insights into the Utilization of Fauna Species of Communities within the Leyte Sab-a Peatland, Philippines

Toctocan, Clivene, DENR-Ecosystems Research and Development Bureau

Day 4: 28 November, Thursday

Parallel session: Ruby A

Session 10-1: Wetlands and sustainable built environment

Chair: Prof. Nappy L. Navarra, D. Eng., College of Architecture, University of the Philippines Diliman Campus

Co-chair: Arch. Richelle Rhea R. Baria, College of Architecture, University of the Philippines Diliman Campus

Rapporteur: Mr. Rej Winlove Bungabong, SCPW and Ecosystems Research and Development Bureau

9:00-10:20	S10-1: Social Acceptability Assessment for Nature-Based Solution for Wastewater Treatment: The Case of the Wastewater Facility in Bayawan City, Negros Oriental (Philippines) Darry Shel Estorba, SCPW S10-2: Assessing the Effects of Landscape Changes in Mangrove and Fishponds on the Ecological Structure in Catanduanes Island, Philippines Leandro Lorenzo Berba, University of the Philippines S10-3: Understanding the Social Connectivity of Blue-green Infrastructure in Urban Wetlands: A Scoping Review of Current Themes Aaron Julius Lecciones, University of the Philippines S10-4: Mainstreaming Biodiversity in Infrastructure: A Wetland Conservation and Management Perspective Celestino B. Ulep, SCPW
10:20-10:30	Coffee and tea break
Special Session: Meeting of the Living Lakes Network	
Chair: Ms. Amy M. Lecciones, Society for the Conservation of Philippine Wetlands (SCPW) Rapporteur: Mr. Jose Carlo H. Quintos, SCPW	
10:30-11:30	Meeting of the Living Lakes Network
11:30-13:00	Lunch / Side events (11:30-12:30)

Day 4: 28 November, Thursday

Parallel session: Ruby B

Session 11: Wetlands and disaster risk reduction management

Chair: Ms. Emiko Nagakura, Wetland International Japan

Co-chair: Dr. Tanabe Atsushi, Ramsar Center Japan

Rapporteur: Mr. Pyae Phyo Aung, Nature Conservation Society

9:00-10:20	S11-1: Mapping Fire Susceptibility in Leyte Sab-A Basin Peatland, Philippines Gladly Mae Vijandre, DENR-ERDB-WWRRDEC S11-2: Mangrove Conservation as Flood Management Approach in Kawit, Cavite, Philippines Raia Alexis, Gallardo, University of the Philippines S11-3: Green-Gray Engineering for Coastal Greenbelts in Pedada, Ajuy, Iloilo, Philippines J.H. Primavera, Zoological Society of London
10:20-10:30	Coffee and tea break

Day 4: 28 November, Thursday

Parallel session: Sapphire A

Session 12-2: Wetlands and ethnobiological knowledge

Chair: Prof. Shimpei Iwasaki, Ramsar Center Japan

Co-chair: Dr. Bishnu Bhandari, Nepal Wetland Society

Rapporteur: Ms. Yuki Ozaki, Ramsar Center Japan

9:00-10:20	S12-4: Faith-based Conservation in wetlands Durga Dash, Pallishree S12-5: Understanding of Wetland Animals in Korean Traditional Painting Gea-Jae Joo, University of the Philippines S12-6: Human-Dolphin Mutualism, Faith and Social Taboo in Myanmar Than Htun, Myanmar Forest Association S12-7: What Science and Native People Say on Snake-headed fish (<i>Channa striata</i>), a Common Freshwater Fish Species in Sri Lanka Indika R. Palihakkara, University of Ruhuna
10:20-10:30	Coffee and tea break
Session 12-3: Wetlands and ethnobiological knowledge	
Chair: Prof. Shimpei Iwasaki, Ramsar Center Japan Co-chair: Dr. Bishnu Bhandari, Nepal Wetland Society Rapporteur: Ms. Yuki Ozaki, Ramsar Center Japan	
10:30-11:30	S12-8: Nomenclature of Waterbodies After Fauna Jitendriya Naik, Pallishree S12-9: Values of the Lesser Adjutant in the Indigenous Communities Puspa Lal Pokhrel, Tribhuban University S12-10: Social Taboos on Wetland Fauna Tapas Ranjan Chakraborty, Bangladesh POUSH
11:30-13:00	Lunch / Side events (11:30-12:30)

Day 4: 28 November, Thursday

Parallel session: Sapphire B

Session 5: Carbon-rich wetlands

Chair: Mr. Suh Seung Oh, Ramsar Regional Center – East Asia (RRC-EA)

Rapporteur: Ms. Seong-Bo Kim, RRC-EA

9:00-10:20	S5-1: Wetlands as Fundamental Carbon Sink Across the Hindu Kush Himalaya (HKH) Region Dan Zhu, Chengdu Institute of Biology, Chinese Academy of Sciences S5-2: “C-WETLAND”: A New Paradigm to Enhance Conservation of Carbon-rich Wetlands Huai Chen, Chengdu Institute of Biology, Chinese Academy of Sciences S5-3: Peatland Inventory and Assessment in India Shivani Negi, Dhruv Verma, Wetlands International South Asia S5-4: TBC Srijana Joshi, ICIMOD
10:20-10:30	Coffee and tea break
Session 13: Wetland International - Philippines Conservation and wise use of wetlands	
Chair: Dr. Annadel S. Cabanban, Wetland International - Philippines	
Rapporteur: Ms. Danica Uy, Wetlands International-Philippines	
10:30-11:30	PS3-7: Biodiversity of the Shinan Tidal Flats, Woo Shin Lee, Shinan County, Republic of Korea PS1-3: Assessing Species Diversity and Carbon Stock in Mangrove Ecosystem: Implication for Conservation and Restoration Strategies in Nangka II, Mogpog, Marinduque, Philippines Althea Monleon, Mangrove Matters PH PS3-3: Assessment of Mangrove Resource Rehabilitation in terms of Regeneration Capacity and Species Diversity in Buyabod, Sta. Cruz, Marinduque, Philippines Ellen Grace Aguiflor, The Hearth Movement PS1-5: Community-led Initiatives on adapting System of Rice Intensification (SRI) in Chilika Ramsar Site, India, Jitendriya Naik, Pallishree
11:30-13:00	Lunch / Side events (11:30-12:30)

Table of Contents

Preface	i
Manila Statement	ii
Program	iv
Ceremonial Speeches	1
Keynote Presentation	5
Wetland-based Solutions in the Philippines	6
Wet RASC, Rapid Assessment of Sequestered Carbon for wetlands	7
Society of Wetland Scientists Professional Certification Programme: Opportunity for wetlands experts	8
Panel Discussion	9
Wetland-based Solutions, from Idea to Action	10
Oral Sessions	12
Session 1 – Wetlands and climate change adaptation and mitigation	13
Session 2 – Wetland restoration	22
Session 3 – Wetland biodiversity	30
Session 4 – Conservation and wise use of wetlands	48
Session 5 – Carbon-rich wetlands	59
Session 6 – Wetland education in the formal education sector (wetlands schools)	65
Session 7 – Innovations in CEPA approaches	75
Session 8 – Wetlands, Nature-positive economy, and SDGs	83
Session 10 – Wetlands and sustainable built environment	92
Session 11 – Wetlands and disaster risk reduction management	97
Session 12 – Wetlands and ethnobiological knowledge	102
Poster Sessions	113
Session 1 – Wetlands and climate change adaptation and mitigation	114
Session 2 – Wetland restoration	120
Session 3 – Wetland biodiversity	125
Session 4 – Conservation and wise use of wetlands	134
Session 6 – Wetland education in the formal education sector (wetlands schools)	138
Session 7 – Innovations in CEPA approaches	140
Session 11 – Wetlands and disaster risk reduction management	146
Field Visit	148
Green Filters Facility at Panguil River Eco-Park, Pangil Laguna	149
Candaba Wetlands and the Mt. Arayat Protected Landscape in Pampanga	150
Las Piñas-Parañaque Wetland Park	152
Side Events	154
The Living Lakes, Biodiversity and Climate Project	155

Issues Related to Balance Wetlands Conservation and Renewable Energy: Enhancing cooperation between Japan-Taiwan	155
Side Event on the Draft Ramsar Resolution on Wetland Vulnerability	156
Introduction of “Green Catchment based Flood Management”: A new approach to flood management and Sustainable Societies of Kumagawa River, Japan.....	156
Wetland Education in the Formal Education Sector: Activities in Practice	156
Traditional or Local Ecosystem-based Disaster Risk Reduction (Eco-DRR) Related to Wetlands in Asia	157
Wetland CEPA Program Case Study: Integrative Approaches to Wetland Conservation and Education.	157
Closing Program.....	158
Outstanding Oral and Poster Presentations	159
Closing Messages	162
List of Exhibitors	163
List of Participants	165
Annex A. Photo-documentation	

Ceremonial Speeches

Ceremonial Speeches

Dr. Musonda Mumba

Secretary General, Convention on Wetlands

Dr. Musonda Mumba expressed her pleasure in joining the 10th Asian Wetland Symposium, offering special thanks to the Society for the Conservation of Philippine Wetlands, Ramsar Regional East-Asia, and Ramsar Center Japan for their dedicated efforts in organizing the event. Since its inception in 1992, the symposium had served as a vital regional forum, fostering collaborations among diverse stakeholders involved in the conservation, sustainable management, and wise use of wetlands in Asia.

Dr. Mumba noted that the 9th Asian Wetland Symposium had brought together 300 wetland conservationists from 23 countries, and this year's symposium continued that tradition under the theme, "Wetland-based solutions," which was a topic of utmost importance to her. She emphasized the need to acknowledge the ongoing challenges faced by wetlands, including climate change altering rainfall patterns and jeopardizing agriculture, as well as water-related disasters, such as floods and droughts, which were a significant proportion of natural disasters, especially in Asia.

To reverse these trends, Dr. Mumba highlighted the critical role of wetlands in climate change adaptation and mitigation. She expressed her delight that the symposium would address important agendas related to wetland conservation, including practical and innovative approaches to nature-based solutions, enhancing youth engagement, and disaster risk reduction strategies. This, she said, was a commendable step toward integrating wetland conservation across all sectors of society and contributing to the synergistic implementation of the Convention on Wetland Strategic Plan, the Sustainable Development Goals, and the Kunming-Montreal Global Biodiversity Framework.

As the symposium unfolded, Dr. Mumba encouraged participants to remain inspired by the potential of collective efforts. She believed that by working together, they could create a future where wetlands thrived, supporting both nature and the people of Asia. Dr. Mumba thanked everyone for their commitment to this vital cause and wished all participants the very best for a fruitful and inspiring symposium.



Ceremonial Speeches

Mr. Suh Seung Oh

Executive Director, Ramsar Regional-East Asia

Mr. Suh Seung Oh began his speech by inviting the audience to reflect on moments of collective growth and progress in wetland conservation over the years. He recounted key milestones in the inception and current achievements of Asian Wetland Symposium, including the significant advancements in wetland monitoring and conservation efforts in East Asia since the early 1990s. He acknowledged the challenges posed by events such as the COVID-19 pandemic but emphasized the resilience and adaptability of the conservation community.



Mr. Suh emphasized the need for continued dialogue and cooperation to address pressing environmental challenges. He proposed a structured approach for future initiatives, aiming to enhance the network of conservation efforts while encouraging innovation and inclusivity. He emphasized that these endeavors are not only impactful but also serve as a means to inspire a deeper connection with nature and foster a sense of shared responsibility across the region.

Mr. Suh closed his speech by expressing gratitude to the attendees for their commitment to wetland conservation, urging everyone to embrace the journey ahead with enthusiasm and purpose.

Prof. Shimpei Iwasaki

President, Ramsar Center Japan



Professor Shimpei Iwasaki highlighted the importance of understanding wetland conservation in Asia and its significance to both environmental and human well-being. He stressed the need for collaboration across various sectors, including businesses and agricultural industries, to address conservation challenges.

A key focus of his speech was on leveraging innovative tools, such as web-based solutions and databases, as platforms for enhancing conservation efforts. These platforms are intended to foster information sharing and collaboration, aiming to provide benefits not only for the environment but also for human societies.

Professor Iwasaki encouraged participants to engage in ongoing initiatives and to contribute their knowledge and experiences. He expressed hope that these efforts would serve as stepping stones for integrating wetland conservation with broader socio-economic goals, such as sustainable development and profit-making in industries.

Ceremonial Speeches

Arch. Celestino B. Ulep

President, Society for the Conservation of Philippine Wetlands, Inc.

Arch. Celestino Ulep, President of SCPW emphasized the critical role of collaboration in advancing wetland conservation efforts. He acknowledged the diverse group of participants—including educators, policymakers, wetland managers, practitioners, and non-governmental organizations—highlighting the value of mutual learning and sharing practical experiences in conservation.

He introduced to the participants the concept of the "Living Lakes Network," aimed at promoting collaboration across Southeast Asia, defining terms of engagement, and creating sub-networks to enhance conservation efforts. Also, he showcased the key projects under their "Living Lakes" initiative, which integrates biodiversity conservation with climate action.

Arch. Ulep concluded by welcoming all attendees and urging them to actively participate over the next four days and to utilize the event as a platform for networking, building friendships, and deepening their commitment to wetland conservation. He expressed hope that the shared experiences and strengthened networks would inspire continued dedication to raising awareness and fostering peace through wetland conservation.



Keynote Presentation

Wetland-based Solutions in the Philippines

Dr. Carlos Primo David

Undersecretary for Integrated Environmental Science, Department of Environment and Natural Resources, Philippines

Dr. Carlos Primo David highlighted the critical challenges and opportunities in water resource management and conservation in the Philippines. In his speech, he emphasized the importance of collaboration, data-driven decision-making, and adopting nature-based solutions to address water-related issues effectively. Despite receiving abundant annual rainfall, the Philippines faces significant challenges due to inefficient systems and a lack of cohesive policies. Dr. David pointed out that 75% of the country's water resources are managed by the National Irrigation Administration under the Department of Agriculture, complicating efforts to optimize water for domestic, industrial, and agricultural needs.

He commended recent initiatives, including comprehensive mapping of rivers, lakes, and mangrove forests, which leverage satellite imagery and citizen science to create validated datasets essential for informed management and conservation. Future mapping projects, focusing on seagrass and coral reef ecosystems, are set to enhance understanding of marine and coastal resources, with Dr. David stressing the need for strong partnerships to support these efforts.

Dr. David advocated for integrating nature-based solutions into water management strategies, critiquing the traditional reliance on engineered approaches that often exacerbate downstream flooding. He called for prioritizing wetlands, reservoirs, and other natural water retention systems over infrastructure-heavy solutions that neglect ecological impacts. He urged a shift in mindset to view water as a resource rather than a liability, alongside policy realignments to ensure sustainable and equitable water distribution.

Referencing the devastating impacts of recent typhoons, particularly in flood-prone areas like the Bicol Peninsula, Dr. David highlighted the urgency of addressing systemic vulnerabilities in water and flood management. He concluded by calling for robust partnerships, enhanced cross-sector collaboration, and the integration of innovative practices to achieve sustainable water resource management in the Philippines.



Wet RASC, Rapid Assessment of Sequestered Carbon for wetlands

Prof. Max Finlayson

Charles Sturt Gulbali Institute of Agriculture, Water and Environment, Australia

Prof. Max Finlayson presented the Wetland Rapid Assessment of Sequestered Carbon (WetRASC) as a tool for estimating carbon storage in wetland aboveground vegetation and soils that contain large amounts of carbon, measuring carbon sinks and fluxes. Finlayson noted that WetRASC is still a work in progress but holds promise in guiding management decisions.



Prof. Finlayson highlighted the data sources used in WetRASC, which include geospatial maps and databases of wetland carbon content derived from soil core measurements. He presented data showing the growth in the number of publications on carbon in wetlands over nearly 40 years, reflecting the growing body of knowledge on this subject. Despite this extensive research, he pointed out the challenge of navigating such a vast amount of information and stressed the need for tools like WetRASC to guide effective management. Also, he discussed how various factors influence the amount of organic carbon that can be stored in wetland areas, noting both positive and

negative effects of this process. He emphasized the importance of understanding these factors to inform management practices, bridging the gap between science, management, and policymaking.

Prof. Finlayson referenced the Ramsar Convention Briefing Note No. 12 on blue carbon, which emphasizes the role of wetlands in carbon sequestration. He discussed the ecological restoration of degraded wetlands as a natural climate solution, enhancing CO₂ uptake while simultaneously reducing methane emissions. However, he acknowledged that estimates of the total carbon in wetlands remain uncertain.

In conclusion, Prof. Finlayson emphasized that while carbon sequestration is critical for addressing climate change, it is equally important to maintain the biodiversity and ecosystem services that wetlands provide, advocating for a balanced approach to both carbon management and biodiversity conservation.

Society of Wetland Scientists Professional Certification Programme: Opportunity for wetlands experts

Dr. Matthew Simpson

Globalization Committee Chair, Society of Wetland Scientists Professional Certification Programme

Dr. Matthew Simpson's presentation focused on the Wetland Scientists Professional Certification Programme, a global initiative aimed at certifying wetland professionals to meet high standards in education, experience, and ethics. The program is independently accredited by the Council of Engineering and Scientific Societies in the U.S.

The program's mission is to establish standards comparable to other professions like engineering and architecture. Dr. Simpson highlighted that over 3,800 professionals are currently certified, with the program expanding internationally through partnerships with organizations such as the Ramsar Regional Centre in East Asia. The certification program also seeks to establish recognition from international bodies and promote regional training courses.

The program certifies individuals based on specific criteria, including educational requirements in biological, physical, and quantitative sciences, and a specialized wetland course. Applicants must demonstrate five years of relevant work experience in various sectors, such as consulting, government, academia, or NGOs. Certification is also based on a statement of expertise, references, and a reasonable application fee depending on the applicant's country.

Dr. Simpson emphasized the benefits of certification, including enhanced recognition within multidisciplinary teams and greater credibility, as well as the ability to work internationally. The program encourages ongoing professional development, ensuring certified individuals continue to update their skills. Additionally, certification can benefit students entering the workforce by adding credentials to their resumes.

Dr. Simpson invited the participants to apply for certification and contribute to the program's growth, particularly by becoming regional champions, identifying training opportunities, and supporting the development of a certification scheme for wetland social sciences, which is set to launch next year.



Panel Discussion

Panel Discussion: Wetland-based Solutions, from Idea to Action

Hon. John Jack T. Raymond, Jr.

Mayor of Bayawan City, Negros Oriental, Philippines

Mayor John Jack Raymond of Bayawan City shared the successful implementation of a nature-based wastewater treatment facility in Bayawan City, which utilizes constructed wetlands to treat wastewater for 756 households. This project has significantly improved public health by reducing waterborne diseases, particularly among children. Additionally, it has enhanced food security by using treated water for irrigation and generated income through vegetable gardening. The facility is cost-effective, with maintenance costs 77-80% lower than those of conventional treatment systems, making it a replicable model for other local governments. Community involvement is a key feature of the project, as residents actively participated in its planning, implementation, and maintenance, fostering a strong sense of ownership and responsibility toward environmental management. Furthermore, the project aligns with the Philippine Clean Water Act and promotes sustainable water management solutions.



Mr. Yoshihiro Natori

Advisor, Wetlands International Japan

Mr. Yoshihiro Natori, the Advisor of Wetlands International, Japan, highlighted the crucial role of wetlands in disaster risk reduction (DRR), particularly in mitigating the effects of flooding and tsunamis. He emphasized the need for regional collaboration to enhance wetland conservation and management, referencing ongoing efforts in Southeast Asia to promote the integration of wetlands into disaster risk management strategies.

Dr. Perlle Velasco

Society for the Conservation of Philippine Wetlands, Inc. and University of the Philippines Los Baños



Dr. Perlle Velasco presented a nature-based solution project funded by the Japan-based EPNGCR, which focuses on integrating constructed wetlands for water treatment in several countries, including the Philippines, Sri Lanka, and Vietnam. The project highlights the need for effective frameworks and guidelines to assist local government units (LGUs) in replicating and implementing constructed wetlands. She also emphasized the importance of monitoring and continuous research for ensuring the success of these solutions. Dr. Velasco shared that while many practitioners initially doubted the feasibility of constructed wetlands, they became more convinced after witnessing successful implementations in real-world settings.

She proposed the creation of knowledge hubs where LGUs could visit to learn about and observe the operation of constructed wetlands.

Panel Discussion: Wetland-based Solutions, from Idea to Action

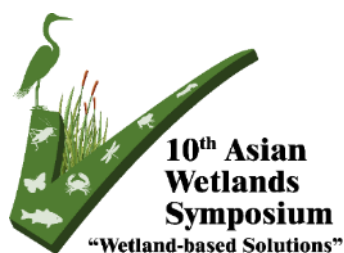
Mr. Norman Ramirez

Program Officer, Ramsar Regional Center – East Asia

Mr. Norman Ramirez the Program Officer of Ramsar Regional Center - East Asia discussed importance of local ownership and participation in wetland management projects. He acknowledged that while success stories of wetlands are shared, scaling up these solutions across the region requires adaptability and a focus on local contexts. He also highlighted the crucial role of disseminating successful practices and learning from past experiences, which are essential for encouraging the adoption of wetland conservation strategies in other areas.



Oral Sessions



Session 1 - Wetlands and climate change adaptation and mitigation

Wetland ecosystems as a key solution for climate change mitigation and adaptation that includes Eco-DRR, GHG emissions, carbon sequestration and neutrality, and carbon sinks

S1-1 Tubbataha Wetlands in the Face of Climate Change

Angelique M. Songco

S1-2 Carbon Stock Assessment of Leyte Sab-a Peatland, Philippines

For. Dorina K. Espenilla, Ms. Linda B. Sauyen, For. Rej Winlove Bungabong

S1-3 Estimation of Blue Carbon Stocks in Unawatuna Mangrove Forest for future Carbon trading in Sri Lanka

I.R Palihakkara, N.D.S.Waduawawala, M.G.M. Prasanna

S1-4 Japan's Policy of Disaster Resilience Based on River Basin

Mai Kemmochi

S1-5 Metabolic Dynamics of Restored Seagrass Meadows: Implications for Blue Carbon Potential

Mariche B. Natividad, Jian-Jhih Chen, Hsin Yu Chou, Wen-Chen Chou

S1-7 Restoration of the Sago (*Metroxylon sago* Roett.) Ecobelt for Disaster Risk Reduction and Climate Change Adaptation in Butuan City, Philippines

Rowena P. Varela, Meriam M. Santillan, Glenn Arthur Garcia, Roger T. Sarmiento

S1-8 Ecosystem based Approaches towards Adaptation and Disaster Risk Reduction in Coastal Bangladesh

Tapas Ranjan Chakraborty, Anusree Ghosh, Md. Asaduzzaman

S1-1

Tubbataha Wetlands in the Face of Climate Change

Angelique M. Songco *

Abstract

The Tubbataha Reefs Natural Park, an offshore marine Ramsar Site in the Sulu Sea, Philippines, is renowned for its biodiversity. This marine wetland encompasses extensive coral reef ecosystems, seagrass beds, and shallow marine waters up to six meters deep. These habitats help support over 700 species of fish, 360 species of coral, 23 species of sharks and rays, and numerous marine mammals, birds, and invertebrates. Shallow-water coral reefs are often overlooked as wetlands because they are underwater or inaccessible. Tubbataha's shallow waters and complex habitats are nurseries, feeding grounds, and shelters for juvenile fish and invertebrates. The park's lagoons provide safe habitats for juvenile fish to mature before moving to coral reef habitats, highlighting the interconnectedness of wetland and reef ecosystems. Tubbataha's wetlands also serve as natural barriers, dissipating wave energy and moderating storm impacts on its islets, habitats of seabirds. While coral reefs sequester less carbon than mangroves and seagrasses, they play a significant role in marine carbon cycling and climate change mitigation. Recent sea surface temperature rises have caused extensive coral bleaching in Tubbataha, affecting up to 43% of shallow reefs in some areas. Ship grounding incidents and marine litter also threaten the park. More frequent and more intense storms that now form in the Sulu Sea have caused extensive coral damage, especially in shallow waters. Protecting this offshore wetland in the middle of nowhere requires substantial investments in enforcement, education, public awareness, science, and partnerships. Park authorities must secure the necessary capacity and financial resources to effectively manage this vital marine wetland.

Keywords: Marine wetlands, climate change, wetlands management

* Protected Area Superintendent, Tubbataha Reefs • tmo@tubbatahareefs.org

S1-2

Carbon Stock Assessment of Leyte Sab-a Peatland, Philippines

For. Dorina K. Espenilla^{*†}, Ms. Linda B. Sauyen^{**}, For. Rej Winlove Bungabong

Abstract

The Leyte Sab-a Peatland (LSP) carbon stock assessment was conducted as part of a collaborative research initiative by the Philippines DENR-Ecosystems Research and Development Bureau (ERDB) and the Biodiversity Management Bureau (BMB). Following the Philippines localized methodology on Whole Ecosystem Carbon Stock and Sequestration Assessment (ERDB Technical Bulletin No. 2021-01), the carbon pools of LSP including Above Ground Biomass (AGB), Below Ground Biomass (BGB), Forest Litter (FL), Herbaceous and Soil Organic Carbon (SOC) at different depths were estimated. Data on species identification, diameter at breast height (DBH), and total height were measured and recorded for the computation of AGB using existing allometric equations. BGB was computed using the root-to-shoot ratio derived from AGB data. For litter and herbaceous carbon, samples were collected within the established plots, properly labelled, air-dried, and then oven-dried to determine their biomass. SOC was assessed by conducting soil coring using an auger to collect soil samples, which were air-dried prior to further laboratory analysis. Each carbon pool was multiplied by the corresponding carbon fractions to determine the total carbon stock. The carbon pools were identified and sampled according to land use types, including peat swamp forest (PSF), grasses and sedges (GS), and cultivated land (CL) areas. Sampling sites were strategically distributed in seven barangays within the LSP: Gapas and San Isidro in the Municipality of Sta. Fe; Divisoria, Tabangohay, Langit, and Veteranos in the Municipality of Alangalang; and Capilihan in the Municipality of San Miguel, Leyte, Philippines. Results showed that PSF had the highest carbon stock, with 2,793.38 MgC/Ha-1 comprising 57.30% of the sampled peatland. This result may be attributed to the occurrence of all the carbon pools in the area which include AGB, BGB, FL, Herbaceous, and SOC compared with other land uses where some of these carbon pools were absent. PSF was followed by the GS with 1,156.98 MgC/Ha-1 (23.73%) and the CL with 924.80 MgC/Ha-1 (18.97%). In terms of carbon pools per land use, the SOC of PSF had the highest with 2,625.70 MgC/Ha-1, followed by AGB carbon (107.44 MgC/Ha-1), BGB carbon (41.48 MgC/Ha-1), Herbaceous (13.02 MgC/Ha-1), and Litter (5.74 MgC/Ha-1). For CL, the SOC has 907.45 MgC/Ha-1, while Herbaceous biomass accounted for 17.35 MgC/Ha-1. For GS, the SOC was computed at 1,143.06 MgC/Ha-1, while the Herbaceous biomass has 13.92 MgC/Ha-1. Overall, SOC had the highest computed carbon stock of all types of land use. Based on these findings, the study revealed that the PSF, covering 939 hectares areas, has the highest carbon stocks followed by the 752 hectares GS and 261 hectares of CL. Overall, the total carbon stock of the LSP was estimated at 3,733,136.18 MgC. These results highlight the importance and role of the intact natural peatland ecosystems in terms of carbon sequestration. To sustain the effectiveness of LSP in carbon sequestration, improvement in land use practices is recommended. Likewise, the implementation of continuous monitoring of the carbon pools is recommended to gather vital data, which will inform policy decisions and enhance peatland management strategies in LSP.

Keywords: Carbon stock, Soil Organic Carbon, Above Ground Biomass, Below Ground Biomass, Carbon Pools, Leyte Sab-a Peatland

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S1-3

Estimation of Blue Carbon Stocks in Unawatuna Mangrove Forest for Future Carbon Trading in Sri Lanka

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Abstract

Mangroves are the species of plants which are extremely valuable for the existence of the coastal eco system. There are about 110 species of mangroves distributed in the world and 21 mangrove species are distributed in Sri Lanka. Mangrove plants acts a crucial role in coastal eco system and people's lives of coastal region. Mangroves protect coastal region from the coastal erosion and provide habitats for number of creatures. The most important thing is mangroves can store more carbon than rainforest. This carbon stored by mangroves under the soil and the plant. Ecologically it is very important process to balance the carbon cycle. Calculating of carbon capturing capacity of mangroves is an upcoming world trend that is important for the conservation of mangroves. The purpose of this study is to estimate and analyze the total organic carbon stock (above ground, below ground and soil) of mangrove area in Unawatuna. It was included the identifying of true mangrove species and the relationship of mangrove species distribution against accumulation of total carbon (above ground, below ground and soil) in the area. This research was carried out in Unawatuna mangrove area close to Maduganga Ramsar Site from June to December 2022. Mangrove area is within a latitude 6° 2'9.72"N - 6° 1'25.83"N and longitude 80°14'40.70"E - 80°15'15.66"E. The land area is covers 90.4 hectares with a perimeter of 4.74 Km. A standard 10m×10m sized, 5 plots were selected using Random Sampling Method. From each plots soil samples were extracted randomly in 3 depths (30cm, 60cm, 90cm) from each location the total number of samples were 45(3x3x5). Diameter at Breast Height (DBH) of dominating four species of mangroves, were recorded by applying standard scientific methods and estimate the above ground (AG) and below ground (BG) carbon by multiply DBH into standard factors for given species (DBH x factor). The soil weight of each plot was calculated for each depth using the bulk density of each layer. Soil weight=Bulk density × Soil volume. Averaged soil carbon was measured by ignite the dry soil samples in 550 oC for 4hrs and reducing the ignite weight from the initial weight of the dry soil. Major Mangrove species in Unawatuna mangrove forest were identified and are *Bruguiera gymnorhiza* (Mal Kadol), *Excoecaria agallocha* (Thela Keeriya), *Rhizophora mucronata* (Maha Kadol) and *Bruguiera sexangula* (Mal kadol). Results revealed that above ground, below ground and soil carbon mass of the research area is 130.2578 ton/ha, 1.7 ton/ha, 5,579.85 ton/ha respectively. Total average estimated blue carbon (AG, BG, and Soil) in Unawatuna mangrove forest is 5711.82 tons/ha. Therefore, researchers and policy makers can use these findings not only educate the surrounding householders to protect the area but also use the findings for the future carbon trading activities in Sri Lanka.

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Japan's Policy of Disaster Resilience based on River Basin

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Abstract

Climate change is causing more frequent and severe flooding around the world, and Japan is no exception. In response to the increased risk of flooding, Japan has developed a new policy called “River Basin Disaster Resilience and Sustainability by All,” and amended several acts in 2021 to implement this policy. This presentation shows this new policy and amended statutes, and then evaluates them from the perspective of Eco-DRR. This new policy brought two major changes to Japan's flood control measures. First, a shift was made from flood control only through infrastructure construction, such as levee and dam, to disaster resilience through land use regulations and green infrastructure. Japan's past flood control measures were based on the rapid discharge of rainwater into rivers and sewers. However, the policy of disaster resilience based on river basin allows a certain amount of inundation to minimize damage. This policy shift is made with changes in precipitation patterns due to climate change. Second, the entity responsible for flood control measures has expanded from the government to citizens and developers. This intention is expressed in the word “by all.” Citizens have been the beneficiaries of government flood control measures, but they have also come to play a role in flood control measures. To enhance storage of flowing water, the recent amendments create “Storage Function Conservation Zone” and add the requirements of the special green space conservation districts. The “Storage Function Conservation Zone” will be designated for land along the river that has a water retention and recreation function, and it is a legal mechanism to realize the traditional Japanese flood control technique of “Kasumi-Tei (open levee).” In the “Storage Function Conservation Zone,” people are forbidden to disturb a water retention and recreation function. This new zone may be applied to wetlands and rice fields along the river. On the other hand, the special green space conservation districts are utilized to preserve green space located in urban areas. Development of the special green space conservation districts is forbidden, and the landowner is eligible for tax exemptions. These zoning and land use regulations are evaluated as an implementing Eco-DRR. The policy of “River Basin Disaster Resilience and Sustainability by All” places great emphasis on disaster resilience but seems to lack a biodiversity conservation perspective. For that reason, there are few advantages for landowners or stakeholders who are interested in environmental protection to take advantage of these mechanisms. Japan's present policy may prioritize disaster resilience over biodiversity conservation. However, it is necessary to harmonize them in the future.

Keywords: River Basin Disaster Resilience and Sustainability by All, Green Infrastructure, Eco-DRR

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S1-5

Metabolic Dynamics of Restored Seagrass Meadows: Implications for Blue Carbon Potential

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Abstract

Seagrass ecosystems are recognized as major carbon sinks and crucial contributors to climate change mitigation and ocean acidification reduction, yet their ecological functions are threatened by rapid decline. Restoration of seagrass has emerged as a critical nature-based strategy for CO₂ removal, coastal recovery, and biodiversity enhancement. However, the metabolic dynamics and carbon sequestration potential of restored seagrass meadows remain underexplored. This study aims to assess whether restoration enhances metabolic rates—specifically gross primary productivity (GPP), community respiration (CR), and net ecosystem productivity (NEP)—and further evaluate the carbon sink potential of restored seagrass ecosystems. Using ex-situ core incubation, we compared these metabolic parameters between vegetated seagrass (SG) and bare sediment (BS) during wet and dry seasons. Seagrass beds exhibited significantly higher GPP in both seasons (wet: 26.01 ± 0.97 mmol O₂ m⁻² h⁻¹; dry: 14.36 ± 1.11 mmol O₂ m⁻² h⁻¹) compared to BS (wet: 0.74 ± 0.19 mmol O₂ m⁻² h⁻¹; dry: 2.13 ± 0.42 mmol O₂ m⁻² h⁻¹). A similar pattern was observed for NEP, with SG showing higher NEP than BS in both the wet (SG: 207.46 ± 6.30 vs BS: 20.10 ± 2.84 mmol O₂ m⁻² d⁻¹) and dry seasons (SG: 99.57 ± 5.54 vs BS: 4.38 ± 3.43 mmol O₂ m⁻² d⁻¹). These values suggest that seagrass can shift benthic ecosystem metabolism towards a net autotrophic state, acting as a carbon sink. Our findings highlight the ecological importance of seagrass restoration in mitigating climate change through carbon sequestration. This study is the first to quantify the metabolic performance of restored seagrass meadows in Asia using ex-situ core incubation. While this innovative approach enhances feasibility, in-situ assessments are necessary to validate these results and provide a comprehensive understanding of seagrass ecosystem dynamics. Additionally, integrating carbonate dynamics, such as calcium carbonate precipitation and dissolution, is crucial for fully accounting for the carbon balance of these ecosystems.

Keywords: seagrass metabolism, primary productivity, *H. uninervis*, climate change

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S1-7

Restoration of the Sago (*Metroxylon sagu* Roett.) Ecobelt for Disaster Risk Reduction and Climate Change Adaptation in Butuan City, Philippines

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Abstract

In the Philippines, increasing occurrence of typhoons with higher intensity have been experienced in the last two (2) decades. The La Niña phenomenon has triggered more frequent and dangerous flooding in vulnerable areas. Butuan City, the regional center of Caraga Region, is highly vulnerable to flooding due to its location at the mouth of the Agusan River, the 3rd longest river in the Philippines with a length of 350 km. In the Agusan River Basin, sago palm is ubiquitous in marshy areas and has been the staple food for the local people in the past decades. Sago or starch palm, accumulates about 200-300 kg of starch in its trunk due to its high capacity to sequester Carbon. The palms serve as a buffer to flash floods when the Agusan River overflow during heavy rainfall, minimizing the adverse effects to communities along the river. Sago is utilized in other Southeast Asian countries for industrial use (food, medical, packaging materials). Its industrial use is still to be explored in Butuan City. The Caraga State University partnered with the riverside communities in Butuan City 1) to restore the natural sago ecosystem to rebuild the sago ecobelt in the riparian zone of Agusan River; 2) to establish the sago eco-innovation village for utilizing sago for flood control, as food source, for gas emission sequestration, for DRR; and 3) to educate the residents in building resilience against the adverse impacts of climate change through developing sago innovative products for livelihood. Two (2) villages along the Lower Agusan River were selected to be partners in establishing sago eco-innovation village. Replanting of sago was done to restore the sago-based ecobelt. Stakeholder analysis was conducted to ensure stakeholder engagement in the sago eco-innovation village. Training-workshops and other capability development programs were conducted on eco-friendly sago harvesting, sago starch processing, product development using sago starch and other sago-based materials. The findings of the survey revealed that residents are highly interested to participate in the sago eco-innovation village. The residents are aware on the importance of sago ecobelt as buffer against flooding, hence, they see that sago restoration as important. The sago from natural sago stands have not been utilized economically. Therefore, the capability building among residents on product development out of sago starch and other sago-based materials is a welcome initiative. In Caraga State University, innovative sago products have been developed, which will be inputs in training the local sago processor association on sago product development. Currently, local champions have been identified to promote the sago eco-innovation village. Although the innovation village establishment have been started, there are challenges since the sago areas in the riparian zone of Agusan River has been titled and used for human settlement. The urbanization of the riparian zone near the city proper of Butuan can restrain the development of the sago eco-innovation village

Keywords: sago ecobelt, social innovation, disaster risk reduction, climate change, *Metroxylon sagu*

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S1-8

Ecosystem based Approaches towards Adaptation and Disaster Risk Reduction in Coastal Bangladesh

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Abstract

Bangladesh is one of the most vulnerable countries to climate change. The climate change resulted extreme events in the coastal area of the country. Bangladesh has the single largest mangrove patch of the world and a huge area of man-made mangroves. The cyclone frequency is very high and it is increasing day by day. There is salinity intrusion. The country has significant achievements in climate change adaptation and Disaster Risk Reduction (DRR). This achievement is a result of comprehensive management by different stakeholders. The present study reflects the wetland management and co-benefit from the ecosystem-based adaptation and ecosystem-based disaster risk reduction. The objective of the study was to classify the Ecosystem-based Adaptation and Eco-DRR interventions based on the targeted hazards and output of the projects implemented by non-government organizations in the coast. The Drivers-Pressures-State-Impacts-Responses (DPSIR) framework was employed to evaluate the ecosystem and sustainable management strategies in the face of climate vulnerability. The DPSIR framework serves as an analytical tool for monitoring changes, identifying driving factors, assessing impacts, and evaluating responses within an ecosystem. In this context, drivers are the fundamental factors instigating various pressures in the ecosystem, while pressures are the direct causes of changes. The state refers to conditions of ecosystem, encompassing physical, chemical, and biological aspects. Impacts signify the consequences ecosystem functionality and responses denote societal efforts to address the resulting challenges. The DPSIR framework comprises four key stages: interpretation of drivers and pressures, description of state changes, analysis of impacts, and evaluation of human responses. The outcome and the sustainability of the approaches were detailed based on the results and its contribution towards the ecosystem wellbeing. The ecosystem wellbeing indicators were species diversity, carbon sequestration potential but by vegetation progress and food wave compactness. Indigenous knowledge is supportive to Eco-DRR planning. The study found that the Eco-DRR attempts need to be adopted based on the local ecosystem potential. Emerging climate concerns are challenges that need to be addressed. The wetlands in the coastal areas are diverse types. A proper Eco-DRR planning requires synergy between the science, policy, and practices. Also, it should be locally led.

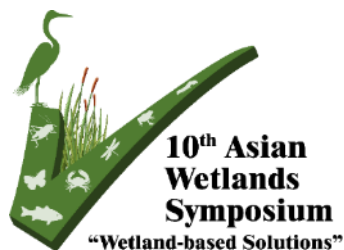
Keywords: Adaptation, Eco-DRR, Wetlands

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Session 2 - Wetland restoration

Wetland ecosystem and species restoration approach and case studies towards sustainable wetland management

S2-1 Peat Soil Profile and Water Quality Characteristics in Differing Land Uses of Leyte Sab-A Peatland, Philippines

For. Criskim C. Parian, Ms. Kimberly Ann. T. Alanano, Sharmaine E. Bantas, Rej Winlove M. Bungabong

S2-2 Nakaikemi-shicchi: A Case Study of Mitigation Measures for Environmental Protection during Shinkansen Construction

Hea-jin, Park, Ken-ichi Yokoi

S2-3 Philippine Mangroves– History, Management and Conservation

J.H. Primavera

S2-6: Reexamine of the Legal Role of Sister Wetland Agreements: The Case of Sister Wetlands in Japan and Australia

Shiina Suzuki

S2-8: Building with Nature Indonesia: Restoring coastline and inspiring action at scale

Apri Susanto Astra, Eko Budi Priyanto, Yus Rusila Noor

S2-1

Peat Soil Profile and Water Quality Characteristics in Differing Land Uses of Leyte Sab-A Peatland, Philippines

For. Criskim C. Parian^{*†}, Ms. Kimberly Ann. T. Alanano^{**}, Sharmaine E. Bantas^{***},
Rej Winlove M. Bungabong^{****}

Abstract

Peatlands are among the ecologically important freshwater ecosystems providing a variety of services. However, there is still limited information on its ecology and biophysical characteristics. In 2023, the Leyte Sab-a Basin Peatland (LSBP) was characterized to determine its soil profile and water quality status. LSBP covers around 3,088 hectares total land area which lies in the 4 municipalities of Leyte Province, Philippines. The peatland has been utilized for various uses of which 44% of its total area has been converted for agriculture. The remaining 1,740 hectares in the eastern half of the basin consist of small remnant areas of peat swamp forest and sedge/grassland (ADB 2000). The peat soil profile and water quality of the Leyte Sab-a Peatland were assessed through simple random sampling in varying land uses such as peat swamp forest, grasses and sedges, and cultivated land. The study revealed that among the three land uses in LSBP, peat swamp forest contains the highest average percentage of organic matter at 100-150cm depth yielding $32.60 \pm 4.06\%$. The grasses and sedges area also contains a significantly high average organic matter of $27.69 \pm 7.16\%$ at 50-100cm depth. On the other hand, it was observed that organic matter is relatively low in cultivated land at 0-50cm depth, however, $22.38 \pm 5.65\%$ organic matter content at 50-100cm depth was detected. These data indicate that a thick layer of peat has been formed in LSBP implying high potential and capacity for carbon storage. Moreover, low organic matter content in cultivated land could be attributed to the disturbance in the area which if not abated might cause further degradation of the peatland which may contribute to higher greenhouse gas emissions. For the water quality, the pH levels for all sampling sites across various land uses fell within the acidic to neutral range, with an average of 6.91 ± 0.79 for cultivated land, 6.8 ± 0.82 for grasses and sedges, and 6.54 ± 0.42 for peat swamps. Among the assessed areas, the most acidic water with a pH of 5.68 was within grasses and sedges. These characteristics indicate that a high concentration of hydrophobic Natural Organic Matter contributes to the water's acidic nature and brownish color. Additionally, dissolved oxygen (mg/L) levels were measured, with results showing 5.82 ± 0.86 for cultivated land, 6.42 ± 4.30 for grasses and sedges, and 5.34 ± 1.33 for peat swamps. Low levels of dissolved oxygen in water indicate contamination and are crucial in assessing water quality, pollution control, and treatment processes. The relatively low dissolved oxygen levels in peat water are expected due to the decomposition of organic matter. The acidic pH and low dissolved oxygen levels are all indicative of the influence of hydrophobic NOM and the unique properties of peat water. Nevertheless, the Philippines lacks a specific water quality standard for peatland waters, which significantly differ from both freshwater and marine environments. Thus, appropriate monitoring tools, conservation, and management strategies for this peatland shall be intensified and collaboratively implemented among stakeholders to sustain its ecological functions.

Keywords: Leyte Sab-a Peatland, Peat Soil, Organic Matter, Peat Water

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Nakaikemi-shicchi: A Case Study of Mitigation Measures for Environmental Protection during Shinkansen Construction

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Abstract

Nakaikemi-shicchi (Nakaikemi Wetland), located in the Hokuriku region of central Honshu, Japan, is a highly accessible Ramsar site in the country, which is just 2-km away from the JR Tsuruga Station. However, just a month before its designation as a Ramsar site in 2012, an extension of the Hokuriku Shinkansen line was approved for cutting through the area slated for protection. This extension included a tunnel through the wetland source, Mount Miyama, and a crossing of its only drainage channel, the Ushirodani Valley. Concerns were raised about the impact of construction on hydrological environment of the wetland. Dr. Christopher Brigg, the former Secretary General of the Ramsar Convention, visited the site and expressed concerns. Through the efforts of citizen groups and individuals, the route was changed in 2015 to avoid and minimize impacts on the wetland. In addition to route change, the Japan Railway Construction, Transport and Technology Agency (JRJT) implemented a series of mitigation measures, such as monitoring hydrology, flora, and fauna of Nakaikemi-shicchi, establishing a follow-up committee composed of experts for receiving feedback from the monitoring results, and developing an environmental management plan for constructing the Miyama Tunnel. The tunnel, completed in August 2021, was constructed with a watertight structure for minimizing groundwater leakage into it. Despite these various measures, the committee confirmed that groundwater levels had declined, and that the populations of some indicator species had not recovered from a declining phase induced during the construction period. To compensate for these impacts, the JRJT initiated a wetland restoration plan in the Ushirodani Valley. In addition, the existing environmental management plan was revised to focus on wetland restoration in the Ushirodani Valley. This new environmental management plan can be evaluated as a pioneering case, in which all five principles of mitigation for environmental protection have been applied in executing a public project. A working group has been established for assessing wetland restoration in the Ushirodani Valley, and various stakeholders, including government agencies, citizens, nongovernmental organizations, and experts, are participating in the process. As the working group is led by young generation from the local community, discussions on the future vision for the restored wetland, including management and wise use, are expected to take place.

Keywords: Nakaikemi-shicchi, Wetland Restoration, Compensatory Mitigation

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Philippines Mangroves – History, Management and Conservation

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Abstract

Philippine mangroves are as diverse (~40 true mangrove species) as they were widespread in the 1900s (numerous towns and villages with mangrove placenames). The paper recounts man grove-associated stories such as the naming of Manila, the First Mass in the country, and even the origin of “quarantine.” Aside from historical/cultural value, mangrove services include coastal protection and carbon sequestration placing them in the forefront of Climate Change adaptation and mitigation. With high rates of mangrove loss, mainly due to brackishwater culture pond conversion, the Philippines has a decades-long history of mangrove rehabilitation dating back to World Bank and Asian Development Bank projects in the 1980s-90s. After the turn of the century, such funding from international development agencies was continued by the Philippine government through the 2011 multimillion PhP National Greening Program that ran for four years and was extended by another 10 years. A confluence of factors – massive external funding, a limited coastal (fringe) planting area and contentious fishpond tenure – has influenced the way mangrove protocols evolved. Success indicators of national and international development programs emphasize quotas (e.g., number of hectares and mangroves to be planted) rather than mangrove survival. Hence the concern was how to complete planting in the targeted area within the allocated budget and period of time. Such considerations have led to the present default mode of planting *Rhizophora* on seagrass beds (or mudflats) – the wrong species in the wrong sites. Within the context of the above scenario, the Zoological Society of London (Philippine Country Program) has pioneered in mangrove R&D programs in many sites in the Visayas and Mindanao over the last 16 years. Based on this wealth of experience and expertise, ZSL recommends the following science-based mangrove rehabilitation and conservation policies and protocols: a) prioritize the reversion of abandoned fish/shrimp ponds to mangroves over seafront planting applying Assisted Natural Regeneration, such mangrove reversion could be shortened to ~3 years vs 15-20 years required for Natural Regeneration (Case Study: Leganes, Iloilo), b) where seafront planting is necessary, plant the right species, the dominant *Avicennia marina* and *Sonneratia alba* rather than the conveniently available *Rhizophora*, at middle to upper intertidal elevation rather than on subtidal seagrass beds and intertidal mudflat (Case Study: Dumangas, Iloilo), c) apply Green-Gray Engineering, when necessary (Case Study: Ajuy, Iloilo), d) international and national development agencies should undergo a paradigm shift in defining success as forest area created or rehabilitated rather than target area planted. That is, to count the mature plants surviving at the end instead of newly planted propagules at the beginning. This paper further recommends that CRM/ICM policies and programs incorporate and institutionalize the following mangrove targets: c) restore a 100-m wide protective coastal greenbelt of mangroves (and/or beach forest) to reduce up to 60% of energy from wind and swell waves d) maintain a 4:1 mangrove-pond ratio for sustainability of brackishwater pond aquaculture.

Keywords: ZSL, mangrove rehabilitation, abandoned pond reversion, seafront planting, coastal greenbelt

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Re-examine of the Legal Role of Sister Wetland Agreements: The Case of Sister Wetlands in Japan and Australia

Shiina Suzuki*

Abstract

Almost 50 years have passed since the Ramsar Convention on Wetlands (Ramsar Convention) was adopted, and about 40 years have elapsed since the Japan-Australia Migratory Bird Agreement (JAMBA), a bilateral accord concerning migratory birds between the two countries, came into effect. However, the protection of migratory birds remains fragmented, and the decline and degradation of wetlands, which serve as habitats for these birds, has not been halted. One reason for this situation can be attributed in part to the lack of academic, technical, and social linkages, as well as insufficient information sharing between Japan and Australia regarding the provisions of the Ramsar Convention and JAMBA. While various strategies for protecting migratory birds and conserving wetlands as habitats have been considered, the need for a sister wetland agreement has been mentioned in international environmental treaties in a piecemeal manner. In JAMBA, the term "sister agreement" is not employed and is viewed as an "appropriate measure" to be taken by the two governments, interpreted as one of the essential "cooperation" measures. Conversely, the Ramsar Convention has indicated the need for sister wetlands since the late 1990s, as reflected in resolutions VII.11, VII.19, and XI.8 Appendix II. Sister wetland agreements in the international community are expected to serve as a means to increase the number of registered wetlands, protect and conserve these areas, facilitate information exchange at various levels, provide technical assistance, and promote international cooperation, including environmental education for stakeholders. However, some sister wetland agreements are effectively fulfilling their intended roles, such as information exchange and environmental education for stakeholders, while others are either formally continued or virtually suspended after their conclusion. What factors account for the divergence among these situations? This study focuses on the Sister Wetland Agreements between Japan and Australia and presents the results of field surveys of three such agreements: "Kushiro Wetland/Hunter River Estuary Wetlands," "Yatsu Tidal Flat/Boondall Wetland," and "Fujimae Tidal Flat/Swan Bay Wetland." Based on interviews with local wetland managers and relevant government officials, this study also investigates the legal issues involved in ensuring the effectiveness of the agreements by clarifying the elements that enable them to fulfill the roles required by the Convention from three perspectives: the process leading to the conclusion of the agreements, the state of negotiations at the time of their conclusion, and the responses following the conclusion of the agreements. In conclusion, the study clarified to ensure the effective implementation of the sister agreement, it is essential to continue conducting periodic reviews to reflect contemporary needs and local conditions. Additionally, since each sister agreement is significantly influenced by municipal administration, it is necessary to facilitate the ability of wetland managers to request responses from the state based on Article 6.3 of the Ramsar Convention.

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Keywords: Sister Wetland Agreement, Ramsar Convention, International Environmental Law

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Building with Nature Indonesia: Restoring coastline and inspiring action at scale

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Abstract

The coastal area of Demak on the north coast of Java, is experiencing severe erosion and tidal flooding resulted from mangrove conversion for aquaculture, groundwater extraction, infrastructure development, and climate change. As a result, several kilometers of land have been lost, communities have become severely vulnerable, and the agriculture and aquaculture sectors that are the engines of economic growth have suffered significant losses. Conventional hard infrastructure measures have not proven effective, nor have they returned the economic, environmental, and social benefits that a healthy mangrove forest offers. Building with Nature (BwN) is an innovative approach to integrated coastal zone management that provides resilience by combining smart engineering and mangrove rehabilitation, while introducing sustainable land use practices. This approach serves coastal protection, helps communities become more resilient, and adds value to nature, biodiversity, and the local economy. Mangrove greenbelts present coastal protection services, allowing for the maintenance of mangrove forests when the ecological and socio-economic conditions behind them are met. Mangrove restoration programmes are conducted through sediment-trapping semi-permeable structures and pond conversion along coastlines and rivers. In parallel, a coastal field school programme supports communities to integrate mangroves in sustainable aquaculture practices. Community groups from 9 coastal villages in Demak were engaged through BioRights, a funding mechanism that links conservation and economic activities, from planning, implementation, to monitoring and evaluation. The programme, co-managed with experts in engineering, ecology, and aquaculture, also implement capacity building, knowledge exchange and embedding Building with Nature into government policy and planning. The programme has dedicated 119 ha for mangrove restoration, of which 60 ha are better protected mangroves. In addition to Demak, Indonesian Ministry of Marine Affairs and Fisheries has mainstreamed 23 km of semi-permeable structures as a coastal resilience programme in 13 districts/cities in Indonesia. Together with farmers, the programme has implemented good aquaculture practices in 464 ha of ponds and has shown an increase in productivity and income. The programme is also faced with challenges of land subsidence and extreme natural conditions due to climate change, which must be considered in the sustainability of programme implementation in the coastal areas of Demak. Together with ONE Resilient Semarang team, Wetlands International is bringing expertise and learning from the Building with Nature programme in Demak to the Water as Leverage programme in Semarang which is adjacent and connected. Through an inclusive, multi-stakeholder and integrated design approach, with a vision for the coastal part of the city that includes restoration of mangrove green belts and other blue-green infrastructure, the team has developed fundable concept projects. With the EcoShape consortium, Wetlands International also initiated the Building with Nature Asia programme to accelerate adaptation by adopting Building with Nature as a socially and environmentally inclusive engineering approach that transforms the engineering sector across Asia to work with nature, not against nature, and provide benefit for people in cities and settlements along Asia's vulnerable coasts, lakes, rivers, and deltas. The Building with Nature Indonesia programme is also designed to inspire coastal managers to incorporate the approach into urban and rural development programmes, thereby contributing to replication and scale-up across Indonesia. Several other programmes have been implemented in Indonesia as a form of sustainability of the BwN programme, including the To Plant or Not To Plant and the Global Mangrove Alliance Chapter Indonesia programme. Currently, a local NGO with support from the private sector is developing a replication programme for BwN Indonesia to be implemented on the north coast of Central Java. International recognition through 3 prestigious awards, one of which is the World Restoration Flagship-UN Decade on Ecosystem Restoration, opens up opportunities

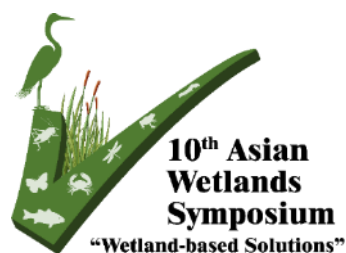
Oral Sessions

for programme to contribute to accelerating adaptation with the Building with Nature approach around the world.

Keywords: building with nature, wetland restoration, mangrove

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Session 3 - Wetland biodiversity

Wetland biodiversity that defines its richness and abundance, and discuss important species and habitats including wetland birds

S3-1: Species Abundance and Diversity of Avifauna in the Pasig River, Philippines

Alon Velasquez, Veronica Mercado, Cynthia Marquez, Maria Lourdes Q. Moreno

S3-2: Community-Based Monitoring of Bird Species Diversity in Dagatan Lake, Tayabas City, Philippines

Angelica Q. Olar, Melvin C. Rada, Jomar L. Padilla

S3-3: Activity Patterns of Small Carnivores in Peat Swamp Forest Sites at the Kampar Penninsula and Pulau Padang, Sumatra

Dian Andi Syahputra, Muhammad Iqbal, Muhammad Mulyo

S3-4: Biodiversity of the New Ramsar Site Menipo Nature Recreational Park

Elisa Iswandono, Arief Mahmud, Alfian Herdi Feisal, Hariany Siappa

S3-5: Flora and Fauna Composition of Leyte Sab-a Basin Peatland: Basis for Sustainable Ecosystem Management and Conservation Planning

Janice B. Otana, Jeffrey Jaymes A. Mesias, Enrily S. Bantas, Rej Winlove M. Bungabong

S3-6: The Katunggan it Ibajay (KII) STORY: Twenty-five Years of Mangrove Biodiversity Conservation in Aklan, Panay Is., Central Philippines

J.H. Primavera, D. Dequito, R. Golbeque

S3-9: Migration Studies of Cinereous Vulture (*Aegypius monachus*) between South Korea and Mongolia

Seung-Kook Kwak, Duck-Seung Kim, Yerim Lee, Min- Jun Kwak, Gombobaatar Sundev, Gea-Jae Joo

S3-10: Analysis of Population Changes, Habitat Requirements, and Feeding Characteristics of Wintering Populations of Cinereous Vulture (*Aegypius monachus*) at Vulture Restaurants in Goseong, South Korea

Min-Jun Kwak, Duck-Seung Kim, Yerim Lee, Gombobaatar Sundev, Gea-Jae Joo, Seung-Kook Kwak

S3-11: Changes in Breeding Phenology of Terns in Tubbataha Reefs, the Philippines

Maria Retchie Alaba, Arne Jensen, Angelique Songco, Segundo Conales, Jr. , Noel Bundal, Cresencio Caranay, Jr. , Jeffrey David, Rowell Alarcon, Gerlie Gedorra, Michael Dylan Chua

S3-12: Diversity of Mangrove-associated Gastropods in Siargao Island Protected Landscape and Seascape, Philippines

Marlon V. Elvira, Joe Carlo Labial, Iris Coralde Abayon, Harold Lipae, Emmanuel Ryan de Chavez, Romell A. Seronay

Oral Sessions

S3-13: Foraging Microhabitat Selection of Spoon-billed Sandpiper in the Upper Gulf of Mottama, Myanmar

Pyae Phyoe Aung, Graeme M. Buchanan, Philip D. Round, Christoph Zöckler, Chris Kelly, Naruemon Tantipisanuh, George A. Gale

S3-14: 16s rRNA gene metabarcoding reveals insights relating soil bacterial communities to plant species and peat properties of the Leyte Sab-a Basin Peatland – a degraded tropical peatland in Northeastern Leyte, Philippines

Reynaldo P. Peja Jr., Jayson D. Baldesco, Dave A. Caparas, Libertine Agatha F. Densing, Heremerose E. Matutes, Lilibeth G. Miralles, Judith B. Jomadiao, Nyok-Sean Lau

S3-15: Population Trends of Wintering Waterbirds in the Republic of Korea: Analysis of the Wintering Waterbird Census in 2002-2022

Yerim Lee, Hyunbin Jo, Gombobaatar Sunde, Gea-Jae Joo

S3-16: Composition, Abundance, and Diversity of Rotifers in Pasig River – a vulnerable wetland in the Philippines

Yves Christian L. Cabillon, Cynthia C. Marquez, Rhenzo V. Rance, Mhelissa Anne D. Dorado, Maria Lourdes Q. Moreno

S3-1

Species Abundance and Diversity of Avifauna in the Pasig River, Philippines

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Abstract

Pasig River, an important freshwater ecosystem for transportation, economic activities, water resources, and survival of both Manila Bay and Laguna de Bay, has been widely affected by environmental degradation throughout the years. In the 1990s, it was declared biologically dead despite being classified as a Class C River by the Department of Environment and Natural Resources (DENR) – Environmental Management Bureau, Philippines. One major factor that diminishes its ecological integrity is due to the presence of human settlements and various developments along the whole stretch of the river that are sources of various types of pollution. But despite being considered the “toilet bowl” of Metro Manila, it is still inhabited by a variety of avifauna species. Birds are known to be excellent bio-indicators of environmental health. Since most studies concerning the Pasig River focus more on the physico-chemical aspects of its water resources, information on the present biodiversity in the area, specifically bird species abundance, is quite limited. Through field observations, birds were identified based on calls and photographs that were taken from the field during the dry season in the Philippines. This research shows the species composition of birds in the three subsections of the Pasig River namely 1) Napindan and Bambang-Kalawaan (Upstream); 2) PUP (Midstream); and 3) Valenzuela-Hulo and Delpan (Downstream). Based on observation, bird species richness is equivalent to $S=40$. Dominating species mostly belong to Ardeidae, Columbidae, and Hirundinidae as compared to the other twenty-six (26) families noted. Out of the 40 species observed, the most abundant are the Whiskered tern (*Chlidonias hybrida*), Little egret (*Egretta garzetta*), and Eurasian tree sparrow (*Passer montanus*). Observed species differ by distribution status: resident ($n=22$), migrant ($n=6$), endemic ($n=5$), resident-migrant ($n=4$), and introduced ($n=3$). Results were analyzed using the Paleontological Statistics (PAST) software version 4.03. As interpreted, the Shannon-Wiener index of Pasig River in terms of species abundance is poor ($H=1.53$), while Simpson’s is at 0.54. Data shows that the river is an important area for some species. Although most of the observed species are categorized as Least Concern based on the conservation status of the International Union for the Conservation of Nature, this river system needs better protection and improved management to create suitable habitats for many bird species. As a follow-up to the DENR’s Pasig River biodiversity assessment in 2009 and 2013, this study could also serve as a basis for what management strategies are suitable for the restoration of the Pasig River. At the same time, data derived from this research may be used for further ornithological studies and assessment of wildlife in urban ecosystems including but not limited to their feeding behavior, habitat preference, human-wildlife relationships, and others. Methods used for this research can be replicated in other urban river systems. It is also recommended that the same assessment shall be conducted in tributaries connected to the Pasig River. To complement a ridge-to-reef approach, this bird assessment could supplement for more comprehensive studies on avifauna from Laguna de Bay down to Manila Bay.

Keywords: Pasig River, Philippines, avifauna, species, abundance, distribution

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S3-2

Community-Based Monitoring of Bird Species Diversity in Dagatan Lake, Tayabas City, Philippines

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Abstract

Dagatan Lake is two (2) hectare lake, is situated in a secluded forest in Tayabas City. The lake was vulnerable to anthropogenic activities such as hunting, small-scale logging, and other human activities. From 2016 to 2023, the Tayabas City Environment and Natural Resources Office together with the TAPAT-Kalikasan - a local organization concerning with the environment and natural resources, have conducted Quarterly Community-based Biodiversity Monitoring for birds. The objectives of the program include the bird species composition, endemism, diversity, relative abundance, and conservation status for the development of management strategies for the conservation and protection of the area. A point count method was used consisting of 9-point count stations with at least 250 meters intervals in the vicinity of Dagatan Lake in Tayabas City. The bird species were identified using field guides, visual encounters, and bio-acoustic cues. Overall results showed that there are 85 bird species, from 36 families and 2,495 individuals were identified. The birds' endemism ranged from 57-71% and the resident bird species were 29-43%. The Shannon diversity index shows that the diversity of the birds inhabiting the area is increasing from 2.7 in 2016 up to >3 in 2023. The family Columbidae has the most bird species followed by the Cuculidae, Dicaeidae, and Alcedinidae. The most abundant bird species was the Philippine Bulbul *Hypsipetes philippinus*, followed by the Philippine Duck *Anas luzonica*, and the Philippine Hanging Parrot *Loriculus philippensis*. However, there are two (2) species with Endangered category, two (2) Vulnerable and five (5) Near Threatened based on the IUCN Redlist, and there are four (4) Critically Endangered, one (1) Endangered, seven (7) Vulnerable and one (1) other Threatened Species under DAO 2019-09. The Quarterly Community-Based Biodiversity Monitoring System program of the City Government of Tayabas, along with the enrichment planting, intensive IEC campaigns, and strong partnerships and active participation of partnered organizations proved to be effective in lessening threats to birds of Dagatan Lake. The conservation and protection of the lake ecosystem is important since it serves as a habitat for the threatened bird species. The continuous support of concerned government agencies and the declaration of the lake as a critical habitat will be an important mechanism to save its diverse ecosystem.

Keywords: Dagatan Lake, birds, abundance, endemic, threatened, conservations

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S3-3

Activity Patterns of Small Carnivores in Peat Swamp Forest Sites at the Kampar Peninsula and Pulau Padang, Sumatra

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Abstract

Small carnivores play an important role in the ecosystem, particularly in maintaining ecosystem stability. In this study, we would like to understand the overlapping activity patterns of small carnivores in two different locations that are consistently documented by camera trapping activities in Pulau Padang and Kampar Peninsula, these three species are Malay Civet (*Viverra zibetha*), Small-toothed Palm Civet (*Arctogalidia trivirgata*), and Leopard Cat (*Prionailurus bengalensis*) from camera trap data 2020-2023. Restorasi Ekosistem Riau (RER) started using camera traps to monitor wildlife on Kampar Peninsula in 2015 and on Pulau Padang in 2017. Time-stamped camera trap images provide an opportunity to understand species ecology and community interactions, such as variation in activity patterns and partitioning along the temporal niche axis. The data was analysed using the Overlap package in R. Based on the result of this study showed that the activity pattern in both location of these three small carnivores quite similar for *Arctogalidia trivirgata* which its most active at 00:00 and 24:00, *Prionailurus bengalensis* activity in Pulau Padang almost active during the day at the hours 12:00 compared to Kampar no activity of this species at this time. The other different also in the activity pattern of Malay Civet, in Pulau Padang the Malay Civet reach the peak activity at late night around 23:00 and lower in the morning, while in Kampar reach the peak activity in the late morning around 01:00. The species that had high overlap in their activity periods in two different locations are *Viverra zibetha* (0.70), *Prionailurus bengalensis* (0.64) and *Arctogalidia trivirgata* (0.61) as follows. Overall, the activity pattern of these three species is nocturnal.

Keywords: Restorasi Ekosistem Riau, Activity Patterns, Small Carnivores, Camera Traps, *Viverra zibetha*, *Arctogalidia trivirgata*, *Prionailurus bengalensis*

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S3-4

Biodiversity of the New Ramsar Site Menipo Nature Recreational Park

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Abstract

Menipo Nature Recreational Park is a new Ramsar site (number# 2543) that was designated as eighth Ramsar site for Indonesia on April 22, 2024. The purpose of this research is to analyze and describe the ecosystem diversity and species richness in the Menipo area. The research was conducted from January to April 2024. The method used in this study is a field ground check of the results of land cover analysis of the Ministry of Environment and Forestry's image for ecosystem types in 2022. Turtle and cockatoo population data from semi-natural breeding records of ramsar site managers from 2020 to 2023. Data on migratory birds and other animals were obtained from records of management officers during patrol activities in the area. The results of the study showed that the ecosystems in the Menipo area are intertidal mangroves forested wetlands 1,497.175 ha, freshwater pools 3.75, freshwater marshes / pools 131.62 ha, shrubs 46.42 ha, rivers 68.19, savanna 420.07 ha, beaches 53.59 ha, coastal forests 53.54 ha and dry tropical forests 17.11 ha, and salt marsh 101.06 ha. Migratory birds that inhabit this area are *Fregata ariel*, *Esacus magnirostris*, *Charadrius ruficapillus*, *Pelecanus conspicillatus*, *Egretta sacra*, *Egretta novaehollandiae*, *Merops ornatus*, *Todiramphus sanctus*, *Himantopus leucocephalus* and *Charadrius leschenaultia*. The number of species on the Menipo Island is 28. Yellow-crested Cockatoo (*Cacatua sulphurea parvula*) on the island was found as 62 individuals in 2021, 64 individuals in 2022, and 63 individuals in 2023. Documented turtle species include *Lepidochelys olivacea*, *Chelonia mydas*, and *Eretmochelys imbricata*. Timor deer (*Rusa timorensis*) is one of the important mammal species on the island. Menipo has a diverse ecosystems that support migratory birds, turtles, and other species.

Keywords: Menipo, Ramsar site, migratory bird, turtle.

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S3-5

Flora and Fauna Composition of Leyte Sab-a Basin Peatland: Basis for Sustainable Ecosystem Management and Conservation Planning

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Abstract

The Leyte Sab-a Basin Peatland (LSBP) is one of the earliest identified and confirmed peatlands in the Philippines. LSBP plays an important role in providing various ecosystem services which include habitat for diverse flora and fauna. However, the ongoing land use conversion in the area poses a significant threat to its biodiversity. An assessment was conducted to characterize the present flora and fauna of the 7 barangays within the LSBP. The assessment covered the three identified land uses in LSBP which include peat swamp, grass and sedges, and cultivated land. For floral assessment, random sampling through the establishment of nested quadrat for peat swamps, line intercept for cultivated land and grass and sedges, and opportunistic listing were utilized for the assessment to measure the population of species. In assessing the fauna, species richness data were gathered based on a combination of transect line walks, modified circular plots, opportunistic listings, and purposive sampling. Nine forest tree species dominated by Lanipau (*Terminalia copelandii* Elmer) were surveyed in the upper canopy layer of the peat swamp forest. The diversity of the grass and sedges was recorded as very low, with evenness indices ranging from moderate to high. Cultivated lands showed very low to low diversity indices. However, it is noteworthy that the majority of the plant species surveyed are native to the area. A total of 59 avian species from 33 families and 12 herpetofauna species from 9 families were recorded in the area. The highest species richness was recorded in Divisoria, Alangalang (39) and San Isidro, Sta. Fe and Veteranos, Alangalang with 27 species. A total of 7 amphibians and 5 reptiles are recorded. Four amphibian species and 2 reptile species recorded in the study sites are found endemic to the area. Additionally, thirteen bird species were identified as endemic, 1 nearly endemic, with 4 classified as threatened, 34 as resident, and 11 as migratory bird species. Nevertheless, the computed diversity indices of avifauna across all study sites are relatively low. The avian species recorded under the threatened category include the Philippine Hanging Parrot (*Loriculus philippensis*), Pinsker's Hawk-Eagle (*Nisaetus pinskeri*), Philippine Green-Pigeon (*Treron axillaris*), and Philippine Duck (*Anas luzonica*). It is important to recognize the area's biological significance as a refuge for a multitude of plant and animal species, including endemic, threatened, and migratory species, as well as a nesting site. The information generated could serve as a great tool for crafting policies for sustainable management and conservation of the Leyte Sab-a Peatland Basin. A protection zone must be designated within the peatland and vegetation enhancement to the degraded patches, especially in peat swamp forests.

Keywords: Leyte Sab-a Basin Peatland, flora, fauna, threatened, endemic

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S3-6

The *Katunggan it Ibajay* (KII) Story: Twenty-five Years of Mangrove Biodiversity Conservation in Aklan, Panay Is., Central Philippines

J.H. Primavera, D. Dequito*, R. Golbeque

Abstract

A 100-ha basin mangrove in Ibajay, Aklan, central Philippines is the model for environmental conservation, showcasing the essential processes of research and development for an ecopark. Since the 1980s when ‘People Power’ stopped mangrove clearing for fishpond construction, the area remained largely unknown to local government agencies and the local community. That is, until SEAFDEC Aquaculture Department researchers “discovered” the pristine forest in the late 1990s. Its high biodiversity boasts of 27 species of true mangroves, with the crown jewel of the forest a centuries’ old *Avicennia rumphiana* measuring 9 m in girth, and therefore called the Avatar Tree. This paper describes the transformation of a mangrove ‘jungle’ into a modern ecopark visited yearly by thousands of students, researchers, government, and private sector employees. The decade following 2000 was marked by research (mangrove taxonomy, integrated mangrove-aquaculture systems), organizing local communities, and engaging the local government (including the passage of a municipal ordinance protecting 44 ha of mangroves as ecopark). These activities were facilitated by SEAFDEC AQD (2000-2007), a Pew Fellowship in Marine Conservation (2005-2010), and the Zoological Society of London (ZSL, 2009 to present). Since then, the ecopark has provided a setting for educational documentaries, and a venue for dozens of Mangrove and Beach Forest training courses of ZSL since 2009. The bamboo-nipa center has been transformed into a concrete, multipurpose hall with lecture room, audiovisual facilities, kitchenette, etc., and the loop of the 1.8-km board walk has been completed, the bamboo planks replaced with hardwood and concrete. All these were made possible by the infusion of multimillion peso government funding from the national (BFAR and TIEZA), and legislative branches of government. Under the 2021 ProCoast project of ZSL/GIZ, the KII Ecopark was established as a Center of Learning and its Social Marketing Plan and Business Plan was developed. The people’s organization (PO) was reactivated; livelihood activities such as the PO store and gasoline station were established, and the number of P.O. CoMSCA (savings association) groups increased from 1 (2014) to 8 (2023). Recently, the One MERALCO Foundation funded the Php2M One for Trees Project to plant one million mangrove seedlings. An unintended but positive result of the project was the clearing of wide areas of nipa stands (to allow the planting of mangrove seedlings) that have prevented natural recruitment. The KII has achieved much local and national recognition, including 3rd Place in the 2023 Best Mangrove Awards, and Finalist in the Para El Mar Award for Best Locally Managed MPA.

Keywords: ecopark, basin mangrove, ZSL, SEAFDEC AQD, Pew Fellowship

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S3-9

Migration Studies of Cinereous Vulture (*Aegypius monachus*) between South Korea and Mongolia

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Gea-Jae Joo^{*****}

Abstract

Global population consists of 15,600 to 21,000 individuals, with 50% are resident East Asia. Studies of migration routes and patterns of the vulture species in this region are limited. Our aim is to identify the migration route and patterns of the species in East Asia using GPS tracking devices (PTT). We attached backpack type of satellite transmitters on 7 individuals in wintering areas in Goseong, South Korea (34°59'12"N 128°19'17"E) and 7 juveniles in breeding ground of Mongolia (046°12'35.00"N; 106°02'24.00"E, 046°15'04.00"N; 108°45'58.00"E). Based on primary data on coordinates, duration, distance, speed, and correlation with weather conditions, we found out that vultures (n=9 vultures) migrated from Mongolia to Korea between mid-October and late November. An average duration of travel was 15.1 days, distance was 2,192 km, and speed was 159.8 km/day. The return migration from Korea to Mongolia started from late February to late April. Their average duration of migration was 14.4 days, total distance - 2,245 km, and speed -165.9 km/day on average. During the spring migration, vultures carefully picked up favorable winds to minimize energy expenditure, utilizing tailwinds. This study results clearly showed that the high correlation between weather condition and migration patterns were occurred. This result suggests that climate change could significantly impact on vulture migration pattern. Migration studies confirm that wintering birds feed, rest and roost near paddy fields and other wetlands, thus wetland conservation is essential to protect this species.

Keywords: *Aegypius monachus*, migration, habitat, Korea, Mongolia

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S3-10

Analysis of population changes, habitat requirements, and feeding characteristics of wintering populations of Cinereous Vulture (*Aegypius monachus*) at vulture restaurants in Goseong, South Korea

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Abstract

The Cinereous Vulture is widely distributed from southern Europe to East Asia, with an estimated global population of 15,600 to 21,000 individuals. Over 50% of the global population inhabit East Asia, primarily breeding in Mongolia, with immature individuals wintering in South Korea. To prevent exhaustion of the vulture species that migrate and winter in the south, particularly South Korean organizations have been operating vulture restaurants (feeding stations) in certain areas. This study aim was to understand long-term population changes and feeding habits of the species at the vulture restaurant in Goseong, South Korea. The number of the vulture species in Goseong has increased from 10 individuals in 1996-1997 to a maximum of 840 individuals in 2019-2020. Our observation data showed that duration of wintering vultures in Goseong was 124.5 days on average. Most wintering individuals (96.1%) were immatures or being 1-3 calendar years old. Based on the correlation between the number of individuals and the feeding supply, overage consume was 0.62 kg per individual. We found a total of 10 roosting sites, mostly located within 15 km of the feeding site. Majority vulture restaurants of the vultures closely related to wetlands such as rice field, wetland valleys, etc... The average frequency of visits to these vulture restaurants was once a week per an individual. This study can provide important input to the conservation management of the vultures, particularly in identifying significant wintering locations and amounts of food to support wintering populations. Due to close location of feeding areas of the vultures to various wetlands in Goseong, South Korea, conservation actions for wetlands and waterbirds will be very beneficial for the conservation of this vulture species in South of Korea.

Keywords: *Aegypius monachus*, wintering habitats, vulture restaurant, feeding characteristics

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S3-11

Changes in breeding phenology of Terns in Tubbataha Reefs, the Philippines

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Abstract

The Tubbataha Reefs Natural Park and World Heritage Site (TRNP) in the Philippines is both a marine protected area and an Important Bird Area. It is part of the East Asian-Australasian Flyway, serving as one of the critical sites for seabirds in the region. TRNP hosts the largest congregation of breeding seabirds in the country and represents one of the last multi-species seabird colonies in South East Asia. These seabirds breed on the two islets in Tubbataha: Bird and South Islets. Since 2004, comprehensive seabird inventories have been conducted quarterly, and their presence is monitored monthly. Jensen and Songco (2016) conducted a thorough review of the breeding seabirds in the park, including three species of Boobies and Brown Noddy *Anous stolidus*, Black Noddy *A. minutus worcesteri*, Great Crested Tern *Thalasseus bergii*, and Sooty Tern *Onychoprion fuscatus*, from 1981 to 2013. The Black Noddy, endemic to the Sulu Sea and now only known to breed in Tubbataha, is a tree-nester. The other three species lay eggs on the ground. This study documents the change in the breeding phenology of these four species from 2004 to 2023. From 2004 to 2013, the Brown Noddy was mainly present from late April to early November, with the peak breeding season occurring from May to August. However, a shift in the breeding period has been observed in recent years. Early breeding was recorded from 2018 to 2022, with eggs appearing in February. Breeding was also recorded later in the year, in November, from 2019 to 2023. The Black Noddy primarily breeds from late April to August, and in some years, from September to October (2008 and 2009). In 2018, breeding began early in February. They also overwintered in small numbers and began to breed in November (2018 to 2023) until February and beyond of the following year. From 2004 to 2023, the Great Crested Tern bred mainly from May to August and, in some years, from October to November (2004-2006, 2009, and 2018) but in smaller numbers. From 2021, they began arriving in large numbers in February, although they did not lay eggs until April. The Sooty Tern has two subpopulations: the first breeding from February to July and the second from September to November. This species is usually absent from the park from December to the end of February. In some years (2017, 2018, and 2020), they overwintered and bred in November. In 2020 and 2022, breeding started early in January and had laid eggs in February. In 2021, breeding of the second subpopulation began early in June/July. The breeding patterns of these four species have shifted, as evidenced by their absence or unusually high breeding numbers during specific years or outside their typical breeding season. These changes may be associated with the impacts of the El Niño Southern Oscillation, the frequency of high-temperature anomalies, and differences in chlorophyll concentrations in the Sulu Sea.

Keywords: Seabirds, breeding phenology, Tubbataha

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S3-12

Diversity of Mangrove-associated Gastropods in Siargao Island Protected Landscape and Seascape, Philippines

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Abstract

There are few studies on mangrove mollusks in the Siargao Island Protected Landscape and Seascape (SIPLAS), and the available information is limited to specific species with economic value. This study aimed to assess the diversity of mangrove-associated gastropods and correlate them with water physicochemical and edaphic parameters. Results showed 24 species of gastropods belonging to 12 families across the sampling areas. The most frequently encountered species belong to the family Potamidae, specifically *Terebralia palustris* and *T. sulcata*. Santa Monica showed the highest value among the three areas based on abundance, richness, and species diversity. However, the three areas have no distinct snail composition based on Principal Component Analysis (PCA). In the clustering analysis, five major groupings of snail species were identified. The abundances of some species also appeared to correlate with mangrove characteristics and the edaphic examined parameters. *T. sulcata*, *Cassidula nucleus*, and *Cassidula philippinarum* showed a high correlation with the soil's water pH and organic matter content. *Littoraria scabra*, *L. intermedia*, *Cerithium corallium*, *Longchaeus maculosus*, *Telescopium telescopium*, *Clypeomorus bifasciata*, *Neritodryas dubia*, and *Monodonta labio* showed a high affinity for the prop roots of *Rhizophora*, water temperature and salinity. Lastly, *L. pallescens*, *Nerita trifasciata*, *N. planospira*, *N. balteata*, *N. exuvia*, *Drupella margariticola*, *C. pellucida*, *T. palustris*, and *Muricodrupa fenestrata* had a high association with the Total Dissolved Solids (TDS) in the water. These results indicated a distinct habitat preference and type of vegetation for specific families of gastropods in the mangrove habitats of SIPLAS. This baseline can be used in subsequent comparisons and monitoring works on the diversity and community structure of mangrove-associated gastropods in SIPLAS.

Keywords: Mollusks, mangrove ecosystems, Siargao Island, benthic macroinvertebrates

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S3-13

Foraging Microhabitat Selection of Spoon-billed Sandpiper in the Upper Gulf of Mottama, Myanmar

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Abstract

Spoon-billed Sandpiper (*Calidris pygmeus*) is Critically Endangered, declining 9% per year since 2009; although important wintering sites have been identified, little is known about why particular sites are selected. Intertidal mudflats are important for the survival of migratory and resident shorebirds. The mudflat provides numerous food sources for migratory waterbirds. The Gulf of Mottama Ramsar Site, Myanmar is one of the largest wintering sites across the East Asian- Australasian Flyway supports perhaps 60% of the global population of Spoon-billed Sandpiper in winter. Our objective was to identify microhabitat characteristics of Spoon-billed Sandpiper at foraging locations. We considered 1) location (relative to the distance to the main channel of the gulf); 2) temporal patterns (relative to the tide cycle); 3) physical substrate characteristics; and 4) possible food sources. Spoon-billed Sandpipers were observed at 26 foraging locations during the study (November 2019-March 2020). The sandpipers were found more frequently on mixed sand-mud substrate, similar to over-wintering sites in Bangladesh, and while it is likely that the mixed sand-mud substrate was generally further from the main channel than the pure sand substrate, presumably due to tidal action, we found no evidence that Spoon-billed Sandpiper locations were associated with the tide cycle. Logistic regression models indicated that foraging locations were associated with shallow surface puddles, compared to random locations. The mixed sand-mud substrate supported more polychaetes relative to crabs or insect larva, the three most common prey types in our 442 benthos samples used to assess prey availability. Our results strongly support the point that the Gulf of Mottama needs to be protected as an intact functioning estuary and key site for Spoon-billed Sandpiper and other threatened shorebirds. Although we have identified some characteristics of foraging sites associated with Spoon-billed Sandpiper at Gulf of Mottama. But we still have a lack of understanding whether and how potential prey drives their site selection and how these characteristics vary among wintering sites.

Keywords: *Calidris pygmeus*, East Asian-Australasian Flyway, mudflat, prey availability, shorebirds

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S3-14

16s rRNA gene metabarcoding reveals insights relating soil bacterial communities to plant species and peat properties of the Leyte Sab-a Basin Peatland – a degraded tropical peatland in Northeastern Leyte, Philippines

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Abstract

Tropical peatlands are important providers of various ecological services such as water regulation, nutrient cycling, and carbon sequestration. They possess diverse floral and microbial compositions, largely influenced by their peat properties. However, agricultural drainage has considerably altered their landscapes, undermining their ecological integrity and functions. The Leyte Sab-a Basin Peatland (LSBP), spanning about 2,108 hectares, is the Philippines' second-largest confirmed peatland. It is a vital water catchment in the northeastern portion of Leyte, offering flood control in nearby communities. Unfortunately, during the 1970s, extensive deforestation and drainage for agricultural purposes significantly degraded the peatland. Current rehabilitation initiatives of the LSBP are based primarily on floral assessments and peat physicochemical characterizations, but the microbial component remains poorly understood. This study aims to bridge this gap and provide insights into the roles of microbes in LSBP conservation and management. Peat microbial communities under six distinct plant species (*Cyrtosperma merkusii*=CM; *Fimbristylis umbellaris*=FU; *Ilex cymosa*=IC; *Metroxylon sagu*=MS, *Phragmites karka*=PK; *Terminalia copelandii*=TC) classified into three vegetation types: (1) peat swamp forest (PSF): IC and TC, (2) grassland (GL): FU and PA, and (3) peatland with cultivation (PC): CM and MS, were assessed by bacterial 16s rRNA gene (v3-v4) sequencing. Alpha diversity analyses (Shannon-Weiner index, Chao1 index, Faith's PD, Pielous's evenness, and Simpson's index) using relative read abundances of amplicon sequence variants (ASVs) revealed similar species diversity among sites. Firmicutes and Proteobacteria, Chloroflexi, and Acidobacteria were the most predominant bacterial taxa across all sites. Principal coordinate analysis (PCoA) using Bray-Curtis dissimilarity revealed that plant species more significantly influenced the bacterial community structure than by vegetation type. Meanwhile, canonical correspondence analysis (CCA) showed that pH, gravimetric water content, ammonia, and nitrate were the core parameters correlating with bacterial communities. Bacterial biomarkers for each vegetation species were identified through linear discriminant analysis effect size (LEfSe) (LDA score > 4). Notably, IC had the most numerous markers, with *Paraclostridium* exhibiting the greatest effect size among 36 markers, while MS had the fewest, identifying only members of *Alicyclobacillales*. These findings suggest that the LSBP exhibits micro-scale spatial variations in microbial abundance and composition, driven by the botanical origin of the peat and localized differences in specific peat properties. Furthermore, this study provides the first insights into the microbial ecology of tropical peatlands in the Philippines, serving as a foundational step in incorporating their roles into rehabilitative planning and interventions.

Keywords: peatland, LSBP, peat microbes, 16s rRNA gene, metabarcoding

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S3-15

Population Trends of Wintering Waterbirds in the Republic of Korea: Analysis of the Wintering Waterbird Census in 2002-2022

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Abstract

The Korean Peninsula, located within the East Asian-Australasian Flyway (EAAF), provides significant habitats for migratory waterbirds, including streams, lakes, reservoirs, and coastal areas. Since the 1990s, South Korea has conducted extensive monitoring programs for migratory birds, focusing on wintering waterbirds as well as spring and summer shorebirds at major wetlands nationwide. In this study, we analyzed population trend changes of 19 wintering waterbird species across 101 wetlands in S. Korea from 2002 to 2022, categorizing them by feeding and habitat types. Additionally, we employed dynamic time warping (DTW) and geographical self-organizing maps (Geo-SOM) to assess both spatial and temporal population changes. The results revealed a decline in surface-feeding waterbirds, particularly among upending and grazing types, while diving and pursuit diver demonstrated an increasing trend. Among the habitat types, only estuaries exhibited a declining trend. Population time series were grouped into three clusters based on the silhouette index, with two clusters showing population declines between 2008 and 2012. Spatial similarities in annual changes were divided into five clusters, with species within the same feeding types generally displaying similar patterns, although some species exhibited unique trends. Habitat loss due to urbanization and climate change has contributed to the decline in surface-feeding waterbirds. Notably, the Four Rivers Project, carried out in S. Korea between 2008 and 2012, likely had a negative impact on surface-feeding waterbirds by increasing river depth and reducing riparian areas. Differences in resource preferences and habitats among species within the same feeding type suggest the need for more detailed studies. Our findings provide valuable insights into the status of wintering species and can help prioritize conservation efforts for waterbirds. We recommend considering external factors, such as environmental data, to identify the drivers and threats behind population changes in waterbirds in the future.

Keywords: Wintering waterbirds, population, trend, South Korea

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S3-16

Composition, Abundance, and Diversity of Rotifers in Pasig River – a Vulnerable Wetland in the Philippines

Yves Christian L. Cabillon^{*,**†}, Cynthia C. Marquez^{*}, Rhenzo V. Rance^{*}, Mhelissa Anne D. Dorado^{*}, Maria Lourdes Q. Moreno^{*}

Abstract

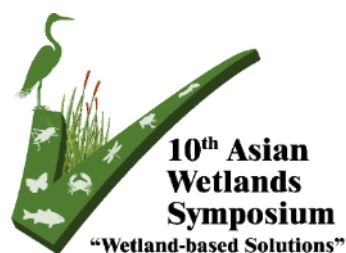
The Pasig River, a vital waterway in the Philippines, has become a glaring reminder of environmental degradation in our inland wetlands. Historically, the Pasig River was pulsed with aquatic life. It served as an alternative transportation route and teemed with diverse fish species like native gobies, carp, and shrimps. Now, it depicts murky waters and dwindling biodiversity. Due to the rapid urbanization and industrialization, Pasig River increasingly became a dumping ground for industrial and domestic wastes, leading to severe water pollution. The dissolved oxygen levels plummeted, creating a hypoxic environment unsuitable for most aquatic life. The decline of the Pasig River's aquatic biodiversity has driven various interventions. The Philippine government launched the Pasig River Rehabilitation Program in the 1990s, aiming to improve water quality through dredging and biological control methods. In an effort to evaluate these various interventions, the Pasig River Coordinating and Management Office (PRCMO) and Ecosystems Research and Development Bureau (ERDB), have been currently conducting a biodiversity assessment of aquatic biota. Aside from fish and macrobenthic invertebrates, zooplankton diversity in Pasig River are determined in order to provide a comprehensive picture of its water quality conditions. Freshwater zooplankton, particularly Rotifers, are important biological indicators in a waterbody. Information on their composition, abundance, biodiversity, and distribution are useful in the assessment and monitoring of water quality. Data collection to determine the rotifer assemblage was conducted in March 2024. Zooplankton were collected in five pre-determined Pasig River sampling stations. Two upstream stations (Napindan and Kalawaan), 1 midstream (Hulo-Valenzuela), and 2 downstream stations (PUP and Delpan) were assessed. A conical plankton net with a mesh size of 20 microns was towed vertically at a depth of 5 meters. Collected water samples were placed in properly labelled bottles and were fixed with 10% formaldehyde. Rotifers were identified to the lowest possible taxa using taxonomic keys such as those of Mamaril and Fernando (1978), Papa and Mamaril (2018), and Papa et. al (2009). For the density estimation, 1-ml aliquot sample was placed in a Sedgewick-Rafter counting chamber and was analyzed under a compound microscope. Rotifer abundances were estimated and expressed as density or the number of individuals/m³. A total of 10 rotifer species were observed in Pasig River. The highest abundance (3,040 indv/m³) and richness (8 taxa) of rotifers were recorded in the midstream section. The Shannon Diversity Index ranged from 1.252 to 1.907, and the highest value was also computed in the midstream. Among the rotifers identified were pollution-tolerant species such as *Brachionus* spp., *Keratella* spp., and *Filinia* spp., which validates the degraded water quality condition of Pasig River. A similar study (Lazo et.al, 2009) documented 30 rotifer species which is relatively higher than the 10 species encountered in this study. The low diversity and richness of rotifers observed further confirms the continuous deteriorating condition of Pasig River. Monitoring other aquatic biota and integration of water quality parameters should be conducted, and vital interventions should be continued in order to revive one of the most historically important and vulnerable inland wetlands in our country.

Keywords: zooplankton, Rotifers, Pasig River

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Session 4 – Conservation and wise use of wetlands

Research and case studies on protecting and conserving wetlands and relatively small wetlands located in either rural or urban areas that support the livelihoods of local communities and biodiversity

S4-1: Building with Nature Approach in Mangrove Ecosystem Restoration for Coastal Resilience

Yong Huai Mei, Azwani Sahibu

S4-2: The Wise-Use Checklist as a Science–Policy Interface – the Interaction of Science and Policy in Taiwanese Wetland Conservation Policy

Chen-Guang Lee

S4-3: Toward Sustainable Management of Nonglom Wetlands, Attapeu, Lao PDR

Kosal Mam, Viengxay Xaydala

S4-4: Assessment of Water Surface Area Changes in Inle Lake, Myanmar: Remote Sensing Approach

La Minn Ko Ko, Takeshi Fujino

S4-5: Rapid Assessment of Ecosystem Services in Small Agricultural Reservoirs: A case Study from Gunsan City, ROK

Migyeong Jung, Gwang Hee Yang, Ji Yoon Kim

S4-6: Wetlands: The Life Support of Zamboanga City, Philippines

Vanessa Joy G. Dael

S4-7: Proposal for Wise Use of Crab Resources in Sundarbans Reserve Forest and its periphery areas

Ozaki Yuki, Doi Masanori, Hasan Ahmed Chowdhury, Zahir Uddin Ahmed, Tapan Ghosal, Asaduzzaman Miah, Md. Jayedul Islam

S4-8: Enhancing Wetland Conservation and Sustainable Livelihoods through Integrated Rotational Salt and Fish Farming in Cox's Bazar

Tapan Kumar Ghosal

S4-1

Building with Nature Approach in Mangrove Ecosystem Restoration for Coastal Resilience

Yong Huai Mei^{*†}, Azwani Sahibu^{**}

Abstract

Building with Nature (BwN) is one of Nature-based Solutions which integrate the natural ecosystem elements in the design of water infrastructures to benefit environment, economy, and society. This pilot project adopted BwN approach to address the environmental issue at Tanjung Kepah, a small fishermen's village located in Manjung District, Perak, Malaysia. The majority of the locals there are fishermen, who depend on the coastal resources for their primary source of income, with small-scale companies serving as a supplement. Unfortunately, the area has suffered severe erosion due to strong wave energy and an imbalance in natural sediment dynamics, resulting in the destruction of nearly two kilometers of mangrove belt along the shore. In collaboration with Universiti Teknologi PETRONAS (UTP) and local community of Tanjung Kepah, a 25 m length of permeable wave screen structure was installed along the coast to attenuate wave energy and restore the natural sediment balance from erosive to accreting. Generally, the structure is fence-like design consists of two rows of vertical bamboo poles with two rows of horizontal bamboo connected to the vertical poles, and bundles of tree branches and twigs as filling materials in between the poles. The structure has been recognized as a holistic and cost-effective solution that incorporates natural ecosystem elements mimicking the complex root system of mangroves. Numerical modelling of the structure placement on the site revealed a reduction in current speed and maximum significant wave height behind the wave screen. This impact and change create a sheltering effect on the shore where low energy and sedimentation are promoted to enhance mangrove ecosystem recovery. Once the dynamic equilibrium of the area has been reached, enrichment planting of suitable species will be carried out to facilitate the recovery in accordance with the appropriate guidelines. Furthermore, the participatory approach from multidisciplinary stakeholders to implement this project is an essential element towards successful coordination and balanced decision-making. Strategic partnerships with the relevant local authorities; Department of Irrigation and Drainage (DID), Forestry Department (FD), and Land and District Office (LDO) from the project initiation phase facilitate the implementation of relevant project strategies and allow tools for change in practice on coastal restoration work. Meanwhile, local communities are empowered to augment their knowledge, system understanding, and skills in the design and construction processes. Their voluntary involvement will establish a sense of ownership and make informed decisions on the monitoring and maintenance work in the long run. Moving forward, the communities assisted by the Fisheries Research Institute (FRI) Malaysia are currently designing a farming model for sustainable cultivation and harvest of shellfish. The traditional local knowledge along with the scientific input could improve the farming practices and proper operation without causing a negative impact on the ecosystem. We believe this will not only be able to support the local socio-economy but also enhance coastal resilience through the reinstatement of the full range of ecosystem services they provide, combined with the sustainable use and management of the resources.

Keywords: Building with Nature; Mangrove Restoration, Community-based

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The Wise-Use Checklist as a Science–Policy Interface – the Interaction of Science and Policy in Taiwanese Wetland Conservation Policy

Chen-Guang Lee *

Abstract

The ‘Wise-Use Checklist’ was designed as a science–policy interface (SPI) to assist scientists, NGOs, and planners in formulating the ‘Conservation–Utilisation Plans for Wetlands of Importance’ in Taiwanese wetland conservation policy programme. Feedback from the planning teams, however, indicated that the checklist was difficult to use. Therefore, this research employed the perspective of SPIs to understand the barriers people were experiencing while implementing the checklist and identify the factors influencing the governance between science and policy in wetland conservation. The study mainly focused on the period from 2013 to 2015, when the wetland conservation policy was transformed into legislation and regulations in Taiwan. Semi-structured interviews were used to understand the thoughts of planners who participated in the formulation of the plans. The interviews revealed that the checklist is useful for information and strategy integration. However, the main barrier to the planners was the uncertainty produced by perception divergence, technical difficulties, and policy–institutional barriers, rather than the checklist itself. The responses identified tensions and governance issues among the scientists and between the scientists and policymakers with respect to wetland conservation policies. The research yielded two findings in the aspect of the SPIs themselves, and six areas for discussion in the aspect of governance between wetland scientists and policymakers. The six discussions are: 1. The implicit influence of uncertainty and institutions suppressed the arguments of wetland conservation produced by the planners 2. The dialogue between science and policy was insufficient and often unidirectional. 3. The mismatch between environmental systems and institutions caused fragmentation in environmental strategies. Proper system models are suggested to support information and knowledge integration. 4. Competition among the wetland sciences pushes policymakers to choose conservative stands. The work of SPIs harmonisation is necessary for increasing the efficiency of wetland conservation. 5. The different concepts of time among scientists and policymakers may influence the flexibility of the wetland conservation plans and actions. 6. Wetland scientists’ ability to imagine the ‘future’ may be limited by their professional training. Proactive and visionary measures for wetland conservation require co-production of science–policy interactions.

Keywords: science–policy interfaces, wetland conservation policy, Wise–Use Checklist, Wetland Conservation Act, Taiwan

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S4-3

Toward Sustainable Management of Nonglom Wetlands, Attapeu, Lao PDR

Kosal Mam*, Viengxay Xaydala**

Abstract

Nonglom is a permanent freshwater lake, 1 to 2.5 meters deep and covering approximately 20 hectares. It is surrounded by paddy fields farmed by residents from Hom and Thamaleuy villages. Located in a seasonally flooded plain with heavily degraded habitats, the lake receives surface runoff from a nearby plateau and drains into the Sekong River through a seasonal channel. Recent studies show that the lake disconnects from its groundwater system during the dry season. In 2006, a regional project introduced a one-day traditional fishing practice policy to manage the lake and surrounding flooded plain. However, no local consultation was conducted, and no written management plan was produced. The initiative was initially successful but ceased in 2009 when the project ended. While traditional rice farming does not pose an issue, access to both water and fishing, which is open and non-sustainable, compounded with chemical pollution from watermelon farming in the dry season, presents serious concerns. The case study aims to document the co-management planning process for Nonglom within the Attapeu Agrological Living Landscape, supported by the CGIAR-Agroecology Initiative (AE-I) and facilitated by WorldFish Cambodia and IWMI Lao PDR. The results from the process will be documented and shared with the broader international agroecological community of practice. The process began with a stakeholder consultation workshop, from which Nonglom was selected and broader stakeholder groups were mapped in. An awareness workshop was organized with the broader community to validate the need for actions. A dedicated group of a dozen members from the stakeholder groups was established to co-design and co-develop the management plan. The group identified and prioritized threats, defined long-term goals, and set management objectives before proposing a set of actions and activities. The draft management plan addresses current threats and challenges, setting five objectives: promoting sustainable water use, mitigating agricultural pollution, ensuring sustainable fishing, restoring ecological functions, and developing local management mechanisms. Actions include establishing a management committee and four thematic groups focusing on water use, fisheries conservation, research and monitoring, and patrol and awareness. Local stakeholders committed to the plan and signed up for the proposed management committee and thematic groups, with initial capacity building provided to support implementation. The project and local stakeholders are now looking to establish sustainable local financing mechanisms to support long-term engagement and wetland management. The bottom-up co-management planning reinforces the current participatory process, and the knowledge generated by the network of stakeholders in the planning process and in implementing the plan thereafter is expected to inform policy decisions at immediate and higher levels on how to improve resource management at the local and broader scale. Key lessons include that discontinuous external support without genuine local engagement did not lead to lasting solutions, despite some short-term successes. The importance of early and continuous stakeholder engagement, fostering a sense of ownership and commitment by the broader community to the management plan, is emphasized. The study underscores the need for a long-term sustainable local financing mechanism to support ongoing engagement and sustainable wetlands management.

Keywords: Nonglom Lake, sustainable water use, agricultural pollution, sustainable fishing, ecological restoration, local management mechanisms, stakeholder engagement, sustainable financing.

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S4-4

Assessment of Water Surface Area Changes in Inle Lake, Myanmar: Remote Sensing Approach

La Minn Ko Ko^{*†}, Takeshi Fujino^{*}

Abstract

The Inle Lake, situated in Shan State, Myanmar, ranks as the country's second-largest lake, hosting a population exceeding 170,000 people in its vicinity. The primary livelihood of these inhabitants revolves around agriculture, with a notable emphasis on floating gardens. Renowned for its picturesque setting, diverse wildlife, and unique human cultures, the Inle Lake stands out as one of Myanmar's premier tourist attractions. Additionally, it serves as a crucial water source for one of the nation's significant hydroelectric complexes. Nonetheless, the lake faces severe threats from both natural and anthropogenic factors spanning several decades, posing risks such as the reduction of open water surface area and a potential decline in water quality (Lwin and Sharma, 2012). This study aims to concentrate on monitoring changes in the lake's surface water area, contributing valuable insights to the sustainable management of the land ecosystem. Landsat data were obtained from the Earth Explorer website, rainfall (RF) from JAXA Climate Rainfall Watch and evaporation (ETo) from FAO AQUASTAT Climate Information Tool. Changes in water surface area between 2003 and 2023 were examined using Landsat images in ArcGIS. Additionally, correlation with the surface water area changes of Inle lake and meteorological variables was analyzed to understand which climatic variables contribute to the surface water area changes. The surface water area (SWA) in Inle Lake varied significantly over the past 21 years, ranging from a minimum of 49.81 sq km in 2009 to a maximum of 85.15 sq km in 2018. Annual rainfall data, ranging from 291.27 mm in 2003 to 920.65 mm in 2010, while ETo varied with 1,000 mm/m in 2023 to 1,350 mm/m in 2010, both showing weak correlation with SWA changes. These patterns suggest that other environmental and anthropogenic factors, beyond rainfall and evapotranspiration, may be influencing lake dynamics. Similar findings are reported by Coe & Foley (2001) and Olago (2001), who noted large seasonal and interannual fluctuations in water bodies, often reaching 20-30%. Kummu et al. (2014) further emphasized that fluctuations exceeding 20% over multiple years are considered significant. Also in our study, significant reductions in SWA exceeding 10% were observed in 2009, 2011, and 2015. Sustainable water management practices, including the promotion of organic farming to reduce harmful runoff and long-term monitoring programs, are recommended for maintaining the lake's ecological balance (Lwin & Sharma, 2012; Li et al., 2022). We observed substantial fluctuations of surface water area in Inle Lake over the last two decades, highlighting the complexity of the lake's dynamics. Our findings on a weak relationship between surface water area, rainfall, and evapotranspiration suggest that other factors such as land use changes and human activities may play a more prominent role in sustainable lake management. Our findings suggest sustainable water management practices in Inle Lake such as the involvement of local communities in conservation efforts and the integration of water resource management with land use planning for ensuring the lake's ecological and socio-economic viability in the future.

Keywords: Surface Water Area, Inle Lake, Remote sensing, NDVI, Land Use Land Cover

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S4-5

Rapid assessment of ecosystem services in small agricultural reservoirs: A case study from Gunsan City, ROK

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Abstract

RAWES (Rapid Assessment of Wetland Ecosystem Services) provides a rapid and comprehensive understanding of ecosystem services in various wetland ecosystems. It is increasingly being applied to different wetland types in Asian region to capture the status of wetland ecosystem services that are rapidly changing due to pollution, land use change, urban expansion, climate change, and management options. In this preliminary study, three small agricultural reservoirs (i.e., Mije, Baekseokje, and Okgu reservoirs) in Gunsan city were selected as test sites. These are typical types of artificial wetlands in agricultural landscape along the west coast of the Republic of Korea. Each site is located close to an urban area and has characteristic uses by local residents and regional visitors. Mije Reservoir is located in the city center and has various recreational facilities. Baekseokje is an old reservoir with dense wetland vegetation. Despite the continued expansion of *Sailx* spp. and succession, it continues to recharge and supply groundwater, providing irrigation water to nearby agricultural land. Okgu Reservoir was created as an agricultural reservoir in the early 1920s and is still used for agricultural and industrial water supply. However, it suffers from severe water pollution and algae blooms in the summer. The rapid assessment was conducted in two steps. First, we searched academic literature, reports, and gray literature related to three reservoirs. Then, we visited each reservoir site, reviewed the potential benefits identified in the literature review phase, interviewed local residents, and assessed the items that related to provisioning, regulating, cultural, and supporting service. The overall methodology followed the RAWES practitioner's guide. Overall, Mije Reservoir received a high RAWES score in cultural services due to its easy accessibility to local communities. Baekseokje Reservoir received a high score in supporting service because of its well-preserved wetland vegetation and habitats. Okgu Reservoir had a lower ecosystem service due to negative components such as severe eutrophication and green algae blooms. Although these three reservoirs are located close to each other, the results of RAWES showed large differences in the relative importance of ecosystem services. The overall ecosystem services and their relative contribution closely related to the current condition of reservoirs and regular management activities. This study highlights diverse roles and ecosystem services of small reservoirs. The results can be used to suggest efficient wetland management planning based on the characteristic benefits of individual sites.

Keywords: Ecosystem Services, RAWES, Artificial Wetland

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Wetlands: The Life Support of Zamboanga City, Philippines

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Abstract

Wetland plays an important role as it provides various beneficial services for the people and the environment. Wetlands, also called the “earth’s kidney”, serves as a pollutant filter which improves the water quality for the most basic human needs – domestic, agricultural, farming, and industrial use. Other functions wetlands serve are floodwater storage, wildlife habitat, life cycle support to many marine species, aesthetics, and recreation. Zamboanga City caters two (2) Protected Areas that has wetland ecosystem – the Pasonanca Natural Park (PaNP), a newly declared ASEAN Heritage Park (AHP), and the Great and Little Sta. Cruz Islands Protected Landscape and Seascape (GLSCIPLS). The Pasonanca Natural Park is one of the main sources of potable water catering to the majority of Zamboanga City. The PaNP and GLSCIPLS maintain a high significance in terms of biodiversity. Wetlands outside protected areas within the city such as the Calarian Wetland, Vitali Wetland, Victoria Wetland, Mampang-Tugbungan Wetland, Talon-Talon Wetland, and Sa-az River and San Ramon Shoreline Wetland are identified as Asian Waterbird Census (AWC) Sites for waterbird species. Caves are special type of wetlands. In Zamboanga City, there is an abundance of caves scattered among the 98 barangays of the city. The objective of this paper is to elaborate the various services people and the environment benefit from wetland ecosystems. The Department of Environment and Natural Resources is the lead agency in conserving, protecting, and managing wetland ecosystems in the Philippines. The Protected Area Management and Biodiversity Conservation Unit (PAMBCU) of CENRO Zamboanga City conducts annual monitoring of water bird species including migratory water birds, quarterly monitoring of threatened species including the Critically Endangered Philippine eagle (*Pithecophaga jefferyi*), Hornbills, Marine turtles, and Flying foxes, and caves and wetlands assessment and profiling as part of the annual Work and Financial Plan (WFP) of the department. As a result, the PaNP and GLSCIPLS are home to many wildlife species, especially the Critically Endangered Philippine eagle (*Pithecophaga jefferyi*) and Critically Endangered Hawksbill turtle (*Eretmochelys imbricata*) and Endangered species such as the Beach stone- curlew (*Esacus magnirostris*), Giant flying fox (*Pteropus vampyrus*), Green sea turtle (*Chelonia mydas*) and Olive ridley turtle (*Lepidochelys olivacea*). Aside from providing habitat for wildlife species, these PAs also cater as ecotourism sites and provide livelihoods for the indigenous people especially at GLSCIPLS. During the annual AWC, many water birds, especially migratory species were documented feeding and using the different wetlands in the city as their staging sites during the migration period. These water birds, migratory and endemic species include the Endangered Far eastern curlew (*Numenius madagascariensis*), Vulnerable Philippine duck (*Anas luzonica*), Vulnerable Oriental darter (*Anhinga melanogaster*), and Vulnerable Tabon scrubfowl (*Megapodius cumingii*), among others. Classified caves, especially Class II and Class III which are utilized for tourism and resource extraction such as water source for domestic use are few of the positive and beneficial services from karst wetlands. It also presents an opportunity for the local community to have an income generating activity wherein it provides livelihood to the residents hired as local tour guides. In conclusion, the wetlands are vital keys in supporting life in Zamboanga City. Mainly, it provides potable water for the whole city. It also serves as wildlife habitat for threatened species. Lastly, wetlands provide livelihood for the local residents.

Keywords: wetlands, Zamboanga City, protected areas, Pasonanca Natural Park, Great and Little Sta. Cruz Islands Protected Landscape and Seascape

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S4-7

Proposal for Wise Use of Crab Resources in Sundarbans Reserve Forest and its periphery areas

Ozaki Yuki[†], Doi Masanori^{*}, Hasan Ahmed Chowdhury^{**}, Zahir Uddin Ahmed^{***},
Tapan Ghosal^{****}, Asaduzzaman Miah, Md. Jayedul Islam

Abstract

Taking advantage of its natural conditions, Bangladesh has traditionally had a large fishing and aquaculture industry. It remains an important industrial sector. In other words, the fisheries industry is responsible for 3.57% of the Gross Domestic Product (GDP) and a quarter of the GDP of agriculture, forestry, and fisheries in 2020-21. The Government of Bangladesh aims to promote sustainable development of the fisheries sector and food security, poverty reduction and environmental protection in the Bangladesh Delta Plan 2100, enacted in 2018, and in the 8th Five Year Plan (2020-2025). There are many challenges to promoting sustainable development in the fisheries sector. This issue focuses on mud crab, which is considered to have many problems in terms of resource management, although it is second in importance to farmed shrimp as a product that earns foreign currency. This study aims to investigate the actual situation, hold discussions with government officials of the partner country and consider the possibility of future cooperation. The study was conducted in the Sundarbans Reserve Forest (SRF) and surrounding areas in Khulna District, the largest mud crab fishing ground in Bangladesh. A field survey was conducted on the actual situation of the mud crab fishery in the area, the management system of the Reserved Forest, the actual situation of soft-shell crab production, which has developed in recent years, and the actual situation of artificial seed production of crablets, etc., and problems and issues were identified. Based on the results of discussions with relevant organizations, a proposal was made for a “Project for wise use of crab resources in Sundarbans Reserve Forest and its periphery areas” (tentative title), which aims to 1) develop a comprehensive resource management plan for mud crabs in the SRF and its surrounding area, and 2) improve the livelihood of crab fishermen by reducing fishing pressure in the protected forest. The Forest Department (BFD), in collaboration with the Fisheries Department (DoF), Bangladesh Fisheries Research Institute (BFRI) and academic research institutions, would like to prioritize activities such as digitization of catch data and livelihood support for small-scale crab fishermen (creation of compensation programmes for fishermen for limited fishing activities) in the project. The proposal has been shared with the relevant agencies (BFD, DoF and BFRI), who are all highly interested in the issue of crab fisheries in the SRF and its surroundings and understand the need for coordinated activities. In particular, it was understood from the BFD that the Forest Co-management Rule 2017 requires restrictions on activities or livelihood support for residents in peripheral areas that are considered to affect the SRF. It was also well understood that those efforts are supposed to be undertaken by the BFD together with stakeholders such as the DoF and local government to establish a management system. It is hoped that these agencies will consult with each other to determine the specific project components, and then seek support from the Japanese Government, other donors, or NGOs for the necessary parts to be implemented.

Keywords: Wise use, Protected Area Management, Mangroves, Bangladesh, Mud Crab fishery

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Enhancing Wetland Conservation and Sustainable Livelihoods through Integrated Rotational Salt and Fish Farming in Cox's Bazar

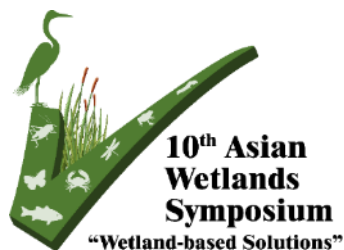
Tapan Kumar Ghosal*

Abstract

Cox's Bazar, a productive marine-coastal region in Bangladesh, is known for its extensive wetlands, providing vital ecological services, and supporting various livelihoods. Traditionally, salt production and aquaculture have coexisted here. However, shrimp and finfish aquaculture's prominence has often overshadowed integrated farming practices. Recently, the shrimp industry has faced significant challenges due to virus infestations, rising temperatures, increasing salinity, and declining groundwater. These issues have reduced shrimp yields and rendered traditional agriculture less viable, threatening aquaculture's sustainability. In response, farmers are adopting rotational systems that combine salt production with white fish and finfish farming post-summer, offering a sustainable alternative that enhances both economic and environmental outcomes. This study explores the benefits and challenges of integrating salt and fish farming in Cox's Bazar's underutilized wetlands. It aims to assess the economic viability, ecological impacts, and sustainability of this rotational system, particularly in response to the shrimp industry's challenges. The study also evaluates how this approach can maximize economic benefits while preserving wetland ecosystems. A mixed-method approach was used, combining field observations, stakeholder interviews, and economic analysis. Data from local farmers, the salt industry, and environmental experts were gathered to assess the integrated farming system's efficiency and environmental sustainability. Comparative analyses were conducted between standalone salt production, fish farming, and the integrated system to determine their respective benefits and challenges. The implementation of rotational salt and fish farming in Cox's Bazar has proven both economically and environmentally advantageous. Alternating between salt production in the dry season and fish farming afterward conserves wetlands and prevents soil salinity buildup, while enhancing biodiversity. Economically, the system stabilizes local livelihoods by diversifying revenue streams. By transforming underutilized wetlands into productive landscapes, this method mitigates risks associated with single-crop farming and supports sustainable wetland management. The study demonstrates that integrating rotational salt and fish farming in Teknaf Upazila, Cox's Bazar, offers a viable solution to the shrimp industry's challenges. By alternating between salt production and fish farming, the system conserves wetland ecosystems, enhances biodiversity, and diversifies local income, promoting sustainable wetland management.

Keywords: Wetland utilization, rotational salt and fish farming, sustainable livelihoods.

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Session 5 – Carbon-rich wetlands

Research and case studies to discuss the soil carbon pool of wetlands and clarify the role of wetlands in the global carbon cycle

S5-1: Wetlands as Fundamental Carbon Sink across the Hindu Kush Himalaya (HKH) Region

Dan Zhu, Huai Chen, Ning Wu

S5-2: “C-WETLAND”: A New Paradigm to Enhance Conservation of Carbon-rich Wetlands

Huai Chen, Zicheng Yu, Ning Wu, Yanfen Wang, Xinwei Liu

S5-3: Peatland Inventory and Assessment in India

Dhruv Verma, Shivani Negi, Dr. Ritesh Kumar

S5-4: High-Altitude Wetland and Ramsar Sites Management Status in the Hindu Kush Himalaya

Srijana Joshi

S5-1

Wetlands as Fundamental Carbon Sink across the Hindu Kush Himalaya (HKH) Region

Dan Zhu^{*†}, Huai Chen^{*}, Ning Wu^{*}

Abstract

In the Hindu Kush Himalaya region, wetlands serve as ecological conduits, demarcating the transitional zones between glacial, forested, and rangeland ecosystems situated at elevated altitudes and aquatic systems such as rivers and lakes at lower elevations. These ecosystems frequently coalesce to form intricate landscapes, a phenomenon potentially attributable to both geological and ecological dynamics. Geological influences are inherently natural, evolving over extended temporal scales, whereas ecological impacts are often anthropogenically mediated and manifest over more abbreviated periods. However, wetlands are experiencing reduction in extent and ecological importance due to a confluence of environmental stressors, including permafrost degradation, ensuing lowering of the water table, exacerbated soil erosion, and intensified grazing activities. These compromised wetlands, once effective carbon sinks, are now potential net emitters of greenhouse gases (GHGs), incurring a substantial GHG liability due to the prolonged timeline and extensive efforts required for their restoration. The development of effective conservation and restoration strategies is impeded by prevailing gaps in our comprehension of wetland carbon cycling processes. Therefore, investigative inquiries have been directed towards understanding the variability in peat accumulation with changes in altitude, discerning potential disparities in carbon sequestration potential and stability between lower and higher altitudes, and identifying the pivotal factors influencing these dynamics. Additionally, the ramifications of human activities and climate change on the regional export of carbon downstream need to be examined as well. To address these issues, a multifaceted research approach has been adopted, entailing the establishment of a comprehensive peatland network across the plateau and the creation of two elevational transects along the Himalayan range. Intensive research endeavors have also been undertaken in the Zoige wetlands, inclusive of a long-term monitoring station. Our research has yielded novel insights into wetland ecosystems. At individual sites, key components of the carbon cycle have been scrutinized, yielding data on net ecosystem exchange, carbon dioxide and methane emissions, and quantification of peat accumulation. Incubation experiments have been employed to elucidate underlying mechanisms where necessary. Landscape-level analyses have considered the spatial configurations of ecosystems and their interconnectivity, examining the interplay between wetlands and adjacent ecosystems, with a quantification of carbon export from these landscapes. On a regional scale, and across significant elevational gradients, patterns of carbon emissions have been characterized, revealing intriguing trends. The synthesis of data from disparate global locales has led to the proposition of a universal pattern concerning methane emissions from mountain wetlands worldwide. These findings have been corroborated through incubation experiments, with further research in this domain being actively pursued. The synthesized findings are as follows: Peat deposition diminishes with increasing altitude, concurrent with a younger initiation period. The capacity for carbon sequestration, as indicated by net ecosystem exchange (NEE), is more pronounced at higher altitudes, as is the temperature sensitivity of organic carbon decomposition. Seasonal freeze-thaw cycles exert a substantial influence on carbon emissions. The mid-altitude wetlands exhibit the most pronounced temperature sensitivity in methane emissions. Conservation and restoration measures have the potential to mitigate dissolved organic carbon (DOC) export from rangeland/wetland ecosystems, whereas permafrost degradation is observed to augment such exportation.

Oral Sessions

Keywords: peatland network; elevational transects; the Zoige wetlands

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“C-WETLAND”: A New Paradigm to Enhance Conservation of Carbon-rich Wetlands

Huai Chen^{*†}, Zicheng Yu^{***,****}, Ning Wu^{*}, Yanfen Wang^{*****,*****}, Xinwei Liu^{*,**}

Abstract

Wetlands have the highest ecosystem service value among all terrestrial ecosystems. Among their ecosystem services, carbon sequestration and its potential ability to mitigate climate change have been extensively discussed recently, not only in the academic community but in media during COP27 of UNFCCC and COP14 of Ramsar. In particular, peatlands—peat-accumulating wetlands—accumulate 600 Gt C globally. However, peatlands were historically exploited for their peat and reclaimed to other land use types. In fact, the definition of peatlands is based on their resource value lying in the organic matter content in peat. Therefore, under goals of conservation and carbon neutrality, “peatlands” may not be a precise concept for estimating and conserving the substantial carbon stock of this type of wetlands. As the most valuable ecosystem on Earth, wetlands including most peatlands provide substantial ecosystem services to human beings. Therefore, as an important part of wetlands, peatlands should not be evaluated by their organic matter content and peat thickness but rather by their important ecological function, especially for their substantial long-term accumulation of soil carbon. For highlighting the carbon stock of wetlands rather than considering their resource characteristics, a new systematic description of carbon-rich wetlands is needed for accurately understanding the distribution of the wetlands, and for better conserving their carbon stock. Therefore, we propose a new term “C-wetland” for carbon-rich wetlands. By replacing resource-oriented “peat” by conservation-oriented “organic soil material”, we conceive a new framework for “carbon-rich wetlands”, with an emphasis on conserving organic carbon rather than consuming organic matter from wetlands. In soil science the boundary between organic soil material and mineral soil material is defined at 12% of organic carbon (by weight), which has also been adopted by the recent Global Peatlands Assessment. From the point of view of conserving organic soil material, defining carbon-rich wetlands should not involve the accumulating thickness. According to abovementioned rationales, we coined a new term “C-wetland” for carbon-rich wetlands defined as a typical wetland with accumulated organic soil materials containing (by weight) no less than 12% of organic carbon. We propose this new term of C-wetland not only to highlight the function of carbon-rich wetlands as long-term carbon sinks and their substantial carbon stock in climate mitigation but also to appeal for the prioritizing of the conservation of global wetland carbon stock, especially under the framework of global carbon neutrality.

Keywords: C-wetland, Peat, Organic soil material

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Peatland Inventory and Assessment in India

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Abstract

Peatlands, despite covering only 3-4% of the global land surface, store nearly one-third of the world's soil carbon, making them crucial for achieving global climate targets. However, the extent of peatlands in India remains uncertain due to limited research and inventory, lack of standardized country specific definition and varied estimation approaches. Global Peatlands Assessment Report (2022) estimated approximately 400,000 hectares of peatlands in India, whereas other remote sensing and modelling-based studies have estimated it to be 100,000-57,00,000 hectares. In response to this uncertainty, this study aims to develop a detailed peatland probability map for India using geospatial techniques. Open-access datasets, including radar, optical imagery, and the SRTM digital elevation model, were employed to identify potential peatland locations across diverse biogeographic zones, such as the Himalayas, Northeast, and Western Ghats. Hydrological, vegetation, edaphic, climatic, and topographical characteristics, along with land cover, were integrated and analysed within a GIS platform. Classification models, suitable for both tropical and temperate regions, were developed and applied, followed by an overlay analysis to determine probable peatland locations. The findings are crucial for mapping both peatlands and other carbon-rich wetlands. Preliminary results indicate that peatlands in the Himalayan and Northeastern zones could cover up to 0.8% of their total geographical area. The peatland probability map was validated using 55 field sites at different elevations and LULC classes to assess its accuracy. The model successfully identified known peatland locations, including Khecheopalri, Chandertal, Loktak Lake, Tsokar, and several alpine marshes in Uttarakhand and Himachal Pradesh. Most high-probability peatland areas were found in mid- to high-altitude rangelands and forested regions. Efforts are currently underway to enhance the model accuracy by incorporating data from other studies, national-scale inventories, and additional sampling in carbon-rich wetlands and swamp forests. The study prioritizes mapping and assessing these ecosystems to refine area estimates, conduct further research on greenhouse gas fluxes, and integrate the role of peatlands and other carbon-rich wetlands into India's action plans for climate change, wetlands, and biodiversity conservation.

Keywords: peatlands, biogeographic zones, geospatial, carbon-rich wetlands

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High-altitude wetland and Ramsar sites management status in the Hindu Kush Himalaya

Srijana Joshi^{†*}

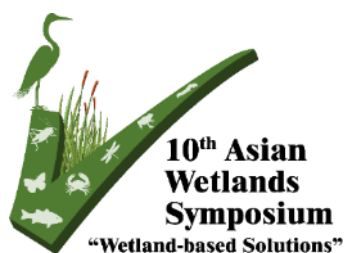
Abstract

High-altitude wetlands, located above 3,000 masl, of the Hindu Kush Himalayan (HKH) region play a critical role in local economies and regulation of natural processes. These wetlands are vital for flood mitigation, water flow regulation, water quality maintenance, and serve as significant carbon sinks. High-altitude wetlands in the HKH region harbour a wide array of floral and faunal species and are important habitats for many rare, threatened, and endemic species, and breeding and staging areas for migratory waterfowl. They are also critical for the healthy completion of the yearly life cycle of flagship migratory waterfowl that use the Central Asian flyway. However, many of these wetlands are degraded, resulting in ‘missed links’ in habitats along the migration route. Beyond the economic and ecological benefits of high-altitude wetlands, these sites also hold cultural significance for local communities. Of the 44 designated Ramsar sites in the HKH region, 21 are high-altitude wetlands. However, many of these Ramsar sites are under severe threat due to climate change and anthropogenic pressures, including unplanned development, unregulated tourism, excessive resource harvesting, overgrazing, and declining water quality. These stressors are not only degrading wetland ecosystems but also disrupting the migratory routes of flagship waterfowl, leading to habitat fragmentation and ecological imbalances. Addressing these challenges requires robust research and baseline studies to deepen scientific understanding, enable long-term monitoring, and guide effective conservation and management strategies. Integrating wetland conservation, restoration, and co-management into climate change mitigation and adaptation frameworks is essential to ensure their sustainability. Strengthened policies and practices will safeguard the ecological, economic, and cultural value of high-altitude wetlands, ensuring they continue to support biodiversity and community resilience in the face of a changing climate.

Keywords: peatlands, biogeographic zones, geospatial, carbon-rich wetlands

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Session 6 – Wetland education in the formal education sector (wetlands schools)

Case studies facilitating wetland schools and wetland education programs in the formal education sector at the national and regional levels in support of implementing Ramsar Resolution XIV.11

Wetland education in the formal education sector

S6-1: How to Leverage the Social Function of Nature Education in Nature Reserves: A Case Study of Yancheng wetlands and Rare Birds National Nature Reserve in Jiangsu Province

Chen Yaqin, Wang Xiao

S6-2: Conservation of Dafeng's Père David's deer (*Elaphurus davidianus*) and Wetlands

Ding Yuhua, Qi Liyan

S6-3: Exploration on Wetland Education in Primary Schools of Jiangnan District, Wuhan City, Hubei Province, China

Cheng Hui, He Lu

S6-4: Exploration and Practice of Sustainable Development Pattern of Chinese Horseshoe Crab Conservation Community in Fujian, China

Li Yuhong

S6-5: China Wetlands School

Wei Zhilin, Qi Liyan

S6-6: Design and implementation of Geographical interdisciplinary thematic teaching "marine shellfish culture" for junior middle school

Zhang Xuliang, Wei Haixiu, Pan Zhuo

S6-7: Using ecological research base to explore a new model of nature education taking Zhangye Wetland Museum as an example

Yang Fuhui, Wang Yuting, Liang Yaqiong

S6-1

How to Leverage the Social Function of Nature Education in Nature Reserves: A Case Study of Yancheng Wetlands and Rare Birds National Nature Reserve in Jiangsu Province

Chen Yaqin ^{*†}, Wang Xiao ^{**}

Abstract

With the rapid development of society and economy, protecting the natural environment and enhancing public awareness of ecological protection have emerged as a global imperative. In 2019, National Forestry and Grassland Administration of China issued the "Notice on Fully Leveraging the Social Functions of Various Nature Reserves to Vigorously Promote Nature Education." Based on existing educational outreach efforts, various types of nature reserves have incorporated nature education into their overall work plans as a key focus, proactively seeking out effective models for nature education. This paper takes Yancheng wetlands and Rare Birds National Nature Reserve in Jiangsu Province (hereafter referred to as the 'Rare Birds Reserve' as a case study to explore how the Reserve actualizes its social responsibilities through proactive involvement in nature education, with a specific focus on the implementation of school-based wetland education programs. The paper first introduces the basic situation of Rare Birds Reserve, elucidating that nature education is one of its important functions and central tasks. It then highlights the Reserve's practices in promoting wetland education in schools. The paper analyzes the current issues in its work and proposes further considerations for future endeavours.

Keywords: Rare Birds Reserve, nature education, social function, school

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Conservation of Dafeng's Père David's deer (*Elaphurus davidianus*) and Wetlands

Ding Yuhua*, Qi Liyan*

Abstract

David Deer (*Elaphurus davidianus*), commonly known as "Milu deer" is a rare and endangered species. China is the homeland of the Milu deer, and wetlands are the Milu deer's habitat. From 3000 to 10000 years ago, the population of David deer developed to its heyday. However, due to climate changes, human hunting, and habitat destruction, wild populations of Père David's deer became extinct in China more than 200 years ago. On August 14, 1986, 39 Milu deer were sent to Dafeng Milu Deer Nature Reserve in Jiangsu, China. After 38 years the population of Milu deer has grown to 8,216, with the largest population in the world. Protecting the milu deer is equivalent to protecting the wetlands. The effective protection of the Dafeng Milu Deer Wetland has greatly enriched the biodiversity of the wetlands. The conservation of Dafeng's Père David's deer and its wetland habitat is a significant undertaking with long-lasting benefits for future generations. It is our responsibility to continuously promote and advance the culture of wetland and Père David's deer conservation, disseminating knowledge to ensure consistent and dedicated efforts in this field. Since the establishment of China's first Wetland School in Dafeng in 2004, a new journey of Père David's deer wetland education has commenced. Over the past 20 years, in order to raise public awareness of nature conservation and encourage participation in the protection of Père David's deer and wetlands, the China Wetland School Network Committee has made full use of the natural resources surrounding Dafeng Père David's deer Wetlands to establish 13 wetland schools as platforms for education. Through the practice, it has proved that the construction of wetland schools and the dissemination of Milu deer wetland knowledge have constantly injected new impetus into red deer wetland protection. This work has received enthusiastic participation from the school, strong support from the government, and full recognition from society, showcasing the strong vitality of wetland schools.

Keywords: Père David's deer, wetland habitat, conservation, education

S6-3

Exploration on Wetland Education in Primary Schools of Jiangnan District, Wuhan City, Hubei Province, China

Cheng Hui^{*†}, He Lu^{**}

Abstract

The practice of wetland education in primary and junior middle schools of Jiangnan District, Wuhan City has summarized abundant experiences and achievements on local wetland education. Wetland education occupied an important position in ecological civilization education. The primary and junior middle schools of Jiangnan District of Wuhan City have been devoted to wetland education since the 1980s. In the past 30 years, the Education Bureau of Jiangnan District has been adhered to the concept of "people-oriented, future-oriented", deeply promoted wetland ecological education, and fully utilized the ecological, educational, and cultural value of wetlands. To promote the coordinated development of local regions, schools, teachers, and students, and achieve all-win situation of all parties. Through wetland education, Jiangnan District hopes to participate in country's ecological civilization construction, improve education quality, cultivate future talents with ecological civilization awareness, promote the all-round growth of students, and lead professional development of teachers, gradually forming a wetland education brand with distinctive characteristics, and contributing to the Chinese-style modernization construction of harmonious coexistence between man and nature. Education Bureau of Jiangnan District has adopted many measures for developing wetland education. In early stage, Huazhongli Primary School carried out wetland education by organizing "Love Birds and Protect Birds" activity, built a campus wetland education hall, compiled school-based textbooks, and became the first wetland school in the district. Since then, other schools have also launched innovative activities, such as "Pay Attention to Wetlands, Love My Lakes" of Huazhongli Primary School, "Protect Bar-headed Geese" of Qingfen Road Primary School, "Monitoring Water of Jiangnan District" of Daxing Road Primary School, and "I am a Naturalist" of Zhenxing Road Primary School. In addition, Dandong Primary School launched "Wetland Vientiane 5+N " special courses. Regional collaborative advancement has formed a linkage mechanism, wetland education has been incorporated into the overall education system, and resource integration, team building, and project research have further improved the professional level and practical depth of wetland education. After years of exploration, Jiangnan District has created 11 wetland schools, won many honors for wetland education, such as National Advanced Unit for Extracurricular Science and Technology Education, Hubei Provincial Environmental Protection Government Award. The wetland education activities of many schools won great results in the National Youth Science and Technology Innovation Competition, which enhanced students' environmental awareness and motivation and further improved teachers' professional ability, achieved coordinated development of multiple parties in the region and provided valuable experience for other areas. In the future, Jiangnan District will continue to establish new wetland schools, explore more effective measures and contribute to wetland protection and Chinese-style modernization.

Keywords: wetland education, wetland school, Jiangnan District, Primary School

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S6-4

Exploration and Practice of Sustainable Development Pattern of Chinese Horseshoe Crab Conservation Community in Fujian, China

Li Yuhong^{*,**†}

Abstract

This research project aims to explore a sustainable development model for the Horseshoe Crab Protection Community (HSCC) along the coast of Fujian. The project seeks to address ecological issues and benefits while also focusing on livelihood development strategies for local fishing communities. The study employs literature reviews, personal interviews, and investigations conducted by sample survey method on tidal flats during the two hours before and after the lowest tide. Population and Habitat Assessment: The study investigates and clarifies the population and resource status of juvenile horseshoe crabs, identifying threats to their habitats. This helps the HSCC, and resource management units understand the current status and threats to juvenile horseshoe crab habitats. Restoration Evaluation Index: A status and restoration evaluation index system for juvenile horseshoe crab habitats is established. This aids the HSCC and resource management units in understanding the protection and development needs of these habitats. Cultural Integration: Tangdong Fishing Village's unique cultures, such as Cai's ancestral culture, overseas Chinese culture, ancient house culture, and marine production culture, are integrated into a horseshoe crab-themed rural park. This includes planning cultural tourism study programs and practice demonstrations to help develop a cultural tourism economy. New media promotions are utilized to increase the visibility and influence of Tangdong Village, attracting tourists and promoting local economic development and rural revitalization. Educational Activities: Huaqiao University students lead Huaqiao University Jimei Affiliated School (China Wetland School) students to Tangdong Village to engage primary and secondary school students from HSCC in research activities on horseshoe crab protection. These activities, scheduled around festivals like Chinese Valentine's Day, promote wetland research and other scientific activities, enhancing the scientific understanding and conservation actions of local youth. Resource Connectivity: The HSCC connects with government units, experts, scholars, universities, research institutions, and civil society groups to strengthen science popularization and expand its influence. For example, during Chinese Valentine's Day in 2023, the Quanzhou Wetland Society connected these resources to advance scientific research, popular science, and cultural tourism in Tangdong Village. The science popularization activities were recognized with the National Excellent Science Popularization Activities award by the China Association for Science and Technology. This project explores the dual goals of protecting coastal biodiversity and promoting Chinese culture in fishing villages. By integrating wetland ecological education for youth, connecting multiple social resources, and promoting a new model of eco-tourism economic development, it aims to achieve a win-win situation for ecology, economy, and culture, thereby promoting rural revitalization and sustainable development.

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China Wetlands School

Wei Zhilin*, Qi Liyan*

Abstract

On December 26, 2004, China's first wetland school was officially inaugurated in Dafeng City, Jiangsu Province. As of June 2024, China has established 151 wetland schools in 22 provinces, municipalities and autonomous regions. The purpose of the establishment of wetland school is to carry out the popularization and education of wetland knowledge through the platform of primary and secondary schools as well as wetlands parks, and gradually let the public understand wetland knowledge and participate in wetland conservation, so that the wetland conservation must be started by teenagers, and only in this way is the hope of persistent wetland conservation. Over the past 20 years or so, China has established Wetlands School and Wetland School Network Committee, formulated application and approval procedures for wetland schools, compiled and published the Guide to the Construction of Wetland Schools, compiled more than 30 school-based textbooks, designed and promoted the flags, logos and banners of China Wetlands School, published six wetland school columns and special magazines, and trained more than 300 professional teachers. Held experience exchange and seminars for 8 times for 2000 people, held annual meetings for 9 times for nearly 3000 people, and formulated the five-year Development Strategic Framework of China Wetland School Network. A platform for experience exchange and information sharing in wetland schools has been established, and units and individuals who have contributed to the construction and development of wetland schools have been commended for many times. The construction and development of wetland schools have injected new vitality into the education and teaching of primary and secondary schools, wetlands parks, increased new teaching knowledge for teachers, and stimulated new learning interests for students. In recent years, China's wetland schools have laid a solid foundation and shown a momentum of rapid development. The establishment of the wetland school is only the first step in the long march to finish, and the road is long and arduous. Finally, wish wetland education blooms all over the world.

Keywords: wetland school, China Wetland School Network Committee, construction and development

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Design and implementation of Geographical interdisciplinary thematic teaching “marine shellfish culture” for junior middle school

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Abstract

The Ministry of Education of the People's Republic of China promulgated the *Compulsory Education Curriculum Program* (2022 edition) and new curriculum standards of 16 national curriculums, which including Chinese, Mathematics, Physics, Chemistry, Science, Geography, Biology, etc., in April 2022. The new curriculum program proposed that the compulsory education curriculums should follow the principles of focusing on cultivating students' core competencies, strengthening of curriculum integration and required primary schools and junior middle schools to strengthen the collaborative education function of curriculums, and perform interdisciplinary thematic teaching. Developing marine shellfish culture is an effective activity to wise use of the intertidal tidal wetlands. Marine shellfish culture does not need feed, however it can purify seawater of intertidal tide and offshore, provide high-quality protein food for human beings, fix carbon dioxide in atmosphere, and slow down the trend of global warming. Designing and implementing interdisciplinary thematic teaching of marine shellfish aquaculture in primary schools and junior middle schools has great significance, which can help students fully understand the concept of marine resource, the current status and resource & environmental benefits of marine shellfish aquaculture, learn the concept of marine resource and how to rational utilize marine resources, form consciousness of protecting marine resource and environment. To teach students the ability of solving real complex issues by using multidisciplinary knowledge and skill comprehensively, we created teaching situations by using real problems of marine shellfish culture of Qingdao City, Shandong Province, China, designed and implemented the geographical interdisciplinary thematic teaching of "marine shellfish culture" for primary schools and junior middle schools by combining theoretical teaching methods and field practice teaching methods, according to the requirement of interdisciplinary thematic teaching of *Compulsory Education Geography Curriculum Standards* (2022 edition). The main marine shellfish feed by fishermen in Qiangdao City include clams (*Ruditapes philippinarum*), Pacific Oyster (*Crassostrea gigas*) and Atlantic Bay Scallop (*Argopecten irradians*). The content of the interdisciplinary thematic teaching "marine shellfish culture" includes the classification, organism structure, and growth characteristics of marine mollusks, the morphological characteristics, material composition, hierarchical structure and ecological functions of their shells, the types of marine shellfish culture, breeding methods and cycles, and their regional differentiation in Qiangdao City, the existing problems, the factors which affect the yield and quality of marine shellfish culture, the ecological and economic benefits of marine shellfish culture, etc. It can effectively cultivate students' feelings of home and country, core competencies, innovation consciousness, practical ability, teamwork ability and oral expression ability.

Keywords: Interdisciplinary thematic teaching, Core competencies, Marine shellfish culture, Innovation consciousness, Practical ability

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Using ecological research base to explore a new model of nature education taking Zhangye Wetland Museum as an example

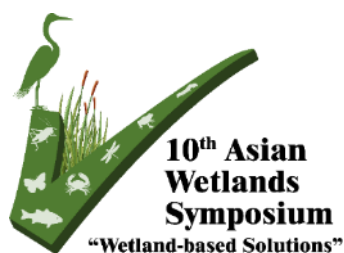
Yang Fuhui^{*†}, Wang Yuting^{**}, Liang Yaqiong^{***†}

Abstract

Natural education is a new form of juvenile education that has arisen in China in recent years, and it is still in the exploratory stage of development. Wetland Museum in Zhangye city, as a window for the public awareness. How to carry out wetlands education in wetland museum is an important topic worth studying. Taking Zhangye Wetland Museum as an example, this paper gives full play to the advantages of ecological research base, carries out a series of wetland nature education activities with teenagers as the main object, wetlands as the theme course, field experience as the main way, and harmonious coexistence between man and nature as the overall goal, and explores a new model of nature education. By observing wetland natural elements, natural environment, and natural phenomena, the students deepened their understanding of the harmonious coexistence between man and nature, enhanced their awareness of ecological environment conservation, and achieved the positive role of spreading wetland knowledge, practicing ecological civilization, and promoting harmonious coexistence between man and nature, providing references for the development of nature education in the region. Zhangye city located in the middle of Hexi Corridor, south to the Qilian Mountains, north to the Badain Jaran Desert. The Heihe River, the second largest inland river in the country, originates from the Qilian Mountains. The main tributaries of Heihe River flow through the territory of our city to form a large wetland, and the key ecological functional area of Gansu Province. The reed buds are luxuriant on the bank; Do not look at Qilian peak snow, wrong Zhangye recognize Jiangnan; Ganzhou city north of the water cloud township, every autumn deep look yellow; The mountains are wrapped in plain brocade, and the weak water ice cast crystal bridge. It is the true portrayal of the four beautiful times of Zhangye Heihe Wetland by ancient and modern poets. In recent years, relying on the beautiful environment, superior resources and excellent teachers, Zhangye Heihe Wetland has actively carried out a series of wetland ecological education activities with teenagers as the main object, local wetlands as the theme course, field experience as the main way, and harmonious coexistence between man and nature as the overall goal, and explored a unique new model of ecological education. In May 2020, Zhangye Heihe Wetland National Nature Reserve was awarded the title of Wetland School by China Wetlands School Network Committee which become the second wetland school in Gansu Province and the fifth wetland school in the country. In 2023, it was rated as National Nature Education School (Base) by the Chinese Society of Forestry. The wetland School of Zhangye Heihe Wetland National Nature Reserve independently developed 8 types of wetland ecological education courses according to the curriculum formulation paradigm of the famous curriculum theorist Taylor, which provided a theoretical basis for the development of wetland ecological education activities. Based on local characteristics, fully tap the resources of the museum exhibition hall, develop the cognitive courses of Exploring the Wetland Museum Wetland - the Cradle of Life and Online Wet Blog, so that young people can learn about wetlands through museum visits; Relying on the superior resources of Zhangye National Wetland Park and Zhangye Heihe Wetland National Nature Reserve, and focusing on the components of wetland system, namely abiotic elements (water, soil, climate, etc.) and biological elements (wetland plants, birds, fish, mammals, etc.), we have developed exploration courses such as Wetlands and Water Sources, Wetlands and Plants, Wetlands and Birds, and Wetlands and Insects. Let young people go into the wetland to explore the ecological function and biodiversity of the wetland; Combining theme days, traditional festivals, current political hot topics and other themes, we will develop wetland culture inheritance and competition courses such as Wetlands and Photography, Wetlands and Traditional festivals, and Wetlands and Painting. The rich

Oral Sessions

content and different types of courses meet the needs of teenagers seeking novelty and difference, and effectively ensure the concrete implementation of wetland ecological education.



Session 7 – Innovations in CEPA approaches

Innovative approaches and studies for CEPA (communication, capacity building, education, participation, and awareness) activities from diverse wetland stakeholders

S7-1: The SCPW Wetland Center Design Competitions: 20 years of CEPA for Wetland Centers in the Philippines

Aaron Lecciones, Amy Lecciones, Carlo Quintos, Darry Shel Estorba, Zenaida Ugat

S7-2: Connecting People, Nature, and Society: The East Asia Black-faced Spoonbill Flyway Children's Exchange Project

Akane Tokorodani, Hea-Jin Park, Yu Takaku, Nao Kusumoto, Mika Sasaki, Mayu Komori, Masato Dohi

S7-4: Empowering Conservation through Community Knowledge: Mangrove Assessments and Education in Del Carmen, Siargao Islands

Genea N. Cortez, Jorge Anton D. Ordas, Sarah G. Zamudio, Eiana Joshier Odulio, Chen Yen Ting, Rosario R. Rubite, Danilo N. Tandang, Cecilia B. Moran

S7-5: Empowering Community-Driven Wetland Conservation: The Development and Impact of the gamified mobile data collection App (Wetland Journey)

Prasad Jayasinghe, Matthew Simpson, Isuru Ranaweera, V. Manogaran, Andrea Berardi, Priyane Amerasinghe, Anuruddha Kumara

S7-6: Preliminary assessment of aquatic plants monitoring in urban reservoirs using citizen science program

Seong Min Lee, Migyeong Jung, Yunu Son, Yesil Yun, Ji Yoon Kim

S7-7: Promoting grassroots-level wetland cooperation network in the Bay of Bengal region: A case of crab bank initiative

Shimpei Iwasaki

S7-1

The SCPW Wetland Center Design Competitions: 20 years of CEPA for Wetland Centers in the Philippines

Aaron Lecciones^{*†}, Amy Lecciones^{**}, Carlo Quintos^{**}, Darry Shel Estorba^{**}, Zenaida Ugat^{**}

Abstract

In 2005, a pioneering design competition named “Designing Lumban Delta as an Eco-tourism Site” was launched by the Society for the Conservation of Philippine Wetlands in cooperation with a student organization, ASAPHIL-UP, to help spread awareness of the importance of green architecture and the wider consequences of bad development on the environment and on the sustainable development in the country. The competition aimed at providing future-builders of society the opportunity to expand their awareness of the role of wetlands in a built environment challenged by climate change and unsustainable development. The competition was opened nationwide, and student groups were invited to use an interdisciplinary approach for problem solving that targeted social (focusing on the local community), economic (providing local livelihood through eco-tourism), and cultural (strengthening of Filipino design aesthetic) aspects of designing a wetland center within a CEPA framework. A novel aspect of the competition was requiring the student groups to attend a series of learning activities from experts from relevant fields and disciplines in a series of symposiums that provided the needed foundation for holistically designing wetland centers and to bring to the fore issues of the wise-use and conservation of wetlands to the youth. This structuring of the competition focusing heavily on CEPA activities was a hallmark feature that separated it from other design competitions of its time. Because it was important to spread the work of these student groups to a wider audience, this competition also required the student groups to create scaled models of their designs, aside from the standard architectural design boards. Thus, CEPA activities during and after the competitions included exhibits of these work in different venues – from schools and shopping malls to the Philippine Senate. This initial design competition in 2005 was a success and became the inspiration for three more design competitions in 2009, 2014 and 2024. Since the first design competition in 2005, the SCPW has expanded the aims of the design competition, to now include partnering with interested organizations to fund the designs for local wetland communities leveraging on both a wider network of sponsors and partners. As a result of the design competitions, the SCPW in partnership with national government designed the Las Piñas – Parañaque Wetland Park Wetland Center Complex from 2013 to 2020. Continuing challenges include aspects of competition management and administration such as fundraising and operations, and importantly, steering messaging towards CEPA-aligned themes especially with an increasingly diverse set of sponsors and partners. Among lessons learned include choosing timely themes for the competition; flexibility in competition structure and format; listening to local communities, sponsors, and partners; and planning for post-competition activities to multiply the benefits of the SCPW wetland center design competition.

Keywords: Wetland Centers, Design Competitions, CEPA

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Connecting People, Nature, and Society: The East Asia Black-faced Spoonbill Flyway Children's Exchange Project

Akane Tokorodani^{*†}, Hea-Jin Park^{**}, Yu Takaku^{**}, Nao Kusumoto^{**}, Mika Sasaki^{**}, Mayu Komori^{**},
Masato Dohi^{***}

Abstract

Team SPOON aims to connect people to nature and people to each other through the Black-faced Spoonbill that migrates across East Asia, thereby connecting issues that lie down both nature and society, so that many people can consider, address, and solve them as their everyday future. The Black-faced Spoonbill is an endangered species with only about 6,000 birds in the world. It is a migratory bird that travels across East Asia, including Russia, Korea, Japan, China, and Taiwan. For migratory birds such as the black-faced spoonbill, which require a variety of wetlands across the region, the rapid decline of wetlands since the 1970s has had a major impact on their habitat. In the 1990s, the black-faced spoonbill was temporarily on the verge of extinction, but the population increased as a result of cooperative conservation efforts throughout the Flyway. However, the increase in population alone attracted attention, and a proposal was made in 2024 to downgrade its Red List category from Endangered (EN) to Least Concern (LC). However, the wetlands on the flyway remain threatened, and there is a need to protect the wetlands in the sphere of life, not just in terms of abundance. Cooperation in the sphere of living things is not only important for nature but also for peace, as people deepen their understanding of each other in solidarity. Team SPOON has produced a ring with the same design as this foot ring to visualize the connection between people and the black-faced spoonbill. Currently, there are about 500 SPOON members with these rings, mainly in East Asia. As part of our activities, we have conducted workshops for children at the Black-faced Spoonbill Flyway; in 2019, we held workshops in Ganghua Island and Tainan, where together we read one picture book in each language and heard stories from the children. The children shared their considerations about the birds and the wetlands where they live and their wish to preserve the richness of nature beyond their region for the future and wrote messages to children in another place in the flyway. The adults who participated in the workshop were taught anew by the children about the importance of nature, learned about the connection between wetlands and the world, and began to think again about the future of wetlands. Based on this experience, in 2022, the “East Asia Black-faced Spoonbill Flyway Children's Exchange Project” was planned and implemented to listen to the voices of children, who will be the main actors in creating the future. In this project, a total of 39 children (5 from Fukuoka, 15 from Ganghua, 8 from Tainan, and 11 from Hong Kong) gathered online to learn about each other's wetlands, share landscapes, and make friends across regions and languages. Youth participation is required in the Ramsar Convention, as well as in the Convention on Biological Diversity, EAAFP, and others. It is necessary to listen to the opinions of not only the younger people who are already participating representatives, but also the younger people who depend on wetlands for their livelihood and interested youth, and to collaborate with them in the sphere of living things. This report summarizes the purpose, activities, and results of Team SPOON's project with children, and discusses methods of connecting in the sphere of living things and listening to the words of the younger generation.

Keywords: Black-faced Spoonbill, Flyway, Young generation

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Empowering Conservation through Community Knowledge: Mangrove Assessments and Education in Del Carmen, Siargao Islands

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Chen Yen Ting^{*}, Rosario R. Rubite^{***}, Danilo N. Tandang^{*****}, Cecilia B. Moran^{*,**,†}

Abstract

The Del Carmen Mangrove Forest Reserve in the Siargao Islands is a crucial wetland ecosystem in the Philippines. This study aimed to assess the mangroves, promote environmental education, and foster community participation in conservation. Exhaustive botanical surveys conducted across 11 barangays from July 2019 to October 2022 documented a rich diversity of 166 plant species belonging to 145 genera and 73 families. Notably, 20 species were true mangroves, and 20 were Philippine endemics. Based from IUCN listing, seven threatened species were identified. Recognizing the importance of both scientific and local knowledge for successful conservation, the project emphasized active community engagement through fieldwork, workshops, and the creation of educational materials. This collaborative approach aimed to transform the contiguous mangrove forest into a natural laboratory, fostering teacher-student partnerships and empowering the local community. Building on the mangrove assessment and biodiversity studies, the project, supported by the National Research Council of the Philippines (NRCP), produced 21 educational science videos, a science workbook, and a mobile game application. These resources are valuable tools for the local community and stakeholders to enhance their understanding and appreciation of the mangroves. By rooting knowledge in science and branching out education through community participation, this project strives to improve conservation practices and garner support for the Ramsar recognition of the Del Carmen Mangrove Forest Reserve.

Keywords: community-based conservation, floral biodiversity, mangrove education

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Empowering Community-Driven Wetland Conservation: The Development and Impact of the gamified mobile data collection App (Wetland Journey)

Prasad Jayasinghe^{*}, Matthew Simpson^{*}, Isuru Ranaweera^{**}, V.Manogaran^{**}, Andrea Berardi^{***},
Priyanie Amerasinghe^{***}, Anuruddha Kumara

Abstract

The Lassana Kolonnawa Wetlands Conservation Youth Network, initiated by Emotional Intelligence and Life Skills Training Team (Guaranteed) Limited, demonstrates effective youth engagement in environmental conservation within Sri Lanka's Colombo Wetlands. Emotional Intelligence and Life Skills Training Team (Gte) developed the gamified mobile application to mobilize local communities in Colombo, Sri Lanka, for wetland data collection, in collaboration with the Lassana Kolonnawa Wetlands Conservation Youth Network. This initiative was financially and technically supported by the Cobra Collective UK and guided by the International Water Management Institute (IWMI). The development and deployment of the gamified app faced significant challenges, including the COVID-19 pandemic and Sri Lanka's economic and political crises. Despite these obstacles, the app empowers community members to gather and record ecological data, fostering local stewardship and contributing to a robust, community-driven database. This participatory approach ensures data accuracy and enhances public awareness and involvement in wetland conservation efforts. Complementing the app, a dedicated website was created to display the collected data, providing a platform for transparency and broader dissemination of conservation findings and experiences. This case study focuses on the development process and impact of the gamified app and its associated website, detailing the technical and community engagement strategies employed, along with the challenges and successes encountered. The initiative highlights the potential of combining technological innovation with grassroots participation to achieve sustainable environmental outcomes, serving as a replicable model for wetland conservation efforts worldwide.

Keywords: Wetland conservation, community engagement, gamified app, technological innovation, data collection, environmental stewardship, Colombo Wetland, Sri Lanka.

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S7-6

Preliminary assessment of aquatic plants monitoring in urban reservoirs using citizen science program

Seong Min Lee^{*}, Migyeong Jung^{*}, Yunu Son^{*}, Yesil Yun^{*}, Ji Yoon Kim^{*†}

Abstract

Citizen science strengthens the communication between researchers and the public, promotes public awareness, and can contribute to collect a large amount of monitoring data through participatory surveys. We organized a wetland monitoring program focusing on the occurrence of aquatic plants in urban reservoirs and the output was further compared to check the differences in collected monitoring data between citizen participants and researchers. After indoor education session, field survey was conducted in July and September 2023 at three sampling sites in Mije reservoir in Gunsan City, Republic of Korea. Participants (i.e., family unit) used a self-made plant sampling anchor and smartphone application (i.e., Earth Loving Explorers managed by Donga Science) to record aquatic plants in each site. As a result of the 2023 programs in Gunsan city, 17 aquatic macrophytes (submerged: 9, floating-leaved: 4, free-floating: 3) were recorded by 17 family teams. Eight aquatic plant species were newly recorded in the same reservoir than were found in past literature. The average identification accuracy of participants' data was confirmed to be about $77.9 \pm 8.1\%$, and the recorded number of aquatic plant species was 3.4 ± 1.5 species per survey. The number of aquatic plant species recorded by a single team was less than 50% compared to the researcher. When monitoring results of several teams (e.g., about 10 or more) were accumulated as repeated sampling, the combined results become closer to those of researchers. Considering most of the students participated in the aquatic plant monitoring for the first time, it is thought that if the field experience is accumulated through repeated education programs, the gap between the participants and researchers will be reduced.

Keywords: Citizen Participatory Surveys, Environmental Education, Macrophytes

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Promoting grassroots-level wetland cooperation network in the Bay of Bengal region: A case of crab bank initiative

Shimpei Iwasaki^{*†}

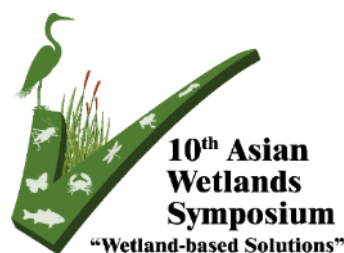
Abstract

There is increasing emphasis on the need for effective ways to gain the collaboration and cooperation of individuals and organizations to promote wise use of wetlands at both national and regional levels, considering the complex and interconnected challenges facing wetland ecosystems. The establishment of a wetland cooperation network is essential for addressing these challenges. Recognizing this, various wetland cooperation network initiatives, such as the Ramsar Regional Centers and Wetland Link International, have been established. However, there was no grassroots-level wetland cooperation network in the Bay of Bengal region. Ramsar Center Japan (RCJ), a non-governmental organization organized in 1990, has since been promoting CEPA in pursuit of fostering the mission of the Ramsar Convention in Asia. Through continued interactions with partners working for wetland conservation in the Bay of Bengal region, RCJ identified common challenges related to wetland management and conservation. Despite many historical, cultural, social, and economic commonalities, efforts to conserve and manage the region as a single marine ecosystem are limited. To address this, a grassroots-level international wetland cooperation network, the Bay of Bengal Wetland Partnership (BoBWeT), was established in 2018. Under the BoBWeT platform, the crab bank method has been identified as a good practice to promote the wise use of specific crab species. United efforts among the partners have led to a consensus that commercial crab species have become more popular for obtaining foreign currency, leading to a drop in crab catch per unit efforts in some countries. Crab fishery production is expected to decline in the future due to intense fishing pressures, including the catching of small juveniles and egg-bearing crabs. These shared understandings among the partners necessitated further actions to promote the wise use of crab species and their habitats. This enabled the launch of a project focusing on responsible fisheries using the crab bank method in the region. By using the concept of crab banks, the BoBWeT has been effectively implemented, creating an environment for mutual sharing of benefits and raising voices to inform the decision-making process in the region. This includes advocating for the concept of crab banks through workshops and setting up new crab bank organizations. Despite similar backgrounds behind wetland ecosystems within the country and in Asia, there are few efforts to share lessons learned from wetland ecosystems among stakeholders. Based on the grassroots-level wetland cooperation network in the Bay of Bengal region, this paper provides implications for the further need to build and strengthen wetland cooperation networks to bring the stakeholders together for the wise use of wetland ecosystems.

Keywords: wetland cooperation network, the Bay of Bengal Wetland Partnership, crab bank

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Session 8 – Wetlands, Nature-positive economy, and SDGs

Best practices and studies to discuss the role and contribution of wetlands to achieve the Sustainable Development Goals (SDGs) and case studies from the business sector that consider direct contribution to wetland conservation by shifting economic policy-making in a nature-positive way. Case studies on Environmental, Social and Governance (ESG) approaches are also included in this session.

S8-1: Del Carmen Mangrove Forest Reserve: From Illegal Mangrove Cutting and Illegal Fishing to DENR Nominee to the UN Ramsar List of Wetlands of International Importance

Alfredo Coro II, Mayor, Municipality of Del Carmen

S8-2: Evaluation of 5-Year Coastal Resources Management (CRM) Plan: Highlighting the importance of Wetland in the coastal area of Balanga City

Nerissa Mateo, King James Dela Rosa

S8-3: Integrating agriculture and tourism with mangrove conservation through development of ecological structure in Nasugbu, Batangas

Daphne Corpuz, Nappy L. Navarra, Selena Balbino Santos

S8-4: Realizing Transformative Change Towards Nature-Positive Economy in Wetlands: Experiences from Ramsar Sites in Japan

Yuki Arai

S8-5: Piloting Business Opportunities through Sustainable Livelihoods: Gelam Conservation and Small-Scale Enterprises

Chik Maslinda Omar, Daria Mathew Abdullah, Muhammad Zaid Nasir, Nur Syahirah Wahab, Hafifah Azhar, Wan Muhamad Faaiz Wan Mohamad Baharudin

S8-6: Navigating Uncertainties: Livelihood Development Strategies for COVID-Affected Fisher's Community of the Bay of Bengal

Md. Asaduzzaman

S8-8: Laying the Foundation for a Crab Bank in Merbok, Kedah: Insights from a Pilot Project

Rabiatul-Adawiah Ahmad Rashid, Wan Mazlina Wan Mehammud, Shimpei Iwasaki, Thakorn Khakaikitthawat

S8-9: Sustainable Crab Bank Development through Community Engagement and Traditional Management Practices in Banda Aceh

Alfi Rahman, Thakorn Kakhaikitthawat, Shimpei Iwasaki, Muhammad Nawawi

S8-1

Del Carmen Mangrove Forest Reserve: From Illegal Mangrove Cutting and Illegal Fishing to DENR Nominee to the UN Ramsar List of Wetlands of International Importance

Alfredo Coro II, Mayor[†], Municipality of Del Carmen^{*}

Abstract

The Del Carmen Mangrove Forest Reserve is 4,871 hectares of contiguous mangrove cover located in Del Carmen, Siargao Islands, Surigao del Norte, Philippines. Until 2010, illegal mangrove cutting and illegal fishing activities were rampant in the mangrove forest with the community accepting these practices as norms. New local government leadership pushed for conservation, protection and preservation of the mangrove ecosystems leading to introduction of reforms and innovations. Process of Transformation included science-based evidence to support new policy decisions, communicating the science and needed actions leading to better enforcement of laws, and co-creating solutions using community-driven development model for alternative livelihoods. Policy reforms included a comprehensive fishery legislation of sustainable and illegal fishing practices while the communication strategy meant developing campaigns targeted for each demographic with household visitation, classroom level lectures, conduct of rave parties and concerts, international marathon and global forum inclusions. Co-created solutions resulted to a community based eco-tourism program that resulted directly almost 1000 families. The collective impact is in the reduced illegal-fishing practices by 97% and zero mangrove cutting. The direct socio-economic outcomes are the poverty incidence decreased from 69.9% (2010) to 25.3% (2023) for a 44.6% reduction, and monthly family income stream increase from Php2000 (2010) to P15000 (2023). By 2020, the local government commissioned a study to research on the effect of these changes to the mangrove ecosystem and the communities around the ecosystem if we can qualify for the indicators of the UN Ramsar List for Wetlands of International Importance. In 2021, the local government efforts on mangrove protection and preservation were vindicated when the Del Carmen Mangrove Forest was official declared to have protected the people of Del Carmen from the storm surges caused by Super Typhoon Rai (PH: Odette) when it made landfall. Last February 2024, the Minister of the Environment of the Philippines officially endorsed the Del Carmen Mangrove Forest Reserve to the UN Ramsar List as a Wetlands of International Importance.

Keywords: Del Carmen, Philippines, Mangroves

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S8-2

Evaluation of 5-Year Coastal Resources Management (CRM) Plan: Highlighting the importance of Wetland in the coastal area of Balanga City

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Abstract

The formulated Coastal Resources Management Plan is an integral framework used for the familiarization of the community with the present status of different ecosystems. It implements various management programs: Fisheries Management, Habit Management, Shoreline/Foreshore Management, Coastal Tourism Development, Waste Management, Enterprise and Livelihood, Watershed Management, Coastal Zoning, Gender and Development, Health and Sanitation Management, and Legal and Institutional Arrangement from 2016–2021. The main purpose of this plan is to supplement the formulation of comprehensive development plan of Balanga City focusing in the legal framework, management strategy, environmental and social assessment, establishment of Marine Protected Area, mitigating costal pollution and strengthening the monitoring, controlling and surveillance within the coastal area from the active participation of organized local communities, other government agencies and private partnerships. This study identifies the manifestation of its four (4) parameters: social, economic, ecological, and natural effects, which determine the need for valuable insights and essential data for policymaking, effective planning, and innovative interventions addressing gaps and issues, particularly in the wetland area in the coastal environment of Balanga City. Within the duration of implementation, data are gathered based on the outlined objectives of this plan, which aim to reflect the outcome effect of the abovementioned parameters. Among the four, the impact of the wetland is very evident in the ecological area, which shows a highly significant influence in increasing the fish catch rate and the presence of migratory birds, subsequently affecting economic and social growth within the coastal community. Moreover, the active participation of other government agencies and the private sector resulted in the enhancement of the wetland structure by expanding the mangrove forest and the stability of mudflat areas. Environmentally responsive infrastructure supported the elevation of economic and social areas, achieving a sudden increase in fish processing products and employment rates related to the fishing industry. Despite the positive outcome observed, the major concern for solid waste management is still intercepting the full manifestation of four parameters. Limitations are encountered in accurately evaluating the natural effects due to the need for a scientific approach that gathers relevant information for a more comprehensive understanding. This instructive evaluation of the CRM plan lays out a progress blueprint for appropriate and relevant steps from the local government of Balanga City to its wetland area.

Keywords: Coastal Resources Management Plan, policymaking, ecological

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S8-3

Integrating agriculture and tourism with mangrove conservation through development of ecological structure in Nasugbu, Batangas

Daphne Corpuz^{*}, Nappy L. Navarra^{**}, Selena Balbino Santos^{***†}

Abstract

Nasugbu, Batangas, designated as a Special Tourism Zone in 2007 (Dizon, 2015), offers beaches for coastal recreation and hiking in forests and mountains. It is also an agricultural municipality yielding various crops supporting local livelihood. Despite these resource assets, the potential for Nasugbu's development in the tourism and agricultural sectors remains unrealized due to threats of land use conversion of existing forests. This study identified and evaluated the existing ecological structure of a watershed in Nasugbu and developed an ecological plan that proposes management strategies to conserve the municipality's ecological integrity while considering its economic needs that agriculture and tourism deliver. Using overlays of Soil type, Landforms, and Land cover maps of the watershed, eleven biotopes were identified in the site: Sloping Forest, Sloping Grassland, Sloping Shrubland, Mangrove Forest, Hilly Forest, Hilly Shrubland, Hilly Cropland, Valley Shrubland, Valley Cropland, Flat Built-up, and Flat Cropland. The ecological values of these biotopes were assessed using criteria adapted from Jarvis and Young (2005): Period of Development, Rarity, Habitat, and Area, with scores ranging from 1 to 5 points, resulting in scores between 4 and 20 for each biotope. The highest-scoring biotopes, Sloping Forest (19 points), Mangrove Forest (18 points), and Hilly Forest (19 points), form the Cores of the watershed's Existing Ecological Structure. High-value isolated biotopes were identified as Patches; those adjacent to the western coast were Edges. Corridors were identified based on the watershed's water network. From this, the proposed Ecological Landscape plan recommends four (4) planning strategies based on each biotope's ecological values.: Preservation, Conservation, Creation, and Improvement. Preservation involves protecting areas from anthropogenic disturbances by introducing buffer zones around the Core's edges. Conservation and Improvement allow controlled agricultural and tourism activities. Select agricultural lands may be converted to forests for Patch Creation. Corridors can be enhanced by reinforcing vegetative structure and complexity to improve wildlife habitability and connectivity between Patches. For the Edge structure, mainly built-up area adjacent to the Mangrove Forest, mangrove reforestation activities within these areas will create an Edge with higher ecological value.

Keywords: mangrove conservation, agriculture, tourism

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Realizing Transformative Change Towards Nature-Positive Economy in Wetlands: Experiences from Ramsar Sites in Japan

Yuki Arai^{*†}

Abstract

A “nature-positive economy” is defined by UNEP (2021) as “an economy that is regenerative, collaborative and where growth is only valued where it contributes to social progress and environmental protection”. In order to achieve a nature-positive economy, “transformative change”, which requires changes in both individuals and social structures, is considered indispensable. Although the economic value of the world's wetlands is estimated at \$36.2 trillion per year, wetlands often fail to contribute to local sustainable economic activities. While simultaneous realization of conservation/restoration of wetland ecosystems and sustainable economic activities is one of the essential aspects of Ramsar site management as well as nature-positive economy, overuse of wetland resources and conflicts among different stakeholders are commonly observed. However, there are a small number of cases where people have managed to go through a transformative change to pursue nature-positive economy by overcoming various challenges. Yet, there are few studies on the processes of how transformative change towards nature-positive economy can occur. The objective of this study was to explore the process, barriers, and enablers in realizing transformative change toward a nature-positive economy in wetlands through case studies. Three Japanese Ramsar sites (Shizugawa-wan, Kabukuri-numa and the surrounding rice paddies, Oyama Kami-ike and Shimo-ike) were selected as the target sites. Semi-structured interviews were conducted with key informants from each site (i.e. government officials, fishermen, farmers, NGO/NPO staff, researchers, etc.). In addition, secondary data analyses were conducted using wetland management plans, official reports and academic journal articles. The results indicated that lack of knowledge and experience, lack of immediate economic benefits, heavy burden and high cost of implementing environmentally friendly methods, conflicting values among stakeholders were observed as barriers to transformative change towards nature-positive economy. On the other hand, a leader/facilitator who connects stakeholders, external supporters (e.g., NGOs, researchers, private companies), outsiders with different ideas, expectations of future economic benefits, financial support and continuous communication served as important enablers in realizing transformative change towards nature-positive economy in the target Ramsar sites.

Keywords: nature-positive economy, transformative change, Ramsar sites

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Piloting Business Opportunities through Sustainable Livelihoods: Gelam Conservation and Small-Scale Enterprises

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Abstract

The Melaleuca Forest, known locally as the 'Gelam' forest, is a type of freshwater forest predominantly composed of the *Melaleuca cajuputi* tree species. Primarily distributed along the east coast states of Terengganu and Kelantan in Peninsular Malaysia, this forest forms majestic yet crucial ecosystems within these landscapes. These Melaleuca trees thrive in wetlands, lowlands, and peat areas along the coast, commonly found behind the mangrove zone, where pure or mixed stands may develop. They tolerate various conditions, from fertile to poor soils, and endure waterlogging during the monsoon season, which typically lasts three months. Despite spanning 22,879 hectares across Peninsular Malaysia, only 367.5 hectares are protected as Permanent Forest Reserve. The rest fall under state land, often slated for conversion to other uses, or alienated land, primarily privately owned. This leaves the forest vulnerable to land-use changes driven by local and national planning initiatives. Consequently, the Gelam forest is frequently exploited and converted for agriculture, aquaculture, mining, and urbanization. Insufficient research has led to Gelam forest being undervalued and regarded as unproductive, further exacerbating the risk of degradation. In the Setiu Wetlands, WWF-Malaysia is actively engaged in freshwater conservation programs focusing on establishing scientific data for informed decision-making and advocating for the protection and sustainable management of Gelam forests to ensure long-term conservation. A community livelihood project that utilizes and extracts Gelam leaves for essential oil was piloted in 2021. This project aims to demonstrate the forest's potential while addressing environmental challenges such as biodiversity loss and resource depletion. The project also addresses societal issues like geographic and economic imbalances while promoting sustainable resource use. However, sustaining the project requires multi-stakeholder involvement, including the local community, Setiu district authorities, and local and national research experts. By leveraging the opportunity to expand the project, WWF-Malaysia utilizes internal technical guidance to develop sustainable financing for nature-based solutions (NbS), which address climate change, biodiversity loss, and resource depletion while supporting local livelihoods. Attracting public and private investment by showcasing long-term benefits is key to success. Though the journey is just beginning, sustained collaboration can create lasting positive change for both nature and communities.

Keywords: Wetlands, Gelam forest, community livelihood, multi stakeholders, nature solutions

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Navigating Uncertainties: Livelihood Development Strategies for COVID-Affected Fisher's Community of the Bay of Bengal

Md. Asaduzzaman^{*†}

Abstract

The COVID-19 pandemic has heavily impacted the household and individual level earnings in Bangladesh with around 13 percent of people have become unemployed. There was a lockdown across the country along with restriction to move. As a consequence, many people lost their job and move back to the rural areas, that created a pressure on the rural natural resources. The main livelihood option in rural area is agriculture in Bangladesh. Besides there are other livelihood options like service sector in public and private sectors and other industries and business also. The people from the Teknaf peninsula who are non-resident to that area are mostly engaged in different industries based on Chattogram and a good number of people are government and private sector employees. The main occupation of the people of Teknaf peninsula is mostly fishing. The Teknaf Peninsula or Teknaf Sea Beach is one of the longest sandy beach ecosystems in the world, length is around 80 km. It represents a transitional ground for the fauna of the Indo-Himalayan and Indo-Malayan ecological sub-regions. Important habitats at the site include mangrove, mudflats, beaches and sand dunes, canals and lagoons and sea. Mangrove forest occurs in Teknaf peninsula both as natural forest with planted stands and mostly distributed in the intertidal zone. The Teknaf peninsula mangroves support the habitat of 161 different fisheries species. During the time of Covid 19 pandemic, fishing was not banned strictly but fishing in a group was highly forbidden. Also, the market was collapsed, there was disruption in supply chain and the ice factories were not in function. Economic loss was very high for the fishers fishing on the Bay of Bengal. The fishers depended on forest resources. In that situation Bangladesh POUSH has implemented projects for economic recovery of the Covid affected Bay of Bengal fishers. The objectives of the projects were to support the livelihood by sustainable fishing and agriculture. Sustainable fisheries supported a productive fish population in the coast. The current paper is based on the findings and learning from the projects and initiatives in the Teknaf Peninsular targeting the pandemic recovery. The methodology is result-based monitoring of the intervention. The project was implemented during the period 2021 to 2023. The recovery period of the Covid 19 pandemic was found comparatively shorter, it was because of the coordinated planning of all sectors.

Keywords: Covid 19, Livelihoods, Peninsular

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S8-8

Laying the Foundation for a Crab Bank in Merbok, Kedah: Insights from a Pilot Project

Rabiatul-Adawiah Ahmad Rashid^{*}, Wan Mazlina Wan Mehamud^{**†}, Shimpei Iwasaki^{***},
Thakorn Khakaikitthawat^{****}

Abstract

Over-exploitation, climate change, and poor management of coastal ecosystems are among various factors that led to the mass reduction of fisheries resources. Such a situation directly affects the livelihood and financial income of the coastal communities which rely mainly on these resources as a source of living. The crab bank initiative is an approach that has been taken by various concerned parties such as the fisheries department, affected communities, and NGOs in many countries as an effort to enhance the coastal fishery resources. The initiative is also very relevant in ensuring Food Security as highlighted in the sustainable development goals. This pilot study on the crab bank initiative, which is held in Merbok, Kedah adopted the method used by communities in Khung Kraben Bay, Chanthaburi Province, Thailand. Nevertheless, some adjustments and adaptations are made due to some geographical and social factors. As compared to the main site in Thailand, the site of this study is suitable for the breeding of mud crabs rather than blue swimming crabs. This study was separated into several stages which include the planning stage, the development stage, and the implementation stage. During the planning stage, project members were identified and baseline information about the production of mud crabs was gathered from local fishermen. In the development stage, the designated site of the project is identified. The implementation stage started in August 2024 and involved the activity of collecting the mother crab. The number of gravid mud crabs collected, and baby mud crabs harvested were monitored, recorded, and documented. Suggestions and further recommendations were included as a reaction to the findings of the pilot study.

Keywords: crab bank, sustainability, fisheries, food security, coastal ecosystems

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S8-9

Sustainable Crab Bank Development through Community Engagement and Traditional Management Practices in Banda Aceh

Alfi Rahman^{*†}, Thakorn Kakhaikitthawat^{**}, Shimpei Iwasaki^{***}, Muhammad Nawawi^{*}

Abstract

Banda Aceh, located at the northern tip of Sumatra, Indonesia, faces unique geographical challenges and opportunities. The city was heavily impacted by the 2004 Indian Ocean tsunami, which inundated over 40% of the city and reached up to 5 km inland. In the years following the disaster, the coastal areas of Banda Aceh have continued to face pressures such as overfishing, climate change, and the conversion of coastal lands, including mangrove forests. These environmental changes have significantly reduced crab populations. In response, a collaborative initiative has been launched to develop a sustainable Crab Bank in Banda Aceh. The Crab Bank is a community-based fisheries management system that allows egg-bearing mother crabs to spawn before being sold, thus contributing to the conservation of crab populations. This initiative is supported by multiple stakeholders, including Ramsar Center Japan (RCJ), academia, government agencies, local coastal institutions like Panglima Laot, and local businesses. Panglima Laot, a traditional institution integral to Acehnese society for over 500 years, plays a critical role in enforcing the sea customary law (Hukum Adat Laot), which ensures sustainable coastal resource management. To explore the development and impact of the Crab Bank initiative in Banda Aceh, a qualitative research methodology was employed. This research utilized a combination of observations, participatory approaches, and interviews. The data collected were analyzed using thematic analysis to identify key themes and insights related to community engagement, traditional practices, and sustainable crab management in coastal wetlands. Preliminary findings highlight the significant role of Panglima Laot in coastal resource conservation through Hukum Adat Laot. The Crab Bank model has been well-received by the community, with strong engagement facilitated through regular meetings, training sessions, and participatory decision-making. The initiative will provide economic benefits by ensuring a steady supply of crabs. Integrating innovative conservation efforts with traditional management practices has created a robust framework for sustainable coastal wetland management.

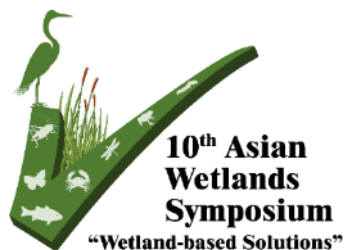
Keywords: Crab Bank, Banda Aceh, multi-stakeholder engagement, coastal conservation, community empowerment, sustainable development

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Session 10 – Wetlands and sustainable built environment

Case studies and practices on designing and constructing facilities and infrastructure adjacent to wetlands in consideration of Eco-DRR and sustainable development in urban and rural areas

S10-1: Social Acceptability Assessment for Nature-Based Solution for Wastewater Treatment: The Case of the wastewater facility in Bayawan City, Negros Oriental (Philippines)

Ma. Catriona Devanadera, Darry Shel M. Estorba, Kayla Guerrero, Amy M. Lecciones

S10-2: Assessing the effects of landscape changes in mangrove and fishponds on the ecological structure in Catanduanes Island, Philippines

Leandro Lorenzo Berba, Nappy L. Navarra, Selena Balbino Santos

S10-3: Understanding the social connectivity of blue-green infrastructure in urban wetlands: A scoping review of current themes

Aaron Lecciones, Ken Yocom

S10-4: Mainstreaming Biodiversity in Infrastructure: A Wetland Conservation and Management Perspective

Arch. Celestino B. Ulep

S10-1

Social Acceptability Assessment for Nature-based Solution for Wastewater Treatment: The Case of the Wastewater Facility in Bayawan City, Negros Oriental (Philippines)

Ma. Catriona Devanadera*, Darry Shel M. Estorba^{**†}, Kayla Guerrero*, Amy M. Lecciones^{**}

Abstract

The challenge in treating wastewater has continuously been occurring, aggravated by rapid urbanisation, unsustainable human activities and practices, and population growth. Majority of wastewater globally is yet to be treated, and millions of people still have limited access to safe and clean facilities, resulting in individuals practising unsafe and unsustainable human practices such as open defecation. In the Philippines, the environment is experiencing adverse effects evident in the hydrological and ecological changes in the river systems due to the previous economic conditions coupled with rapid industrialisation. A nature-based solution (NbS) for wastewater treatment, such as constructed wetland (CW), can be an alternative for cities and municipalities in the Philippines. The case of the wastewater facility in Bayawan City, Negros Oriental, is the best example of NbS-CW operating for almost 17 years. With the aim of replication and successful implementation of NbS projects, social acceptability assessment is a crucial support tool to study social acceptance, benefits, barriers, and opportunities as perceived by the stakeholders for implementing NbS projects. Social preparation such as training, seminars, consultations, and local government commitment and partnership are also greatly needed to successfully implement, replicate, and adopt NbS technologies and projects in the Philippines.

Keywords: nature-based solutions, wastewater treatment, constructed wetlands, social acceptability

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S10-2

Assessing the effects of landscape changes in mangrove and fishponds on the ecological structure in Catanduanes Island, Philippines

Leandro Lorenzo Berba^{*}, Nappy L. Navarra^{**}, Selena Balbino Santos^{***†}

Abstract

Catanduanes Island is considered the “last frontier” of Region V (Bicol Region) due to its expansive forest cover and variety in landforms. These forests host many native flora and fauna and provide many ecosystem services to existing local communities in the island. This study examined the existing ecological structure of a region in Catanduanes that showcased abundant river systems, varying topography, and diversity in land cover types, including a mangrove forest at the northern portion of the region. An ecological plan was proposed to enhance the ecological value of the region and mitigate threats to these high-value areas. A total of 19 biotopes were identified through mapping and analysis of soil, landform, and land cover types in the site. Key biotopes were determined to have high ecological value and comprise two (2) Ecological Cores as part of the Existing Ecological Structure. The Corridors were defined from the system of tributaries, streams, and waterways found within the region. Several ecological management strategies were proposed to enhance its ecological value and connectivity. For all Cores, there shall be strict restriction of access to limit disturbance from human activity. Permeable buffer zones were also added along the edges of the Cores to restrict aggressive conversion of upland and mangrove forests to agricultural land use prevalent in the region. Abandoned fishponds were recommended for conversion to mangrove forests, given proper communication and compensation to affected fishpond owners and other stakeholders. Fishponds still in operation are recommended to be converted to hybrid farming systems such as mangrove-shrimp farming to improve ecological value while maintaining livelihood benefits to stakeholders. By identifying Existing Ecological Structures, management strategies can be proposed in an Ecological Plan to enhance the inherent value of a region’s natural features while mitigating threats to such valuable features.

Keywords: ecological planning, mangrove conservation, fishpond conversion

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S10-3

Understanding the social connectivity of blue-green infrastructure in urban wetlands: A scoping review of current themes

Aaron Lecciones^{*†}, Ken Yocom^{**}

Abstract

Many of the challenges to sustainability in the built environment derive from the degradation of the ecological functions of the natural environment human settlements are built upon. These challenges are compounded by social patterns, economics, and political processes, and other human systems that make cities function. Contemporary urban science has developed to better understand the natural and human complexities of solving urban sustainability by combining social and physical sciences in treating fundamental processes that drive, shape, and sustain cities and urbanization. Many theories and principles that have explored these fundamental processes investigate the role of complex socioeconomic-ecological systems. Studies at the intersection of urban metabolism and the urban fabric, urban ecosystems and urban ecosystem health, and urban ecology attempt to engender sustainability by simulating natural ecosystems in the built environment. A particular set of similar concepts under nature-based solutions (NBS), and commonly appear as blue-green infrastructure (BGI), have recently been scaled to the urban form. The Wetland City is among those urban conceptions where BGI will play an important role. Research in the implementation of NBS and BGI in cities focuses on the geophysical, engineering, and non-human species aspects but seldom on the social dimensions that influence its planning, design, and implementation. Recent research has highlighted the importance of the social dimensions that underpin the success of nature-based solutions and is therefore critical to sustainable urban strategies like the Wetland City. Among the many social dimensions that influence the effectiveness of NBS is the aspect of social connectivity of urban wetlands which is the communication and movement of people, goods, ideas, and culture along and across these wetland landscapes. An investigation of the current state of research in this field for studies conducted between 2000-2024 by scoping literature using the PRISMA methodology reveals thirteen articles analyzed for the types, scale, and function of social connectivity in urban wetlands. There is a dearth of literature that investigates the themes of social connectivity, urban wetlands, and blue-green infrastructure. The definitions in the scoping literature for social connectivity are wide-ranging and apply to different contexts. This variability in meaning and difficulty in setting definitions for social connectivity of blue-green infrastructure in urban wetlands obscures any attempt to conceptually link the importance of the socio-spatial configurations in the success of hybridized built environment landscapes. There is also no specific literature that directly expounds on the physical and spatial aspects of social connectivity in urban wetlands vis-à-vis the co-benefits derived from BGI. A direction of research is proposed concentrating on the social connectivity of BGI to support the successful implementation of hybridized landscapes through nature-based solutions in the built environment.

Keywords: Urban Wetlands, Social Connectivity, Value Perception

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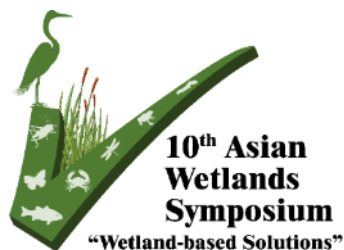
S10-4

Mainstreaming Biodiversity in Infrastructure: A Wetland Conservation and Management Perspective

Arch. Celestino B. Ulep

Abstract

The CBD defines “biodiversity mainstreaming” as “ensuring that biodiversity, and its components are factored into policies and practices that rely and have an impact on it.” This can be achieved through two ways: integration of biodiversity conservation in cross-sectoral plans, and in sector-specific plans. On a project-specific level, the CBD recommends that the most practical entry point for biodiversity mainstreaming is through the EIA system, since it is the main tool for taking in to account the social and environmental considerations that need to be examined in order to make the development programs and projects environmentally sustainable. Other Approaches to biodiversity mainstreaming include: National Biodiversity Strategies and Action Plans; Land Use Plans/Physical Development Plans, and the guidelines therefor; Strategic Environmental Assessment; Project Feasibility Studies, and Market-based Instruments (MBI). Constraints that need to be addressed in mainstreaming biodiversity include, among others, the lack of specific guidelines for biodiversity impact assessment, lack or biodiversity specialists to be included in the EIA team, and EIA Review Committees, and the lack of ecosystem-based specialists, particularly in wetland ecosystems. In the context of wetlands, mainstreaming biodiversity through the EIA system will need to formulate the guidelines (with emphasis on types of ecosystems such as wetlands) and strengthen the capacities and capabilities of specific professionals with specific science background, for biodiversity impact assessment.



Session 11 – Wetlands and disaster risk reduction management

Research and case studies on adopting disaster risk reduction management approach in wetland management

S11-1: Mapping Fire Susceptibility in Leyte Sab-A Basin Peatland, Philippines

Glady Mae V. Vijandre, Rej Winlove M. Bungabong, Criskim C. Parian

S11-2: Mangrove conservation as flood management approach in Kawit, Cavite, Philippines

Raia Alexis Gallardo, Nappy L. Navarra, Selena Balbino Santos

S11-3: Green-gray Engineering for Coastal Greenbelts in Pedada, Ajuy, Iloilo, Philippines

J.H. Primavera, R.J. Loma, J.D. Coching, C.L. Montilijao

S11-1

Mapping Fire Susceptibility in Leyte Sab-A Basin Peatland, Philippines

Glady Mae V. Vijandre^{*}, Rej Winlove M. Bungabong^{**}, Criskim C. Parian^{***}

Abstract

The 3,088-hectare Leyte Sab-A Basin Peatland (LSBP) in the Province of Leyte, is renowned for its unique biodiversity and ecological significance. However, it faces significant threats from peat fires. Peat fire incidents in the area have increased in recent years, exacerbated by climate change-induced droughts and human activity, specifically draining peatlands for agriculture and other land use. Said incidents will pose threats of catastrophic consequences if immediate action is not urgently taken. In 2023, joint research activity was conducted by the Philippines DENR-Ecosystems Research and Development Bureau (ERDB) and Biodiversity Management Bureau (BMB) to initially assess the fire susceptibility of the four (4) municipalities within the LSBP utilizing the Geographical Information System (GIS) and remote sensing techniques. Due to the lack of Philippine standards for assessing the fire susceptibility of peatlands, the study adopted the methodology of Narissara and Dimitris (2019), which was applied in the Kuan Kreng Peat Swamp Forest in Thailand. The adopted methodology evaluates seven (7) factors with high influence on fire ignition in peatland areas: climate, land use/land cover, distance from settlements, distance from roads, distance from rivers, elevation, and slope. Each factor has a numerical score of 1 to 5 (very low, low, moderate, high, and very high) as rank for the fire risk class. Based on the assessment, most of the Peatland areas are found to be susceptible to fire, with only two classifications: Very High to High Susceptibility. The mapping identified very high fire-susceptible areas across six (6) barangays in Alangalang, and two (2) barangays in San Miguel, Santa Fe, and Tacloban City. Additionally, the fire susceptibility assessment revealed significantly high susceptible areas in other barangays in Alangalang, as well as in San Miguel and Santa Fe. To ensure the accuracy and reliability of the identified fire-susceptible areas, an aerial mapping survey was conducted using an unmanned aerial vehicle (UAV) or drone as well as an actual ground ocular survey. The ground survey provided a detailed visual assessment of the possible extent and intensity of fire susceptible areas. Several burned areas induced by human activities and threats to the peatland were observed and recorded for two (2) consecutive years, 2023 and 2024. Remarkable observations and results showed that peat fires were distributed in areas far from a water body, and LSBP receives a modest amount of rainfall. The developed fire susceptibility map of LSBP from this study will serve as a valuable tool for establishing effective fire detection and monitoring systems of Peatlands. By utilizing this map, the concerned Local Government Units as well as the local Bureau of Fire Protection and DENR can proactively prevent and minimize peatland fires in Leyte Sab-a. However, the development of a localized tool to assess the fire susceptibility of peatlands in the Philippines is recommended as this will be crucial for effective fire management and conservation efforts of peatlands in the country. The tool will involve assessments using specific methodologies and precise parameters appropriate to the biophysical characteristics and conditions of the Philippine peatlands.

Keywords: Peatland, Fire susceptibility, Leyte Sab-a Peatland

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S11-2

Mangrove conservation as flood management approach in Kawit, Cavite, Philippines

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Abstract

Kawit is one of many coastal municipalities that comprise the most flood-prone areas of Cavite, Philippines (CEP, 2020). Stormwater runoff from upland areas and high tides from the coast result in the fast rise of water levels in coastal Cavite. In October 2022, Typhoon Paeng caused massive damage to coastal Cavite where flood walls broke down and rivers inundated its peripheries. Considering DENR Cavite's planned conservation of mangroves as nature-based flood defense for the area (Cachola, 2020), this study examines the ecological structure of Kawit to propose an Ecological Plan focusing on mangrove conservation. Seven (7) biotopes were identified through mapping and analysis of soil, landform, and land cover types in the site: (1) Urban Coastline, (2) Formal Subdivision, (3) Sandy Beach, (4) Fishpond, (5) Lowland Urban, (6) Reclaimed Land, and (7) Mangrove Forest. Using criteria from Jarvis and Young (2005), the study assessed the value of biotopes based on their Period of Development (D), Area (A), Rarity (R), and Habitat Diversity (H). Through this assessment, the existing ecological structures were determined. Mangrove Forest was assessed to have the highest ecological value and designated as an Ecological Core of the site. Smaller patches of mangroves distributed among Fishpond comprise the Matrix of the site. Urban Coastline, Sandy Beach, and Reclaimed Land all form the Ecological Edge; the Ylang Ylang River and the Manila-Cavite Road were both considered as linear Corridors. From this, several management strategies were proposed as part of an Ecological Plan. Restoration and expansion of mangrove forests in conjunction with regulation of housing and development along the coast would help minimize land conversion and reclamation. Similarly, mangroves in abandoned fishponds in the Matrix can be restored to improve connectivity with existing mangrove forests and adjacent fishpond restoration efforts. Aquasilviculture can be promoted to retain fishponds as livelihood for the local community. Regulation of tourism activities is recommended to retain the improved ecological value to the coast. The study demonstrated that by identifying existing ecological structures, management strategies for mangrove conservation can be developed to address and mitigate the impacts of flooding from upland runoff and inundation from rivers and coasts.

Keywords: ecological planning, mangrove conservation, flood management

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S11-3

Green-gray Engineering for Coastal Greenbelts in Pedada, Ajuy, Iloilo, Philippines

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Abstract

Mangroves are natural buffers that protect coastal communities from wave surges and tsunamis. In the Philippines, mangrove cover has drastically declined and its loss has been associated with conversion to other uses, particularly aquaculture ponds in the 1980s. Various management and rehabilitation efforts were implemented in the country to reverse the trend. However, physical factors such as waves, currents and wind affect survival rates of newly planted seedlings. The Zoological Society of London – Philippines explored different strategies to increase survival rates of mangroves in high energy coasts. In 2010, two breakwaters (70 m and 110 m long) were constructed in Pedada, Ajuy, Iloilo, Philippines, an area where erosion has lowered beach elevation by >1 meter, too low for mangrove survival. The breakwaters are temporary piles of rocks 0.9 m high and 1.5 m wide designed to last until the mangroves are tall enough to withstand wave action. Results show an increasing trend in elevation with a maximum sedimentation rate of 50 cm/year and maximum sedimentation level of 150 cm behind the breakwaters. Accretion in one of the breakwaters increased from 210 m² in 2010 to 3,822 m² in 2016. Identifying the edge of soil accretion has been difficult in recent surveys as it already started to converge with sediments landward and natural recruits have already established. None survived among the *Avicennia marina*, *Sonneratia alba* and *Rhizophora mucronata* planted in 2010. Planting continued in 2012 when sediment was already firm and stable. *S. alba* was recorded to have the highest survival rate at 73.6% among the species planted. Natural recruitment of *S. alba* and *A. marina* were also recorded in 2013, but difficult to distinguish between planted seedlings in succeeding surveys. The trees are now 15-25 ft tall.

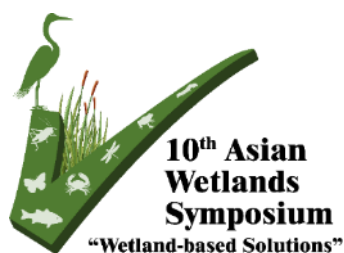
A survey of Mangrove Community Structure behind the breakwater in 2023 showed:

- Total Stand Basal Area (SBA): 28.36 m²/ha (*Sonneratia alba* 18.68 m²/ha, *Avicennia marina* 9.66 m²/ha, *Rhizophora mucronata* 0.01 m²/ha)
- SBA: Trees = 28.27 m²/ha; Saplings = 0.06 m²/ha; Seedlings = 0.03 m²/ha
- Total Density = 9,333 stems/ha (*S. alba* 3,300 stems/ha, *A. marina* 5,867 stems/ha, *R. mucronata* 167 stems/ha)
- Species Diversity (Shannon- Weiner): 0.29
- Importance value: (*S. alba* 113, *A. marina* 187)

The Ajuy, Iloilo breakwaters highlight science-based approaches backed up by properly designed engineering structures enhancing mangrove survival in highly eroded areas.

Keywords: ZSL, breakwaters, sedimentation, Stand Basal Area, Importance value

* Presenter



Session 12 – Wetlands and ethnobiological knowledge

Case studies of identifying the socio-cultural use and value of wetland fauna by recognizing the importance of correlation of wetland and people

S12-1: Crabs in Human Culture

Bishnu Bhandari

S12-3: Insights into the Utilization of Fauna Species of Communities within the Leyte Sab-a Peatland, Philippines

Clivene O. Toctocan, Marylou G. Andrada, Rej Winlove M. Bungabong

S12-4: Faith-based Conservation in Wetlands

Durga Dash

S12-5: Understanding of Wetland Animals in Korean Traditional Painting

Gea-Jae Joo, Seon Ryeong Lee, Yoseok Choi, Seoyoon Bae, Donghyun Hong, Seung-Been Heo, Yuno Do, Ji Yoon Kim, Maurice Lineman

S12-6: Human-Dolphin Mutualism, Faith, and Social Taboo in Myanmar

Htun Paw Oo, Than Htun

S12-7: What science and native people say on snake-headed fish (*Channa striata*), a common freshwater fish species in Sri Lanka

Palihakkara. I.R, Sooriyarachchi. N, Rajapaksha. RMPU

S12-8: Nomenclature of Waterbodies After Fauna

Jitendriya Naik

S12-9: Values of the Lesser Adjutant in the Indigenous Communities

Puspa L. Pokhrel

S12-10: Social Taboos on Wetland Fauna

Tapas Ranjan Chakraborty

S12-1

Crabs in Human Culture

Bichnu Bhandari*

Abstract

From time immemorial, ethnic people have developed some kinds of relationships with plants/animals at different levels – material, cultural, religious, social, psychological, mythological, and spiritual levels. They have developed different ways to use them whole or in parts like what, why, when, where, how and how much. The knowledge associated with the use of plants and animals is called ethno-biological knowledge. This knowledge is transferred from one generation to another through oral tradition. Be that as it may, it is vanishing from the society because the old generation is passing away and the youth are not any more interested in it. Therefore, the topic of discussion is the ethno-biological knowledge of crabs in the tribal society. This knowledge is found in a fragmented way in folklore, fairy tale, literature, songs, art, symbol, etcetera. They have not been well documented. Therefore, they are underutilized and underrepresented in decision making processes of different hierarchies. A rapid survey shows that crabs are used as outstanding delicacies in restaurants like Ministry of Crabs in Sri Lanka or Crab Kingdoms in China and Singapore, where signature dishes of icon crabs are served. Thus, crabs are becoming popular as an attraction of food tourism. But the central objective of the paper is show how crabs have been used by ethnic groups or tribal society. It was found that crabs are used in a number of ways. Their use includes in medicine, religion, spirituality, mythology, folklore, legend, belief, social taboos, prejudice etcetera. For example, the Tharus of Nepal eat crabs as roast, deep-fried, chutney, omelet, pakoda and soup. Kakhori, one of the main dishes is chutney is served all the times. And it is an important item in festival. It is served with breakfast, lunch, dinner, and snack. In Hindu religion people offer live crabs to Lord Shiva to drive away ear-related disease. According to dream analysts, dreaming of a swimming crab means one is going to have a relationship problem. More importantly, crabs are used in primary health care also such as in treating common ailments (cough, cold, headache, diarrhea, burns, cut-wound, fungal infections, stomach ache, wounds and fractures). The world-wide survey shows that in addition to primary health care, crabs are also used to treat various blood diseases including detoxification, cold, cough, asthma, typhoid, joint pain, miscarriage and increasing female fertility. In Chinese mythology, the legend shows the love of crabs shown by writer Li Yu, nicknamed as Crab Fairy. In the crab season, he would have at least 20 fresh crustacean dishes every day. He even appointed a Crab servant just to cook crabs for him. In a Chinese poem, it is mentioned that "there is no better joy in the world than having crab and wine together". The paper concludes with some practical suggestions as follows.

1. Despite prejudices against the crab, they have been the part of human culture from time immemorial.
2. Cultural approach is as important as physical approach. Both should go hand-in-hand.
3. The ethno-biological knowledge of crabs should be developed in systematic ways like delving, documenting, developing a package and disseminating them as wide as possible.

Keywords: Crab, Ethnobiological Knowledge, Use, ethnic peoples, Culture, Crabs

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S12-3

Insights into the Utilization of Fauna Species of Communities within the Leyte Sab-a Peatland, Philippines

Clivene O. Toctocan^{*}, Marylou G. Andrada^{**}, Rej Winlove M. Bungabong^{***}

Abstract

Peatlands are vital wetlands that support unique ecosystems and provide essential resources and services to local communities (UNEP 2007). This study investigated the socio-economic uses of fauna species within the Leyte Sab-a Basin Peatland (LSBP) in the Philippines. By examining the local perceptions and practices related to peatland wildlife, this study results underscored the significance of this ecosystem. Triangulation methods involving one-on-one interviews, key informant interviews (KII), and focus group discussion (FGD) were the primary data gathering and validation tools. A total of 460 dwellers of various socio-economic backgrounds within the LSBP were interviewed in eight barangays across three municipalities in Leyte Province, namely, Alang Alang, Santa Fe, and San Miguel. The results of the interview highlighted that the majority (83.3%) had heard of the word peatland, but only 69.8% regarded it as important. When asked about the different anthropological activities being conducted within the peatland, almost half (49.78%) reported the hunting of wildlife. The reasons provided for this activity included food sources, livelihood, and recreation. As a food source, the results revealed that a significant portion (75.7%) of the respondents relied on peatland resources for food. The primary species harvested included snail, wild pig, wild cat, python, and fishes such as tilapia, Imelda fish, catfish, and carp. Likewise, different bird species such as Philippine duck, cattle bird, heron, *tikling*, and *bebe* were also not only being harvested for consumption but also sold, indicating the roles of these fauna species in local livelihood. With regard to the harvesting of fishes, a majority (58.7%) reported the burning of vegetation in the LSBP in order to expand their fishing areas. Relative to this, they likewise reported that in fishing, the use of illegal activities such as poisoning and electricity were also rampant. During a focus group discussion on the identification of fauna species within the LSBP, it was revealed that notable observations indicated a decline in certain species for the last ten years, primarily those exploited for human consumption. These include python, cobra, Visayan wild pig, carp, Peat eel, shrimp, Philippine duck, wild cat, *bebe*, *tikling*, heron, *tokmo*, *ihalas nga bugsok*, and *tigkaro*. The respondents believed that contributory to the decline of these species were unregulated harvesting, the absence of local policies, and the intrusion of individuals from other barangays engaging in hunting activities. This indicated the impact of unregulated practices and external pressures on the population of fauna species. This likewise emphasizes the importance of local policies which could serve as a crucial tool towards the conservation and responsible utilization of these fauna species within the peatland community.

Keywords: Leyte Sab-a Basin Peatland, peatland, provisioning services, socio-economic survey

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Faith-based Conservation in Wetlands

Durga Dash*

Abstract

Many religious traditions designate the nearby wetlands, ponds, and rivers, as holy or spiritually significant sites resulting in forbiddance of killing of animals. Visitors provide food to fishes, turtles, and ducks in these places. Likewise, there are so many holy temples along the Indian rivers. The same is true in Odisha too where the biggest river is the Mahanadi and all the Ramsar sites are situated along it. In this river, a rare fish species, Mahanadi Mahashir is protected at Huma, 30 Km. downstream of Hirakud. The species has been designated as a State fish and is only available between Hirakud and Satakosia Ramsar Site in Mahanadi. Recently, its population has come down. Scientists have taken steps for its breeding, but have not been successful at all. Everyday over thousands of visitors come to the temple and the offerings are made to God, Shiva and the offering are fed to the Mahashir as a tradition. It is believed that visitors will be blessed by God Shiv if they provide offerings to the fish as food in Mahanadi. The visitors also enjoy the feeding to fishes. It is estimated that about 5 quintals of food are sold to the visitors daily. During the flood in the River, they stay in groups. There is a small crab species (maximum 20 gram in weight) available in Chilika having medicinal values. Elderly people quite often become sick of constipation. Due to constipation the people suffers and their family members also become worried. In this situation people make curry of this crab with recipe. The crab curry is very useful in treating constipation within a day. It is also used as food and medicine by the poor people. People catch these crabs for their own food but not for sale. The people have their own traditional knowledge in the community. It is said that when water frog locally called as “Brahmani bengal” croaks, it means that it is sign of rainfall soon. When people hear the croaking sound of water frog, they have smiles in their faces and begin to prepare their lands for cultivation. The traditional healers prepare their own medicine with available resources. In my childhood my right leg was suffering from eczema. I was suffering from it for about 10 years. It is a skin disease of chronic nature causing inflammation, redness, irritation, and itching. It is also very painful. In 1970, my father took me to a traditional healer in a nearby village. The traditional healer told me to collect one skeleton of a turtle. I collected a skeleton of a dead turtle and gave him. He burnt it with cow-dung cake. It became charcoal. He prepared a powder, mixed it with mustard oil and made paste. He gave me that I applied it over the eczema. Eczema was completely cured in a month. It was when I was at the age of 14 years and studying in class VIII. From that time the skin disease disappeared from my body. Fish is considered an indicator of good fortune in community. It is tradition that the bride goes to the house of the bridegroom immediately after wedding. The new bride brings many gifts to the house of the bridegroom. Among them the snakehead murrel fish (called Seula in Oria) is a must. It is believed that the murrel fish is a sign of good fortune for the newly married couple.

Keywords: Traditions, disease, temples, knowledge

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Understanding of Wetland Animals in Korean Traditional Painting

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Yuno Do^{****}, Ji Yoon Kim^{*****}, Maurice Lineman^{*****}

Abstract

Korean traditional art has conveyed rich meanings through the enjoyment of leisure activities and the decoration of homes or environments. Animals and plants in particular have long been significant subjects along with landscapes, with animals carrying unique symbolic meanings. This study aims to explore the roles and meanings of wetland animals in Korean traditional paintings. Using e-museum, a national museum collection search site, we collected paintings from the 1700s following, a period when common people began to engage with art. The primary subjects included cranes, geese, turtles, tortoises, frogs, carp, ducks, crabs, shrimp, and shells. In the 'Ten Longevity Symbols painting', turtles and cranes symbolize longevity. Paintings of geese and reeds, representing the desire for peace and comfort in old age. Additionally, catfish and carp signify success and are frequently used in paintings wishing for success in state examinations. Goldfish, shrimp, shells, kingfishers, mandarin ducks, and ducks symbolize marital harmony and fertility, often appearing as decorations for homes or weddings. Toads and frogs represent luck and fortune and are typically used to wish for a bountiful harvest. Cranes are very frequent subjects in Korean traditional paintings. Their symbolic significance, such as nobility and integrity, is so widespread that cranes are often used in place names throughout Korea. Cranes and mandarin ducks are also made into various decorative items and frequently appear in traditional stories and poetry, highlighting their cultural importance. These wetland animals hold significant value in Korean traditional art and culture. Therefore, increasing the understanding and conservation of wetlands could be facilitated by using these animals as primary subjects in systematic research and practical applications. While there have been attempts to educate and raise awareness of wetlands for children through books like "Wetland Culture for Children," they have not been significantly successful. It is necessary to further discover the cultural value of wetland animals suitable for various age groups and use them as educational materials. Moreover, it is essential to actively convey the significance of wetland animals and their meanings to countries outside of Korea to emphasize the importance of cultural diversity.

Keywords: Traditional cultural expressions, wetland symbol, wetland art

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Human-Dolphin Mutualism, Faith, and Social Taboo in Myanmar

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Abstract

In some society of Myanmar, ethnographic studies show that a lot of ethnological knowledge, especially the relationship of men with wetland fauna can be found. In some tribes, it has been the main source of their livelihood. In this paper three cases from the Ayeyarwady River Basin have been briefly presented. Mutualism practiced between humans and wildlife is a rare ecological phenomenon but the relationships between fishermen and Ayeyarwady Dolphin (*Orcaella brevirostris*) is an outstanding example of human-dolphin reciprocal relationship in the Ayeyarwady River of Myanmar. This relationship has been recognized by the establishment of Ayeyarwady Dolphin Protected Area and 59 cooperatives by the cast-net fishermen. Both fishermen and dolphins benefit from each other, namely, (1) repeatedly striking the sides of their canoe with the round end of the paddle, (2) splashing the water sharply with the flat end of the paddle, (3) letting the heavy side of their cast-net dangle on their boat making a tinkling sound, (4) vocalizing a guttural call from the throat similar to a turkey, and (5) throwing the cast-net to attract dolphins near the boat and engage themselves in herding fishes in a semi-circle. As the dolphin pushes its half-submerged flukes in the direction of the fisherman, which serves to further concentrate the fish school and provides a 'signal' to the fisherman to cast their net. The establishment of Ayeyarwady Dolphin Protected Area is an important step aiming the protection of this "critically endangered" dolphin and the unique example of human-dolphin cooperation for protecting the vital interests of local communities. U Shin Gyi is widely believed to be a benevolent guardian spirit (Lord of the Sea) of waterways for people and fishermen in lower Myanmar. He is often seen next to a tiger and crocodile, symbolizing his connection to both land and water. According to a mythical story, once in an expedition, U Shin Gyi and fellow lumberjacks landed on Meinmahla Island of the Ayeyarwady Region. Two Nat (a celestial body) sisters highly enticed by his harp-playing prevented further movement of his vessel. Seeing this standoff, he drowned himself into the sea to become U Shin Gyi Nat. All vessels going into sea are in his protection and offerings are made to him before going into the sea. People also go to the Nat shrine with offerings in the month of March to pay homage, prayers and seek blessings from the Spirit. Social taboos against the whale, fishermen believe that seeing a whale at sea is an indication of bad luck or a kind of warning sign of their wrong way of action, speech, mind, or body to which the celestials at the sea do not like. In order to appease the Spirit, they throw water and rice into the sea as soon as they see a whale to excuse their wrong way of action.

Keywords: Mutualism between humans and wildlife, social taboos against the whale

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Human-Dolphin Mutualism, Faith, and Social Taboo in Myanmar

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Abstract

Channa striata called as striped snake-headed fish or Loola in the local language is native to South Asian countries. This freshwater fish belongs to the family *Channidae* and popular edible fish species among the people in and around natural and manmade freshwater bodies in Sri Lanka, with a number of beliefs especially among elderly generations. Despite the importance of biodiversity and fisheries in Sri Lanka, members of this family and species are one of the least studied in a scientific way. To fill that gap a questionnaire survey was conducted around the Nilwala river basin in Matara District, Sri Lanka with 75 responders who were fully and partially doing fishing as their livelihood. Results were presented as percentages and statistical analysis was done with the t-test. The respondents of 90% believe that regular consumption of striped snake-headed fish was effective in treating anemia, particularly in postpartum and pregnant mothers. Native people used to believe snakehead as one of the best superfoods for quick postpartum recovery and regular consumption of snakehead would heal the mother's body and improve the synthesis of milk for feeding baby. Almost all the respondents strongly believe Snakehead fish is not only a healthy food but is often used as medicine to treat diseases. It is one of the best-known fish species for its traditionally identified pharmacological benefits such as its healing and pain-relieving effects, its ability to increase energy in the human body. So, it is a habit to visit a sick person with a bowl of cooked snakehead as a meal for the patient. The Ayurvedic doctors of Sri Lanka prescribe snakehead consumption for patients suffering from arthritis due to known anti-inflammatory properties. More than half of the respondent fishermen (56%) believe that the large number of small fingerlings that appear closer to the water surface before they go fishing in the morning is a lucky sign of a good catch. Snakehead used to swim upward of the water run during rain looking for new habitats for egg laying, and if more fish swam towards the opposite side of the water run during the start of the rainy season, native people used to believe the relatively high amount of rain for that cropping season. More than 90% of the respondents say because Snakehead fish are carnivores, they eat fish, frogs, snakes, insects, earthworms, and tadpoles, so its meat is said to have a rejuvenating effect, especially for those who are recovering after serious illnesses. The cooking practices include wiping with ash to eliminate the slippery texture as the fish has of slimy appearance on the body. The most popular cooking practice is cooking with thick coconut milk as the native people believe this method will deliver more nutrients to the body. Snake fish is considered as fish for children, as they believe snake fish consist of good proteins for brain development in early childhood, which is proved by scientific evidence that snakehead is a good source of essential fatty acids of omega-3 and omega-6, essential elements of brain development. The snake head is one of the fish for easy consumption as the fish consists of the main vertebral column but without tiny spikes which is suitable to include in a child's plate. Gifting a snakehead is considered as a symbol of friendship in native people as the fish is not available frequently and consuming a snakehead is a richness in the diet. If an excess amount of snakeheads is available more than diet, people used to dry the snake fish and kept in a smoky net called 'Dum Messa' for future use. Results revealed that there is a significant user benefit of striped snake-headed fish than other freshwater fish species in the research area. With reference to scientific evidence, many analyses give similar results, stating that snakehead fish contains an abundant amount of crude protein (23%) crude fat (5.7%), and crude ash (1.8%). It is a low-fat fish with an average fat of less than 10%. Fatty acid. From the perspective of nutrition, snakehead fish acts as a functional food, bringing health benefits. It is a good food source because of its high content of amino acids and fatty acids.

Oral Sessions

Keywords: Snakehead, Native people, nutrients, believes

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Nomenclature of Waterbodies After Fauna

Jitendriya Naik*

Abstract

It has been a tradition to name wetlands after the most common fauna that are found in the area. Chilika Lagoon is one of them. In the past, this area was the habitat of kites. The Chilika is made up of two words – Chilla and Ilaka. In Hindi, Chilla means a kite and Ilaka means an area. Chilla Ilak over times became corrupted into Chilika. Chilika is one of the largest brackish water lagoons along the Bay of Bengal and the largest wintering ground for migratory birds. It is home to a number of threatened species of plants and animals and one of the hotspots of biodiversity in the country. It is also one of the Ramsar sites in India. Similarly, the fresh water lake Ansupa is the largest fresh water lake and also a Ramsar site in Odisha. The literature survey reveals that Ansupa in the past was known as Ainspa Pata (Ainsa meaning plenty of fish & birds and Pata meaning a water source. Some people believe that Ansupa come from the word Hansa-pata (Hansa meaning wild swans and Pata meaning water source) because the lake was an attractive place for the flocks of wild swans. In the course of time, be that as it may, lake is now known as Ansupa lake. Another storey is about a turtle. The turtle is locally called *Kainchha* in Oria. One fable is that that God once came down to the Earth from heaven to save the Earth. In Mahabharat (a Hindu Epic) queen Gandhari during childhood used to go with her mother to take bath in the river. Once she found 100 turtle eggs in sand. She played with them and then threw all of them into water. The eggs were damaged and did not hatch at all. Knowing this the mother turtle was both sad and angry with Gyandhari and gave a curse, "*May you also lose your 100 children during your lifetime.*" Later Gyandhari also lost her 100 sons during the Mahabharat war. Another storey is about a wetland bird, Egret locally called *Baga*. It lives on eating fish and insects. The people believe that the egret is also culturally active in following Hindu traditions. For example, the month of November (Kartik in Hindi) is a sacred month for Hindus and they do not eat any meat during this month. And in the last 5 days of this month people even do not go for fishing. During this last five days, it is believed that even the Egret does not eat fish. There are many folk-lores on wetland fauna such as Irrawady dolphin, crocodile, turtles, egrets. Irrawady dolphin is only seen in Chilika. It helps fisherman at the time of fishing. Fisherman always prefer the presence of dolphin in their fishing area. Whenever the fishermen go for fishing, they always take their boats towards the dolphin area. They also make sound using the sticks against the boat which ultimately call the dolphin of their coming for fishing. During fishing the dolphin acts in such a way the fishes come near the boat and fall inside the net-cast area. Hence the dolphin is the friend of fishermen. Another folklore about dolphin (called Khera locally) is that it is also called *Sadhab Bohu* (Sadhaba means business community and Bohu means a bride and collectively meaning the bride of a rich family) travelling abroad for business. Once due to failure in her duty, the *Sadhab Bohu* was cursed to become a dolphin. Now people believe that the dolphin go abroad like Java, Bornio, Balli, Sumatra for maritime business. Another important folk-lore on crocodile, which is famous in India. The story is told to children by their parents at home and to students by teachers in schools. The central message is that do not cheat your friends.

Keywords: Tradition, Wetlands, Lake, Fish

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Values of the Lesser Adjutant in the Indigenous Communities

Puspa L. Pokhrel*

Abstract

The paper is a study on the relationship of indigenous peoples (the Dhimal peoples) with the Lesser Adjutant called Bhundiphor Garud in Nepali (*Leptoptilos javanicus*). The study shows that a close relationship between them. Some of the findings of the study are summarized below. The bird described in many books of Oriental Philosophy are important economically, esthetically, and culturally in the eastern Terai of Nepal. They have a great medicinal values and used in incantation. Parts of the dead Lesser Adjutant are intensively used by local Ayurvedic Practiceners, sorcerers (Dhami) and shamans (Jhankkri). The sorcerers and shamans use its plumes, wings and shin-bone to exorcize or keep witches away and use in various rites and rituals. Simons and sorcerers use instruments, called Dhyangro (traditional flat drum) in front of shin- bone with claws and wings. On the one hand, these traditional healers start to tremble their bodies and begin to treat the sick. This system of treatment is common in the villages of indigenous peoples. On the other hand, local endemic herbalists and Ayurvedic practitioners mix its bill with herbal plants like the lightening weed (*Drymaria cordata* L.) and sweet flag (*Acpris calamus*) to prepare medicine in order to cure fever, headache and indigestion Its eggs are mixed with pure red soil and used for the treatment of diarrhea. According to Hindu mythology, the Lesser Adjutant is regarded as a holy bird because the bird is the primary vehicle of Lord Vishnu. Lord Vishnu is always riding on the shoulders of Garud. Its zoomorphic idols of Garud are placed in the front of temples, temple complex, shrines and other sacred places. Sorcerers and shamans believe that the bird is means of travel for Lord Vishnu. They also regard the bird as sacred and is represented in the houses of indigenous communities as paintings, figurines or replica. They respect the bird and do not hunt this wetland. Only the bills, claws and shin-bones of the dead bird are used in the rituals, treatment, and exorcism. The bird is an important predator of pest and insect. Therefore, they are friends to farmers. y Insect, pests, snakes, rats, grasshoppers, snails, crabs, monitor lizards, frog, caterpillar, dragonfly, and butterfly are prey for the birds. Its notable use is the eradication of locust pandemonium. Present study exposes significant ethnozoological, ethnomedicinal, religious and cultural knowledge, skill, practice, and food habit of local people of indigenous community and their close relationship as well as association with Lesser Adjutant. It could be effectual and beneficial in sustainable use of wetland bird in the study area. Similarly it could also efficacious in generating awareness, conservation, and preservation of wetland biodiversity before the bird is jeopardized forever. In conclusion, the study shows that people possess a greater understanding of the name and ecological aspects of the species, yet they lack substantial knowledge about its conservation. To address these challenges, both local communities and the government should take proactive steps to raise awareness about the species' ecology, conservation needs and ethnobiological knowledge. The issue of this knowledge should be in the school curricula. This study provides some essential baseline data for field-based research and the development of plans and policies aimed at conserving the Lesser Adjutant in human dominated landscapes.

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Social Taboos on Wetland Fauna

Tapas Ranjan Chakraborty^{*†}

Abstract

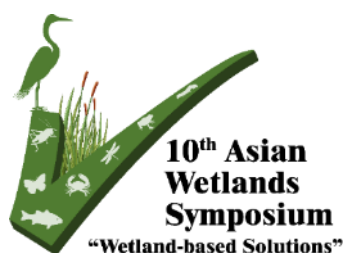
The research was conducted at Medir Hoar to document the use of wetland fauna and their taboos. The tools included observations, community consultation and interviews in Nasirnagar village, district Brahmanbaria. Haor is a vast water body during monsoon and cropland during winter. The Crab is not eaten because it will make the tongue thick. Napter Pora Koi fish (*Badis badis*) is not eaten because it is a reborn fish. Mrigal Fish (*Cirrhinus cirrhosus*) is not eaten by pregnant women. Great Snakehead (*Channa marulius*) is not eaten by many Muslims as it is associated with Hajrat Shahjalal. Helicopter Catfish (*Wallago attu*) is not eaten in a winter month. Gaura fish (*Clupisoma gaura*) is not eaten since it eats human stool. There is a saying about it; “All fishes eat stool, but only Gaura is blamed”. Eating Bengal Mud Eel fish (*Ophisternon bengalense*) cures anemia, Asian Stinging Catfish (*Heteropneustes fossilis*) helps increase milk production of lactating mothers. Men will avoid eating the head of this Catfish because eating will cause their wife to die. Indian Mottled Eel (*Anguilla bengalensis*) is a very good medicine for the treatment of hemorrhoids. Indian Chaca fish (*Chaca chaca*) is a medicine for the babies to stop problems like teeth grinding and bedwetting. Frog calls rain to come. If there are no rain people arrange a marriage ceremony between two bullfrogs. Eating the heart of a toad (*Duttaphrynus melanostictus*) cures asthma. The nesting trees of Pallas’s Fish Eagle didn’t cut down because they carry dry twigs to the funeral of their forefathers. Having an Egret colony or a nest in a homestead is a sign of getting rich. Egrets flying in a normal blue sky is a sign of nor’wester. Ganges River Dolphin is the carrier of Goddess Ganga and considered holy, but its fat is a medicine for arthritis. Regarding dragonflies there is a taboo in which Gandhari, a character in Mahabharata lost all her hundred sons as she made a necklace of 100 dragonflies in her previous life. The study also made a quick survey on the practice of taboos. It was found that almost all the taboos are known to all age groups of the people even though the traditional knowledge is not documented and is transmitted verbally. The culture of storytelling has nearly been diminishing. The taboos have significant conservation values. Some taboos are associated with religious norms and are being practiced without any deviation. Those not associated with religions are being deviated but very minutely. There is also an influence of modern education and lifestyle. Because of medicinal values some species are under threat or at risk especially those related to the treatment of sexual disease and arthritis. The chick of a White Breasted Water Hen is eaten for lengthening the male time in intercourse. The taboos need to be documented for the conservation and betterment of the wetlands, and for the dissemination of knowledge.

Keywords: Wetland Fauna, Taboos, Conservation

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Poster Sessions



Session 1 - Wetlands and climate change adaptation and mitigation

Wetland ecosystems as a key solution for climate change mitigation and adaptation

PS1-1 Irregularity in Mass nesting of Olive Ridley Sea Turtle along BoB

Acharya Chinmaya Mishra

PS1-2 Planter Rain Garden in Kumamoto, Japan

Akane Tokorodani, Fumiko Taura, Yukihiro Shimatani

PS1-3 Assessing Species Diversity and Carbon Stock in Mangrove Ecosystem: Implication for Restoration and Conservation Strategies in Nangka II, Mogpog, Marinduque, Philippines

Althea M. Monleon, Jolo Rey B. Ola

PS1-4 Comparative Assessment of Greenhouse Gas Emissions from Peatlands:

A Study on Bambanin and Caimpugan Sites in the Philippines

Diana Riza A. Africa, Joel B. Orella, Noel C. Pascua, Catherine Hope Bustillo, Cynthia C. Marquez

PS1-6 The Philippines Blue Carbon Quantification Protocol (BCQP):

An Introduction to the National Protocol and Case Study in e-NIPAS Protected Areas

Venus S. Calanda, Christian L. Montilijao, Clare Anne Duncan

PS1-1

Irregularity in Mass nesting of Olive Ridley Sea Turtle along BoB

Acharya Chinmaya Mishra *

Abstract

Olive Ridley Sea Turtle is the second smallest sea turtles among the endangered species under the category of Schedule-1 (family- Cheloniidae). It migrates in huge numbers in beginning of November every year for mating and nesting along the coast of Bay of Bengal. The sea beach in Rushikulya River mouth along Bay of Bengal at Purunabandha in Ganjam district of Odisha and adjacent to Chilika Ramsar Site, India is famous for second largest mass nesting beach of this sea turtle in World. This 5 Kms. long beach is changing its natural situation every year which is causing barrier in mass nesting. Unfortunately, the turtle population is decreasing due to the adverse impact of Climate Change as follows. 1-The eggs are being damaged by the untimely thunder storms in the nesting beach, 2- The eggs are also destroyed by sea erosion, 3-The mother turtle are not coming to the beach for nesting once in each three years due to unfavourable weather condition, 4-Variation in temperature causes in high sex population which has a negative impact over the environment and biodiversity conservation. 5-The variation in eco-system for favourable condition in organising mass nesting. Hence the local community has started volunteering to save the turtle hatchlings from predators. Educating the local people to avoid light in the night at the time of hatchlings starts to move to sea. Release the hatchlings from nets, bushes and other dangerous places and release to sea.

Keywords: Sea Turtle, Mass Nesting, Eggs, Turtle Hatchlings

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PS1-2

Planter Rain Garden in Kumamoto, Japan

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Abstract

Compared to about 100 years ago, the global average temperature rose by 0.99°C, with a corresponding increase in rainfall during the Asian rainy season. At the same time, urbanization has expanded impervious surfaces in many regions. The increased heavy rainfall associated with global warming and expanded impervious surfaces will raise flood risks. Under such circumstances, both conventional flood control measures focusing on rivers and "Catchment-Based Flood Management" covering the entire watersheds, including agricultural lands, forests, and urban areas, are required. "Rain Garden", one of the methods of Catchment-Based Flood Management, is a planting space or land use for temporarily storing or infiltrating rainwater that falls on non-permeable or semi-permeable areas such as roofs and roads, instead of discharging it directly into a drainage channel or river. Rain gardens are "temporarily storing water wetlands" and have various benefits not only runoff control but also groundwater recharge, creation of habitats for living creatures, water purification, and community development, etc. In addition, it is a relatively inexpensive and simple technique that can be made by oneself, it is an easy method of wetland restoration to be introduced in urban areas. We have developed a "Planter Rain Garden" and installed it at two locations in Kumamoto Prefecture to promote wetland restoration in urban areas and contribute to Eco-DRR. Planter rain gardens are usually placed on non-permeable ground and collect rainwater from drainage pipes. They can be easily installed in areas covered with asphalt or where it is not easy to dig into the ground to control runoff and provide habitat for creatures. While there are examples of planter rain gardens in the U.K. and other countries, Japan cannot introduce them as they are because of their high rainfall and it requires large planters. Therefore, we developed a new Planter Rain Garden with a "perforated" structure. By drilling small holes in the bottom of the planter and allowing rainwater flowing into the planter to run off little by little, the calculated peak flow rate during flooding can be reduced. We also intend to contribute to the local forest industry by developing a planter rain garden using local timber. This paper introduces a case study of a Planter Rain Garden in Kumamoto, Japan, and ascertains the challenges and solutions in the production process from an interview survey. In addition, an interview survey will be conducted to understand the difficulties in maintenance and management and how to solve them. Based on these surveys, we will discuss how to promote planter rain gardens as a means of wetland restoration by citizens in urban areas.

Keywords: Eco-DRR, Rain Garden, Wetland Restoration

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PS1-3

Assessing Species Diversity and Carbon Stock in Mangrove Ecosystem: Implication for Restoration and Conservation Strategies in Nangka II, Mogpog, Marinduque, Philippines

Althea M. Monleon^{*†}, Jolo Rey B. Ola^{**}

Abstract

Mangrove forests are among the most biologically diverse ecosystems and play a crucial role in climate change adaptation by sequestering carbon, up to five times more than terrestrial forests. However, they face threats from human activities, resulting in a significant decline and degradation of Philippine mangroves and subsequent carbon emissions. While carbon stocks have been measured in other parts of Asia and the Pacific, information is still limited in the Philippines, with certain geographical areas, like Marinduque Province, being neglected. Therefore, this study aims to address this gap by focusing on assessing species diversity, biomass, and carbon stock in Nangka II, Mogpog, Marinduque, as the study site, providing essential baseline data for mangrove ecology. Data were gathered using transect line plots for diversity and vegetation analysis while a nondestructive approach and an allometric equation was used to calculate the aboveground biomass, carbon content, and the estimation for carbon dioxide sequestration potential. Twenty-two plots with a size of 10 m x 10 m were established to account for the mangroves' diversity, biomass, and carbon stock. Moreover, multivariate analysis of mangrove community data was used for vegetation analysis. The findings revealed that the study area is home to a total of 18 mangrove species belonging to 7 families and 8 genera. However, the Shannon-Wiener index indicated a low value of 1.85. *Avicennia marina* was found to be the most frequently occurring species with a relative frequency of 18.2% because of its euryhaline nature that can tolerate a wide range of water salinity, from salty to fresh water. While *Avicennia officinalis* was found dominating the mangrove forest with an importance value of 65.5%. Furthermore, the average estimated carbon stock in the study area is 621.0 Mg C/ha, with a CO₂ equivalent of 2278.9 Mg/ha. Statistical analysis of the sampled area revealed two distinct groups of plots, with the seaward area exhibiting a high species count but less tree girth value, while the landward area showed a relatively low species count but contributed a high amount of diameter at breast height, total basal area, aboveground biomass, and carbon, belowground biomass and carbon, and CO₂ equivalent. Long-term monitoring of existing and future conservation and restoration projects is necessary to track their impacts on carbon sequestration rates and assess degradation rates resulting from development projects.

Keywords: carbon stock, diversity, mangrove

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PS1-4

Comparative Assessment of Greenhouse Gas Emissions from Peatlands: A Study on Bambanin and Caimpugan Sites in the Philippines

Diana Riza A. Africa^{*†}, Joel B. Orella^{**}, Noel C. Pascua^{*}, Catherine Hope Bustillo^{**}, Cynthia C. Marquez^{*}

Abstract

Wetland habitats known as peatlands are characterized by the buildup of organic matter called "peat," which is composed of decomposed and partially decaying plant debris submerged under conditions of high-water saturation. These ecosystems are of global significance as they act as one of the most effective carbon sinks, holding approximately one-third of the world's soil carbon. Tropical peatlands, which account for 77% of the world's total peatland carbon pool, play a crucial role in regulating the global carbon cycle. According to studies, the emissions from using peat for fuel production in common forestry-drained peatland areas are almost equivalent to those from burning coal to generate heat and electricity. Due to their substantial role in causing global climate change, greenhouse gas emissions from soils to the atmosphere are of utmost concern. Information on peatland in the country is very limited let alone their GHG emissions. Peatland's potential contribution to our Nationally Determined Contribution emission reduction targets is also poorly understood. This study intended to determine and compare the greenhouse gas (GHG) fluxes between two peatlands in the country namely: 1) Bambanin Peatland in Victoria, Oriental Mindoro, and 2) Caimpugan Peatland in San Francisco, Agusan del Sur. Data collection was conducted in June to November 2019. Carbon dioxide (CO₂) flux was measured in-situ using Li-Cor 8100A instrument. Simultaneously, gas samples were collected in evacuated glass vials using a gas sampling kit attached to the same instrument. The gas samples were brought to the laboratory to be analyzed for methane (CH₄) and nitrous oxide (N₂O) concentrations using gas chromatography-flame ionization detector (GC-FID). Average CO₂ fluxes range from 8.12-9.92 $\mu\text{mol m}^{-2} \text{s}^{-1}$ and -0.19-6.26 $\mu\text{mol m}^{-2} \text{s}^{-1}$ in Bambanin and Caimpugan peatlands, respectively. The results revealed that CO₂ flux in Bambanin peatland is significantly higher ($p < 0.005$) than that of Caimpugan peatland. This can be attributed to the greater disturbance in Bambanin peatland than in Caimpugan peatland. Local communities continued developing and converting the peatland site. This may have resulted mainly from low awareness on the importance and benefits of peatlands which was validated during a focused group discussion conducted in the area. CH₄ and N₂O fluxes were higher in Bambanin peatland; however, the differences in fluxes of these gases between the two peatlands were not statistically significant. CO₂ was observed to have the highest flux of the three greenhouse gases at both peatland sites, with only trace amounts of CH₄ and N₂O detected. Peatlands cover a small percentage of the Earth's surface but store a significant amount of carbon. Loss or degradation of peatlands can lead to substantial greenhouse gas emissions, impacting global climate change. Efforts to manage peatlands sustainably, restore degraded peatlands, and prevent further degradation are critical for mitigating climate change. Strategies include rewetting drained peatlands, implementing responsible land-use practices, and raising awareness about the importance of conserving these ecosystems.

Keywords: GHG emission, peatland, climate change

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PS1-6

The Philippines Blue Carbon Quantification Protocol (BCQP): An Introduction to the National Protocol and Case Study in e-NIPAS Protected Areas

Venus S. Calanda^{*}, Christian L. Montilijao^{*}, Clare Anne Duncan^{**}

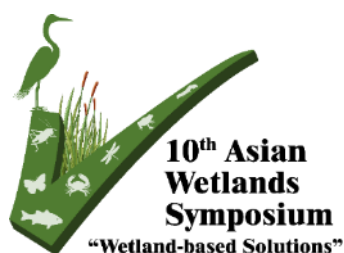
Abstract

Mangrove conservation has been gaining much attention in meeting national and global targets on climate change mitigation and adaptation. Healthy mangrove forests help mitigate greenhouse gas emissions by sequestering and storing high densities of atmospheric carbon dioxide (CO₂) within their biomass and into the soils over long timescales if undisturbed (Alongi 2014). Despite their importance, these ecosystems have been threatened by natural and human activities that have proved to cause irreversible damage to coastal ecosystems requiring immediate attention for protection, rehabilitation, and conservation (Goldberg *et al.* 2020). Reversing and slowing loss of Philippine mangrove ecosystems has been a conservation priority in recent decades (Primavera 2008; Duncan *et al.* 2016; Gerona-Daga & Salmo 2022), amplified by a growing awareness of the role of mangroves as carbon sinks (Corcino *et al.* 2023). While blue carbon is gaining substantial research attention, whole-ecosystem data on carbon stocks is still lacking and highly variable (Corcino *et al.* 2023), and blue carbon concepts are not yet uniformly incorporated into climate strategies at national scales (SunStar 2024). The USAID Sustainable Interventions for Biodiversity, Oceans, and Landscapes (SIBOL) project, together with DENR BMB, Zoological Society of London-Philippines, national blue carbon scientists and experts, are working together to develop a simplified guide to key technical staff, coastal managers, and field practitioners for carbon measurement and analysis in coastal ecosystems: The Blue Carbon Quantification Protocol (BCQP). The BCQP is a standardized approach to measuring, monitoring, and reporting blue carbon in the Philippines (mangroves, seagrass). The protocol will also help in scaling up blue carbon opportunities for the country to meet the emission reduction goals and Nationally Determined Contributions as outlined in the 2015 Paris Agreement. Establishing blue carbon stocks will also improve national confidence in blue carbon potential which will further inform conservation strategies and strengthen climate mitigation initiatives. Further, SIBOL conducted comprehensive blue carbon stock assessments under the BCQP, in two protected areas under e-NIPAS - Siargao Island Protected Landscape and Seascape (SIPLAS) and Masinloc and Oyon Bay Protected Landscape and Seascape (MOBPLS) in May-June 2023. We estimated a total of 25,733 kilotonnes (Gg) carbon dioxide equivalent (CO₂e) stock stored in the mangrove above- and below-ground biomass and top 1m soil within SIPLAS' 9,350.125 ha mangrove forest (DENR PAMO SIPLAS, 2020), and a total of 127.43 Gg CO₂e stock within MOBPLS' 146.18 ha protected mangrove forest (MOBPLS PAMP, 2023). The two PAs will serve as model sites for mangrove blue carbon stock assessment and results will form part of the national body of blue carbon knowledge, provide evidence and inform policy makers on potential inclusion of these nature-based solutions to climate change into national mitigation strategies.

Keywords: blue carbon, protected area, mangrove, climate change

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Session 2 – Wetland restoration

Wetland ecosystem and species restoration approach and case studies towards sustainable wetland management

PS2-1 Germination of Pagatpat *Sonneratia alba*: Effect of Seed Drying on Root and Shoot Development

Rona Joy Loma, Richardson Medina, John Paul Bainggan, J.H. Primavera

PS2-2 From Abandoned Ponds to Mangrove Ecopark: The Story of the Leganes Integrated Katunggan Mangrove Ecopark (LIKE) in Iloilo, Central Philippines

J.H. Primavera, R. Golbeque, D. Dequito

PS2-3 Prediction of wetland vegetation using deep learning

Yoshiyasu Fujimura, Chiaki Murakami, Reiko Akita, Miho Igarashi

PS2-4 Germination trails on *Camptostemon philippinensis* (Gapas-gapas), Endangered

Jofel D. Coching

Poster Sessions

PS2-1

Germination of Pagatpat *Sonneratia alba*: Effect of Seed Drying on Root and Shoot Development

Rona Joy Loma^{*}, Richardson Medina, John Paul Bainggan, J.H. Primave

Abstract

The seafront mangrove species *Sonneratia alba* locally known as pagatpat has emerged to be the most resilient in the face of Typhoon Haiyan and other super storms, with seemingly dead branches growing/exhibiting shoots (from their apical meristems) after a month, in contrast to dead bakhaw *Rhizophora* species. Because of their firm trunks and regularly shed bark, planted *S. alba* have also shown high survival in contrast to dead *Avicennia marina* (trunks broken by heavy filamentous algae) and *Rhizophora* sp. (vulnerable to barnacles) seedlings in a Dumangas, Iloilo plantation. Yet *Rhizophora* spp. continue to be the favored species for mangrove rehabilitation because of a) their relative availability and easy planting methods, and b) the low availability of *S. alba* seedlings due to high nursery mortality. Over the last decade, the Zoological Society of London (ZSL) has attempted to germinate *S. alba* in Pedada, Ajuy, Iloilo and other project sites, but with little success due to high seedling predation (by crabs, annelids, slugs). That is, until 2023 when partner people's organizations (POs) guided by ZSL biologists successfully propagated more than 200,000 *S. alba* seedlings based on a series of trials on various nursery protocols. This paper reports the results of sundrying of seeds on appearance of roots and shoots. Three treatments – control, 1 hr. drying, and 5 hr. drying – were set up with three replicates per treatment. The seeds were sown in plastic containers with paper towels and tap water (100 ml) at 100 seeds each; containers were covered with transparent plastic and monitored daily for appearance of roots and shoots for 19 days. Results are: Average number of seeds with roots: control - 95.89 seeds; 1 hr. drying - 92.15; 5 hr. - 82.67 Average number of seeds with shoots: control - 49.83 seeds; 1 hr. - 45.94; 5 hr. - 46.17 No. of seeds with roots appearing after 28 hr.: control - 90.33 seeds; 1 hr. - 78.67; 5 hr. - 48.66 . Green leaves started to appear on the 4th day after sowing. Although there is no significant difference in the average number of seeds that have grown leaves among treatments, control seeds that did not undergo drying had longer roots and stems, and higher viability. Seeds subjected to 5 hr. drying have short roots and some of the leaves were cut at the base. Future experiments will focus on eradication of predators, seedling size/age for transfer to individual polybags, effect of varying levels of shade/sun on growth and survival.

Keywords: ZSL, Ajuy, Iloilo, sundrying, roots, shoots

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PS2-2

From Abandoned Ponds to Mangrove Ecopark: The Story of the Leganes Integrated Katunggan Mangrove Ecopark (LIKE) in Iloilo, Central Philippines

J.H. Primavera, R. Golbeque *, D. Dequito

Abstract

Historical rates of mangrove loss have been greatest in Southeast Asian countries such as the Philippines where brackishwater pond culture has also been the most active. Furthermore, increasing storm frequency and intensity associated with climate change have been the highest hence massive resources are being poured into disaster mitigation and adaptation. However, these mangrove initiatives have focused on the seafront which is open access but ecologically challenging (with generally low survival rates). Philippine laws mandate the reversion of abandoned brackish water ponds. Such reversion is relatively easy because the ponds are located in the middle to upper intertidal where mangroves used to thrive. But they are also fraught with tenurial conflicts which the seafront strategy avoids. High regeneration rates in shallow ponds are illustrated by the Leganes Integrated Katunggan Ecopark (LIKE) in Iloilo, central Philippines. This success story of pioneering pond-to-mangrove reversion is underpinned by social and biological success factors: a) science-based protocols, b) Assisted Natural Regeneration (ANR), c) volunteer planting, and d) political will. Abundant wildlings of the naturally dominant *Avicennia marina* (vs *Rhizophora* species long favored for their easy availability and planting) are harvested for direct planting in vacant pond spaces, or for conditioning in a nursery. Applying the concept of ANR, only excess wildlings are taken – after all, mangroves have been called sapling banks. The project was greatly facilitated by the creation of a Municipal Environment and Natural Resources Office and passage of a municipal ordinance declaring 15-ha area a protected ecopark. Government support and political will have been consistent despite the change in local executives after each of two elections. Pond rehabilitation started in 2009 under the Community-based Mangrove Rehabilitation Program of the Zoological Society of London in collaboration with the municipal government. Over the 4-year project, 80,000 wildlings (out of 90,000 collected) were bagged for nursery conditioning, then outplanted by students, government staff, local communities, private sector employees and other volunteers. In volunteer planting, the contribution of labor from planters such as local folk gives them *de facto* mangrove ownership and commits them to ensuring survival of the plants to maturity. In contrast, paid planting often becomes a mere business transaction which ends when planters are paid for their efforts, and plant survival becomes of minor concern. Recent gains of the 15-ha LIKE include the granting of the Disney Conservation Hero Award to a local government champion who was the project workhorse from the start, formation of the Mangrove Seedling Growers Association by local fishers, construction of a Php1.6 million Information Center (to replace the temporary nipa hut), donation by the German government of a community kitchen, planting of 63 native bushes along the roadway to the Center, and groundbreaking for the construction of a view deck along the 300-meter footwalk. As a learning site for regular mangrove training courses, the Ecopark has given local stakeholders pride of place, and more significantly, a 200-meter-wide greenbelt that protects households and adjacent fishponds from storms. In 2023, LIKE was awarded First Prize for the Best Mangrove Awards in the biennial Para El Mar celebration.

Keywords: ZSL, pond reversion, volunteer planting, Assisted Natural Regeneration

PS2-3

Prediction of Wetland Vegetation Using Deep Learning

Yoshiyasu Fujimura^{*†}, Chiaki Murakami^{*}, Reiko Akita^{*}, Miho Igarashi^{*}

Abstract

Riverine and peatland vegetation face to loss of biodiversity. For example, flow regulation by dams makes less-disturbance condition, leading to the topographical fixation of high waterbeds and low watercourses. It has resulted in tree growth in floodplain followed by reduction of flow capacity and loss of biodiversity such as hydrophyte or disturbance-dependent species. In case of peatland, the area has been shrinkage associated with land development and has been influenced by upstream and surrounding land use. In addition, climate change should affect flow regime of both surface and ground water, which will in turn affect vegetation. Develop models to predict the effects of environmental changes, such as flow regulation by dams, topographical changes due to river channel excavation and climate change, on vegetation. The vegetation map is used as the objective variable and the results of the topographic and hydrological analysis such as slope, water flow velocity, depth of water, etc. as explanatory variables. And the relationship between them is modelled using deep learning. The accuracy of topographic and hydrological analysis results is strongly influenced by the accuracy of digital elevation models (DEM). This analysis was carried out using a DEM with a resolution of 5 m or better. The model outputs the probability of occurrence for each vegetation type as a value of 0~1. The accuracies of output reproduced vegetation map exceed more than 70% in most cases which we apply the model. The useful point of this model is that it can easily map the predicted results according to multiple comparative plans. ex. where the hydrophyte vegetation establishes, and where the trees invade. This vegetation prediction models using deep learning are highly reproducible of current conditions and the output is easy to understand visually. It is an effective tool for nature restoration and ecosystem management and is expected to be increasingly used in the future.

Keywords: Riparian vegetation, Riverbed excavation, AI

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PS2-4

Germination trails on *Camptostemon philippinensis* (Gapas-gapas), Endangered

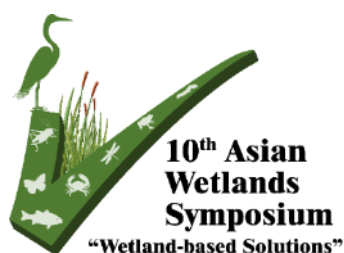
Norielle Diamante^{*}, Jofel D. Coching^{*†}

Abstract

The Philippines has high mangrove biodiversity with a total of 37 true mangrove species and an estimated forest cover of around 300,000 ha (3,000 km²) but since around 1970's, these mangroves are under threat of conversion to various land uses and natural disasters. Mangrove protection and rehabilitation efforts has been conducted to counter mangrove habitat and species loss all throughout the country. However, these efforts are limited to only the most common mangrove species *Rhizophora* spp., *Avicennia* spp., and *Sonneratia* spp., all of which are mostly planted on seafront areas. *Camptostemon philippinensis* (gapas-gapas), a mangrove species classified Endangered in IUCN Red List of Threatened Species, is commonly found in landward and high elevation portions of mangrove forests. Despite its Endangered status, there is limited knowledge and technology available on the germination and propagation of *C. philippinensis*, much more on its outplanting. Germination trials showed that *C. philippinensis* seeds germinate best when sowed in seedbeds soaked with freshwater and within closed-system seedbeds. A major problem with *C. philippinensis* germination in closed system is fungal infestation, which can be prevented through sterilization of the fruits, individual seeds, and the germination seedbed. Ongoing trials for maintaining seedlings in highly controlled environment using freshwater is being conducted and show high survival rates.

Keywords: Mangroves restoration, rehabilitation, *Camptostemon philippinensis*, germination, mangrove nursery

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Session 3 – Wetland biodiversity

Wetland biodiversity that defines its richness and abundance, and discuss important species and habitats including wetland birds

PS3-1 Then and Now: How does the macroinvertebrate community in the Pasig River change from 15 years ago?

Annieraj A. Velasco, Raneer Christina M. Telosa, Cynthia M. Marquez, Maria Lourdes Q. Moreno

PS3-2 Macroinvertebrate Communities as Indicators of Ecological Health in the Babuyan River, an Inland Wetland within Palawan's Biodiversity Hotspot

Cynthia C. Marquez, Marcgell Adrian O. Bumanglag, Diana Riza A. Africa, Yves Christian L. Cabillon, Ma. Sheila G. Dequina, Maria Lourdes Q. Moreno

PS3-3 Assessment of Mangrove Resource Rehabilitation in terms of Regeneration Capacity and Species Diversity in Buyabod, Sta. Cruz, Marinduque, Philippines

Ellen Grace N. Aguiflor

PS3-4 Composition, Abundance, and Distribution of the Diatom Genus, *Chaetoceros* Ehrenberg, along the coastal waters of Calatagan, Batangas

Larry V. Padilla, Rej Winlove M. Bungabong

PS3-5 Case Studies of Biodiversity Monitoring Surveys in Coastal Areas, "Monitoring Site 1000 Project "

Ryoko Ueno, Ken-ichi Yokoi, Hikaru Wakamori, Misuzu Aoki

PS3-6 Crab bank helps to increase the Crab population in BoB

Wardi Kasinath

PS3-7 Biodiversity of the Shinan Tidal Flats, South Korea

Chang-uk Park, Gyeon Nam Ko, Woo Shin Lee

PS3-8 Migration Pattern of Whooper Swan *Cygnus cygnus* in South Korea and Mongolia

Yerim Lee, Seung-Kook Kwak, Gombobaatar Sundev, Soronzonbold Ochirvaani, Gea-Jae Joo

PS3-1

Then and Now: How does the macroinvertebrate community in the Pasig River change from 15 years ago?

Annieraj A. Velasco ^{*†}, Raneer Christina M. Telosa ^{**}, Cynthia M. Marquez ^{**}, Maria Lourdes Q. Moreno ^{**}

Abstract

Macroinvertebrate community structure metrics are one of the reliable indicators in the comprehensive assessment of aquatic ecosystems. The Pasig River Coordinating and Management Office (PRCMO) and the Ecosystems Research and Development Bureau (ERDB) are currently assessing the biodiversity of the Pasig River and its tributaries to update previous data. This includes evaluating macroinvertebrates as indicators of wetland health. This paper examined the changes in species composition, abundance, and diversity of macroinvertebrates associated with aquatic plants like water hyacinth (*Pontederia crassipes* Mart. formerly *Eichornia crassipes* (Mart.) Solms), hornwort (*Ceratophyllum demersum* L.), kangkong (*Ipomoea aquatica* Forssk.), and quaiapo (*Pistia stratiotes* L.) in the upstream (US), midstream (MS), and downstream (DS) sections of the river. Samples were identified to the family level, comparing current assemblages with data from 2009. Previous assessments showed that arthropods were the predominant group among the surface water macroinvertebrates across the entire stretch of the river. Numerically, they comprised 68.56% of the total macroinvertebrate collection. Molluscs accounted for 31.06% of the population, while Annelids represented 0.38% by density. Species richness ranged from fifteen (15) to twenty-four (24) species across different parts of the river. Shannon diversity index values were as follows: ranging from 2.22 to 2.279 in the US section, 2.12 in the MS section, and 1.77 to 1.88 in the DS section. In the 2024 assessment, species richness ranged from five (5) to seven (7) species, with these species respectively belonging to the Phylum Arthropoda and Phylum Mollusca. Molluscs were the most prevalent macroinvertebrates (60.40%). Diversity index values were as follows: 1.159 to 1.568 for the US section, 1.726 for the MS section, and 0.9802 to 1.458 for the DS section. These values were not on par with the 2009 baseline results, which showed a dominance of arthropods. In both assessments, pollution-tolerant organisms such as non-biting midges (Family Chironomidae) and rat-tailed maggots (Syrphidae), bladder snails (Physidae), other invasive gastropods like the apple snails (Ampullariidae) were found to inhabit the river's macrophytes. Most of these recorded taxa were indicative of eutrophic waters. Insects with moderate to high pollution sensitivity, such as dragonflies (Odonata) and mayflies (Ephemeroptera) observed in previous assessments, were absent in the recent evaluation. Changes in the composition of macroinvertebrate community structure can be a result from the recent regular removal of aquatic macrophytes to address the impacts of infestation of these vegetation mats particularly on navigation and access to other fishery resources in the river. Nevertheless, further investigation into other factors influencing the assemblage is necessary, including long-term monitoring of temporal factors and historical resource utilization in the river.

Keywords: biodiversity, macroinvertebrates, river

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PS3-2

Macroinvertebrate Communities as Indicators of Ecological Health in the Babuyan River, an Inland Wetland within Palawan's Biodiversity Hotspot

Cynthia C. Marquez[†], Marcgell Adrian O. Bumanglag^{*}, Diana Riza A. Africa^{*}, Yves Christian L. Cabillon^{*},
Ma. Sheila G. Dequina^{*}, Maria Lourdes Q. Moreno^{*}

Abstract

Water resource assessments in the country often prioritize physicochemical measures, overlooking biotic integrity and its environmental interactions. This neglect has contributed to global declines in freshwater biological communities characterized by the emergence of invasive and tolerant species, decreased taxa richness, and loss of sensitive species. The Pasig River, once deemed biologically dead, illustrates this trend. Despite their reliability, biological indicators like macroinvertebrates have yet to be integrated into the national protocols for monitoring rivers and streams. The Babuyan River, the longest in Palawan, sustains diverse habitats and wetland-dependent species, reinforcing Palawan's status as the Philippines' "last ecological frontier" and highlighting its rich biodiversity. A study was conducted to evaluate its health by analyzing its water chemistry and macroinvertebrate diversity across three sections, each with different levels of disturbance. Macroinvertebrates were collected using mesh sieves in shallow areas and grab samplers in deeper areas, particularly midstream and downstream. The study measured density, species richness, Shannon Diversity Index (SDI), and the Family Biotic Index (FBI). Diversity was calculated using the Paleontological Statistics Software Package for Education version 4 (PAST). While the in-situ water quality parameters for all river sections adhered to Class B standards, the Water Quality (WQ) index scores indicated otherwise. WQI scores ranging from 60-67 revealed critical conditions in the midstream and downstream sections, a finding supported by biological metrics. Despite the high abundance (757) and variety of taxa, diversity index scores ranging from 1.40 to 2.02 suggested moderate pollution levels across different sections and seasons. Species richness ranging from 6 to 15 indicated severe to moderate levels of degradation, with the upstream section having the highest species count and the downstream section the lowest. Similarly, while the FBI scores showed very good (3.99) and good (4.87) water quality conditions for the upstream and midstream sections, the downstream section demonstrated poor water quality (6.074). The presence and dominance of indicator species supported these findings, reflecting changes in environmental conditions and water quality along the river's gradient. Pollution-sensitive Hydropsychidae larvae were abundant in the relatively undisturbed upstream areas. In contrast, pollution-tolerant gastropods, such as *Melanoides maculata*, *M. tuberculata*, and *Tarebia granifera*, dominated the more disrupted downstream section. Macroinvertebrate-based metrics indicate that the downstream section of the Babuyan River is impaired and necessitates environmental protection. Furthermore, the study confirms that macroinvertebrates are reliable indicators of river health and useful for monitoring aquatic ecosystems. Integrating these findings with other ERDB studies on freshwater macroinvertebrates can inform a policy brief advocating for the inclusion of biological assessments in the national water quality management program.

Keywords: macroinvertebrates, indicators, diversity

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PS3-3

Assessment of Mangrove Resource Rehabilitation in terms of Regeneration Capacity and Species Diversity in Buyabod, Sta. Cruz, Marinduque, Philippines

Ellen Grace N. Aguiflor *

Abstract

Mangrove forest ecosystems' resilience depends on the regenerative potential of mangrove plants, which adapt to varying conditions, enhancing their regrowth ability, especially in areas affected by water flow and environmental factors. Understanding how an ecosystem recovers from environmental pressures requires studying its regeneration capacity. This study assessed diversity and regeneration capacity of mangrove species in Buyabod, Sta. Cruz, Marinduque, and explored the relationship of mangrove regeneration to pH and salinity by establishing transects, quadrats, and subplots. Data analysis was conducted using NMDS, ANOSIM, SIMPER, and PCA. Fourteen (14) mangrove species totaling 431 individual plants were identified, belonging to the families Avicenniaceae, Rhizophoraceae, Euphorbiaceae, Sterculiaceae, and Meliaceae. The biodiversity index (H) of 1.66 indicates a moderate probability of finding one species per plot. The species richness index (R) of 4.93 signifies medium species richness, while the evenness index (E) of 0.27 shows unbalanced species abundance. Ordination of diversity in different quadrats exhibited varied characteristics. Dominant species identified for the regeneration study included *R. apiculata*, *R. stylosa*, *R. mucronata*, *B. parviflora*, *A. alba*, and *A. rumphiana*. The Regeneration Capacity Index (RCI) values indicate fair regeneration across the site, with RCII being greater than RCIII and RCI. The overall mangrove condition was determined by average tree height and regeneration per square meter. Thus, the overall condition was assessed as GOOD. The study revealed species diversity variation at mangrove sites, as shown by cluster analysis and NMDS plots. Findings suggest that pH and salinity influence the survival and distribution of naturally regenerating mangrove species. Threats observed in the study area include water well runoffs, poor regeneration, cuttings, household solid waste, and coastal boulevard construction. Understanding the mangrove habitat condition is crucial for developing effective management strategies to maintain species richness and habitat quality. The study recommends that relevant authorities and organizations, in conjunction with local government units (LGU) and barangay local government units (BLGU), may enforce local laws and recommendations to conserve and protect the region. This will ensure the continued richness of its biodiversity.

Keywords: dominant species, environmental parameters, natural regeneration

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PS3-4

Composition, Abundance, and Distribution of the Diatom Genus, *Chaetoceros* Ehrenberg, along the coastal waters of Calatagan, Batangas

Larry V. Padilla ^{*†}, Rej Winlove M. Bungabong ^{**}

Abstract

Diatoms are significant components of the aquatic ecosystem as they dominate the microalgal community in coastal and oceanic waters. One peculiar genus due to its unique morphology is *Chaetoceros* Ehrenberg, which is regarded as a ubiquitous diatom genus that plays an important role in marine productivity. The environmental regime defining an ecosystem is instrumental to the immensely diverse form and structure of its various species. In the Philippines, few studies have been made that focus on this group, thereby this research intends to provide new insights on the composition, distribution, and diversity of this genus in an important coastal ecosystem in the Philippines, which is Calatagan, Batangas. Water samples were collected in three (3) study areas located at the western, southern, and eastern portions of the peninsula. Microalgal cells belonging to genus *Chaetoceros* were observed microscopically, and were identified, quantified, and subjected to biodiversity indices calculation. Based on the analyses of the samples, it appears that the coastal waters of the study area harbor at least eleven (11) microalgal species classified under genus *Chaetoceros*. Among the species collected, the most frequently observed species are *Chaetoceros affinis*, *C. danicus*, *C. diversus*, *C. lorenzianus*, and *C. laciniosus*. Specimens that could not be identified are reported as *Chaetoceros* spp. Although generally similar, the composition of *Chaetoceros* spp. in the three sampling areas seem to vary. The highest population density has been recorded in Station 2 fronting Barangay Bagong Silang at the southern portion of Calatagan Peninsula. In terms of composition, the dominant taxa in the eastern (Station 1) and southern (Station 2) coasts are more similar and was distinctive when compared to those present at the western coast (Station 3). The findings of this study were able to provide new reports and insights on the presence and diverse composition of *Chaetoceros* spp. in an important coastal community in the Philippines, benchmarking new research in the region targeting more specific genera of phytoplankton.

Keywords: Bacillariophyta, Biogeography, Biodiversity, Phytoplankton, Plankton

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PS3-5

Case Studies of Biodiversity Monitoring Surveys in Coastal Areas, "Monitoring Site 1000 Project "

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Abstract

Based on the Second National Biodiversity Strategy, in 2003, Japan's Ministry of the Environment (MOE) launched the Monitoring Site 1000 Project, a long-term ecosystem monitoring project. This project aimed to detect qualitative and quantitative changes in organisms in various ecosystems in the Japanese c, including alpine zones, forests, Satoyama, inland waters, and coastal areas. More than 1,000 survey sites have been established throughout Japan, will be monitored over a 100-year period. And, monitoring has been conducted with the cooperation of various stakeholders, from researchers to citizens. The results of wide-area and continuous biodiversity monitoring surveys, such as this project, provide crucial information for understanding the impacts on wetland biodiversity. These impacts include long-term and sudden climate change effects, decline of native species due to invasion by alien species, and changes in species distribution areas. Since 2008, Wetlands International Japan has conducted various surveys of rocky shores, tidal flats, seagrass beds, and seaweed beds to determine the current status of coastal areas as part of this project. This coastal monitoring survey involved the cooperation of approximately 540 researchers, among others, over period of 16 years. One notable feature of this coastal areas monitoring survey is that it uses methods that enable the quantitative assessment of biota and biomass. The data obtained from this project are largely available on the website of MOE. These data are expected to be used to develop conservation measures for national and local governments and other administrative agencies. Some of the data obtained in this project have been shared with OBIS and GBIF, thereby enhancing our understanding of long-term changes in biodiversity on a global scale. Notably, two findings that can be drawn from the results of these monitoring surveys over the past 16 years. The first is the impact of the great tsunami and the ground subsidence in 2011 on coastal ecosystems, caused by the earthquake on the Pacific coast of Tohoku. The second is the change in the species composition and the reduction in the area of seaweed beds along the coast of Japan in recent years. The former contributes to the quantitative assessment of the impact of sudden natural disasters, whereas, the latter shows ongoing changes and may be an example of a situation in which the ecosystem has been subject to changes over several years.

Keywords: Biodiversity Monitoring Survey, Coastal Areas, Monitoring Site 1000 Project

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PS3-6

Crab bank helps to increase the Crab population in BoB

Wardi Kasinath*

Abstract

Blue swimming crab is one of the commercial species in BoB. This species is gradually decreasing due to so many causes. In early 2000, this situation was also arisen in Japan, Thailand and also other adjacent countries. But after the establishment of the crab bank, there has been changed positively in this situation. In Ganjam District the migration rate is high because of so many problems and the people go out of the State in search of livelihood. So RCJ, Japan has built the capacity of local fisherman community through training programmes. Crab banks are established in the coastal villages of Ganjam District since last 5 years. The mother crabs are donated by the fishermen to crab bank regularly. After collecting the eggs from the mother crab in crab bank, the donors also take back their crab. The eggs are being processed in the crab bank and the crab lings are released in sea water in evening. Now the crab catch by fishermen has been increased. There was a survey conducted by us that the catch of blue swimming crab was 3 kg. per fisherman in 2018 and now it has been increased to 5 KG. on an average. So Crab bank is a boon to the fisherman in the coming future. The migration in fisherman community will be decreased in the future.

Keywords: Crab, Crab Bank, Fishermen, Eggs

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PS3-7

Biodiversity of the Shinan Tidal Flats, South Korea

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Abstract

The Shinan Tidal Flats, located in South Korea, is a vital ecological area known for its rich biodiversity and extensive pearl mudflats. These tidal flats encompass a variety of habitats, including mixed tidal flats, sandy tidal flats, and a number of uninhabited islands. As one of the largest salt marshes in Korea, they provide a haven for a wide variety of marine and terrestrial life. The ecosystem supports an impressive 144 species of algae and 568 species of macrobenthic animals such as clams, crabs, and mollusks. This biodiversity is not only essential to the local environment, but also plays a critical role in supporting global biodiversity. A particularly significant aspect of the Shinan Tidal Flats is its role as an important stopover site for migratory birds. The flats are an integral part of the East Asian-Australasian Flyway (EAAF), a migratory route used by a large number of waterbirds. Annually, 118 species of waterbirds are observed in the area, relying on the flats for food and shelter during their long migrations. Among these birds, 17 species are classified as Near Threatened (NT) or Endangered (EN) according to the International Union for Conservation of Nature (IUCN) Red List. This list includes species that are at significant risk of extinction, highlighting the importance of conservation efforts in this area. Some of the most notable bird species observed at Shinan Tidal Flats include the critically endangered Class 1 Oriental stork (*Ciconia boyciana*) and black-faced spoonbill (*Platalea minor*). These species are particularly rare and face severe threats in their natural habitats, making the conservation of their stopover sites, such as Shinan Tidal Flats, critical to their survival. The flats are also home to the endangered Class 2 Eurasian oystercatcher (*Haematopus ostralegus*) and the Far Eastern curlew (*Numenius madagascariensis*). The presence of these species highlights the global importance of the Shinan Tidal Flats as a biodiversity hotspot. The international community has recognized the ecological value of the Shinan Tidal Flats. On July 26, 2021, the area was inscribed as a UNESCO World Natural Heritage Site. This designation is a testament to the global importance of the Shinan Tidal Flats, both as a critical habitat for a wide variety of species and as a key location for migratory birds. The recognition by UNESCO emphasizes the importance of ongoing conservation efforts and the need for sustainable management practices to preserve this unique ecosystem for future generations. The World Heritage designation also brings increased awareness and support for conservation initiatives in the region. It emphasizes the need to balance human activities with the protection of natural habitats to ensure that the ecological functions of the Shinan Tidal Flats are maintained. Protecting the area is critical not only for the species that depend on it, but also for maintaining global biodiversity and ecological health. The Shinan Tidal Flats are a vital natural treasure, providing invaluable ecological services and a sanctuary for numerous species.

Keywords: Biodiversity; Shinan Tidal Flats; Migratory birds

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PS3-8

Migration Pattern of Whooper Swan *Cygnus cygnus* in South Korea and Mongolia

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Soronzonbold Ochirvaani^{***}, Gea-Jae Joo^{****†}

Abstract

The Whooper Swan (*Cygnus cygnus*) is a migratory species for Korea and a partial migrant for Mongolia. The swan is a long distant migrant and travels from the northern Palearctic to Europe and East Asia. Although, references on full migration of the species in Asia are limited. We tagged 11 individuals of the species using GPS based satellite telemetries in East Asia in order to understand their migration routes, timing, duration, and stopover sites. Out of 11 individuals, we backpacked 5 individuals in Mongolia in July 2022, a single bird in S. Korea in February 2023, and 5 birds in Mongolia in July 2023. However, 7 devices successfully transmitted signals during their migration that we used for analyses. The birds tagged in Mongolia wintered in Rongcheng Bay, China (37°23'N, 122°29'E), and the Anseongcheon (37°00'N, 127°16'E) and Nakdong River estuary (35°05'N, 128°54'E) in S. Korea. The swan tagged in S. Korea bred near the Lena River in the Sakha region of Russia (69°30'N, 125°10'E). Most of the stopover sites were in northeastern China, including rivers or wetlands located in Chifeng (42°16'N, 118°58'E), Beipiao (41°47'N, 120°47'E), and Baotou (40°39'N, 109°50'E). Autumn migration began from early to late September and the latest was in late October. An average duration of migration 27.8 days. During autumn migration, the tagged birds spent 12.3 days on average at 1-3 stopover sites. Spring migration began by late February and mid to late March. An average migration duration was 23.2 days. The duration of spring migration is shorter than autumn. During the spring migration, the tagged swans used 1-3 stopover sites, spending an average of 8.5 days. Our results identified key habitats for Whooper Swans in East Asia, which will serve as critical material for developing conservation strategies. Our findings will significantly contribute to the conservation of breeding, wintering habitats and stopover sites for the species in East Asia.

Keywords: Whooper swan, migration, stopover sites, South Korea, Mongolia

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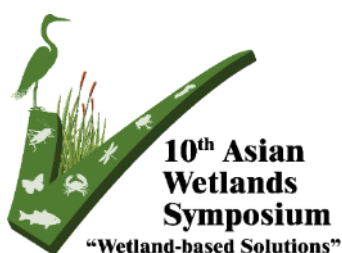
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Session 4 – Conservation and wise use of wetlands

Research and case studies on protecting and conserving wetlands and relatively small wetlands located in either rural or urban areas that support the livelihoods of local communities and biodiversity

PS4-1 Strengthening Conservation through Scientific Studies and Community Engagement: The Case of Setiu Wetlands, Malaysia

Daria Mathew Abdullah, Chik Maslinda Omar, Muhammad Zaid Nasir, Nur Syahirah Wahab, Hafifah Azhar, Wan Muhamad Faaiz Wan Mohamad Baharudin

PS4-2 Historical wetland loss in the Nakdong River: identifying major habitat loss factors over 100 years

Ran-Young Im, Ji Yoon Kim, Hyun-Woo Kim, Gea-Jae Joo

PS4-3 Conservation of Biodiversity of a Small Wetland in Japan by Youth

Yuto Uemura

PS4-1

Strengthening Conservation through Scientific Studies and Community Engagement: The Case of Setiu Wetlands, Malaysia

Daria Mathew Abdullah^{*†}, Chik Maslinda Omar^{**}, Muhammad Zaid Nasir^{**}, Nur Syahirah Wahab^{**},
Hafifah Azhar^{**}, Wan Muhamad Faaiz Wan Mohamad Baharudin^{**}

Abstract

The Setiu Wetlands in Terengganu, Malaysia is a nationally significant wetland and a key conservation landscape for WWF-Malaysia, renowned for its rich biodiversity and interconnected ecosystems, including lagoons, rivers, mangroves, and Melaleuca forests. The wetlands provide essential ecosystem services that support human livelihoods and sustainable development, while safeguarding biodiversity. However, growing land development pressures, driven by the pursuit of economic growth in the district has led to wetland conversion. In response, WWF-Malaysia advocates for urgent protection measures and holistic management the most vulnerable ecosystems, particularly the undervalued and under-studied Melaleuca forests. WWF-Malaysia's conservation strategy involves a multi-faceted approach integrating field research, advocacy, community education, and citizen science, grounded in stakeholder collaboration. Partnering with universities, research institutions and Non-Governmental Organizations, WWF-Malaysia conducts assessments on flora and fauna, flagship species, ecosystem health, land use changes, economic valuation, carbon stock and community dependence on wetland resources. By producing credible, evidence-based knowledge through these scientific and social studies, WWF-Malaysia strengthens its advocacy efforts and promotes data-driven decision making for the long-term conservation of the Setiu Wetlands. The findings from these studies are shared through consultations, informing local, state, and national development plans, as well as environmental impact assessments (EIAs) and management plans. A key milestone from these efforts was the gazettment of 432.4 hectares of the Setiu Wetlands as Terengganu's first State Park in March 2018, with ongoing initiatives to protect additional high conservation value areas. Community engagement is also a key strategy of WWF-Malaysia, working closely with local groups to foster economic empowerment and strengthen the link between conservation and community wellbeing. Overall, the efforts invested are yielding encouraging progress. Despite ongoing challenges, WWF-Malaysia remains committed and optimistic about the wetlands' future prospects, with a focus on collective action and partnerships to secure the conservation and sustainable use of the Setiu Wetlands.

Keywords: Wetlands, Scientific Studies, Evidence-based Knowledge, Community Engagement, State Park

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PS4-2

Historical wetland loss in the Nakdong River: identifying major habitat loss factors over 100 years

Ran-Young Im ^{*}, Ji Yoon Kim ^{**}, Hyun-Woo Kim ^{***†}, Gea-Jae Joo ^{****}

Abstract

In this study, we analyzed the changes of inland wetlands in the Nakdong River watershed to establish historical wetland distribution data as a basis for wetland ecosystem conservation planning. Topographic maps (i.e., published in the 1910s, 1960s, and 2010s) provided by the Korea National Geospatial Information Service were georectified in a geographic information system (GIS), and the areas represented by reservoirs, lakes, reed beds (i.e., *Phragmites*), or wetlands in the historical topographic map legend were digitized as polygons. The spatial characteristics of the identified wetlands, such as area, proximity to the river, changes in land cover, and network distance between wetlands, were calculated and analyzed for their temporal changes from the 1910s to the 2010s. The total area of natural wetlands (e.g., floodplain wetlands, marshes) and old reservoirs identified in the 1910s was decreased by 67.6% over a century (from 87.26 to 28.32 km²). The number and area of the identified wetlands including man-made wetlands in the Nakdong River watershed were about 1,293 wetlands (87.26 km²) in the 1910s, 4,536 (84.40 km²) in the 1960s, and 6,789 (203.46 km²) in the 2010s. The average wetland size was 64,998 m² in 1910s, 18,316 m² in 1960s, and 34,491 m² in 2010s, suggesting that the increase in total wetland area was due to an increase in small impoundments and newly created reservoirs. The increase in total wetland area identified in the 2010s was mainly due to the construction of large dams on the Nakdong River. We found that the average distance between individual wetlands has increased, indicating an increased risk of habitat isolation and loss of wetland ecosystem connectivity.

Keywords: Wetland habitat, Historical loss, Nature wetland, Artificial lake, Nakdong River watershed, GIS

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PS4-3

Conservation of Biodiversity of a Small Wetland in Japan by Youth

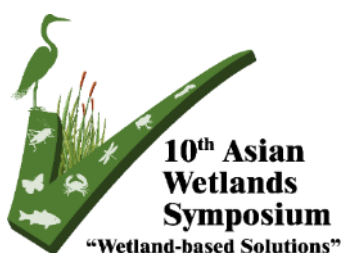
Yuto Uemura*

Abstract

The Jinde-ike Pond is a small reservoir with an area of 650 square metre in a *Satoyama* environment of Awa district, Susaki City, Kochi Prefecture, Japan, which was built more than 100 years ago. It has been carefully managed by the local people, because it was a reservoir for rice paddies to produce rice to be dedicated to the nearby Tenmangu Shrine. It has the name “JIN (God) DE (rice paddies) IKE (pond or reservoir) in Japanese. In recent years, however, because no one uses the pond for rice paddies, it has been left unattended. When I was a child, I often played catching dragonflies in this abandoned pond. In response to the damage caused by the torrential rains in western Japan in 2018, Kochi Prefecture decided that this unused pond would be discontinued from a disaster prevention standpoint. In other words, the wetland ecosystem of the pond will be lost. I was 13 years old in the first year of middle school at the time and felt a sense of crisis of losing the pond. I started a survey of the creatures in the pond on my own in 2019. At first, I was alone, but friends, family members, even some experts began to cooperate with my research, and it became clear that a wide variety of creatures were using this pond. In August 2020, with the results of the biological survey, I had a meeting with the Mayor of Susaki City and appealed him to consider the existence of the pond. In response to my request, he asked the Kochi Prefecture to consider the conservation of the pond. In 2021, the Prefecture changed the construction plan so that it could balance the ecosystem conservation and disaster prevention function of the pond. The renovation of the pond that minimized the impact on living creatures was completed in 2023. I established an NGO “Jinde-Ike Pond Biological Research Group” in 2021, when I was a freshman in high school. Now that I am enrolled at Ehime University, I continue to conduct biological surveys as well as wetland management of the pond with the group members in collaboration with local citizens, and to communicate the value of the pond to as many people as possible. To date, 46 species of dragonflies and 129 species of other creatures (insects, fish, birds, etc.) have been confirmed in the pond. These include 12 species listed in the “Kochi Prefecture Red Data Book 2018: Animals” (endangered and semi-endangered species). The Ramsar Convention calls for the conservation and wise use of small and familiar wetlands as well as the Ramsar sites. I would like to share my experiences how a small wetland rich in biodiversity such as Jinde-ike Pond could be saved from development and conserved by children and youth like us.

Keywords: Small wetlands, Biodiversity, Children and Youth

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Session 6 – Wetland education in the formal education sector (wetlands schools)

Case studies facilitating wetland schools and wetland education programs in the formal education sector at the national and regional levels in support of implementing Ramsar Resolution XIV.11

Wetland education in the formal education sector

PS6-2 Parents-Teachers-Students Partnership Three-fold Approach of ESD Activities in the Conservation of Mangrove Forest in Malaysia

Rabiatul-Adawiah Ahmad Rashid, Takuji Arai, Wan Mazlina Wan Mehammud

PS6-2

Parents-Teachers-Students Partnership Three-fold Approach of ESD Activities in the Conservation of Mangrove Forest in Malaysia

Rabiatul-Adawiah Ahmad Rashid ^{*†}, Takuji Arai ^{**}, Wan Mazlina Wan Mehammud ^{***}

Abstract

Mangrove forest is a kind of dense forest that exists mainly on sheltered muddy shores of tropical and subtropical regions worldwide. It has a unique ecosystem in which it becomes the home for various species of flora and fauna. It provides a source of food for small animals and mankind, including fish, prawns and crabs. Mangrove forest acted as shield from strong waves including tsunami. However, some parts of mangrove forests have been degrading as an effect of urbanization and development in the area. Though in support to the government initiatives in protecting and rehabilitating the mangrove forests in Malaysia, various parties has come forward with replanting activities of mangroves, such activities should be done side by side with educational activities to instill the sense of awareness and knowledge to the public, particularly the younger generations on the importance of sustaining the ecosystem and biological diversity of the mangrove forest. This study adopted the single case study design in which one specific school that is located close to the mangrove forest has been identified as the research site. The main issues lingering the school community is that though it is located very near to mangrove forest, the environmental consciousness as well as the awareness and knowledge on mangrove ecosystem is low. Thus, a threefold approach has been adopted in which activities on mangrove were organized, involving three groups of the school communities. Those groups are the parents, teachers and the students themselves – leading to a strong partnership within one single school setting in enhancing the awareness and knowledge of mangrove ecosystem to the participants. Non-participant observation and interviews were done to collect data on impact of the approach. The output of the activities includes production of information boards and galleries set up by parents and teachers for the benefit of the students. Besides, students' talent was also able to be developed from the activities done, with the collaborative support of both parents and teachers. As for the parents, workshops on mangrove-based products benefit them from the socio-economic perspective. Results show that the threefold approach used could result in great success if it is well-planned and strategized. Such approach indicates that even indirect and informal approaches of teaching and learning may be used in enhancing school communities' awareness and knowledge on mangrove ecosystem effectively.

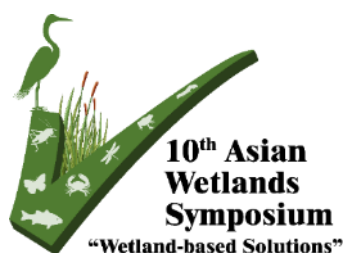
Keywords: Education for Sustainable Development, Conservation, Mangrove, Awareness, Partnership

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Session 7 – Innovations in CEPA approaches

Innovative approaches and studies for CEPA (communication, capacity building, education, participation, and awareness) activities from diverse wetland stakeholders

PS7-1 Mobilizing CEPA activities for Community led Eco-system Management and nature-based solutions in the newly designated Ramsar Sites in India

Durga Prasad Dash

PS7-2 Evaluation and prospects for wetland exchange program between tidal flats in Sinan County, R.O.Korea and the Ariake Sea, Japan

Atsushi Tanabe, Takeshi Fukumoto, Yusuke Kanagae, Sayaka Nakamura, Manabu Shimojitosho, Taketo Kitatmoto

PS7-4 Wetland Centers in Regional Network

Seong-Bo Kim, Norman E.C. Ramirez, Chin Ug Cho, Hang-Ah Kim, Gaon Lee, Ahrum Hyung, Seung Oh Suh

PS7-5 Wetlands in Environmental Education Curriculum to Cope with Adverse Climate Change Scenario

Anusree Ghosh, Tapas Ranjan Chakraborty

PS7-6 Collaboration with YouTube Creators for Wetland-themed Video Clips and Enhancing Public Awareness on Wetlands

Seong-Bo Kim, Norman E.C. Ramirez, Chin Ug Cho, Hang-Ah Kim, Ahrum Hyung, Gaon Lee, Seung Oh Suh

PS7-1

Mobilizing CEPA activities for Community led Eco-system Management and nature-based solutions in the newly designated Ramsar Sites in India

Durga Prasad Dash *

Abstract

The most neglected wetlands such as Tampara, Ansupa, Satakosia & Hirakud have been newly designated as Ramsar sites in the State of Odisha, India in 2022. The local community did not follow the conservation measures in these wetlands since long. The wetlands were filled with debris, plastics, unwanted weeds and at the same time unsustainable fishing practices such as use of zero-net, catching small juveniles, over exploitation in fishing etc. Loss of biodiversity and natural resources causing human migration to other States in search of livelihood. PALLISHREE intervened Communication, Capacity building, Education, Participation & Awareness (CEPA) activities in these Ramsar Sites with the financial support of KNCF, Japan and technical support of RCJ, Japan. In the first year of the project 20 schools have been taken as the learning center in all 4 Ramsar Sites. The interventions were in the field of Different activities have been undertaken to bring community participation on eco-system management and conservation of their own wetlands. 1) Communication: Information, Education & Communication materials have been prepared and circulated among the teachers, students, youth, fishers and women 2) Capacity Building: The teachers, students, youth, fishers and women have undergone different trainings to enhance their capacity 3) Education: Debate and Painting competition, experiments & demonstrations in field 4) Participation: Exposure visit, celebration of World Wetlands Day 5) Awareness: Wall painting in form of picture, street play etc. Impact: 1) Plantation programme has been initiated in the catchments 2) Plastic free zone has been established in all 4 Ramsar Sites 3) Use of Zero net have been reduced in all 4 Ramsar Sites 4) Small fish Juvenile catching has been stopped 5) Use of bamboo gears have been increased in fishing 6) Bigger mesh size net has been used in fishing 7) Fish migration routes are free from encroachments 8) Forest fire has been stopped in the catchments of the Ramsar Sites 9) Students started conservation of house sparrow 10) Students started conservation of medicinal plants 11) Migration has been reduced in the community.

Keywords: Wetlands, Free Zone, Zero Net, Fishing

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PS7-2

Evaluation and prospects for wetland exchange program between tidal flats in Sinan County, R.O.Korea and the Ariake Sea, Japan

Atsushi Tanabe^{*†}, Takeshi Fukumoto^{**}, Yusuke Kanagae^{**}, Sayaka Nakamura^{***}, Manabu Shimojitosho^{****},
Taketo Kitatmoto^{*****}

Abstract

Many wetland-related species, such as migratory waterbirds, live across multiple countries and travel freely. Therefore, international understanding and cooperation is essential for the conservation of those species and habitats. The Ramsar Convention Resolution VII.19 calls for the promotion of site twinning or networks between Ramsar sites in different Contracting Parties to enhance dialogues and information sharing. However, in Asian region, international wetlands exchange programs are limited. For example, in Japan, although there are 53 Ramsar sites in the territory, ongoing international wetland exchange program at government level are only 4 cases, and those wetland exchanges have been mainly focused on migratory waterbirds. Ramsar Center Japan has aimed to Japan-Korea wetlands exchange program focused on tidal flats in Sinan County, R. O. Korea and Saga City, Kashima City, and Arao City, which are located along the Ariake Sea, Japan. Sinan County, a multi-island region consisting of more than 1,000 islands, is located at the southwestern tip of the Korean Peninsula. The huge tidal flat of 110,000 ha is registered as a World Natural Heritage site of “Getbol, Korean Tidal Flats”, which includes the Jeungdo Tidal Flat, a Ramsar site. Saga City, Kashima City, and Arao City, on the other hand, are located along the Ariake Sea in Kyushu, Japan, and respectively supports 3 Ramsar sites, namely Higashiyoka-higata, Hizen Kashima-higata, and Arao-higata. The tidal flat of Sinan County and those of Ariake Sea are thought to have been a single tidal flat formed around the mouth of the old Yellow River about 15,000 years ago. Subsequent tectonic movements caused them to split into two separate areas, but there are many endemic species still live only in the Yellow Sea and the Ariake Sea. In this exchanging program, the officers of Sinan County visited the Ariake Sea in April 2023, and the officers of Saga, Kashima and Arao Cities visited Sinan County in May 2024. Those above provided the opportunities for both sides to exchange information on wetland conservation face to face, and they also recognized the similarities of tidal flat environment, inhabiting organisms, and fisheries on the tidal flats such as seaweed. It was suggested to continue dialogue and information sharing in future, promote exchanging program focusing “children” and/or “fisheries” etc. Both sides confirmed that they would like to promote those future exchanges.

Keywords: CEPA, International cooperation, Ariake Sea, Getbol, Shinan County

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PS7-4

Wetland Centers in Regional Network

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Abstract

Wetland Link International (WLI) is a global platform for wetland centers to share experience, information, and knowledge on the operation of wetland centers and its program facilitation. Initiated by WWT in 1991, WLI has more than 350 members globally and has been recognised as an important mechanism for delivering outreach program of the Ramsar Convention on Wetlands in Resolution VII.9. WLI Asia-Oceania is a regional network with 87 members from 17 countries in Asia and Oceania. The Ramsar Regional Center – East Asia assumed the role of the WLI-Asia in 2016 by signing Memorandum of Understanding with WWT (WLI Global) and expanded its region to Asia and Oceania in 2022. While the expansion brings an increase in the number of network members, we observed there is also a growing interest in attending the biennial conference. This study identified the distribution of countries in the region, the number of members per country, and the type of membership (wetland center or CEPA organization), and number of biennial conference participations in the last seven (7) years. The dominant sub-region in the network is East Asia with 54 members, followed by Southeast Asia and South Asia (12 members). 27 members are from the Republic of Korea out of a total of 87 while China has fifteen (15) members. Wetland Centers (visitor center, education center, information center, etc.) are the most dominant type of the member (55 members) and 32 CEPA organizations make up the network. As the network grows up with the number of members, its biennial conference is also organized with an increased number of participants. The 6th WLI-Asia Conference was attended by 55 participants and the most recent conference (1st WLI Asia-Oceania Conference) in 2024 received 74 participants. Given the increased number of members and participants, the figures can also be analysed in relation to the number of Ramsar sites in the region and in each country. In addition, a comparative study of the patterns of visitor numbers in each member center/organization will provide a better insight into the correlation between wetland centers/CEPA organizations, Ramsar sites, and the tendency of members to attend the biennial conference.

Keywords: Wetland centers, WLI, CEPA, Ramsar Convention on Wetlands

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PS7-5

Wetlands in Environmental Education Curriculum to Cope with Adverse Climate Change Scenario

Anusree Ghosh^{*†}, Tapas Ranjan Chakraborty^{*}

Abstract

Wetlands are interfered in various way by climate change including extreme events and its consequences. Bangladesh is a land of wetlands. During eighties of the last century the environmental education got importance and for around two decades it has drawn attention. But now the investment and attention are not significant. Also, there is a rapid change in the current education and learning system. The objective of the study was to identify a potential way of environmental education that can engage the learners on conservation and protection of wetlands by addressing the current and emerging climate change crisis. To identify the climate change vulnerability the very common and popular assessment tool, 'Climate Changes Vulnerability Risk Assessment' was adopted. The climate change vulnerability of the community was studied for three major types of lake wetlands in Bangladesh, viz, 'Haor', 'Baor' and 'Beel'. To understand their presence in formal and informal environmental education, environmental education projects of five national level NGOs, secondary curriculum of national text board of Bangladesh and five public university courses on environmental education were studied. The informal education mostly emphasized on physical and chemical aspects of environment. Considering the current crisis more attention is required on the impact of climate change in the ecosystems. Contents on Ecosystem-based Adaptation and Nature-based Solutions could make the curriculum more action driven. The modern information technology could be a good option to promote environmental education specifically for work professional and responsive learning. Traditional knowledge may play a very important role on environmental education and climate change adaptation. Human-induced climate change is accelerating, wetland resources are decreasing and the planetary crises have created threats to civilization. The planetary health is the health of human civilization and the state of the natural systems on which it depends; wetland education is a tangible way of sustainable development in a country like Bangladesh. The current pedagogy for environmental education needs improvement. Wetland education pedagogy can bring about transformative learning and hence a variety of pedagogies are necessary. More attention, specifically system thinking is required on the wetland conservation and protection to cope with climate change extreme and adaptation to livelihood, where education is the ladder.

Keywords: Climate Change, Environmental Education, Wetlands

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PS7-6

Collaboration with YouTube Creators for Wetland-themed Video Clips and Enhancing Public Awareness on Wetlands

Seong-Bo Kim^{*}, Norman E.C. Ramirez^{*}, Chin Ug Cho^{*}, Hang-Ah Kim^{*}, Ahrum Hyung^{*}, Gaon Lee^{*},
Seung Oh Suh^{*†}

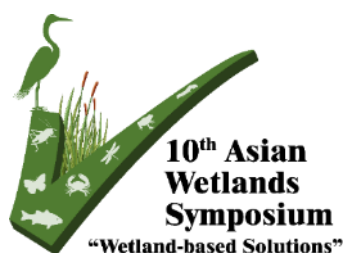
Abstract

YouTube emerged as a dominant social media platform for sharing any type of information and is now also being used as a communication platform. YouTube creators (videographers) become influencers who can give impact on their interested field, or social influencers become YouTubers to communicate more closely with followers or subscribers. Globally, people are using YouTube to explore information they are interested in and to learn and acquire in-depth information they need. With this in mind, the Ramsar Regional Center – East Asia (RRC-EA) has initiated a project named “YouTube Wetland Contents Development” that supports YouTube creators (videographers) in the Republic of Korea in producing more wetland-related YouTube materials in 2020. The invited and selected creators are owners of YouTube channels with various themes: travel, environment and species, botanical art, illustration drawing, drone filming, and local documentary. They produced their own wetland-related YouTube video episodes and successfully published a total of 19 video clips on YouTube. The project continued in Japan, Mongolia, Indonesia, and Philippines in the following years in collaboration with organizational partners in their respective countries (Wetlands International Japan, Mongolian Ornithological Society, Wetlands International Indonesia, and the Society for the Conservation of Philippine Wetlands, Inc.). Total 55 video clips were produced and 9 more video episodes to be followed as the project in 2024 is ongoing in the Philippines. We observed the video clips remain on the YouTube platform and the number of views keep increasing after its first upload. Following that the video clips are exposed to people who are either interested in the concept of YouTube creator or wetlands. We anticipate these YouTube video clips will assist in enhancing awareness on wetlands and reaching out to the public who has relatively less experience on understanding the wetland as the contents and storytelling lines are linked to each existing YouTube creators’ channel.

Keywords: YouTube, Wetlands, CEPA

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Session 11 – Wetlands and disaster risk reduction managements

Research to discuss the soil carbon pool of wetlands and clarify the role of wetlands in the global carbon cycle

PS11-1 Integrating Disaster Risk Reduction into Wetland Management: A Case Study of Community-based Camera Monitoring System in Japan

Takuma Satoh

PS11-1

Integrating Disaster Risk Reduction into Wetland Management: A Case Study of Community-Based Camera Monitoring System in Japan

Takuma Satoh *

Abstract

The phenomenon of climate change has resulted in a notable intensification of natural disasters on a global scale, with a discernible impact on vulnerable ecosystems such as wetlands. In Japan, for instance, the frequency of short-duration heavy rainfall events (>50 mm/hour) has increased from 174 occurrences in the period 1976-1985 to 251 occurrences in the period 2010-2019. This trend highlights the pressing need for the implementation of effective disaster risk reduction (DRR) strategies, particularly in the context of wetland management. The objective of this study is to develop and implement an innovative disaster information system in collaboration with residents, with a particular focus on wetland conservation. A disaster information system was developed and implemented utilizing affordable, general-purpose cameras. The system was designed with the objective of providing residents with convenient access to essential information. Between 2022 and 2024, the system was installed by residents at 26 locations across eight regions, primarily in the Kuma River basin. During the rainy season, the system was utilized by over 336 residents for the monitoring of rivers and roads via smartphone. The study demonstrated that residents were actively engaged in viewing camera footage during rainfall events, which indicated the efficacy of the system and the elevated level of disaster prevention awareness within the community. Building on this success, research is now being conducted to explore the potential application of similar technology to wetland conservation. In particular, the system has been demonstrated to be of significant utility for the remote observation of wetlands during flood periods, reducing the necessity for on-site inspections and potentially decreasing risks to human life. Furthermore, the system has been employed for monitoring paddy fields and wetlands, proving to be an effective mechanism for remote confirmation during flood seasons without the need for physical site visits. The development and implementation of a disaster information system utilizing affordable, general-purpose cameras has demonstrated considerable potential in enhancing community disaster prevention capabilities. The application of this technology to wetland conservation presents a promising pathway for improving both ecological resilience and community safety. Future research should focus on specific methods for applying this system to wetland management, measuring its long-term effects, and further strengthening collaboration with local communities. By integrating disaster risk reduction (DRR) into wetland management practices, communities can harness the natural protective functions of wetlands while simultaneously preserving these vital ecosystems in the face of increasing climate-related risks.

Keywords: IoT, DRR, Monitoring System

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Field Visit

Green Filters Facility at Panguil River Eco-Park, Pangil Laguna

Description of the Venue

As one of the two Frontrunner Initiatives of the Living Lakes Biodiversity and Climate Project (LLBCP) in the Philippines. The Green Filters facility is being implemented by the Society for the Conservation of Philippine Wetlands, Inc. (SCPW), which showcases solutions to solving water pollution issues and promoting ecosystem restoration in the Panguil River Eco Park in Panguil, Laguna.

Panguil River Eco Park is a 14-hectare park located at the foot of the Sierra Madre mountains and is set along the Panguil River which is one of the major tributaries of Laguna de Bay, the largest inland water body in the country. Established in 2009, it is one of the major tourist destinations not only in the municipality but in the province of Laguna. Aside from being a conservation area for natural resources and wildlife habitat, it also provides an essential connection of local communities to nature and serves as venue for other social gatherings.

Constructed wetland (or Green Filters) is a good example of Nature-based Solution (NbS). It is a “natural” way of treating sewage. Constructed wetland is an appropriate technology for areas where land is available or inexpensive, population density is very low, and skilled labor is missing. Green Filters are typically artificial, plant-based wastewater treatment systems that can be described as water channels whose surface is covered with aquatic plants or a natural system of floating macrophytes. It is characterized by low initial investment costs as well as low operation and maintenance costs.

Activities of the Field Trip

On November 27, 2024, as part of the 10th Asian Wetland Symposium, 78 individuals joined in the field visit to Panguil River Eco-Park. They arrived at the Panguil River Eco-Park (PREP) where they were welcomed with the hospitality of the townspeople accompanied by a traditional Filipino marching band and the Himig Balian Chorale group with their performance of local music it is along with refreshments and morning snacks at the park’s pavilion.

The morning session started with welcome remarks from Hon. Gerald A. Aritao, Mayor of Pangil, Laguna where he gave appreciation for the establishment of the Constructed Wetlands at the municipality showcasing the local government’s adherence to policies that are sustainable and encouraging the participants in fostering a deeper appreciation of the eco-park’s beauty and the value of nature-based solutions. Following this, Richmond Samson, General Manager of PREP, provided a comprehensive briefing on the park.

Engr. Jocelyn G. Sta. Ana of the Laguna Lake Development Authority (LLDA) presented the profile of Laguna de Bay, emphasizing its biodiversity, ecosystem services, and the contributions it makes to local livelihoods. She also highlighted LLDA’s initiatives, including water quality monitoring, resource management, and community partnerships, such as the Green Filters Project, which integrates ecological conservation with community development.

A learning session was conducted by Mr. Jose Carlos Quintos of SCPW, who discussed various SCPW initiatives, including youth ecological camps. Ms. Wilna A. Artitchea, CLEAR Youth Network Teacher from DepEd Mabitac, Laguna, shared insights on their experiences with SCPW's ecological youth camps. Following these sessions, participants explored the lush landscapes and natural trails of the Panguil River Eco-Park, immersing themselves in the park’s biodiversity and connecting with nature. Lunch was served after the activity.

The afternoon session featured a presentation and demonstration of the Green Filters project by Ms. Ma. Cheryl F. Prudente of SCPW/Green STEPS. She explained the design and process used in the Constructed Wetland Facility, where microorganisms break down organic matter, reduce pollutants, and restore ecological balance in polluted water. This process, which mimics natural systems, serves as an exemplary model of how human intervention can work harmoniously with nature for environmental solutions. Ms. Prudente, along with Mr. Leo Pietro Aritao, provided participants with a step-by-step guide on cultivating effective microorganisms, enabling them to replicate the process in their communities.

The visit concluded with a sharing and processing of learnings, followed by closing remarks from SCPW. The session ended at 2:30 PM, after which participants departed from the Panguil River Eco-Park. Overall, the visit underscored the critical role of wetlands and nature-based solutions in ensuring environmental resilience and sustainability.

Candaba Wetlands and the Mt. Arayat Protected Landscape in Pampanga

Description of the Venue

Candaba Wetlands

Candaba Wetlands is composed of a vast complex of freshwater ponds, swamps, and marshes and is considered to be Key Biodiversity Area (KBA #31). It is a significant area for agricultural and fisheries production, water for irrigation, natural retention, and also an extremely important staging and wintering area for migratory birds, being part of the East Asian-Australasian Flyway.

Over the years, it continues to face natural and anthropogenic threats in which several portions the wetlands are being drained and converted into limiting habitat for waterfowls. These wetlands are mostly privately-owned with parts that are state-owned, but have been classified as “alienable and disposable” land which poses peculiar concern for conservation. Siltation also occurs but can be controlled by ensuring that upland vegetation cover is adequate especially in the Sierra Madre Range.

This site is part of the Frontrunner Initiatives of the Living Lakes Biodiversity and Climate Project (LLBCP) being implemented by the Society for the Conservation of Philippine Wetlands, Inc. (SCPW). This initiative mainly aims to ensure the conservation and restoration of its wetlands, and protection of the related biodiversity long-term. Specifically, its goal is to develop the 132-hectare farmland owned and managed by farmer’s organization called Macagatal Irrigators Association (MIA), in Paligui, Candaba, Pampanga. Part of its goals is to employ nature-based solutions, biodiversity-friendly agriculture and eco-farm tourism, controlling invasive alien species, capacity-building, citizen science and CEPA. Furthermore, a Wetland Center Complex will also be established to support CEPA activities and promote the conservation and wise use of wetlands.

Mt. Arayat Protected Landscape

Mt. Arayat Protected Landscape was proclaimed to be a protected landscape last April 2022 through Republic Act. No. 11684. This landscape is recognized for hosting a variety of endemic and endangered plant species, including the *Pyrostria arayatenensis* and Arayat Pitogo. Additionally, it is also home to 86 bird species, 14 mammal species, and 25 herpetofauna species.

The declaration mandates the conservation of Mt. Arayat's forest ecosystem while promoting the development of its recreational potential. Over the years, SCPW have contributed to these efforts through initiatives such as the Treepreneurship Project. This program involved training families to cultivate indigenous trees for reforestation and enrichment plantations, supporting sustainable agriculture and biodiversity conservation within the Arayat-Candaba Watershed.

Candaba Wetlands Tour and Briefing

A total of 97 participants joined the field trip to the Candaba Wetlands on November 27, 2024, during the 10th Asian Wetland Symposium. The participants had the opportunity to explore the Macagatal Wetlands, a 135-hectare area of farmland with irrigation canals and dikes, where the Paligui Wetland Education Center will be established. The participants engaged in various activities at the site, including a wetland walk, birdwatching, and a Carabao cart ride. Many guests also shared spotting a variety of bird species, including egrets and black-winged stilts. Additionally, the participants had the opportunity to engage with local communities, particularly barangay officials and members of the Macagatal Irrigators Association, fostering meaningful dialogue and exchange on topics such as farming, leadership, and conservation.

Following the tour, participants gathered at the Barangay Paligui Covered Court in Candaba, Pampanga, for a briefing on the sustainable farm tourism initiative being developed in the Candaba Wetlands. They also learned about the Society for the Conservation of Philippine Wetlands' (SCPW) efforts in promoting sustainable agriculture and wetland conservation at the site.

The program commenced with traditional cultural dances performed by members of Brgy. Paligui, which were enjoyed

by the guests. Hon. Randy Manio, the Barangay Captain of Paligui, delivered the welcome address, expressing his gratitude to all participants and the organizers for selecting the Paligui Wetlands as a field site for the symposium. He emphasized his support for the establishment of sustainable farm tourism in the area and wished the participants a productive and enriching experience in the Philippines and at the symposium. Mr. Raul Cacho, President of the Macagatal Irrigators Association, also welcomed the guests and provided a brief introduction to the association. He expressed his enthusiasm for the Paligui Wetland Education Center, which he recognized as a key factor in providing farmers with alternative livelihoods through sustainable farm tourism.

Next, Ms. Darry Shel Estorba presented an overview of the farm tourism initiative being developed in the Paligui Wetlands. She highlighted the significant threats the wetlands have faced over the years, including land conversion, pollution, and unsustainable agricultural and aquaculture practices. These challenges underscored the urgent need for conservation efforts, leading to the integration of the wetlands into the Living Lakes Biodiversity and Climate Project. This initiative aims to establish sustainable farm tourism while preserving both resident and migratory birds and the wetland ecosystem. Ms. Estorba also outlined plans for the Wetland Education Center, which will serve as an educational hub for the area. To support the farm tourism enterprise, SCPW has already conducted training sessions on sustainable practices in agriculture, tourism, and wetland management. The program concluded with closing remarks from Ms. Amy Leccionenes.

Mt. Arayat Protected Landscape (MAPL) Tour and Briefing

Ms. Cristela Buan, the Assistant Protected Area Superintendent of the Mt. Arayat Protected Landscape (MAPL), presented an overview of the MAPL profiles and the efforts of the Department of Environment and Natural Resources (DENR) in conserving and protecting the area. Ms. Katrina Malig, from the DENR Provincial Environment and Natural Resources Office (DENR-PENRO) Pampanga, discussed the history of their clonal nursery facility, including its maintenance and the tree species used in the National Greening Program. She also highlighted the Pilot Bamboo Production Nursery and provided an overview of the flora and fauna found within Mt. Arayat. During the Q&A session, one participant inquired about the type of teak produced in the clonal nursery. Ms. Malig assured the group that only indigenous teak species are being utilized.

Following the Q&A session, Mr. Ruel Nucup, an upland farmer from Mt. Arayat, shared insights into the Treepreneurship project, a partnership between the Society for the Conservation of Philippine Wetlands (SCPW), the United Nations Development Programme (UNDP), and Unilever Philippines (ULP). He discussed how his family and the local community benefited from various training opportunities and livelihood sources, such as backyard nurseries, enrichment plantations, and eco-trek guiding. This initiative not only raised awareness about environmental conservation but also contributed to the reestablishment of native tree species and increased forest cover in Mt. Arayat. Afterward, participants had lunch, followed by a brief tour of the national park's facilities and clonal nursery, which concluded around 3:00 p.m.

Las Piñas-Parañaque Wetland Park

Description of the Venue

Located along the southern coastline of Metro Manila, Las Piñas–Parañaque Wetland Park, formerly known as Las Piñas–Parañaque Critical Habitat and Ecotourism Area, is a critical habitat that serves as the dwelling domain for more than 80 bird species. The wetland park spans 181.63 hectares in the southwestern portion of Metro Manila.

The park consists of two main sections: Long Island, located in the southwest of Las Piñas City, and Freedom Island, situated in the northeast of Parañaque City. Predominantly made up of mudflats, the park also includes brush, grass, beach, dirt, and mangrove areas. Mangroves, with eight different species, cover approximately 30 hectares, making them the dominant plant species in the area. The surrounding mudflats, which cover around 114 hectares, provide essential feeding grounds for about 5,000 birds daily.

The mission of LPPWP is to be at the forefront of scientific, recreational, and educational initiatives, imparting the wise use of wetlands to the community. The Department of Environment and Natural Resources - National Capital Region, the Tourism Infrastructure and Enterprise Zone Authority, Villar SIPAG, and the Society for the Conservation of Philippine Wetlands are the collective implementers of LPPWP, marking the wetland park as a major contributor to wetland preservation.

Activities of the Field Trip

A total of 83 AWS10 participants arrived at the Las Piñas–Parañaque Wetland Park on November 27, 2024, the third day of the Asian Wetland Symposium, which was designated for field trips.

The program commenced shortly after the coffee break with a brief introduction to the Las Piñas–Parañaque Wetland Park, delivered by park superintendent assistant protected area superintendent Diego Montesclaros. Mr. Montesclaros Jr. shared valuable insights into the park's rich history, its critical ecological role in supporting biodiversity, and the challenges it faces in conservation. The session highlighted the significance of the park as a Ramsar Wetland of International Importance, emphasizing its essential ecosystem services, including flood control, carbon sequestration, and providing a habitat for migratory birds.

This session emphasized the significance of the park as a Ramsar Wetland of International Importance, highlighting its essential ecosystem services, such as flood control, carbon sequestration, and providing a habitat for migratory birds.

Located within a rapidly developing urban landscape, the LPPWP faces numerous challenges. Among the issues raised during discussions were problems related to solid and liquid waste deposition, public occupation and settlements, and habitat encroachment.

To address these challenges, the LPPWP has prioritized the strengthened implementation of its Habitat Management Plan—a habitat-specific rehabilitation and restoration strategy. This plan details methods to improve conditions for targeted species and habitats while establishing a timeline for achieving these ecological enhancements. Its ultimate goal is to deliver measurable ecological improvements that support the long-term health and resilience of the LPPWP.

After the introductory overview, the program transitioned into a Q&A session where three participants raised questions regarding the general status of the wetland park. First, there was an inquiry if mangrove planting is allowed in LPPWP. In response, it was explained that, according to the LPPWP Habitat Management Plan, no additional planting should be implemented in the site to prevent encroachment on equally important habitats, such as the mudflats. However, replacement planting is allowed. There was also a question regarding if the water quality of LPPWP improving. LPPWP Staff highlighted that the water quality in LPPWP is continuously improving, as indicated by the results of quarterly water quality monitoring. However, it was emphasized that recreational water activities are still not advisable, as the water has not yet met the required quality standards.

In addition, the third participant asked about the management interventions for the conservation and rehabilitation of LPPWP. It was noted that LPPWP is one of the few protected areas with a Habitat Management Plan, which is a habitat-specific rehabilitation and restoration strategy. This plan outlines methods to improve conditions for targeted species and habitats, with a timeline for achieving these ecological enhancements. The ultimate goal of the plan is to create

measurable ecological improvements that contribute to the long-term health and resilience of LPPWP. It was also clarified that this plan complements the Protected Area Management Plan.

Another question raised concerned the presence of people living within LPPWP. It was shared that, according to the field consultation and on-site validation conducted in August 2025, which was in compliance with the Survey and Registration of Protected Area Occupants, no protected area occupants, makeshift houses, or informal settler families (ISFs) have been present in the area since the removal of illegal structures in March 2023 and the voluntary relocation of tenants earlier this year. While occasional sightings of individuals have been reported, these individuals were primarily people docking boats or visitors passing through, not residents establishing permanent dwellings.

A photo opportunity followed the Q&A session. Mr. Montesclaros then divided the participants into several groups, each accompanied by a tour guide. The groups embarked on a tour of the site, which lasted over an hour, visiting various areas of the park, such as the mangrove boardwalk, Wetland Center Museum, and auditorium. Upon completing the tour, the participants returned to the main area of the park, where coconut juice was served as a refreshing drink. Lunch was provided at 12:00 PM, and the participants departed the site at 12:30 PM.

Side Events

Side Events

The Living Lakes, Biodiversity and Climate Project

Society for the Conservation of Philippine Wetlands, Inc.

The side event aims to showcase the global project of the International Living Lakes Network being implemented across 10 countries under the "Living Lakes, Biodiversity and Climate Project" or LLBCP. This 5-year initiative is funded by the Germany's Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection under the International Climate Initiative (IKI) with the Global Nature Fund, an NGO based in Germany as the Lead Organization. The main objective of the LLBCP is to ensure that the conservation and restoration of wetlands and the protection of related biodiversity are improved in the long term. The project works on 10 critical landscapes developing Nature-Based Solutions and fostering training and capacity building alongside local partners, such as the Society for the Conservation of Philippine Wetlands, Inc.

The Philippine component of the LLBCP focuses on the establishment of a farm tourism enterprise complemented by a strong CEPA strategy through a Wetland Education Center in the Candaba Wetlands and the Green Filters or Constructed Wetlands in the Pangil River Eco-Park.

The side event will be in a panel discussion format where the speakers who are part of the LLBCP from the Philippines, Cambodia, and Sri Lanka, are invited to share their national initiatives under the project. It will also introduce the International Living Lakes Network and initiate the establishment of a Sub-Network in Southeast Asia.

Issues Related to Balance Wetlands Conservation and Renewable Energy: Enhancing cooperation between Japan-Taiwan

Ramsar Center Japan

With the growing interest in dealing with the global environment issues, environmental policies have been implemented in many fields. One of the issues for environmental protection is balancing or adjusting of wetland conservation and renewable energy. The actions that address renewable energy through the installation of solar panels and other means are not necessarily compatible with wetland conservation. Rather, they are overtaking wetland reclamation, landscape destruction, etc., some of which are perceived as greenwash.

Therefore, this side event we will invite experts from Japan and Taiwan and will focus on responses to wetland conservation and renewable energy creation in each country. Through information sharing, we would like to discuss strengthening collaboration for wetland conservation and identify in promoting solutions to multiple environmental problems, including enhancing wetland conservation.

***Acknowledgement**

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Side Events

Side Event on the Draft Ramsar Resolution on Wetland Vulnerability

Biodiversity Management Bureau – Caves, Wetlands, and other Ecosystems Division

As wetlands play a crucial role in providing ecosystem services such as water purification, flood control, carbon sequestration, and biodiversity habitats, they are increasingly threatened by climate change. Recognizing this, the Biodiversity Management Bureau is organizing a side event during AWS10 to initiate discussions on the need for tools to assess and manage wetland vulnerability. Specifically, the side event will spotlight the draft Ramsar Resolution and the Climate Change Vulnerability Assessment Tool (WetVAT).

The goals are to: (1) Enhance awareness about wetland vulnerability to climate change; (2) Engage key stakeholders in meaningful discussions about WetVAT and its application; and (3) Collect valuable feedback to refine the draft resolution for the upcoming 64th Standing Committee (SC64) meeting and the 15th Conference of the Contracting Parties (COP15) to the Ramsar Convention

Introduction of “Green Catchment based Flood Management”: A new approach to flood management and Sustainable Societies of Kumagawa River, Japan

COI-NEXT Open Innovation Platform of Catchment based Flood Management for Sustainable Societies

"Catchment based Flood Management" (CBFM) is a new approach of flood control measures that target entire watersheds and include not only hard infrastructure but also soft measures such as runoff control, inundation flow control, and land use regulations. "Green Catchment based Flood Management" incorporates an environmental perspective into these measures, and is a flood control measure that leads to sustainable regional development and environmental preservation. In this side event, four speakers will introduce the latest information of CBFM from their perspective and they will share their projects how they deal with flood damage using the idea of Eco-DRR with stakeholders of Kumagawa river area to audience. CBFM will be expected to bring sustainable Society as well and happy to make constructive discussion in event.

*Acknowledgement

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Wetland Education in the Formal Education Sector: Activities in Practice

Korea Wetland School Network

In response to adoption of Resolution XIV.11 Wetland Education in the Formal Education Sector at the 14th Conference of Contracting Parties of the Ramsar Convention on Wetlands, the Korea Wetland School Network (KWSN) was established in 2023 to encourage wetland education in the formal education curriculum. The KWSN will share actual educational programs in practice from schools in the Republic of Korea and participants will have opportunity to experience the hands-on activities (wetland or biodiversity theme) facilitated by the school teachers and wetland education experts.

Side Events

Traditional or Local Ecosystem-based Disaster Risk Reduction (Eco-DRR) Related to Wetlands in Asia

Wetland International Japan

This session will describe and discuss case studies of traditional Ecosystem-based approaches to disaster risk reduction (Eco-DRR) related to wetlands in Asia. As the number of disasters increases globally and the damage has expanded, Eco-DRR draws attention. Due to the impact of climate change, etc., the number of disasters has increased worldwide. Especially, the Asian region is the most affected area in the world regarding the number of disasters, the number of deaths, and the amount of damage. In these circumstances, wetlands could be a natural buffer against an increasing number of natural disasters.

This session will provide an opportunity for understanding this new concept through reviewing case studies and discussion among participants. The case studies would be available from Japan and some countries in Southeast Asia or South Asia. If traditional knowledge and technique still exist and work, it would be beneficial for the area and other countries to understand how they are functioning. It is relevant to Topics of Wetlands and climate change adaptation and mitigation and Wetlands and disaster risk reduction management.

Wetland CEPA Program Case Study: Integrative Approaches to Wetland Conservation and Education

Wild Bird Society of Taipei

This event will present different wetland program innovative case study in wetland conservation and education, showcasing a multi-faceted model that integrates volunteers, cross-disciplinary collaboration, arts, schools, and ESG (Environmental, Social, and Governance) principles. The goal is to provide diverse approaches and solutions for participants to explore and apply in their respective regions.

- 1) Volunteers: Highlight the essential role of community volunteers in wetland monitoring, education, and conservation efforts.
- 2) Cross-disciplinary Collaboration: Demonstrate partnerships among NGOs, government, academia, and businesses to achieve holistic conservation outcomes.
- 3) Arts Integration: Show how arts and culture can be leveraged to raise awareness and engage the public in wetland preservation.
- 4) School Engagement: Share strategies for incorporating wetland conservation into school curricula, fostering environmental stewardship from a young age.
- 5) ESG Practices: Discuss how businesses can integrate ESG principles into their operations by supporting wetland conservation projects.

Closing Program

Outstanding Oral and Poster Presentations

Before the closing message, Dr. Ma. Catriona Devanadera announced the outstanding oral and poster presentations from the parallel sessions. Below is the list of the awardees:

Outstanding Oral Presentations:

Session 1 – Wetlands and climate change adaptation and mitigation

S1-2 Carbon Stock Assessment of Leyte Sab-a Peatland, Philippines

For. Dorina K. Espenilla, Ms. Linda B. Sauyen, For. Rej Winlove Bungabong

Session 2- Wetland restoration

S2-2 Nakaikemi-shicchi: A Case Study of Mitigation Measures for Environmental Protection during Shinkansen Construction

Hea-jin, Park, Ken-ichi Yokoi

Session 3- Wetland biodiversity

S3-3: Activity Patterns of Small Carnivores in Peat Swamp Forest Sites at the Kampar Peninsula and Pulau Padang, Sumatra

Dian Andi Syahputra, Muhammad Iqbal, Muhammad Mulyo

S3-10: Analysis of Population Changes, Habitat Requirements, and Feeding Characteristics of Wintering Populations of Cinereous Vulture (*Aegypius monachus*) at Vulture Restaurants in Goseong, South Korea

Min-Jun Kwak, Duck-Seung Kim, Yerim Lee, Gombobaatar Sundev, Gea-Jae Joo, Seung-Kook Kwak

Session 4- Conservation and wise use of wetlands

S4-1: Building with Nature Approach in Mangrove Ecosystem Restoration for Coastal Resilience

Yong Huai Mei, Azwani Sahibu

Session 5- Wetland and the Sustainable Development Goals (SDGs)

S5-3: Peatland Inventory and Assessment in India

Dhruv Verma, Shivani Negi, Dr Ritesh Kumar

Session 6- Wetland education in the formal education sector (wetlands schools)

S6-5: China Wetlands School

Wei Zhilin, Qi Liyan

Session 7- Innovations in CEPA approaches

S7-2: Connecting People, Nature, and Society: The East Asia Black-faced Spoonbill Flyway Children's Exchange Project

Akane Tokorodani, Hea-Jin Park, Yu Takaku, Nao Kusumoto, Mika Sasaki, Mayu Komori, Masato Dohi

Outstanding Oral and Poster Presentations

Session 8- Nature-positive economy and wetlands

S8-4: Realizing Transformative Change Towards Nature-Positive Economy in Wetlands: Experiences from Ramsar Sites in Japan

Yuki Arai

Session 10- Wetlands and sustainable built environment

S10-2: Assessing the effects of landscape changes in mangrove and fishponds on the ecological structure in Catanduanes Island, Philippines

Leandro Lorenzo Berba, Nappy L. Navarra, Selena Balbino Santos

Session 11- Carbon-rich wetlands

S11-1: Mapping Fire Susceptibility in Leyte Sab-A Basin Peatland, Philippines

Glady Mae V. Vijandre, Rej Winlove M. Bungabong, Criskim C. Parian

Session 12- Wetlands and ethnobiological knowledge

S12-10: Social Taboos on Wetland Fauna

Tapas Ranjan Chakraborty

Outstanding Oral and Poster Presentations

Outstanding Poster Presentations:

Session 1 – Wetlands and climate change adaptation and mitigation

PS1-6 The Philippines Blue Carbon Quantification Protocol (BCQP): An Introduction to the National Protocol and Case Study in e-NIPAS Protected Areas

Venus S. Calanda, Christian L. Montilijao, Clare Anne Duncan

Session 2- Wetland restoration and Session 11- Carbon-rich wetlands

PS11-1 Integrating Disaster Risk Reduction into Wetland Management: A Case Study of Community-Based Camera Monitoring System in Japan

Takuma Satoh

Session 3- Wetland biodiversity and Session 4- Conservation and wise use of wetlands

PS4-1 Strengthening Conservation through Scientific Studies and Community Engagement: The Case of Setiu Wetlands, Malaysia

Daria Mathew Abdullah, Chik Maslinda Omar, Muhammad Zaid Nasir, Nur Syahirah Wahab, Hafifah Azhar, Wan Muhamad Faaiz Wan Mohamad Baharudin

Session 6- Wetland education in the formal education sector (wetlands schools) and Session 7- Innovations in CEPA approaches

PS7-2 Evaluation and prospects for wetland exchange program between tidal flats in Sinan County, R.O.Korea and the Ariake Sea, Japan

Atsushi Tanabe, Takeshi Fukumoto, Yusuke Kanagae, Sayaka Nakamura, Manabu Shimojitosho, Taketo Kitatmoto

Closing Messages

Presentation of the AWS10 Statement on Wetland-based Solutions in Asia

Ms. Amy M. Lecciones

Vice President and Executive Director, SCPW, Inc

Ms. Lecciones, presented the Manila Statement or the AWS10 Statement on Wetland-based solutions in Asia. This document was commented and reviewed by the key stakeholders of AWS10, including the AWS10 secretariat, organizers, and partners during the duration of the AWS10. This statement was discussed in the plenary and was strongly by all the attendees during the closing ceremony.

Closing Remarks

Mr. Suh Seong Oh

Executive Director, RRC-EA

Mr. Suh expressed his deepest gratitude to everyone who contributed to making the 10th Asian Wetland Symposium possible. He extended his thanks to the participants, presenters, organizers, and partners for their support throughout the symposium. He also acknowledged the efforts of the SCPW in leading the hosting of the event in the Philippines, serving as the chair of the National Organizing Committee. Concluding his remarks, Mr. Suh issued an open call to the region, inviting those interested in taking on the hosting responsibility for the next AWS in 2027.

Ambassador Amado S. Tolentino, Jr.

AWS Steering Committee

Ambassador Tolentino also expressed his gratitude to everyone during his closing message. He acknowledged and thanked the RRC-EA for entrusting the Philippines with the opportunity to host such a significant event. Emphasizing the importance of platforms like the AWS, he highlighted the symposium's value in facilitating knowledge exchange, networking, and collaboration on future joint programs for wetland conservation. He further encouraged participants to strengthen their efforts and take action, building on effective approaches such as nature-based solutions. Concluding his remarks, he officially closed AWS10 and wished everyone safe travels.

List of Exhibitors

Country	Organization
China	Wild Bird Society of Taipei
India	Department of Environment, Forest and Climate Change, Bihar Government
Indonesia	Center for Conservation of Natural Resources of East Nusa Tenggara, Indonesia
Japan	Nippon Koei Co. Ltd.
Japan	Japan Wetland Society (JAWS)
Japan	Team SPOON
Japan	Wetlands International Japan
Japan	Ramsar Center Japan (RCJ)
Philippines	DENR IX-PENRO Zamboanga Sibugay
Philippines	Biodiversity Management Bureau - Caves, Wetlands, and other Ecosystems Division
Philippines	Society for the Conservation of Philippine Wetlands, Inc.
Philippines	Puerto Princesa Subteranean River National Park
Republic of Korea	Ramsar Regional Center - East Asia

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Annex A. Photo-documentation

Opening Ceremony



Welcome Dinner



Oral Presentations



Poster Presentations



Side Events

Ramsar Center Japan



Society for the Conservation of Philippines Wetlands



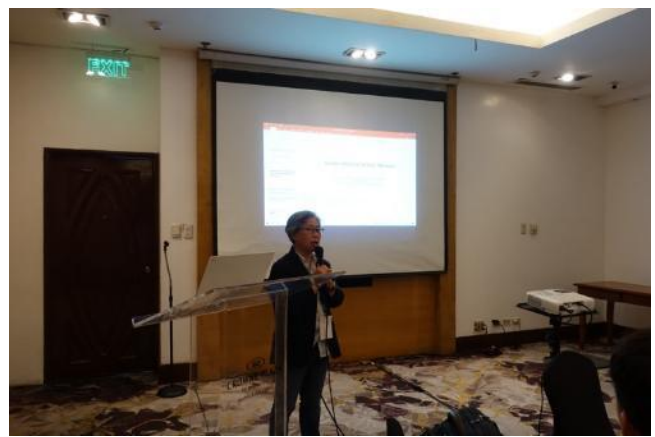
Biodiversity Management Bureau - Caves, Wetlands, and other Ecosystems Division



COI-NEXT Open Innovation Platform of Catchment based Flood Management for Sustainable Societies



Korea Wetland School Network



Wetland International Japan



Wild Bird Society of Taipei



Field Visits

Candaba Wetlands and Mt. Arayat Protected Landscape



Group Photo



Carabao Cart Ride



Wetland Walk and Bird Watching



Briefing on Candaba Wetlands



Briefing on Mt. Awayat Protected Landscape

Las Piñas-Parañaque Wetland Park



Group Photo



Briefing on LPPWP and Tour of Facilities

Green Filters Facility at Panguil River Eco-Park, Pangil Laguna



Group Photo



Learning Session



Tour of Facilities

Outstanding Presentations

Oral Sessions

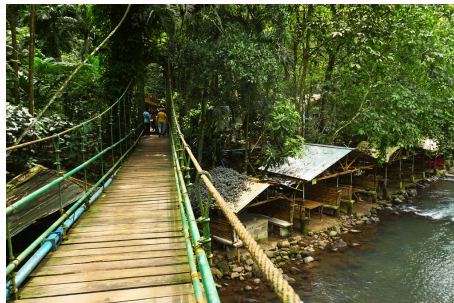


Poster Sessions



Closing Ceremony





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Federal Ministry
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