

NARRATIVE REPORT
International Linkages &
Consortia
(Master of Science in Biology)

Table of Contents

International Linkages & Consortia Error! Bookmark not defined.

Highlights.....2

1. University's position in the international arena.....2

2. Department's step forward towards international linkages and collaboration3

3. Department Strategy for Linkages and Collaboration4

4. Department's Nature of Collaboration and Linkages5

4.1 Linkage to enhance to enhance intellectual assets though advanced studies5

4.2 Collaboration and linkages for joint research and publication6

4.3 Joint publication and co-creation9

4.4 Department led International Linkages24

4.5 Department's support to young academics (MS-Biology students).....27

.....29

4.6 Department led international connections.....29

4.7 Department's best practices in internationalization30

Highlights

1. **High-quality research output.** The department consistently produces impactful research, attracting global collaborators and establishing partnerships across Europe, Asia, and the Americas.
2. **Globally engaged faculty.** With over 100 co-authors from international institutions, faculty actively participate in collaborative publications, research exchanges, and interdisciplinary projects.
3. **Sustainable, long-term partnerships.** Faculty maintain and expand international linkages even after completing studies or training abroad, ensuring enduring academic relationships.
4. **Equitable and diverse collaborations.** From co-publications to co-development of projects, the department fosters inclusive and mutually beneficial global partnerships.
5. **Leadership in global consortia.** Faculty spearhead international research networks and consortia, particularly in biodiversity, conservation, and ecological science.
6. **Support for young academics.** Early-career faculty and students are strongly supported in joining international training programs, fellowships, and research mobility schemes.
- 7.

1. University's position in the international arena

The Commission on Higher Education (CHED) defines internationalization as a process of integrating international, intercultural, and global dimensions into the goals, functions (teaching, learning, research, and service), and delivery of higher education. It involves a process of interchange of higher education between nations, with partnerships between nations, between national systems of higher education, and between institutions of higher education.

As a strategy for quality, CHED through internationalization envisions to 1) enhance the quality of Philippine higher education; 2) uphold the country's reputation as a center of higher education in identified niches/programs of excellence; 3) strengthen the country's role in an interconnected global community; 4) develop Philippine HEIs as productive members of the international academic community; 5) produce graduates with 21st century competencies who are able to live and work in a diverse/multicultural setting; and 6) foster closer cooperation and understanding between the Philippines and the rest of the world. Moreover, CHED released CMO No. 55 s. 2016 on the Policy Framework and Strategies on the Internationalization of Philippine Higher Education). The CMO



provides framework and approaches for the development of institutional internationalization strategies and implementation planning including best practices, partnership building, curriculum development, research opportunities and funding mechanisms.

Furthermore, Republic Act 11448, or The Transnational Higher Education Act of 2018 provides the legal framework for modernizing the Philippine higher education sector and bringing international quality standards and expertise into the country, with a view to making higher education globally competitive, attracting a flow of talented students, faculty, and staff, and improving the country's human resource base. This will enable the higher learning to be globally competitive by attracting pool of talented students, faculty, and researchers and consequently improving the human resource base of the country.

The University of Southern Mindanao with its vision of providing quality and relevant education for its clientele to be globally competitive, culture-sensitive, and morally responsive human resources for sustainable development, has a need to strengthen its international visibility by expanding its partnership and linkages with higher education institutions and research development organizations abroad. To become a global university, USM shall be engaged in internationalization activities in accordance with CMO No. 55 s. 2016 and RA 11448 to strengthen the University's international visibility. Hence, the establishment of the Office of International Affairs is timely and relevant in the move for internationalization of the University. The OIA was approved by the USM Board of Regents by virtue of the BOR Resolution No. 36, series of 2022.

2. Department's step forward towards international linkages and collaboration

Whilst the formal internationalization efforts of the University of Southern Mindanao (USM) are still in their early stages, marked by the recent establishment of the Office of International Affairs, the Department of Biological Sciences has already taken significant headways in building meaningful national and international linkages. Well ahead of the university-wide strategy, the department has proactively cultivated collaborations with academic and research institutions across various countries and institution.

These partnerships span a wide range of areas, including academic capacity-building, knowledge exchange, research collaboration, and the co-development of intellectual assets. Through these initiatives, the department has successfully positioned itself as an active contributor to the global scientific community.

In both past and ongoing efforts, the Department of Biological Sciences has forged local and international ties with the strategic aim of enhancing its teaching quality, advancing research excellence, and strengthening its academic visibility and influence. These linkages not only enrich the department's programs but also provide opportunities for faculty and students to engage in cutting-edge science, cross-cultural academic exchanges, and long-term cooperative projects that align with global priorities in biology and environmental science.

With the rise of accessible digital communication tools and collaborative online platforms, research collaboration and linkages has significantly expanded for the Department of Biological Sciences. These technologies have enabled seamless interaction with international partners, allowing faculty and researchers to co-develop studies, share data in real-time, and publish joint papers without the limitations of geographic boundaries. Virtual meetings shared digital workspaces, and open-access repositories have made it easier to sustain long-term collaborations, participate in global research consortia, and contribute to large-scale datasets. As a result, the Department has strengthened its presence in international research networks and enhanced its capacity to engage in cutting-edge, interdisciplinary science across borders.



Overall, the Department's strong commitment to academic advancement and research excellence among its collaborators and linkages is clearly reflected in the University's recent achievements and recognitions.

3. Department Strategy for Linkages and Collaboration

To build academic excellence, strengthen research capacity, and establish genuine and equitable global engagements and visibility, the Department of Biological Sciences has practiced several strategies for collaboration, grounded in inclusivity, equity, and internationalization.

- 1. Strengthening international academic partnerships.** The department helps faculty move around by supporting graduate studies, postdoctoral training, and short research fellowships at well-known institutions abroad. It builds connections with international universities and research centers for joint research, shared publications, and exchanges of faculty and students. The department also leads and joins global academic groups and biodiversity networks to align with international research goals and sustainable development aims.
- 2. Advancing research-based collaborations.** Collaborative research is at the core of the department's strategy, with a strong emphasis on interdisciplinary and transdisciplinary partnerships. Faculty are encouraged to work with national and international experts across various fields, such as ecology, environmental science, and health sciences, to co-develop impactful research projects. The department also promotes joint grant applications, shared use of research infrastructure, and collective knowledge production to maximize scientific output and relevance.
- 3. Cultivating local and regional linkages.** Local engagement remains a strategic priority. The department collaborates with local government units (LGUs), NGOs, and regional academic institutions to address context-specific challenges through research, community outreach, and science-based policy development. These collaborations enhance the department's societal relevance and facilitate capacity-building at the grassroots level. Alumni and

professional networks are also leveraged to expand opportunities for research mentoring, training, and applied collaborations.

4. **Enhancing student involvement in collaborative projects.** Recognizing students as active participants in the research process, the department integrates them into collaborative projects through joint fieldwork, research internships, and international mobility programs. Students are given opportunities to present in symposia, contribute to publications, and engage in field- and lab-based learning with local and international mentors, thereby strengthening their academic and professional development.
5. **Promoting knowledge sharing, mobility, and co-creation.** The department regularly organizes academic events such as seminars, symposia, and workshops in collaboration with institutional partners. These platforms serve as venues for exchanging research findings, sharing methodologies, and promoting scientific dialogue. In line with open science principles, the department also adheres to FAIR (Findable, Accessible, Interoperable, and Reusable) data standards to make its research outputs accessible to the broader scientific and policy communities.

4. Department's Nature of Collaboration and Linkages

4.1 Linkage to enhance to enhance intellectual assets through advanced studies

A major driver of the Department's growing international linkages is its strong emphasis on higher education mobility. This strategic approach aims to diversify the department's intellectual assets and broaden its global academic reach. For years, it has been a well-established practice within the department to encourage faculty members to pursue advanced degrees and specialized training in reputable institutions abroad. These international academic experiences have not only enriched the individual expertise of faculty members but have also brought in diverse perspectives, modern research approaches, and global networks that continue to strengthen the department's teaching, research, and collaboration capacities. By cultivating a culture of academic mobility, the department ensures it remains responsive to emerging global trends, contributes meaningfully to international scholarship, and fosters cross-border partnerships that benefit both students and the broader academic community.

Among the department's notable faculty members are several who pursued their higher education internationally and have since maintained strong collaborative ties with their former academic institutions through ongoing research and intellectual exchanges. Professor Cabasan earned her Master of Science in Nematology from **Ghent University** in Belgium and later completed her PhD in Bioscience Engineering at **KU Leuven**, also in Belgium. Professor Tanalgo pursued his graduate studies, straight from master's to PhD in Ecology at the **Chinese Academy of Sciences**, while Professor Agduma earned his PhD in Ecology at **Guangxi University**, both located in China. Additionally, Associate Professor Bretana also completed his Master of Science in Nematology at Ghent University. These international academic experiences have not only shaped their expertise but also continue to establish collaborative research, joint publications, and academic exchange programs that benefit the department.

The Department has actively pursued international collaborations through advanced studies and research fellowships aimed at enhancing its scientific capacity. These initiatives have enabled faculty members to gain specialized training and build global academic networks in their respective fields.

For instance, Professor Angelo R. Agduma, during the mid-stage of his PhD, received advanced training at the Arnold Arboretum of Harvard University, where he deepened his expertise in plant anatomy under the mentorship of leading experts. Meanwhile, Professor Casim participated in a sandwich fellowship jointly hosted **by University of the Philippines Los Baños (UPLB)** and the **University of Malaya** in Malaysia, where she advanced her research in molecular parasitology and One Health studies.

In another initiative, Professor Krizler Tanalgo undertook academic training and collaborative research at the **University of Konstanz** and the **Max Planck Institute of Animal Behaviour** in Germany. His engagement focused on expanding his expertise in animal behavior and conservation biology, while also establishing interdisciplinary collaborations that bridge ecological research and behavioural sciences.

These international engagements not only reflect the Department's dedication to research excellence but also ensure its alignment with global scientific standards and emerging research frontiers.

4.2 Collaboration and linkages for joint research and publication

As mentioned in the Research section, one of our key models to establish our collaboration and linkages in through research following the **Publish-to-Partner Model**, where we our produced High-quality publications open doors to collaboration.

Engaging in high-end research is a defining trademark of the Department of Biological Sciences at the University of Southern Mindanao. It reflects the department's unwavering commitment to generating innovative, relevant, and methodologically rigorous studies that align with both national development goals and international scientific standards. This pursuit of research excellence elevates the department's academic reputation and reinforces its role as a key contributor to the advancement of biological sciences.

Our department's competitive research culture is built on foundations of critical thinking, intellectual curiosity, and scientific integrity. These values nurture a dynamic academic environment where faculty and students are encouraged to ask bold questions, explore emerging scientific frontiers, and produce research that addresses both fundamental and applied challenges in biodiversity, ecology, microbiology, and beyond.

As a direct outcome of its research quality and relevance, the Department has increasingly become a selected partner for external academic and institutional collaboration. Invitations to participate in national and international research projects are a testament to the department's scientific credibility, technical expertise, and growing influence in the global academic landscape. These collaborative engagements allow faculty and students to immerse themselves in diverse ecological

contexts, benefit from interdisciplinary approaches, and access a wider pool of funding and infrastructure.

A comprehensive study led by Professor Agduma on the priorities and challenges facing Mindanao's biodiversity and environmental landscape has significantly expanded the department's international engagement. His study, which identified critical ecological threats and research gaps across the region, drew attention not only within the Philippines but also among international scientific institutions concerned with tropical biodiversity and environmental health.

This work became a catalyst for a major collaborative initiative between Filipino scientists and European researchers, specifically through a joint Danish-Filipino project in partnership with the **Naturalis Biodiversity Center in the Netherlands**. The collaboration is focused on investigating pollution and contamination pathways across Mindanao, which is an urgent concern given the region's rich but vulnerable ecosystems and the increasing anthropogenic pressures they face.

As a direct outcome of this linkage, Professor Agduma and his team have been entrusted with leading the Mindanao-based component of the project if funded. The initiative is supported by competitive funding from the Dutch Research Council (NWO), underscoring both the scientific merit of the research and the international confidence in the department's capacity to lead complex, multidisciplinary studies.

In addition, Professor Krizler Tanalgo currently serves on the Advisory Board of an ambitious **international project based** at the **University of Louvain (UC Louvain) in Belgium**, titled "***Biodiversity, Local Knowledge, and Zoonoses in Austronesia: Ethnography of Bats and Related Interspecific Communities***" (Figure 1). This project, funded by the prestigious **European Research Council (ERC)**, explores the complex relationships between biodiversity, human communities, and zoonotic risks, particularly through the lens of bat ecology and cultural knowledge in Austronesian regions.

As a member of the Advisory Board, Professor Tanalgo plays a strategic role in overseeing the scientific direction, methodological integrity, and progress of the project. His expertise in bat ecology, conservation, and human-wildlife interactions has been instrumental in shaping the project's interdisciplinary approach, which merges ethnography, ecological research, and public health concerns.

In addition to providing remote guidance, Professor Tanalgo is also engaged in on-site collaboration through periodic visits to UC Louvain, where he co-supervises graduate students and postdoctoral fellows involved in the project. His involvement not only enriches the scientific rigor of the initiative but also fosters academic exchange and mentorship across institutions. This international engagement further highlights the global relevance and recognition of the Department of Biological Sciences' research leadership, especially in biodiversity and zoonotic interface studies.

Below are the Agreement of Collaboration and certification of the successful partnership between USM-Biology and UC Louvain



Republic of the Philippines
Kabacan, Cotabato
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CERTIFICATION OF SUCCESSFUL PARTNERSHIP INITIATION/IMPLEMENTATION

I hereby certify that the partnership between **University of Southern Mindanao/Department of Biological Sciences/Eco/Con Lab** and **Institut des Civilisations, Arts et Lettres (INCAL) of the Université Catholique de Louvain, Belgium** was initiated and implemented successfully by **KRIZLER C. TANALGO**

This partnership, forged with the intention of fostering collaboration and mutual growth, was conceived and brought to fruition through the dedicated efforts and vision of our esteemed faculty members. Their unwavering commitment to excellence, innovation, and community engagement has played a pivotal role in achieving the objectives set forth during the partnership's inception.

Key Achievements of the Partnership:

Joint Research Initiatives: Our faculty collaborated on various research projects, leading to significant contributions to their areas of expertise and advancing the boundaries of knowledge.

Publication and Academic Recognition: The joint efforts of our faculty led to several notable publications and academic recognitions, further elevating the reputation of both institutions.

As the President of the University of Southern Mindanao, I take immense pride in acknowledging the achievements and dedication of our faculty members. Their passion for excellence and commitment to the core values of our institution have played a vital role in ensuring the success of this partnership.

With this certification, I affirm that the partnership between University of Southern Mindanao and **Institut des Civilisations, Arts et Lettres (INCAL) of the Université Catholique de Louvain, Belgium** has been successfully initiated and implemented by our faculty member, and I look forward to witnessing its continued growth and impact in the years to come.

Reviewed by:


DEBBIE MARIE B. VERZOSA, PhD

Vice President for Research, Development, and Extension

Certified by:


JONALD L. PIMENTEL, PhD
SUC President IV
University of Southern Mindanao

"UNITY IN DIVERSITY AND
SUSTAINABLE DEVELOPMENT IN
MINDANAO THROUGH QUALITY AND RELEVANT EDUCATION."



Agreement of Collaboration/Accord de Collaboration

This 'Agreement of Collaboration' affirms the mutual commitment between the **Laboratoire d'anthropologie Prospective (LAAP)** at the **Université Catholique de Louvain (UCLouvain)**, represented by **Professor Frédéric Laugrand, PhD**, and the **Ecology and Conservation Research Laboratory (Eco/Con Lab)**, Department of Biological Sciences at the **University of Southern Mindanao, Philippines**, represented by **Professor Krizler C. Tanalgo, PhD**.

Professor Laugrand serves as the Director of the European Research Council-Interspecific project based, and Professor Tanalgo serves as a member of the Scientific Advisory Board.

Both institutions share common research interests in **conservation biology** and **anthropology** and recognise the value of equitable international collaboration to address global and local environmental challenges.

Through this partnership, both parties agree to establish, promote, and engage in the following:

1. **Joint research activities** — Co-development and implementation of collaborative research projects, particularly focussing on socioecological systems, anthropological, biodiversity and conservation studies in Mindanao, Philippines;
2. **Knowledge sharing and capacity building** — Exchange of scientific expertise, field data, and best practices through seminars, workshops, and co-organised symposiums;
3. **Visiting Professorships and research exchanges** — Opportunities for faculty members and researchers to visit each institution to contribute to teaching, mentoring, logistic support, and collaborative research, and;
4. **Student mobility and training** — Facilitation of academic exchange, internships, and research training opportunities for students of both institutions, fostering experiential and intercultural learning.

This collaboration is built on the principles of mutual respect, equity and scientific integrity and aims to strengthen the collective contribution of both institutions to advance anthropological knowledge and conservation practice in the Philippines, Belgium and beyond.

CERTIFIED TRUE COPY:


MARGIE N. BUTUAN-GALANG
Chief Administrative Officer
University of Southern Mindanao
Date: _____

pg. 1/2

This Letter of Collaboration does not constitute a legally binding agreement but reflects a shared intent to cooperate in the future. Any specific projects or activities will be formalised through separate agreements as needed.

Signed on this 15th of October 2025 in UCLouvain, Louvain-la-Neuve, Belgium



Professor Frédéric Laugrand, PhD

Director, Laboratoire d'anthropologie Prospective (LAAP), Université Catholique de Louvain, Louvain-la-Neuve, Belgium



Professor Krizler C. Tanalgo, PhD

Research Lab Head, Ecology and Conservation Research Laboratory (Eco/Con Lab), Department of Biological Sciences, College of Science and Mathematics, University of Southern Mindanao, Philippines

Figure 1. Agreement of collaboration between USM through Dr Tanalgo and UC Louvain.

4.3 Joint publication and co-creation

Beyond joint projects and academic advancements, these collaborations serve as platforms for knowledge exchange, mentorship, and capacity building. They open pathways for the transfer of ideas, technologies, and methodologies, thereby broadening the department's intellectual horizons. They also challenge researchers to think beyond institutional and disciplinary silos, an essential characteristic of a forward-thinking, impact-driven research institution.

One notable example of this is the work led by Professor Krizler C. Tanalgo, who spearheaded the development of the Bat Cave Vulnerability Index (BCVI) and the **global DarkCideS database and consortium**. These initiatives have become internationally recognized tools for assessing and prioritizing bat cave conservation efforts. The BCVI has been applied in diverse geographic contexts, including Bulgaria, Central Asia, Ghana, Costa Rica, and Japan, demonstrating its adaptability and scientific value. This innovation also paved the way for Professor Tanalgo's involvement in the DarCo Project, led by the University of Helsinki, which resulted in a large-scale analysis showing significance of bats in subterranean ecosystems boosting the evidence to further protect these habitats. Professor Tanalgo was also invited in joint research with researchers from Bulgarian Academy of Sciences to apply BCVI across all Bulgarian caves. The joint-research produced a first-ever national priorities for cave sites in Bulgaria supporting policies that would balance economic gain and environmental protection. Lastly, based on our previous solid work, national roost prioritization effort with the Spanish Bat Group is currently rolling out in the entire country with potential adaptation in the entire European systems, showcasing how pioneering research can foster meaningful and sustained international partnerships.

In the area of joint research and exploration, the Department has worked with institutions including the **University of Naples Federico II (Italy)**, **University of Helsinki (Finland)**, **University of Hong Kong** (Figure 2), and several universities in Australia, Czech Republic, and Brazil. These linkages have resulted in co-authored publications in leading scientific journals and the development of global datasets on pressing ecological themes such as evolutionary traps, urban biodiversity, and species behavior. Many of these efforts have also contributed to long-term research partnerships and extensive data-sharing frameworks.

In a research collaboration established by Professor Agduma with Professor Altarez from the **University of Southern Queensland**, Australia, who also serves in the military and is a distinguished member of the Corps of Professors at the **Philippine Military Academy** (Figure 3). Their joint research addressed a critical gap in the mapping of coastal forests, particularly in the Sarangani Bay Protected Seascape (SBPS), which has been largely overlooked in both national and global mapping initiatives, such as the 2019 Philippine-wide mangrove extent mapping and in the Global Mangrove Watch Version 3.0. Professor Agduma and Professor Altarez evaluated the performance of three convolutional neural network (CNN) models, U-Net, DeepLabV3, and PSPNet, for their effectiveness in identifying coastal forest cover in SBPS. From the detected forested areas, they analyzed the leaf area index (LAI) and used this to estimate aboveground biomass (AGB) of the coastal forests, providing a more comprehensive understanding

of coastal forest structure and carbon storage potential in this important marine protected area. This paper has undergone peer review and is currently under consideration for publication in the journal *Remote Sensing Applications: Society and Environment*.

Beyond individual research partnerships, Department of Biological Sciences lies in its active participation in global **“network of networks”** collaborations. These linkages allow the Department to engage in large-scale, interdisciplinary knowledge exchange and policy-relevant science through platforms. The Department’s Eco/Con lab serves as a recognized data publisher under the Global Biodiversity Information Facility (GBIF), and co-leads global initiatives such as the DarksideS Consortium, which focuses on cave and subterranean biodiversity.



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CERTIFICATION OF SUCCESSFUL PARTNERSHIP INITIATION/IMPLEMENTATION

I hereby certify that the partnership between **University of Southern Mindanao/Department of Biological Sciences/Eco/Con Lab** and **University of Naples Federico II Naples, Italy** was initiated and implemented successfully by **KRIZLER C. TANALGO**

This partnership, forged with the intention of fostering collaboration and mutual growth, was conceived and brought to fruition through the dedicated efforts and vision of our esteemed faculty members. Their unwavering commitment to excellence, innovation, and community engagement has played a pivotal role in achieving the objectives set forth during the partnership's inception.

Key Achievements of the Partnership:

Joint Research Initiatives: Our faculty collaborated on various research projects, leading to significant contributions to their areas of expertise and advancing the boundaries of knowledge.

Publication and Academic Recognition: The joint efforts of our faculty led to several notable publications and academic recognitions, further elevating the reputation of both institutions.

As the President of the University of Southern Mindanao, I take immense pride in acknowledging the achievements and dedication of our faculty members. Their passion for excellence and commitment to the core values of our institution have played a vital role in ensuring the success of this partnership.

With this certification, I affirm that the partnership between University of Southern Mindanao and **University of Naples Federico II Naples, Italy** has been successfully initiated and implemented by our faculty member, and I look forward to witnessing its continued growth and impact in the years to come.

Reviewed by:



DEBBIE MARIE B. VERZOSA, PhD

Vice President for Research, Development, and Extension

Certified by:



JONALD L. PIMENTEL, PhD

SUC President IV
University of Southern Mindanao

"UNITY IN DIVERSITY AND
SUSTAINABLE DEVELOPMENT IN
MINDANAO THROUGH QUALITY AND RELEVANT EDUCATION."

Agreement of Collaboration/ Accordo di Collaborazione

This 'Agreement of Collaboration' affirms the mutual commitment between the **Lab of Animal Ecology and Evolution** at the **Dipartimento di Agraria, Università degli Studi di Napoli Federico II**, represented by **Professor Danilo Russo, PhD**, and the **Ecology and Conservation Research Laboratory (Eco/Con Lab), Department of Biological Sciences** at the **University of Southern Mindanao, Philippines**, represented by **Professor Krizler C. Tanalgo, PhD**.

Both institutions share common research interests in the **bat ecology, behaviour, and conservation** and recognise the value of equitable international collaboration to address global and local environmental challenges.

Through this partnership, both parties agree to establish, promote, and engage in the following:

1. **Joint field and analytical research** focused on bat ecology, behaviour, and conservation in diverse ecological and cultural contexts.
2. **Knowledge exchange** through seminars, symposia, and academic forums that promote the sharing of research findings, methodologies, and best practices.
3. **Joint publication and open data collaboration**, including the co-development of scientific manuscripts, datasets, and reports that align with FAIR and ethical research principles.
4. **Capacity building and academic exchange**, involving possible **student and faculty mobility**, mentorship, and co-supervision of research projects.

This collaboration is built on the principles of mutual respect, equity and scientific integrity and aims to strengthen the collective contribution of both institutions to advance anthropological knowledge and conservation practice in the Philippines, Belgium and beyond.

CERTIFIED TRUE COPY:

MARGIE N. TUTUAN-GALANG
Chief Administrative Officer
University of Southern Mindanao

Date: _____

pg. 1/2

Figure 2. Agreement of collaboration between the Laboratory of Animal Ecology and Evolution and the USM – Ecology and Conservation Research laboratory, represented by Dr. Krizler C. Tanalgo.



Agreement of Collaboration

This Agreement of Collaboration affirms the mutual commitment between **Assoc. Prof. Angelo R. Agduma**, Principal Investigator, Ecophysiology in a Changing Environment Group, Ecology and Conservation Research Laboratory (Eco/Con Lab), University of Southern Mindanao, Philippines and **Prof. Richard Dein D. Altarez, PROF**, Corps of Professors, Philippine Military Academy, Armed Forces of the Philippines/ThD candidate, University of Southern Queensland, Australia.

Through this partnership, both parties express their shared intention to establish, promote, and undertake collaborative initiatives to:

1. Co-develop, implement, and disseminate collaborative research projects, particularly in the fields of ecology, biodiversity, environmental science, remote sensing, and applications of artificial intelligence, including the co-authorship of resulting scholarly publications and other research outputs; and
2. Exchange of scientific expertise, research data, methodologies, and best practices through lectures, seminars, workshops, training activities, and jointly organized symposia to strengthen research capacity and foster academic collaboration.

This collaboration is founded on the principles of mutual respect, equity, transparency, and scientific integrity. It aims to strengthen the collective contributions of both parties toward advancing scientific knowledge, promoting biodiversity conservation, and supporting evidence-based environmental management in the Philippines and beyond.

This is intended solely as an expression of the parties' shared commitment to collaborate and does not create any legally binding obligations. Any specific research projects, funding arrangements, intellectual property matters, or other collaborative activities arising from this partnership shall be governed by separate written agreements executed by the parties as appropriate.

Signed this 25th day of July 2024 in Baguio City, Philippines.


ANGELO R. AGDUMA
Ecology and Conservation Research
Laboratory (Eco/Con Lab), University of
Southern Mindanao, Philippines


RICHARD DEIN D. ALTAREZ, PROF
Corps of Professors, Armed Forces of the
Philippines

pg. 1/1

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Multi-model convolutional neural network architectures for coastal forest extent and aboveground biomass estimation

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ABSTRACT

Mapping coastal forests through large-scale remote sensing remains challenging, despite extensive local, national, and global efforts. In particular, Sarangani Bay Protected Seascapes (SBPS) in the Philippines has been largely overlooked in both national and global coastal forest mapping initiatives. To address this gap, we evaluated the performance of three convolutional neural network (CNN) models, U-Net, DeepLabV3, and PSPNet, in identifying coastal forests within SBPS. These forested areas detected were subsequently analyzed for leaf area index (LAI), which was then used to estimate aboveground biomass (AGB). Among the models tested, U-Net demonstrated the highest accuracy, achieving an overall accuracy of 92.66 %. In contrast, DeepLabV3, while the fastest to train, yielded lower accuracy. AGB estimates revealed that the municipalities of Glan and Masim had the highest AGB, with 2582.43 Mg ha⁻¹ and 1260.57 Mg ha⁻¹, respectively, while Alabid recorded the lowest at 27.27 Mg ha⁻¹. Although distinguishing true mangroves from non-true mangrove classes in coastal forests remains a limitation, the integration of remote sensing and deep learning offers strong potential for enhancing the accuracy and efficiency for land use and land cover classification, as well as AGB estimation.

1. Introduction

Coastal forests, including mangroves and beach forests, play critical roles in protecting shorelines, supporting biodiversity, and delivering ecological benefits (Das et al., 2022; Naskar et al., 2023). Mangrove forests alone span approximately 147,000 km² worldwide (Bunting et al., 2022). While capable of rapidly colonizing new environments, coastal forests are susceptible to destruction by anthropogenic and natural forces (Long et al., 2016; Primavera, 2004, 2006; Primavera et al., 2004; Primavera et al., 2016a). Significant reductions in the extent of global mangrove forests have historically been documented, and the greatest expanse of mangrove loss has been recorded in North and Central America, the Caribbean, and Southeast Asia (Bunting et al., 2022). These losses are immense (Romañach et al., 2018), therefore, restoration, protection, and the halt of all global losses of mangrove ecosystems are fundamental (Dabalá et al., 2023; Leal and Spalding, 2022).

Mangroves have been better studied (Agduma et al., 2024) than beach forest species (Romeroso et al., 2021; Sabulao, 2020) in the

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Figure 3. Agreement of collaboration between University of Queensland through Prof. Richard Dien D. Altarez and the USM – Ecology and Conservation Research laboratory, represented by Prof. Angelo R. Agduma.

The Department's involvement, through Dr. John Aries Tabora (Figure 4), with global organizations such as the **British Ecological Society**, **European Geophysical Union (EGU)**, **Urban Bird Consortium (URBICON)**, and the **Conflict and Environment Observatory** has facilitated high-level scientific dialogues, collaborative reviews, and policy-influencing outputs. Notably, a joint position paper co-authored with **Universidade Federal de Lavras** was published in the top-journal *Science* and contributed to environmental policy discourse in Brazil. In addition, Dr. Tabora is a major collaborator of the **Locally led East Asian Flyway Acoustics (LEAFA) Migratory Program** led by Cornell University (Figure 5.1 & 5.2). The goal of the project is to establish a regional conservation program of migratory birds in the EAF through a participatory research framework. Through the LEAFA program, we are laying the groundwork to build a robust regional network for acoustic monitoring of migratory species.

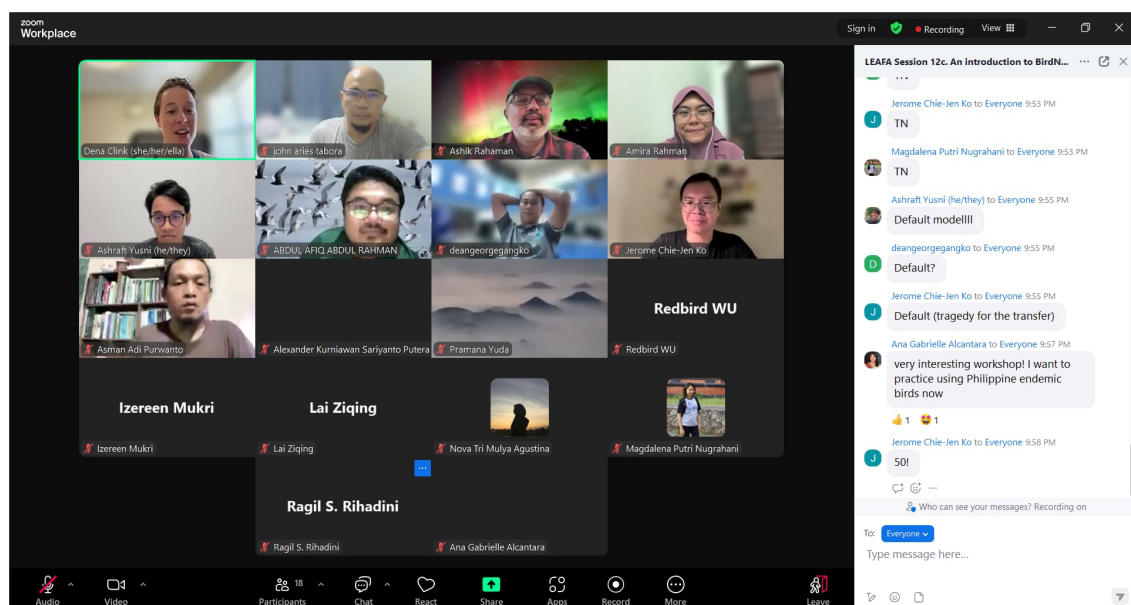


Figure 4. Associate Professor Tabora with the lead team and collaborators for the LEAFA Project discussing the progress and strategies of the program.

Locally, the department is also active to cooperate and collaborate with international linkages efforts of the University. In support to the Memorandum of Agreement (MOA) between The University of Southern Mindanao (USM) and Islamic Relief in 2023, Assistant Hilario-Husain from the Department, together with Assistant Professor from Development Communication Department, were tapped for their technical expertise and facilitated the Conservation Action Planning Workshop in the municipalities of Sultan sa Barongis and Gen. SKP in BARMM in August 2024. This activity was a key deliverable of the L-MARSH Project implemented by Islamic Relief.

By embedding itself within these expansive, interconnected research ecosystems, the Department not only strengthens its global scientific presence but also contributes to shaping research agendas and conservation priorities at both regional and international levels. Collectively, these collaborations have yielded more than 50 joint



PERKUMPULAN BISA INDONESIA
Gondang Legi, RT.01/RW.13, Desa Sariharjo,
Kecamatan Ngaglik, Kabupaten Sleman,
Daerah Istimewa Yogyakarta 55581
INDONESIA

No. : 025/BISA-adm/LEAFA/II/2026
Subject : Year 2 Locally-led East Asian Flyway (LEAFA) Program

Dear John Aries G. Tabora,

It is my pleasure to accept your application and invite you to participate in the second year of the Locally-led East Asian Flyway (LEAFA) Program to be held from September 1, 2025, to September 1, 2026.

To enable your participation, two (2) Song Meter Micro 2 recording devices and one (1) external hard drive for data storage will be provided. The equipment will remain the property of the LEAFA Program for the duration of the program. Upon successful completion of all program requirements, ownership of the Song Meter units will be transferred to the LEAFA partners. LEAFA partners are encouraged to ensure the proper use and routine care of these items, and in the event of loss, theft or damage, you are advised to notify the organizer as soon as possible. This, however, does not guarantee replacement or reimbursement.

Equipment will be shipped to one designated address per country, with local coordination and distribution managed by the LEAFA partners within the country. Any import duties, taxes, or fees will be applied per country shipment, rather than per individual partner. We can cover up to US \$ 187 per country in local taxes or fees associated with your receipt of the Song Meter units; any cost exceeding this amount will be the responsibility of the awardee. We strongly encourage you to work to get a tax exemption for this. Please let us know as soon as possible if we should include a letter for tax exemption with the recorder shipment.

The LEAFA Program will also provide a lump sum of US \$700 for field work and associated costs, including internal shipping of recorders from each country's recipient, research assistants, travel to the field, SD cards, and/or batteries; please confirm with us for any other expenditure outside of this list. All field support expenditures must be incurred within the program period (September 1, 2025 to September 1, 2026). Recipients are expected to retain all receipts related to field support expenses and fill out the provided expenditure form upon completion of the program. Please note that any wire transfer or bank fees will be deducted from the field support allocation.

Your eligibility to retain the equipment is dependent on your successful completion of the second year of the LEAFA Program, which will be evaluated quarterly. Failure to successfully fulfill the minimum participation requirements of the program may require the return of this equipment.

Specifically, your participation in the program will entail:

- Collect data on the agreed-upon schedule, archive the data promptly, and share the associated metadata and a summary of detections quarterly.
- Provide a video documenting your progress by April 1, 2026, in accordance with a video guideline that will be shared by the organizer.

info.bisaia@gmail.com | bisaindonesia.or.id



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Kecamatan Ngaglik, Kabupaten Sleman,
Daerah Istimewa Yogyakarta 55581
INDONESIA

- Submit a midprogram and final progress report, following the template provided by the LEAFA Program.
- Submit all manually verified detections for the collective analysis session by March 15, 2026.
- Attend and actively participate in the monthly organized sessions and the working group sessions.
- Meet the identified goals as outlined by the working groups.
- Respond promptly to emails and communications about the program (within approximately one week) unless in the field or on leave.
- Acknowledge the grant in talks and publications using the following format: We acknowledge the Locally Led East Asian Flyway (LEAFA) Program led by BISA Indonesia, K. Lisa Yang Center for Conservation Bioacoustics, Cornell Lab of Ornithology, Cornell University, and Universiti Malaysia Terengganu. Funding for this project comes with generous support from the Cornell Lab of Ornithology through the H. Elliot McClure Fund for the Research and Conservation of Birds in Asia, as well as Arm and WILDLABS through the WILDLABS Award 2025.

To indicate your acceptance of this invitation and its terms, please sign below and return this letter to Asman Adi Purwanto (asman@bisaindonesia.or.id) with cc to pa429@cornell.edu by February 5, 2026.

Regards,

Asman Adi Purwanto,
Executive Director

I accept this invitation.

Signature/Name: John Aries G. Tabora  Date: 04/11/2026

For office use only. After the program completion, the Executive Director should sign below to indicate that all requirements were met.

Certification/Approval: _____ Date: _____

info.bisaia@gmail.com | bisaindonesia.or.id

Figure 5.1. Proof of collaboration between Dr. Tabora of USM and the Ornithology Laboratory of Cornell University.

publications, advanced the Department's research capacities, and positioned it as a key player in global biodiversity science and conservation policy.

In sum, the Department's cycle of producing high-impact research, earning external recognition, and cultivating collaborative networks creates a thriving and resilient academic ecosystem. It motivates faculty and students alike, fuels continuous innovation, and ensures that the department remains a vital contributor to scientific progress and societal well-being.

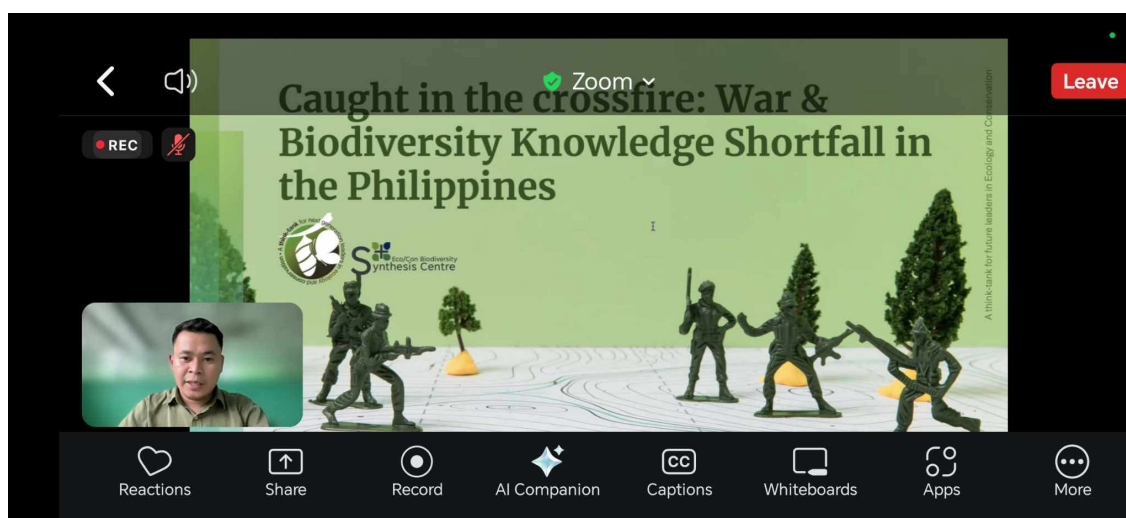


Figure 6. Professor Tanalgo delivering a talk and discussion about their work on war and biodiversity conflict in Mindanao during the first quarter meeting of the Conflict and Environment Observatory based in the United Kingdom.

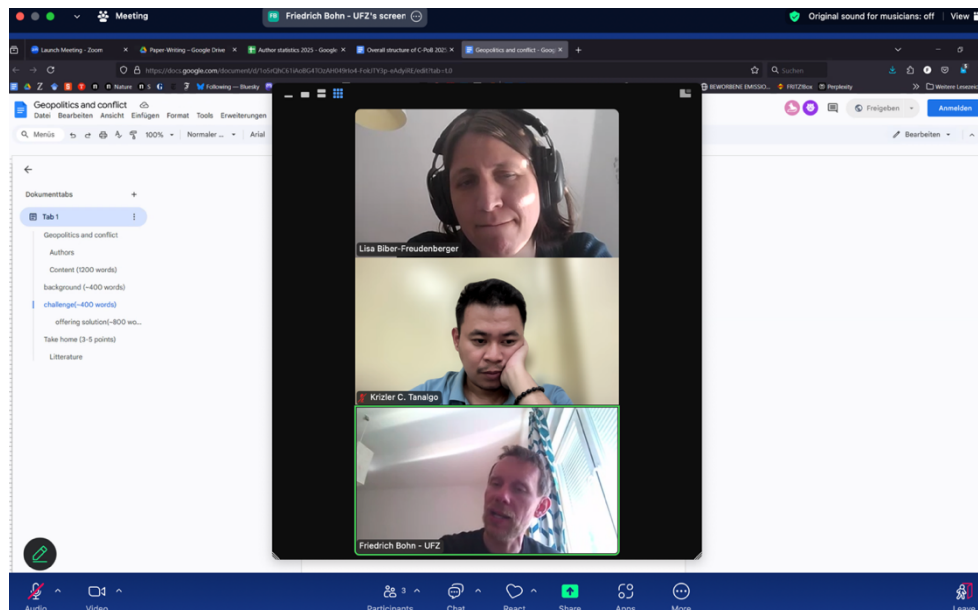


Figure 7. Zoom meeting with Professor Tanalgo (USM Biological Sciences) together Professor Bohn (UFZ-Helmoltz Institute) and Professor Biber (University of Bonn) both in Germany discussing the 2026 Global Biosphere Review funded by the Future Earth



Figure 8. Assistant Professor Hilario giving a community lecture as part of the collaborative work with Islamic Relief.

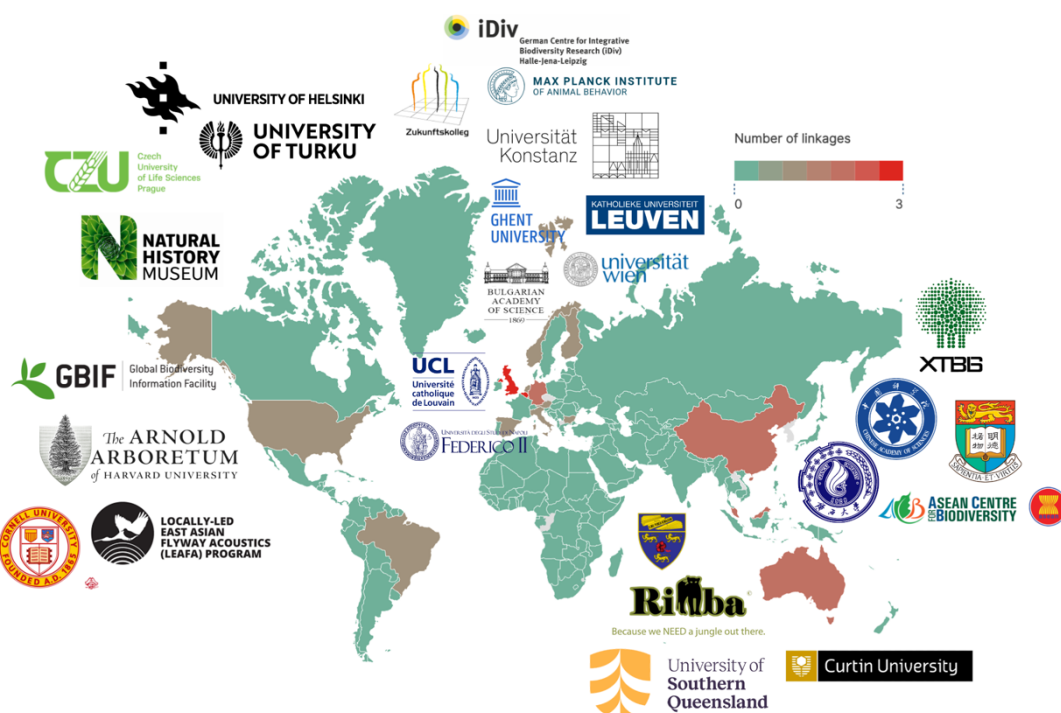


Figure 9. A choropleth map showing the current direct international collaboration and linkages of the Department of Biological Sciences. Complete list and details of collaboration is summarized in Table 1.

Table 1. List of collaborators and linkages of the Department of Biological Sciences from different part of the world based on different nature of collaboration.

Institution	Country of origin	Nature of collaboration	Description of collaboration	Collaboration outcome
Chinese Academy of Sciences	China	Advance studies	The collaboration involves support for academic advancement and research funding support. Around 8 million in Philippine Peso scholarship support, research funding, and mobility.	• PhD degree • Support for open-access publication. • 10 research publications. • Multiple international travel support.
Guangxi University	China	Advanced studies	The collaboration involves support for academic advancement and research funding	• PhD degree • Support for open-access publication.

			support. Around 2 million in Philippine Peso scholarship support, research funding, and mobility.	• 10 research publications. • Funding international travel support.
University of Malaya	Malaysia	Advanced studies	The linkages is part of the sandwich program for PhD degree to pursue research experiment in Malaysia.	• Access to state-of-the-art research laboratories. • Established collaboration and co-publication of several manuscripts and findings from collaboration.
University of Konstanz, Max Planck Institute of Animal Behaviour	Germany	Advanced studies	Advanced interdisciplinary training on animal behaviour and other related trainings in biology.	• Joint research co-creating and co-development. • Access to state-of-the-art facility. • Fundings for open-access journals.
Arnold Arboretum of Harvard University	United State of America	Advanced training	The linkages involve training support to advance on-going research project.	• Equipped with modern approaches to advance plant anatomical research
Locally-led East Asian Flyway Acoustic (LEAFA) Program, Cornell University	United States of America	Joint research and exploration	The collaboration involved co-development of research on bird bioacoustics across EAF.	• Joint publication of a large review and biodiversity data synthesis. • Joint publication of perspectives paper.
RIMBA	Malaysia	Joint research	The collaboration involves databasing and co-creating of Old-world scale analysis.	• Joint publication of a large review and

				biodiversity data synthesis. Joint publication of perspectives paper.
Museu de Ciències Naturals de Granollers	Spain	Joint research	Co-supervise Doctoral student on the development of new conservation tool as part of his PhD project.	- Joint research co-creating and co-development. - Joint publication of a research manuscript in top-journal.
University of Naples Federico II	Italy	Joint research	The linkages and collaboration involve the exchanges of knowledge assets between academics from the two institutions to accomplish extensive research.	- Worldwide dataset for the negative impacts of ecological and evolutionary traps for bats developed. - First comprehensive analysis of the drivers of ecological and evolutionary traps for bats published in top-journal. - Further research was established between academics.
University of Helsinki	Finland	Joint research	Research collaboration for joint paper.	Joint publication of a research manuscript in top-journal.
University of Bulgaria, Bulgarian Academy of Science	Bulgaria	Joint research	Research collaboration for joint paper and co-creation of conservation priorities.	Joint publication of a research manuscript in top-journal.
University of Hong Kong	Hong Kong	Joint research	Research collaboration for joint paper and co-	Joint publication of a research

			creation of conservation priorities.	manuscript in top-journal. Fundings for open-access journals.
ASEAN Centre for Biodiversity	Philippines/ ASEAN	Joint research	Collaboration in terms of data mobility and access to larger database and center within the GBIF infrastructure.	Access and management of the infrastructure to facilitate data mobility within the ASEAN region.
Czech University of Life Sciences Prague	Czech Republic	Joint research	Collaboration through data sharing and joint publication	- Assembly of global database for bird FID and AD from urban areas. - Joint publication of data paper in a top-journal. - Long-term partnership.
Leiden Naturalis Biodiversity Center	The Netherlands	Joint research and exploration	The collaboration and linkages involve the joint exploration of the pollution pathways across freshwater bodies in Mindanao.	- Research funding for exploration. - Joint publication of a research manuscript in top-journal.
University of Southern Queensland with/ Philippine Military Academy	Australia	Joint research	Research collaboration for joint paper.	Joint publication of a research manuscript in top-journal.
University of Turku	Finland	Joint research and exploration	Global collaboration for synchronized ecological experiment.	- Joint publication of a research manuscript in top-journal. - Co-creation of global database.
University of Curtin	Australia	Joint research/	Collaboration through joint research for global	Joint publication of

			underground biodiversity.	data paper in a top-journal.
Museum of Natural History, London	United Kingdom	Joint research/Network of networks	Research collaboration for joint paper and global database.	- Joint publication of data paper in a top-journal. - Formalized global change database and collaborative consortium.
Universidade Federal de Lavras	Brazil	Joint research/Network of networks	Joint position letter in a form of formal publication supporting Brazilian environmental policy.	- Joint publication of a position letter in the top-journal <i>Science</i>. - Influenced the Brazilian environmental policy.
Urban Bird Consortium (URBICON), University of Vienna	Austria	Joint research/Network of networks	Collaboration through joint research in global priorities and direction for urban birds.	- Joint publication of data paper in a top-journal. - Long-term partnerships
DarkcideS Consortium	Philippines	Joint research/Research leadership	The collaboration and linkages are co- led by the faculty member of the Department of Biological Sciences. The collaboration within the consortium involves the databasing of global caves and underground ecosystems though open and FAIR data sharing.	- Joint publication of data paper in a top journal. - Formalized bat database and collaborative consortium.
UC Louvaine	Belgium	Joint research/Research leadership	Supervision of graduate and postdoctoral researcher under the European Research Council (ECR) funded research.	- Joint publication of a research manuscript in top-journal. - Funding support to travel and trainings.

				Visiting professorship at UC Louvaine.
Islamic Relief	United Kingdom	Network of networks	Collaboration includes community engagements with people from the BARMM region.	Community engagement and extension efforts.
Global Biodiversity Information Facility (GBIF), Norway and Southeast Asia	Norway (global headquarters)	Network of networks	Affiliated with the facility and access to include data mobilization from the Philippines and beyond. The collaboration also involves access within the network of biodiversity data mobilised and infrastructure.	The Department's Eco/Con Lab has become a data published and manager in GBIF infrastructure, making the first in region 12 and few institutions in the Philippines.
The Conflict and Environment Observatory	United Kingdom	Network of networks	The collaboration includes access and linkage across members of the observatory network.	Platform to share and further collaborate on ideas and co-creating of innovative ideas with members of the network.
European Geophysical Union	Germany	Network of networks	The collaboration includes co-development of the 2026 Biosphere Research Review.	Co-development of a global environmental scan of the most significant concerns across the globe.
British Ecological Society	United Kingdom	Network of networks	Access to link and collaborate with members of the network through provision of platform of communication.	Funding to present and travel to UK.

4.4 Department led International Linkages

As a premier department in research and biology education, the Department of Biological Sciences did not only a partner institution but has also taken a leading role in advancing the linkages in institutions from Asia, Europe, and beyond. Such engagements not only enhance the department's research capacity and academic excellence but also solidify its reputation and influence within the global scientific community. By consistently driving forward these international linkages, the department plays a key role in shaping the university's global academic branding and positioning it as a competitive and collaborative player in the international higher education and research landscape.

One notable example of the department's leadership in international collaboration is the **DarkCideS Consortium**, co-led by Professor Krizler C. Tanalgo and Associate Professor Jessa A. Tabora together with Professor Alice C. Hughes from Chinese Academy of Sciences and University of Hong Kong. This initiative forms part of a long-term effort to globally map and conserve cave-dwelling bats. The DarkCideS database traces its roots to the development of the "Bat Cave Vulnerability Index (BCVI)" project, launched in 2014 under the "Global Bat Cave Vulnerability and Conservation Mapping Initiative". This work later expanded through collaborative projects such as "Mapping Karst Biodiversity in Yunnan" and the "Southeast Asian Atlas of Biodiversity," both awarded to Professor Hughes' research project. Between 2019 and 2020, the core team formally expanded the project by inviting global experts in bat cave ecology and conservation to build a broader research network. This effort led to the establishment of the DarkCideS Consortium, a platform aimed at fostering sustained collaboration, centralized data-sharing, and conservation action. As of today, the consortium includes 36 collaborators from over 20 countries spanning six continents, representing a wide range of diverse expertise in bat conservation, cave ecology, and biodiversity science.

Professor Tanalgo is responsible for the overall running of the consortia currently housed at the Ecology and Conservation Research Laboratory (EcoCon Lab) at the University of Southern Mindanao. In addition, Dr. Tanalgo as the project leader of the DarkCideS, is now collaborating with Dr Mamola at the University of Helsinki to integrate the database to map global cave biodiversity through the **Biodiversita+** funding in the European Union. The partnership through this project increased the visibility of the Biology Department and USM in the scientific society and in the open-science movement.

This collaborative effort has made significant contributions to global research, including studies on the origins of COVID-19 and the identification of future hotspots for zoonotic disease spillover. The consortium's data and analytical frameworks have been instrumental in understanding the ecological contexts of disease emergence, particularly in regions where human-wildlife interactions are intensifying.

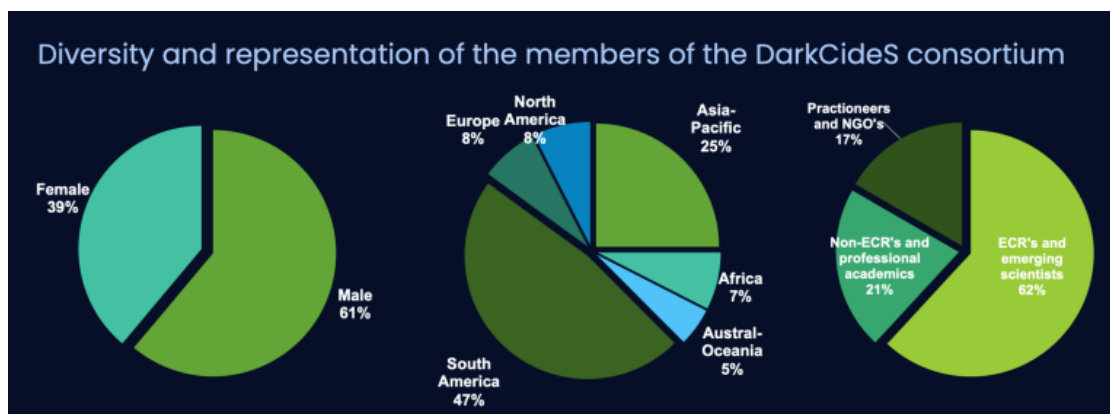


Figure 10. Diversity and representation of the members of the DarkCideS consortium based on their gender, geographic origin, and career stages. Data is available from <https://darkcides.wordpress.com/our-team/>.

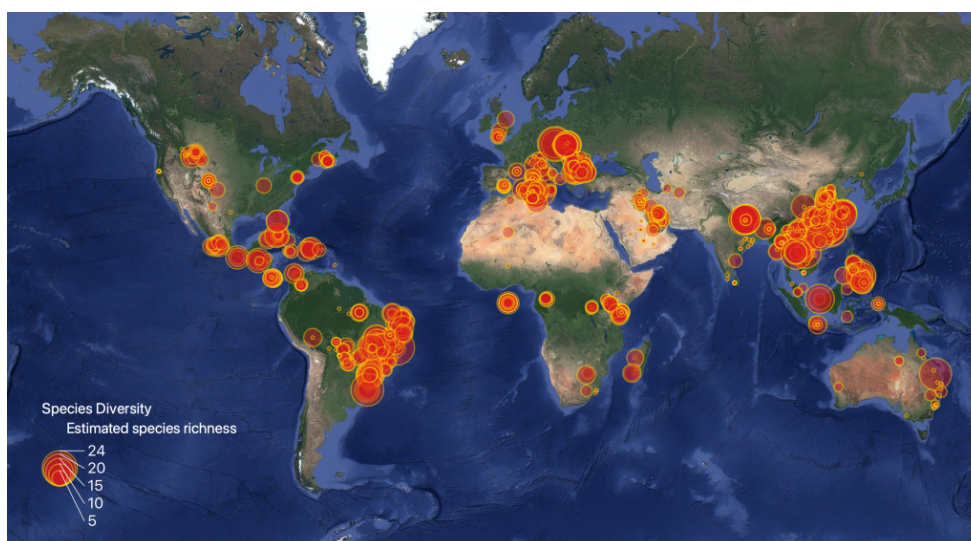


Figure 11. Status of the DarkCideS database and its global coverage. Data is available from <https://darkcides.wordpress.com/database/>.



Republic of the Philippines
Kabacan, Cotabato
UNIVERSITY OF SOUTHERN MINDANAO
Tel. No. 064-572-2138
email address: op@usm.edu.ph

CERTIFICATION OF SUCCESSFUL PARTNERSHIP INITIATION/IMPLEMENTATION

I hereby certify that the partnership between **University of Southern Mindanao/Department of Biological Sciences/Eco/Con Lab** and **Water Research Institute, National Research Council, Italy** was initiated and implemented successfully by **KRIZLER C. TANALGO**

This partnership, forged with the intention of fostering collaboration and mutual growth, was conceived and brought to fruition through the dedicated efforts and vision of our esteemed faculty members. Their unwavering commitment to excellence, innovation, and community engagement has played a pivotal role in achieving the objectives set forth during the partnership's inception.

Key Achievements of the Partnership:

Joint Research Initiatives: Our faculty collaborated on various research projects, leading to significant contributions to their areas of expertise and advancing the boundaries of knowledge.

Publication and Academic Recognition: The joint efforts of our faculty led to several notable publications and academic recognitions, further elevating the reputation of both institutions.

As the President of the University of Southern Mindanao, I take immense pride in acknowledging the achievements and dedication of our faculty members. Their passion for excellence and commitment to the core values of our institution have played a vital role in ensuring the success of this partnership.

With this certification, I affirm that the partnership between University of Southern Mindanao and **Water Research Institute, National Research Council, Italy** has been successfully initiated and implemented by our faculty member, and I look forward to witnessing its continued growth and impact in the years to come.

Reviewed by:



DEBBIE MARIE B. VERZOSA, PhD

Vice President for Research, Development, and Extension

Certified by:



JONALD L. PIMENTEL, PhD
SUC President IV
University of Southern Mindanao

Agreement of Collaboration/ Accordo di Collaborazione

This Agreement of Collaboration affirms the mutual commitment between the **DarkCideS Project** at the **Ecology and Conservation Research Laboratory (Eco/Con Lab), Department of Biological Sciences at the University of Southern Mindanao (USM), Philippines**, represented by **Dr. Krizler C. Tanalgo**, and the **Molecular Ecology Group (MEG), Water Research Institute, National Research Council (IRSA-CNR), Verbania, Italy**, represented by **Dr. Stefano Mammola**.

Both institutions share strong research interests in **bat ecology, subterranean biodiversity, and conservation**, and recognise the importance of global scientific collaboration in advancing understanding and protection of subterranean ecosystems and their associated fauna.

Through this partnership, both parties agree to collaborate in the following areas:

1. **Exchange of ideas and intellectual dialogue** – Engage in scientific discussions, knowledge exchange, and co-learning activities to advance the field of subterranean conservation, with a focus on bats and subterranean ecosystems.
2. **Data sharing and FAIR Access** – Facilitate the sharing and open (FAIR) access of global biodiversity datasets related to bats and other subterranean fauna, ensuring that data mobilisation and use adhere to international data standards and equitable attribution.
3. **Joint authorship and research outputs** – Collaboratively design, conduct, and publish joint research papers and reports arising from shared scientific efforts, recognising all contributing authors and institutions fairly.

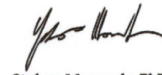
This collaboration is founded on the principles of mutual respect, equity, open science, and scientific integrity, and aims to contribute to the global understanding and protection of subterranean ecosystems through research, data sharing, and international cooperation.

CERTIFIED TRUE COPY:
MARGIE N. BUTUAN-GALANG
Chief Administrative Officer
University of Southern Mindanao
Date: _____



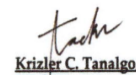
This Agreement of Collaboration is not legally binding but represents a shared intent to collaborate in good faith. Specific research activities or outputs resulting from this partnership may be formalised through separate agreements as appropriate.

Signed on this 21st of October 2025, in Verbania, Italy, and Kabacan, Cotabato, Philippines [online].



Stefano Mammola, PhD

Senior Researcher at the Water Research
Institute, National Research Council (IRSA-
CNR), Verbania, Italy



Krizler C. Tanalgo, PhD

Ecology and Conservation Research
Laboratory (Eco/Con Lab), Department of
Biological Sciences, College of Science and
Mathematics, University of Southern
Mindanao, Philippines

Figure 12. Proof of collaboration between USM as represented by Dr Tanalgo and the Molecular Ecology Group of Water Research Institute, National Research Council, Verbania, Italy thru Dr. Stefano Mamola.

4.5 Department's support to young academics (MS-Biology students)

The Department of Biological Sciences remains deeply committed to nurturing the next generation of scientists through strong support for international training, paper presentations, and attendance to Conferences.

The participation of **MS Biology students and Faculty members in international scientific conferences** and trainings (Figure 13, 14 and 16) provides valuable opportunities for scholarly growth, professional networking, and global engagement. Through the presentation of their research, students receive insights and constructive feedback from experts, exchange scientific ideas and research experiences with fellow scholars, and enhance their competencies in research, scientific communication, and critical thinking. More importantly, these international engagements provide avenues for establishing **professional networks and potential research collaborations with scientists and researchers from different countries**, thereby broadening the students' perspectives and strengthening the research culture and international visibility of the **MS Biology Program and the University of Southern Mindanao**.



Figure 13. Miss Florilyn Diliman and Professor Lothy F. Casim during the 4th International Convention of Philippine Society of Parasitology in July 3-5, 2024 at UPLB-Los Baños.

Winning awards (Figure 14) in international conferences reflects the **quality, relevance, and competitiveness of the research conducted by MS Biology students** and demonstrates their ability to meet standards of scientific work beyond the local and national levels. Such recognition enhances students' confidence and competencies in research and scientific communication, increases opportunities for **professional networking and potential international research collaborations**, and strengthens the visibility and reputation of the **MS Biology Program and USM** within the broader scientific community.

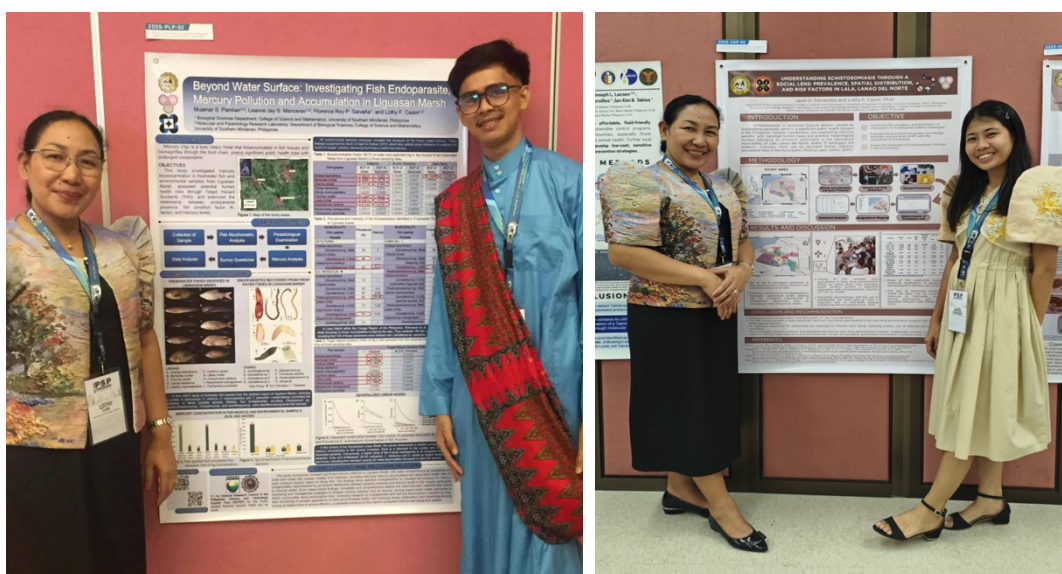


Figure 13. MS-Biology students - Mr Muamar S. Pamlian (Left photo) and Miss Jazel D. Fernandez (Right photo), with their thesis adviser – Dr Lothy F. Casim attended and presented their papers during the International Conference of the Philippine Society of Parasitology held in Camp John Hay, Baguio city last July 1-4, 2025.



Figure 14. Mr. Pamlian won **2nd Place in the Best Poster Competition (Professional Category)**, competing against numerous participants from various universities in the Philippines and abroad.



Figure 15. Mr Muamar S. Pamlian (MS Biology student) and Dr Lothy F. Casim (MS-Biology faculty) attended in the International Conference of ASEAN Congress of Tropical Medicine and Parasitology last June 8-10, 2026 at Movenpick Hotel and Resort, Boracay.

4.6 Department led international connections

The Department of Biological Sciences further demonstrates its commitment to internationalization through active global engagement and scholarly exchange. Its flagship research facility, the Eco/Con Lab, organizes the **Eco/nnect Webinar Series**, which provides a dynamic platform for international discussion and dissemination of

cutting-edge research findings in biology, fostering academic collaboration across borders.



Eco/nnect serves as a platform for first-hand information from experts in the field. This is a bi-monthly online seminar related to ecology, biodiversity, evolution, and conservation delivered by our invited experts from different institutions within the country and abroad. In 2022, the Eco/Lab led three (3) online international webinars with at least 500+ participants and views via Zoom, livestreaming, and YouTube channel.



1. **Pollination Services in Agroecosystems: Case Studies in Thailand.** Dr Tuanjit Sritongchuay, UFZ-Helmholtz Centre for Environmental Research, Department of Computational Landscape Ecology, Leipzig, Germany. <https://bit.ly/3VTJiCM>
2. **Translating Conservation Science into Policy and Practice.** Dr Alice C Hughes, School of Biological Sciences. <https://bit.ly/3UDYzH1>
3. **The foamy world of Spittlebugs: Biodiversity and historical evolution of the Cercopidae.** Dr Elorde Crispolon Jr., Museum National d'Histoire Naturelle, Paris, France/USM College of Agriculture, Kabacan, Philippines. <https://bit.ly/3VNoMno>

4.7 Department's best practices in internationalization

The Department of Biological Sciences has firmly established its presence and influence in the international academic and research landscape, as demonstrated by its robust linkages with institutions across Asia, Europe, and the Americas. This global recognition is a result of the department's commitment to excellence and its strategic best practices, which include the following:

1. Consistent production of high-quality research, which attracts international collaborators and opens doors to cross-institution scientific partnerships.
2. A highly receptive and proactive faculty, eager to engage in diverse collaborative efforts, from research exchanges to co-authored publications.

3. A forward-looking mindset focused on sustainable and long-term partnerships, with faculty maintaining and expanding international linkages even after completing advanced degrees and training abroad.
4. Diverse and dynamic forms of collaboration, including joint research, co-publication, and co-development projects, while ensuring equitable benefits and mutual respect among partners.
5. Leadership in international research networks and consortia, with faculty initiating and coordinating global initiatives in biodiversity, conservation, and ecological research.
6. Strong institutional support for young academics, empowering early-career faculty and students to participate in international training programs, fellowships, and research exchanges to strengthen their academic and professional competencies.