FINAL WORKSHOP

on PEER Project 3-100:

Building Mekong Genetic Biodiversity Network

Siem Reap, Cambodia, 12-14 June 2018
Acknowledgements

All PEER Project partners in addition to the Mekong River Commission would like to thank USAID for making this project possible. Particular acknowledgement goes to Ms. Kelly Robbins and Dr. Cameron Bess in the United States who have been active and helping in this project for all three years. Furthermore, the hard work of Ms. Napak Tesprasith and Ms. Shanni Silberberg is greatly appreciated.

A special thanks also goes to Dr. Kent Carpenter and Prof. Dr. Vu Ngoc Ut who have been the Principal Investigators (PI) of the PEER Project 3-100. Their hard and diligent work in organising and reporting about the project have led to the successful implementation of the project’s objectives.

Furthermore, we would like to thank all PEER partner institutions and their relevant researchers: Three years of very important research were successfully completed with many results relevant for the Mekong River Basin. These three years have successfully established a regional research network in the field of genetic biodiversity. In this regard, Dr. Binh Thuy Dang needs to be particularly acknowledged for her technical and analytical support and her role as Co-PI. She has long experience in field work and the technical analysis from samples. Nha Trang University provided its technical laboratory various times for high quality assessment of the samples.

Regardless, we thank: Dr. Chheng Phen, Mrs. Sim Thavary, Mrs. Sim Thavary, Mr. UY Sophorn, Mr. Chuoy Samol, Mr. Ou Sary from the Inland Fisheries Research and Development Institute, Cambodia; Dr. Latsamy Phounvisouk and Soukphamixay Xouimanivong from the Living Aquatic Resources Research Centre, Lao PDR; Dr. Chaiwut Grudpan, Dr Jarungjit Grudpan and Dr. Achara Jutagate from Ubon Ratchathani University, Thailand; Dr. Vu Ngot Ut, Dr. Duong Thuy Yen, Ms. Nguyen Thi Ngoc Tran from Can Tho University; Dr. Dang Thuy Binh, Ms. Vu Dang Ha Quyen, Ms. Nguyen Thi Tho, Ms. Truong Thi Oanh, Ms. Le Phan Khanh Hung, Ms. Tran Quang Sang, Mr. Doan Vu Thinh from Nha Trang University, Viet Nam; and finally Dr. Kent Carpenter, Ms. Amanda Ackiss, Ms. Ellen Biesack and Mr. Brian Stockwell from Old Dominion University United States.

At last to make the Final Workshop of the PEER Project 3-100 possible, we would like to acknowledge the staff from the Environmental Management Division of the Mekong River Commission. Their hard work have guaranteed the success of this workshop. Particular thanks to Dr. So Nam, Chief Environmental Management Officer; Dr. Phattareeya Suanrattanachai, Fisheries Management Specialist, Mr. Vanna Nuon Fisheries and Ecology Officer and Ms. Vannida Chanpradith, Administration Assistant.
Foreword
The Mekong Rivers Commission Secretariat in collaboration with USAID welcomes all participants to the Final Workshop of the PEER Project3-100: Building a Mekong Genetic Biodiversity Network.

The final PEER workshop of Project 3-100: Building a Mekong Genetic Biodiversity Network aims to summarise three years’ of valuable and intensive research on the endangered genetic biodiversity in the Lower Mekong Basin. Climate Change in addition to economic development is happening all around us and particularly, the Lower Mekong Basin is suffering from the rapid changes, which are now occurring. Immense droughts followed by flash floods have caused significant damage and the continuous decline in fisheries and other natural resources are a threat to the livelihood and well-being of the people.

Furthermore, minimal resources, deforestation and further pollution due to unsustainable agricultural activities has led to a threatening of the existing species diversity. Similar to the Amazon in South America, the LMB and its untouched surrounding forests has been identified as a biodiversity hotspot providing habitat to thousands of flora and fauna species including mammals, amphibians, reptiles, birds and fish. Currently, however, this big habitat is being continuously disturbed, removed or polluted in various ways and the number of species is shrinking day by day.

It is therefore of great importance and pleasure to co-organise and facilitate this Final PEER Workshop in Siem Reap, which focuses on the research of genetic biodiversity in the Mekong River Basin. Six partner organisations, international experts and other PEER-project members will enrich the workshop with insights into their findings and research, focusing on the Mekong River Basin. To emphasize on the importance of species richness and diversity, this workshop will discuss the findings of specifically the lastly obtained results but also focus on future steps and possible research questions that need to be taken to continue this important work. The diverse existing ecosystem can only sustain, if studied and conserved carefully.
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2.8 Biodiversity Conservation in Indochina: An Integrative Approach to Enhance Wildlife Trade Management in the Region

**PEER Partners:**

USAID

Mekong River Commission (MRC)

Old Dominion University

Can Tho University

IfReDI - Inland Fisheries Research and Development Institute

LARReC – Living Aquatic Resources Research Centre

Ubon Ratchathani University

Nha Trang University
Background

The Mekong River Basin (MRB) in Southeast Asia has long been known for its rich aquatic biodiversity. It is often referred to as ‘the Amazon of Southeast Asia’ underlining that status. Millions of people rely on the products of the river, which includes not only fish but also other aquatic animals and plants for their livelihoods and food security. Even today, not all the existing species and their origin are well understood and are continuously studied. With globalization and the rapid land use changes in Southeast Asia, a majority of the MRB’s biodiversity is under threat. In fact, a large number of species have been classified as critically endangered or endangered in accordance to the Red List from the IUCN. In order to limit or avoid extinction, scientists and other experts are required to systematically investigate the relationships between the individual components of the biodiversity. An understanding of these relationships will enable targeted protection of general areas in the MRB and ensure that specific habitat requirements are conserved.

Partnerships for Enhanced Engagement in Research (PEER) is a program, funded by the US Aid. It aims to enhance partnerships between U.S. researchers and scientists/engineers of developing countries to address challenges in global development. In 2014, a team of five different institutions from Southeast Asia successfully applied for a 3-year project under PEER in collaboration with Old Dominion University in the United States and the Mekong River Commission. The partner institutions are: The Inland Fisheries Research and Development Institute of Cambodia, the Living Aquatic Resources Research Center of Lao PDR, Ubonrachthani University of Thailand and Nha Trang University and Can Tho University from Viet Nam. The purpose of this project is to initiate a systematic genetic sampling methodology of important representative fish of the Mekong River and in this process, build a strong biodiversity research network among scientists from Cambodia, Laos, Thailand and Viet Nam.

This network has implemented many activities as objectives of original plan. The achievements are 1) establishment of a genetic biodiversity research network for the Mekong River Basin through collaborative research project; 2) regional trainings organized at Nha Trang University and Can Tho University, Viet Nam; and 3) regional workshop on selected species of wide ranging Mekong River Basin fish by conducting comparative phylogeographic study using advanced genomic methods will be final activity of the PEER project. In this connection, this workshop will be convened to facilitate all scientists of the network to present and report on the final results of each partner institution. Issues of each partner will be addressed and noted for improvement of future fieldwork. Discussions on further joined projects or suggestions for improved methodology will be gathered from this workshop.
Objectives of the Final Workshop

The specific objectives of the Final Workshop are as follows:

- Present and discuss the final results of each participating team for improving fisheries management and biodiversity conservation capacities through a better understanding of both species-specific and riverscape genetics;
- Present and discuss on test biogeographic hypotheses relating to determinants of ecological versus evolutionary time scale processes;
- Summarize the final outcomes and achievements of the 3 years’ project;
- Discuss about the long-term genetic monitoring of economically and ecologically important species of the MRB;
- Plan possible future collaboration among project partners to maintain the built Mekong Genetic Biodiversity Network

Expectation of the workshop

a. Facilitation and strengthen of PEER scientists’ network to share, exchange and discuss on improving biogenetic research/study methodology in the Mekong River Basin.
b. Dissemination and promotion of the results of research/ study of biogenetic of aquatic animals in the Mekong and other regions.
c. Information on population genetics of Mekong key fish species for preparing proceedings of the project completion. And
d. A feasible plan for future collaboration on Mekong fish population genetics work to maintain the built Network among project partners in the Mekong basin.
# Agenda: Final PEER Workshop

**Day 1: PEER Mekong Region Evidence to Action Workshop**

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<tr>
<td>Day 1: Tuesday 12th June 2018</td>
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<tr>
<td>8:30AM</td>
<td>Coffee/tea and Check-In</td>
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<tr>
<td>9:00AM</td>
<td>Welcoming and Framing</td>
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<tr>
<td>10:00AM</td>
<td>Stakeholder Brainstorm</td>
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<td>10:35AM</td>
<td>BREAK</td>
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<tr>
<td>10:50AM</td>
<td>Stakeholder Prioritization</td>
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<tr>
<td>12:00PM</td>
<td>LUNCH</td>
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<tr>
<td>1:00PM</td>
<td>Stakeholder Reframing</td>
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<tr>
<td>2:00PM</td>
<td>Research Gaps</td>
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<tr>
<td>2:30PM</td>
<td>BREAK</td>
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<tr>
<td>2:45PM</td>
<td>Evidence to Action Plan</td>
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<tr>
<td>3:45PM</td>
<td>Wrap-Up</td>
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<tr>
<td>4:00PM</td>
<td>End of Day</td>
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# Day 2: Final PEER Workshop: Progress and Summary

## TENTATIVE AGENDA

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<th>Time</th>
<th>Activity</th>
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<tr>
<td>Day 2: Wednesday 13th June 2018</td>
<td><strong>Session 1: Opening and Introduction</strong></td>
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<tr>
<td>08.00-08.30</td>
<td>Registration &lt;br&gt; <em>Facilitated by MRCS ED Staff</em></td>
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<tr>
<td>08.30-08.55</td>
<td>Welcome Remarks and Opening Statement &lt;br&gt; <em>By US Lead PI, Prof. Kent Edward Carpenter, Old Dominion University</em> &lt;br&gt; <em>By HC Lead PI, Dr. Ut Ngoc Vu, Can Tho University, Viet Nam</em> &lt;br&gt; <em>By USAID Representative</em> &lt;br&gt; <em>By MRC Environment Management Chief Environmental Management Officer, Dr. So Nam, MRC Secretariat, Lao PDR</em></td>
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<tr>
<td>08.55-09.00</td>
<td>Objectives of the Workshop and Adoption of Agenda &lt;br&gt; <em>By Dr. So Nam, Chief Environment Management Officer, MRCS</em></td>
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<tr>
<td>09.00-09.30</td>
<td>1. The Importance of the Mekong Diverse Fisheries &lt;br&gt; <em>By Dr. Phattareeya Suanrattanachai, Fisheries Management Specialist, MRCS</em></td>
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<tr>
<td>09.30-10.00</td>
<td>2. The MRC Fisheries and Environment Monitoring Programmes &lt;br&gt; <em>By Nuon Vanna, Fisheries and Aquatic Ecology Officer, MRCS</em></td>
</tr>
<tr>
<td>10.00-10.30</td>
<td>3. MRC Council Study – Assessing Impacts on the Environment: Ecosystems and Bioresources in the Mekong basin &lt;br&gt; <em>By Dr. So Nam, Chief Environment Management Officer, MRCS</em></td>
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<tr>
<td>10.30-11.00</td>
<td><strong>Tea and Coffee Break</strong></td>
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<tr>
<td>11.00-11.20</td>
<td>4. Population genetics of <em>Ompok bimaculatus</em> in the 3S River Basin &lt;br&gt; <em>By Mr. Uy Sophorn, Inland Fisheries Research and Development Institute (IFReDI), Cambodia</em></td>
</tr>
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<td>11.20-11.40</td>
<td>5. Genetic population of <em>Trichopodus trichopterus</em> from 3 s Basin of the Lower Mekong River &lt;br&gt; <em>By Dr. Latsamy Phounvisouk Living Aquatic Resources Research Center (LARReC), Lao PDR</em></td>
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<td>11.40-12.10</td>
<td>6. Preliminary population genetics of <em>Pangasius lanaudi</em> in Mun-Chi River Basin, Thailand &lt;br&gt; <em>By Dr. Jarungjit Grudpan, Department of Fisheries, Faculty of Agriculture, Ubon Ratchathani University, Thailand</em></td>
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<td>12.10-13.00</td>
<td><strong>Lunch break</strong></td>
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<td>13.00-13.20</td>
<td>7. Population genetics of <em>Pangasius macronema</em> – compare between Thailand and Viet Nam &lt;br&gt; <em>By Dr. Chaiwut Grudpan, Department of Fisheries, Faculty of Agriculture, Ubon Ratchathani University, Thailand</em></td>
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<tr>
<td>Time</td>
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| 14.00-14.20| 9. Genetic diversity and genetic structure of *Macrognathus siamensis* in the Mekong River  
*By Ms. Nguyen Thi Ngoc Tran, Can Tho University (CTU), Viet Nam* |
| 14.20-15.00| 10. Comparative population genetics reveal unhealthy fish populations in the changing Mekong Delta  
*Ms. Vu Dang Ha Quyen, Nha Trang University, Viet Nam* |
| **15.00-15.30** | **Tea and Coffee Break** |
*Ms. Le Phan Khanh Hung, Nha Trang University, Viet Nam* |
*By Ms. Truong Thi Oanh, Nha Trang University, Viet Nam* |
*By Ms. Nguyen Thi Thoa, Nha Trang University, Viet Nam – PhD student.* |
*By Dr. Dang Thuy Binh, Nha Trang University, Viet Nam* |
| **18.00-20.00** | **Farewell dinner** |

**Day 3: Final PEER Workshop: International Experience and Lessons’ Learned**

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<tr>
<td>Day 3: Thursday 14th June 2018</td>
<td><strong>Session 3: Presentations of results and findings of work on fish population genetics conducted by the invited international scientists/experts. (30 minutes for each presentation including questions and answers)</strong></td>
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| 08.30-09.00| 11. Genetic Diversity of Mekong Fishes: Tales from the Past Decade  
*By Prof. Dr. Uthairat Na-Nakorn, Faculty of Fisheries, Kasetsart University, Bangkok, Thailand* |
| 09.00-9.30 | 12. Presentation on Comparative Phylogeography of the 3-S Basin of the Lower Mekong River  
*By Pr. Dr. Kent Edward Carpenter, Old Dominion University (ODU), United States* |
| 9.30-10.00 | 13. Presentation on Harnessing the Power of Genomics in Aquatic Biodiversity Research  
*By Dr. Gregory Maes, Laboratory for Cytogenetics and Genome Research Centre for Human Genetics, Catholic University of Leuven, Belgium* |
<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
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| 10.00-10.30| 14. Presentation on Comparative Phylogeography of the 3-S Basin of the Lower Mekong River  
*By Dr. Jeffrey T. Williams, National Museum of Natural History, Smithsonian Institution, United States* |
| **10.30-11.00** | **Tea and Coffee Break**                                                                                                                |
| 11.00-11.15| 15. Connecting climate change, hydrology and fisheries for energy and food security in Lower Mekong Basin: a baseline study  
*By Prof. Dr. Vilas Nitivattananon, School of Environment, Resources and Development, Asian Institute of Technology (AIT), Thailand & Dr. Sangam Shreshta, Department of Civil and Infrastructure Engineering, Thailand* |
| 11.15-11.30| 16. Cryptic diversity of amphibians in the Lower Mekong uncovered by integrative approach  
*By Dr. Anchalee Aowphol, Department of Zoology, Faculty of Science, Kasetsart University, Chatuchak, Bangkok, Thailand* |
| 11.30-11.45| 17. Using Multi data for inventorying woody tree species biodiversity in the Central Highlands of Viet Nam  
*By Dr. Nguyen Thi Thanh Huong, Department of Forest Resources & Environment Management, Tay Nguyen University, Viet Nam* |
| 11.45-12.00| 18. Biodiversity Conservation in Indochina: An Integrative Approach to Enhance Wildlife Trade Management in the Region  
*By Dr Minh Le, Central Institute for Natural Resources and Environmental Studies of Viet Nam National University, Viet Nam & Dr. Seak Sophat, Department of Natural Resource Management and Development, Royal University, Phnom Penh, Cambodia* |
| **Session 5: Plenary Session: Feedback and Suggestions for future research** |                                                                                                                                 |
| 12.00-12.30| Reflection of project and suggestion for future research and Wrap-Up  
*Led by Dr. Ut Ngoc Vu and Prof Dr Kent Edward Carpenter* |
| 12.30-12.35| Closing Remarks  
*By Dr. So Nam, Chief Environment Management Officer, MRCS* |
| **12.35-13.35** | **Lunch**                                                                                                                        |
| 13.35-17.00| Fieldtrip to Tonle Sap Lake (proposed site)                                                                                           |
Opening Session from PEER Lead

Principal Investigator South East Asia: Professor Vu Ngoc Ut

1 College of Aquaculture and Fisheries, Can Tho University, Viet Nam

Associate Prof. Dr. Vu Ngoc Ut is the Principal Investigator of the PEER-300 project entitled Building a Mekong River Genetic Biodiversity Research Network. Dr. Ut has been teaching and doing research at College of Aquaculture and Fisheries, Can Tho University for almost 30 years. At present, he is a Deputy Dean of the College, responsible for graduate training and quality assurance. He obtained his BSc. from Can Tho University in 1991, MSc. in Aquaculture from Gent University, Belgium in 1997 and PhD. in Applied Marine biodiversity from University of Wales Bangor, UK in 2003. His specialization is focusing on aquatic invertebrate biology and ecology, water quality and bio-monitoring, aquatic ecosystem and biodiversity.

Principal Investigator United States: Dr. Kent E. Carpenter

1 Biological Sciences, Old Dominion University (ODU), United States

Dr Kent Carpenter is a Professor in Biological Sciences at Old Dominion University in Norfolk, Virginia and Manager of the Marine Biodiversity Unit and Global Marine Species Assessment of the International Union for Conservation of Nature. He did undergraduate work at the Florida Institute of Technology and spent over three years as a U.S. Peace Corps Volunteer in the Philippine Bureau of Fisheries and Aquatic Resources, Research Division working on coral reef research. He completed a Ph.D. in Zoological Sciences at the University of Hawaii through a fellowship with the East-West Center. He returned to the Philippines as a Post-doc for the Hawaii Institute of Marine Biology and subsequently held positions at the Kuwait Institute for Scientific Research and the Food and Agriculture Organization of the United Nations in Rome. His primary research interests are marine conservation biology, systematic of fishes, and marine and Mekong River Basin biogeography and phylogeography.
Abstracts of Presentations:

1.1. The Importance of the Mekong Diverse Fisheries

Presenter: Dr. Phattareeya Suanrattanachai

Abstract: The Mekong River has the highest aquatic biodiversity in the world after the Amazon River. More than 870 freshwater fish species only have been found and recorded in the Mekong River Basin, having a total estimate of a total of 1,100 species, which includes coastal or marine visitors. The capture of fisheries production estimates in the Lower Mekong Basin (LMB) countries were approximately 2.3 million tonnes in 2015. This amount was equivalent to 2% of the world and represented about 20% of the world’s inland capture fish production, which was higher than anywhere else in the world. Additionally, freshwater aquaculture production in the LMB were 2.09 million tonnes. The Lower Mekong fisheries are of significant importance from an environmental, social and economic perspective. From an environmental view, fish has the highest conversion efficiency. It only requires a minimum amount of grain to produce 1 kilogram of protein from fish while beef requires five times more. Fish provides food for 70% of all rural households in Cambodia and Lao PDR, indicating their dependence on fisheries underlining the social importance of fisheries. Economically, this sector has generated income and high employment factors through value chains corresponding to 17 USD billions or 3% of the total GDP of the LMB in year 2015. To sustainably manage fisheries, the Mekong Basin-wide Fisheries Management and Development Strategy has been formulated and approved by the MRC Council in November 2017. This strategy is on-going process to develop a project-based action plan to implement.

Biography:

Dr. Phattareeya Suanrattanachai holds a B.Sc. of Fisheries (Fisheries Management) from Kasetsart University, Thailand and a M. Sc. and Ph.D. (Fisheries Sciences) from Kagoshima University, Japan. She has more than 17 years of experience in working with the Southeast Asia Fisheries Development Center-Training Department (SEAFDEC-TD) on coastal resources and inland fisheries development and management in Thailand and ASEAN member countries. She also had work experience as Socio-economic Specialist, the Basin Development Programme (BDP), the Mekong River Commission, for three years. She currently has joined the Environmental Management Division as Fisheries Management Specialist to execute the implementation of the Mekong Basin-wide Fisheries Management and Development Strategy for the Lower Mekong Basin.
1.2. The MRC Fisheries and Environment Monitoring Programmes

**Presenter:** Mr. Vanna Nuon

*The Environmental Management Division, Mekong River Commission Secretariat, Vientiane, Lao PDR*

**Abstract:** Among the five Core River Basin Management Functions, MRC Environment Monitoring Programmes are vital to the success of MRC’s operation, and consist of: (1) hydro-meteorological monitoring/near real-time rainfall and water levels monitoring, (2) sediment and discharge measurement, (3) water quality monitoring, (4) ecological health monitoring, and (5) fisheries monitoring. The objective of these monitoring programmes is to monitor fisheries and environmental indicators in the Lower Mekong Basin contributing to the interpretation of the status and trends of fisheries and the environment. In regards to hydropower development, MRC is developing “Joint Environment Monitoring” where the five monitoring programmes will be expanded to ensure the collection of enough data for better impact assessment of hydropower projects on the mainstream of the Mekong River. The presentation will briefly discuss the five monitoring programmes, joint environment monitoring, data collection and flow.

**Biography:**

**Mr. Vanna Nuon** holds a Bachelor’s degree in Fisheries Science which he obtained in 2003 from the Royal University of Agriculture in Cambodia and a Master’s degree in Aquatic Resource Management in 2008 from the Asian Institute of Technology, Thailand. In addition to his educational background, he has had about 13 years of experience in the field of natural resources management, climate change adaptation, capacity building, project design and management, and both livelihood and biological researches. Prior to the current position as Fisheries and Aquatic Ecology Officer, he worked for MRC Climate Change and Adaptation Initiative as Technical Officer taking charge of Basin-wide Assessment of Climate Change Impact on Ecosystem and Biodiversity including six taxonomic groups (fishes, birds, mammals, plants, reptiles, and amphibians).
1.3. MRC Council Study – Assessing Impacts on the Environment: Ecosystems and Bioresources in the Mekong basin

**Presenter:** Dr. So Nam

1Environmental Management Division, Mekong River Commission Secretariat, Vientiane, Lao PDR

**Abstract:** Since its establishment in 1995, the Mekong River Commission (MRC) has been involved in the collection of data and the development of models, both conceptual and mathematical, aimed at demonstrating and improving the understanding of the functioning of the LMB aquatic ecosystems, and the links between the people and the river. The MRC has used these data and models to aid decision-making in the region as it pertains to the LMB through the analysis of possible changes to river resources, and knock-on effects on the people that depend on them, in response to actual and proposed water-resource developments in the basin at large. The objective of basin-wide fisheries and environmental assessment is to provide clear and comparable information on the impacts of proposed hydropower and other key sector developments on the aquatic ecosystems and their fisheries and other aquatic resources of Mekong River downstream of the Chinese border, inclusive of the Tonle Sap Great Lake and the Mekong Delta. The DRIFT Flows process and Decision Support System (DSS) referred to in the MRC Council Study as the BioRA-DSS, were used to organize existing MRC data, information in the international scientific literature and expert opinion from a highly-qualified and experienced team of river scientists to provide a systemic and systematic picture for the LMB, Tonle Sap River, Tonle Sap Great Lake and the Mekong Delta ecosystems in terms of (1) their ecological condition; (2) possible future changes in condition as a result of project development-driven changes in the water flow, sediment supply and transport, water quality, and lateral and longitudinal connectivity as described through the evaluation of the water-resource development scenarios; and (3) predictions of change in abundance/area/concentration (relative to baseline) for a range of key fish and other bioresource indicators.

Key words: The Council Study, BioRA, DRIFT DSS, the Lower Mekong Basin, Ecosystems and indicators

**Biography:**

Dr. So Nam has nearly 25 years of work experience in research, development, leadership and management covering a wide range of areas including fisheries, aquaculture, environment, agriculture, irrigation, hydropower, and climate change in the Lower Mekong Basin, Europe and the US. He obtained most experience in research, project and programme management including coordination and technical supervision. He has received numerous awards and grants from a diversity of donor agencies and international organizations such as the World Bank, JICA, USAID, ADB, EU, Belgian Technical Cooperation, USAID, DANIDA, DFID, SIDA, GiZ, OXFAM, WWF, FAO, Belmont Consortium, McArthur Foundation, WorldFish Center, Conservation International, NAGAO and the International Foundation of Science.

Dr. So Nam joined the Mekong River Commission Secretariat (MRCS) as the Regional Fisheries Programme Coordinator from 2012 to 2016 and is now (since 2017) the Chief Environment Management Officer. Previous to his work with the MRCS he was the Director of IFReDI. He has published more than 100 technical reports related to fisheries and aquaculture including over 40 peer reviewed publications, some of them in *Science* and *the Proceedings of the National Academy of Science*. Furthermore, he has been reviewing numerous scientific publications and reports for national, regional and international publication.
1.4. Population genetics of *Ompok bimaculatus* in the 3S River Basin

**Presenter:** Mr. Sophorn Uy

*Inland Fisheries Research and Development Institute, Fisheries Administration, Phnom Penh, Cambodia*

**Abstract:** Butter catfishes (*Ompok bimaculatus*) are widely distributed in Pakistan, India, Sri Lanka, Bangladesh and Myanmar. They are also frequently found in the Mekong River in Southeast Asia. We studied connectivity and genetic diversity in *Ompok bimaculatus* at five sites in the Mekong River, 3S River and Tonle Sap Lak across Lao PDR, Cambodia, and Viet Nam using a panel of single nucleotide polymorphisms (SNPs) generated from restriction site-associated DNA (RAD) sequencing. Overall heterozygosity was moderate at all sites, however, fish sampled from Pakse exhibited lower levels of genetic diversity. All pairwise Fst values between sites were significant, principal components and a STRUCTURE analysis indicating four genetic clusters. This includes the population isolated associating to the Khone Falls (Paske versus Siem Riep and Stung Treng), and 3S Rivers (Attapeu in Laos, and Dac Lac in Viet Nam). Historic migration analysis supported that Khone Falls is a natural barrier for *O. bimaculatus*, while being able to move freely around all other sites. Low population sizes of *O. bimaculatus* populations suggest that the population may decrease due to the construction of dams, which may lock migration roots. This will leave this species vulnerable to habitat fragmentation. This finding highlights the potential impacts of hydropower dams to the long-term viability of Mekong fish, and future regional biodiversity.

**Biography:**

Mr. **UY Sophorn** is a government official staff for the Inland Fisheries Research and Development Institute (IFReDI), Fisheries Administration and is responsible for the fish genetic laboratory. His academic background is in fisheries science but he has experience in fish genetic work for his bachelor thesis at Royal University of Agriculture (RUA), Phnom Penh. He participated in a manual training in DNA barcoding of fish species for two months in the Molecular Laboratory at the University of Sains Malaysia (USM), Malaysia. He also joined on two short courses on genomic DNA and data analysis at Nha Trang University (NTU) and Can Tho University (CTU), Viet Nam. Currently, he is enrolled in a Master’s Program in Biodiversity Conservation at the Royal University of Phnom Penh and has been working in the genetic population of fish species for his master thesis.
1.5. Genetic population of *Trichopodus trichopterus* from 3S Basin of the Lower Mekong River

**Presenter:** Dr. Latsamy Phounvisouk¹

¹Living Aquatic Resources Research Center (LARReC), Nong Thang Village, Vientiane, Lao PDR

**Abstract:** The 3S river basin (Sesan, Sre Pok, and Sekong rivers) is the largest tributary and watershed and makes up a significant part of the Lower Mekong River Basin. Three spot gourami, *Trichopodus trichopterus* (Perciformes: Osphronemidae) is widely distributed in Southeast Asia and is commonly found in the Mekong River Basin. *T. trichopterus* is known to migrate into flooded areas during the wet season and returning to the main river systems at the onset of the dry season. This study aimed to investigate the potential impacts of population fragmentation for *T. trichopterus* sampling in the 3S basin (Sekong – Laos, and Dak lac-Viet Nam) and in the adjacent Mekong main branches (Paske, Stung Treng and Kratie). Restriction-site associated DNA sequencing (RAD seq) was used to develop single nucleotide polymorphisms (SNPs). Pairwise Fst, PCA and Structure analyses all showed high divergent and population isolation among the sampling sites. A low effective population size at Sekong and DaK LaK suggests that the impact of the dams and environmental changes may affect the long-term viability of the overall fish population. Hydroelectric dams along the mainstream and tributaries of the 3S Rivers, which are currently under construction or planned may alter the flow and thereby interrupt the migration path of the fish between the floodplain and the main stream. This could have serious impacts on the regionals fisheries’ productivity.

**Biography:**

Dr. Latsamy Phounvisouk holds a PhD in Fish Sciences at the Living Aquatic Resources Research Center (LARReC) and project manager in the management and implementation of community development, rural development, and Livestock and Aquatic production in an Integrated Farming System.

She completed a Ph.D. in Fish Sciences at China Agricultural University, Beijing, China. She returned to Lao as a researcher for aquaculture development at LARReC. Her primary research interests are Livestock and Aquatic production in Integrated Farming Systems in addition to community development, Natural Resource Management and Fish Conservation nationwide, particularly the upland regions in northern Lao PDR.
1.6. Preliminary population genetics of *Pangasius lanaudi* in Mun-Chi River Basin, Thailand

**Presenter:** Dr. Jarungjit Grudpan¹

¹Department of Fisheries, Faculty of Agriculture, Ubon Ratchathani University, Thailand

**Abstract:** In the past, *Pangasius larnaudii* is the most economically interesting of the caught wild Pangasiid Catfish for fisheries and fish cultivation in river floating cage culture in the Mun-Chi watershed, Ubon Ratchathani and adjacent areas. This signature of the commonly found Ubon species ranges in size from 5-7 kg for juveniles and adults, respectively. They are very popular for consumption by the communities in both fresh and processed condition. In the present time, this species has been replaced by other Pangasiid Catfish especially on local markets that are shared by the crossbred strain (*Pangasius larnaudii* × *Pangasianodon hypophthalmus*) due to higher growth rate in terms of culture and so similar meat quantity. The population genetics were studied based on 43 samples from two geographically different sampling sites in Mun-Chi watershed. One site was located on the upstream sampling site located at Chi and Mun River nearby the confluent (27 individuals) while the second sampling site was located 100 km’s downstream at the confluence between the Mun River and the Mekong mainstream (16 individuals). This preliminary study on population genetic analysis suggests that the Mun-Chi regional scale population would probably increase if the government were to open all sluice gates of Pak Mun Dam for four months for fish migration. It is assumed that a period of four months period for this purpose would be efficient enough. However, this would need a more intensive study on tissue samples from various sites along the Mun-Chi Watershed.

**Biography:**

Dr. Jarungjit Grudpan is a full time lecturer of the Department of Fisheries, Faculty of Agriculture, Ubon Ratchathani University. Her expertise lie in fish biology including pollution and toxicology in the aquatic environment. In the period of 2006-2016, Dr. Grudpan has been part of conducting a observation field survey in close collaboration with the other Lower Mekong Basin countries with the aim to gather primary data on fish diversity and their ecological niches in the region. Dr. Grudpan has also co-authored several publications including “Heavy Metal Contamination in Indochinese Molluscivorous Catfish (*Helicophagus leptorhynchus* Ng & Kottelat, 2000) from Mun River Basin, Ubon Ratchathani Province.”, “Impacts of Dams and Global Warming on Fish Biodiversity in the Indo-Burma Hotspot.”, and she has been part of the development of an online database on freshwater fish diversity and distribution in Mainland Southeast Asia.
1.7. Population genetics of *Pangasius macronema* – compare between Thailand and Viet Nam

**Presenter: Dr. Chaiwut Grudpan**

1Department of Fisheries, Faculty of Agriculture, Ubon Ratchathani University, Thailand

**Abstract:** *Pangasius macronema* is the most common Pangasiid catfish found in the Lower Mekong Basin. This species is a generalist of Pangasiidae in terms of its ecological niches found between the upper reach in northern Lao PDR and the lower reach at the delta in Viet Nam. In 2017, 85 individuals were collected from 2 different major sampling sites in the Mun-Chi watershed, Ubon Ratchathani Province, Thailand. The upstream sites were in Wang Yang, which is located nearby the confluence of Mun-Chi River at a distance of more than 100 km to the downstream site in Ban Dan located at the confluence between the Mun River and the Mekong. In this study, the population genetics were analysed on a basis of 63 individuals from 2 sampling sites in the Mun-Chi watershed (Wang Yang: 20 individuals and Ban Dan: 30 individuals). In addition to the sites in Thailand, another site, located on the head water of the Serepok River, Central Plateau Dak Lak (13 individuals), Viet Nam, was assessed to allow comparison between the three sites. The genetic analysis results were non-significant between the 2 populations from the sampling sites in Mun-Chi watershed. On the other hand, the population in Dak Lak are isolated from each other.

**Biography:**

Dr. Chaiwut Grudpan is a full time lecturer of the Department of Fisheries, Faculty of Agriculture, Ubon Ratchathani University. His expertise lies in the fish biology and fish taxonomy especially for the fish found in the Lower Mekong River. He has been involved in intensive observation field surveys on fish diversity and their ecosystems at various sites of the identified ecological hotspot, the Mekong Basin, with close collaboration of the neighboring countries. Belonging to a ten years’ observation field survey (2006-2016) supported by the Nagao Natural Environment Foundation, the Ubon Ratchathani University and the Museum of Fisheries were able to further renovate their capacity on collection and gathering techniques for the voucher fish specimen including the updating of primary data relations with the updated published scientific taxonomic status of the Mekong fish diversity. Being part of this activity, Dr. Grudpan was able to organize many training sessions and workshops in the topic of morphological- and comparative study on Mekong fishes based on primary data and voucher specimens. Especially regional researchers and students in the lower part of the Mekong Basin were invited to attend these sessions to enhance the knowledge and raise awareness about the necessity to sustain them their value as a natural treasure.
1.8. Genetic diversity in domesticated populations of striped snakehead (*Channa striata*) compared to wild populations in the Lower Mekong Basin inferred from mtDNA markers

**Presenter:** Dr. Thuy-Yen Duong  
*1College of Aquaculture and Fisheries, Can Tho University, Viet Nam*

**Abstract:** Snakehead fish (*Channa striata*) have only recently been cultured in Cambodia while having been domesticated for several decades in Viet Nam already. Regional investigations of genetic diversity in wild and cultured striped snakehead populations provide important information for developing proper strategies for domestication at different stages and for genetic resource management of the species in the Mekong region. We collected wild snakehead samples from eight locations in Cambodia including five localities around the Tonle Sap Lake and three in the Mekong River floodplains, and from three wild and three domesticated populations in Viet Nam. Sequencing of two mitochondrial DNA markers Cytochrome b (n=262) and the D-loop region (n=279) found 28 and 128 haplotypes, respectively. Haplotype and nucleotide diversity was highest in Cambodian populations (0.760±0.033 [haplotype] and 0.0024 [nucleotide] for Cytochrome b; 0.990 ± 0.002 [haplotype] and 0.0121 [nucleotide] for D-loop region), and remarkably lower in Viet Namese domesticated populations (0.034±0.033 [haplotype] and 0.0001 [nucleotide] for Cytochrome b; 0.431 ± 0.076 [haplotype] and 0.0034 [nucleotide] for D-loop region, respectively). There were no significant genetic differences between domesticated populations, but collectively domesticated populations were significantly different genetically from wild populations. Genetic differences among populations were positively correlated (P<0.01) with water distances separating them, supporting the “isolation by distance” hypothesis. Findings from this study are important for appropriate management of wild fish populations and farming activities of snakehead in both countries.

**Keywords:** Snakehead fish, *Channa striata*, genetic diversity, domestication, population structure, mtDNA

**Biography:**  
*Dr. Duong Thuy Yen* got her PhD at Michigan State University in 2010 on the fields of Fisheries and Ecology, Evolutionary Biology and Behavior. She works at the College of Aquaculture and Fisheries. Her research interests focus on (i) selective breeding; (ii) applications of molecular genetic tools to address issues in fish breeding, aquatic ecology, aquatic resource management and conservation. For example, using genetic markers, she evaluates genetic impacts of African catfish introduction and hybrid catfish (*Clarias macrocephalus x C. gariepinus*) farming on the gene pool of walking catfish (*C. macrocephalus*) in the Mekong Delta. In addition, she also participates in international collaboration projects on fish genetic diversity, fish selection programs, with different partners (such as IFReDI, Cambodia; Oregon State University, USA; University of Liège, Belgium, etc.).
1.9. Genetic diversity and genetic structure of *Macrognathus siamensis* in the Mekong River

**Presenter:** Ms. Nguyen Thi Ngoc Tran

1College of Aquaculture and Fisheries, Can Tho University, Viet Nam

**Abstract:** *Macrognathus siamensis*, which is one of common species of Mastacembelidae family, is widely distributed in Mekong River areas. However, there has been limited information on genetic diversity of this species. In recent years, Next Generation Sequencing (NGS) has replaced previous methods as DNA or protein markers in genetic diversity studies. Among those NGS methods, ezRAD - restriction site associated DNA sequencing requires less techniques and is of lower cost compared to other methods, applied on different species. This study was conducted investigate the genetic diversity and genetic structure of *M. siamensis* in the Mekong River basin with the ezRAD method. Samples were collected along the Mekong River in several provinces including Pakse in Lao PDR, and An Giang and Dong Thap in Viet Nam. DNA was extracted with a Wizard® SV Genomic DNA Purification System, then 100ng DNA of each sample was chosen for DNA library preparation using a Standard Illumina TruSeq Kit. Pooled libraries contained 90 individuals and were sequenced with a HiSeq 2500 Illumina platform. The results after trimming showed a remainder of 77 individual (Pakse (n=27), An Giang (n=27) and Dong Thap (n=20)). A total of 25485 readings with the length of 454 and 44.86% of GC were analyzed after de novo assembly with a coverage value of 3. Mapping and SNPs calling found 407,435 raw SNPs and following 1056 high quality SNPs were trimmed for further analysis. Fst values show that An Giang and Dong Thap populations are genetically closer compared to the Pakse population (0.014 and 0.097-0.098). Genetic variation among populations using the ANOVA test is 12.97% and 87.03% within populations. Both structure analysis and PCA methods illustrated that the Pakse population is highly genetically different compared to the two populations from Viet Nam. More individuals from other riparian countries should be collected to get an overview of the genetic structure of this species in the Mekong River.

**Keywords:** genetic diversity, genetic structure, *Macrognathus siamensis*, ezRAD

**Biography:**

Ms. Nguyen Thi Ngoc Tran has been working as a researcher in the College of Aquaculture and Fisheries, Can Tho University for three years. She got her Bachelor’s Degree in Aquaculture in 2015. Her research orientation is the application of molecular genetics in aquaculture and fisheries resources management and conservation. One of her studies was using a genetic marker to find out the relationship among Channidae species distributed in the Mekong Delta of Viet Nam.
1.10. Comparative population genetics reveal unhealthy fish populations in the changing Mekong Delta

Presenter: Ms. Vu Dang Ha Quyen

Abstract: The Mekong Delta (MD) of Viet Nam is an ecosystem experiencing numerous threats, which impacts on fish populations that are poorly understood. Understanding the fish population structure within this region may be the key to mitigate the negative effects on these aquatic resources. Currently, no known studies have examined the genetic structure of fish within the MD. Here, we investigate the genetic diversity and connectivity using a panel of single nucleotide polymorphisms (SNPs) generated from restriction site-associated DNA (RAD) sequencing. Two important food fish species (*Polynemus melanochir* and *Boesemania microlepis*) were collected in Siem Reap (Tonle Sap, Cambodia) and across the Mekong Delta (Hau and Tien Rivers) in Viet Nam. Results from pairwise Fst values, principal component and structure analyses indicate high levels of gene flow occurring between the sites sampled across the MD for *P. polynemus* and up to the Tonle Sap for *B. microlepis*. High to moderate levels of relatedness were found in *P. melanochir* and *B. microlepis*, respectively. Low effective population size (Ne less than 500) may indicate an unhealthy population of *P. melanochir* due to long-term environmental changes, while this pattern was not observed for *B. microlepis*. Migration analyses favored the river separate model that allows bidirectional migration of *P. melanochir* among all sites within Hau and Tien Rivers but not between the two rivers. For *B. microlepis*, the Panmixia model was the most supported, suggesting that migration occurs between all sites. An Giang, Dong Thap, and Vinh Long were identified as a major sink in that they receive a 100 fold more migrants than all other sites. This study provided information on population genetics, Ne, and migratory patterns of fish in the changing MD. The outcome will help to identify possible climate change impacts and additional impacts from upstream human activities to the downstream of Mekong River.

Keywords: *Boesemania microlepis*, *Polynemus melanochir*, population genetics, SNPs. Mekong Delta

Biography:

Ms. Vu Dang Ha Quyen has more than 5 years’ experience working in microbiology in aquaculture and molecular biology. She has Bc and Ms in Microbiology. Her research interests include fish immunology, biodiversity and conservation, and population genetics. Quyen is senior researcher/lecturer at Institute for Biotechnology and Environment, Nha Trang University, Viet Nam. In this capacity, she works in genomics laboratory capable of advanced molecular research. Quyen published in national and international journals and has attended international conferences and training workshops. And now she is a PhD student and researcher of PEER projects funded by NFS/USAID (PEER 2-7, 3-100, and 6-435). Through her research as a PhD since 2013 she had more opportunities to work in teams with high qualified researchers and developed new skills in statistical analysis and software programming that are also essential skills for study.

**Presenter:** Ms. Le Phan Khanh Hung

1 Institute for Biotechnology and Environment, Nha Trang University, Viet Nam

**Abstract:** The Lower Mekong Basin (LMB) located in Laos, Thailand, Cambodia and Viet Nam. This region is one of the most diverse freshwater fauna in the world. *Pangasius conchophilus* (Roberts & Vidthayanon, 1991), is an economically important and widely distributed catfish in the LMB. This species migrates upstream to spawn at the beginning of the flood season (between Kratie and Khone Falls); the larvae drift downstream and swept out into flood plain areas. At the end of the rainy season, the young fish return to the mainstream and begin a dispersal migration upstream. It is hypothesized that two *P. conchophilus* populations has been existed: one downstream below Khone Falls and one (or several) above the falls. Overfishing and dams on the main stem of the Mekong River are the threats to this species. The main objective of this study was to investigate population structure of *P. conchophilus* in the LMB in relation to the Khone Falls as natural and under constructed/planned dams as artificial barrier. Total 301 specimens were collected from 11 locations along the mainstream including Loei, Mukdahan, Ubon Ratchathani (Thailand), Banhat, Champasack (Laos), Kandal, Kratie, Stung Treng (Cambodia) and Dong Thap, An Giang-Can Tho (Viet Nam). Restriction-site Associated DNA sequencing (RAD-seq) were used to identify single nucleotide polymorphisms (SNPs). When all locations included, Banhat showed low genetic diversity, and then removed from further analyses. FST tests displayed significantly genetic different, however the value was low (FST = 0.0013 – 0.0081, P < 0.05). Principal Component (PCA) and STRUCTURE analyses, in contrast, suggested that *P. conchophilus* populations highly connected across the LMB. These results do not support two hypothetical distinct populations as naturally separated by the Khone Falls. High effected population size may showing healthy population through free migration, and high recruitment. This study provides genetic information of *P. conchophilus*, which can/will be used to assess the impacts of hydropower dams to fish populations in the Mekong River.

**Keywords:** genetic diversity, population structure, RAD-seq, SNPs, *Pangasius conchophilus*, Lower Mekong Basin

**Biography:**

Ms. Le Phan Khanh Hung has obtained her Bachelor of Science in Biotechnology from Nha Trang University in 2015. She is currently doing her Masters’ degree in Biotechnology at the Institute for Biotechnology and Environment, Nha Trang University, under the supervision of Dr. Dang Thuy Binh. She got involved in the PEER USAID funding project “Building a Mekong River genetic biodiversity research network” from 2015. Her master thesis focuses on investigating the population structure of *Pangasius conchophilus* – a common and economically important fish in the Lower Mekong Basin. Hopefully, this study will provide valuable information for the conservation of aquatic biodiversity in the Mekong River.
1.12. Strong population structure of non-migrate fish (*Trichopodus trichopterus*) in the Lower Mekong Basin

**Presenter:** Ms. Truong Thi Oanh,

*Institute for Biotechnology and Environment, Nha Trang University, Nha Trang, Viet Nam*

**Abstract:** Three spot gourami, *Trichopodus trichopterus* (Perciformes: Osphronemidae) is widely distributed in Southeast Asia and commonly found in the Mekong River Basin. Their habitat includes swamplands, rice fields, ditches, pools and ponds that have shallow sluggish or standing-water with a lot of aquatic vegetation. *T. trichopterus* is known to migrate into flooded areas during the wet season, and returning to the main river systems at the onset of the dry season. Pollution and environmental degradation may threat to this fish populations. The purpose of this study were to detecting population structure between the main stem and Mun tributary of the Lower Mekong Basin (LMB) with relation to the Khone Falls as a natural barriers. Restriction-site associated DNA sequencing (RAD-seq) were used to develop single nucleotide polymorphisms (SNPs). A total of 426 neutral SNPs were identified from 198 individuals collected from 8 locations across Lower Mekong River from Mun River (Ubon Ratchathani, Thailand) and Mekong main stem (Sakon Nakon in Thailand, Paksan and Pakse in Laos, Kratie and Siem Reap in Cambodia, An Giang and Vinh Long in Viet Nam). Low genetic diversity were found in Laos and Thailand populations. Fst test showed significant different between all 8 geographic defined populations, however, the values are small (Fst = 0.00836 - 0.44026, P<0.05). Principal Component (PCA) and Structure analyses suggested that T. trichopterus in LMB could be divided into three distinct genetic groups: (1) Mun River Basin and Thailand-Laos boundary populations (Ubon Ratchathani, Sakon Nakon and Paksan); (2) Pakse population (above the Khone Falls); and (3) below the Khone Falls populations (Siem Reap, Kratie, Vinh Long and An Giang). This study provide the first overview of T. trichopterus population in the Mekong main stem and Mun River, helping improve our knowledge on natural history of fish in this high biodiversity region.

**Keywords:** Lower Mekong River, *Trichopodus trichopterus*, population genetics, RAD-Seq

**Biography:**

Ms. Truong Thi Oanh is currently a member of the Biodiversity and Conservation group at the Institute for Biotechnology and Environment, Nha Trang University, Viet Nam. She earned her Bachelor’s and Master’s degree at Nha Trang University. As an undergraduate, she studied the species diversity and population structure of oysters (*Crassostrea* spp.) in Viet Nam using the mitochondrial COI gene. Since 2013, She joined the PEER projects 2-7 as a Master student, and her research focuses on the population structure of the pink-ear emperor *Lethrinus lentjan* using single nucleotide polymorphisms (SNPs) markers delivering restriction site-associated DNA sequencing (RAD-seq) along the Viet Namese coast. After that, she continued to participate in some activities of the PEER 3-100 project such as sampling, lab-works, training course and conferences. Her research interests include biodiversity, phylogeny and population genetics of marine and aquatic organisms.
1.13. Population genetics of short distant migratory fish (*Ompok bimaculatus*) in the Lower Mekong Basin

**Presenter:** Ms. Nguyen Thi Thoa

1 Research Institute for Aquaculture, Nha Trang University, Viet Nam – PhD student

**Abstract:** Butter catfish (*Ompok bimaculatus*) is an important food source and a potential species for aquaculture, currently threatened by local overexploitation in the Lower Mekong River. It naturally occurs in streams and rivers with sluggish to moderate movements, lakes, ponds, canals and inundated fields. *O. bimaculatus* is the short-distance migratory species, moving between floodplains and adjacent rivers or permanent and seasonal water bodies within the floodplains. In this study, we investigated connectivity and genetic diversity in *O. bimaculatus* from 8 locations across Lower Mekong Basin from Thailand (Pak Mun, Sakon Nakon), Laos (Paksan and Pakse), Cambodia (Siem Riep and Stung Treng), and Viet Nam (An Giang and Vinh Long) using a panel of single nucleotide polymorphisms (SNPs) generated from restriction site-associated DNA (RAD) sequencing. Low genetic diversity was found in Laos's populations (Paksan and Pakse). Non-significant (p > 0.05%) pairwise FST tests (-0.2935 to -0.5763) were only found between Paksan and Pakse and all remaining sites. STRUCTURE analysis suggested that *O. bimaculatus* in Lower Mekong River dividing into 2 distinct populations: above Khone Falls including Thailand and Laos and below the Khone Fall of Cambodia and Viet Nam, as Stung Treng exhibit mixing pattern. PCA plots, however, performed 4 distinct groups such as Thailand, Laos, Stung Treng (Cambodia), and Siem Riep-Mekong Delta. Low effected population size measuring suggests *O. bimaculatus* may not be resilient to long term environmental changes and/or local overfishing. This study provided the first ever population structure of this species in The Mun River and Mekong main branch to gain the knowledge of natural history of Mekong fish, and access the impacts of ongoing and planed hydropower dams in The Mekong River.

**Keywords:** *Ompok bimaculatus*, SNPs, genetic diversity, population structure, Lower Mekong Basin.

**Biography:**

Ms. Nguyen Thi Thoa is a researcher and a PhD student at Nha Trang University in Viet Nam. She is currently working under the division of Aquaculture Biotechnology and Vaccination, Research Institute for Aquaculture in Nha Trang, Viet Nam. She graduated with a Master in Aquaculture, being part of the NUFU project and Nha Trang University in 2011. She is also part of many projects, which are funded by the Viet Namese government such as: the study on disease of Babylonia areolate; the study on extract of herbal remedy to prevent diseases on fish and shrimp; gene conservation of marine and brackish organism; research artificial breeding of spanner crab (*Ranina ranina*). The name of her PhD thesis is “Research diversity of common fresh water fish and genetics populations in the Mekong River, Viet Nam, based on molecular marker applied in resource management and aquaculture”. This study will provide a database genetic diversity of fresh water fish species in the Highlands as well as population genetic diversity and genetic structure for the fish along the lower Mekong River. It will be useful for future natural resource management planning and breeding. Joining with the Peer project has improved her knowledge about bioinformatics analysis as well as modern molecular biology technology application which is particularly useful for her role in the future.
1.14 Comparative phylogeography of fishes in the Lower Mekong Basin – implications for anthropogenic impacts

**Presenter:** Dr. Binh Thuy Dang

1Institute of Biotechnology and Environment, Nha Trang University, 02 Nguyen Dinh Chieu, Nha Trang, Viet Nam

**Abstract:** The Lower Mekong Basin (LMB) is characterized by complicated hydrographic features including wide seasonal fluctuations and many changes experienced and expected from numerous hydropower dams built, under construction or planned. Our study provides a first overview of the comparative phylogeography of Mekong River fish through population genetic studies of 12 species in the LMB. This includes 4 species from locations between Thailand to the Viet Nam Delta (*Pangasius conchophilus*, *Ompok bimaculatus*, *Macrognathus siamensis*, and *Trichopodus trichopterus*), 4 species from the 3S river basin which includes the Sekong, Sesan and Srepok rivers (*Hemibagrus spilopterus*, *Helicophagus leporhinchus*, *Puntioplites falcifer*, and *Henicorhynchus lobatus*), 2 species in Thailand (*Pangasius macronema* and *P. larnaudii*), and 2 species restricted to the Mekong Delta (*Polynemus melanochir* and *Boesemania microlepis*). Results from each of these regions will be reported independently. Overall, along the Mekong main stream, *P. conchophilus* has showed high connectivity, while other species (*O. bimaculatus*, *M. siamensis* and *T. trichopterus*) displayed regional isolation. In the 3S basin, connectivity is limited within the different rivers. Preliminary results for 2 fish species in Thailand shows high population connectivity in the Mun-Chi river Basin. In the Mekong Delta region, high levels of gene flow are occurring between the sites sampled across the Mekong and Bassac Rivers. *Polynemus melanochir* appears to have had limited gene flow between the 2 main rivers, while *B. microlepis* has had high connectivity between the main rivers and up to the Tonle Sap in Cambodia. Low Ne estimates suggest that some of the Mekong species (*P. melanochir*, *O. bimaculatus*) may not be resilient to long term environmental changes, and are vulnerable to habitat fragmentation (*H. spilopterus*). Existing hydropower dams may already have influenced population structure while dams under construction and proposed on the Mekong main stream and its tributaries will likely disrupt the natural population structure of Mekong fish species through fragmentation and have negative effects on fisheries productivity. These studies provide important information on the population structure, effective population size and directionality of gene flow, which improves our knowledge of the natural history of Mekong River fish to assist in sustainable regional development.

**Keywords:** LMB, phylogeography, 3S river basin, Mekong Delta, hydropower dam

**Biography**

**Dr. Binh Thuy Dang** has more than 20 years’ experience working in molecular ecology and fisheries research. She has Msc and PhD in Marine Science. Her research interests include biodiversity and conservation, evolution, and population genetics. Dr. Binh is senior researcher/lecturer at Institute for Biotechnology and Environment, Nha Trang University, Viet Nam. In this capacity, she has built a genomics laboratory capable of advanced molecular research and has supervised many students. Dr. Binh has published in national and international journals and has attended international conferences and training workshops. She is involved in several international projects including: the CARD-ACIAR project, NUFU, SRV2701 NORHED projects under the NORAD framework, and the EU project. She is involved in Erasmus + program. She is a PI and Co-PI of 3 PEER projects funded by NFS/USAID (PEER 2-7, 3-100, and 6-435). Dr. Binh received Supplement from the Evidence-to-Action Program, and for PEER 2-7 project.
2.1 Genetic Diversity of Mekong Fishes: Tales from the Past Decade

**Presenter:** Dr. Uthairat Na-Nakorn

1Department of Aquaculture, Faculty of Fisheries, Kasetsart University, Bangkok, Thailand

**Abstract:** Mekong fish are always attractive because of the high species diversity and other unique characters. In the past decade genetic diversity of Mekong fishes, especially the Pangasiids received much attention. Our group, comprising of Professor Dr. Nobuhiko Taniguchi’s group (Kochi University, Tohoku University, Japan); the Fish Genetics Laboratory of Kasetsart University, Thailand, and Dr. Thuy Nguyen (Network of Aquaculture Centre in Asia-Pacific), have put joint efforts to understand genetic diversity of Pangasiid catfishes in the Mekong River during 2005-2008. The major findings were that (1) the Mekong giant catfish caught in northern Thailand and in Cambodia belonged to the same population; (2) the genetic diversity of MGC was moderate as shown by microsatellites and low based on mt-DNA; (3) the captive stock of MGC in Thailand did not represent the wild population; (4) some species (e.g. *Pangasius sanitwongsei*) not listed by IUCN as endangered, showed very low genetic variation, and etc. Further details regarding other related species will be included in the presentation.

**Keywords:** Mekong giant catfish, striped catfish, genetic diversity, captive stock

**Biography:**

**Professor Uthairat Na-Nakorn** (PhD) obtained a Bachelor’s Degree in Fisheries (1974), Master of Sciences in Genetics (1978) from Kasetsart University, Thailand. Later, she was granted a scholarship from Japan Society for the Promotion of Science (JSPS) to pursue a Ph.D. at Kochi University, Japan and was conferred the PhD degree in Genetics and Breeding in Aquatic Animals in 1998. She has been teaching undergraduate and post-graduate courses in fish breeding, fish genetics and genetic improvement at Department of Aquaculture, Faculty of Fisheries, Kasetsart University since 1978. Under the above themes Prof. Na-Nakorn has been a PI for 19 research projects and published 59 scientific papers and 11 review articles in national and international journals, together with 7 books and book chapters. She has won several awards including the “National Outstanding Researcher Award” in the field of Biology and Agriculture from National Research Council of Thailand in 2007; “Senior Research Scholar 2003” and “Senior Research Scholar 2007” from Thailand Research Fund; Outstanding KU Alumni Award 2013 from Kasetsart University Alumni Association under His Majesty the King’ Patronage; and “Distinguished Research Professor Award 2016” from Thailand Research Fund. At present she is a professor at Department of Aquaculture, Faculty of Fisheries, Kasetsart University, Thailand.
2.2 Comparative Phylogeography of the 3-S Basin of the Lower Mekong River

**Presenter:** Dr. Kent E. Carpenter¹

¹ Biological Sciences, Old Dominion University (ODU), United States

**Abstract:** The so called 3-S basin of the lower Mekong River is composed of the Sekong, Sesan and Srepok rivers and straddles southern Laos and northwestern Cambodia. It contributes significantly to fisheries production in the region but the continued sustainability of these fisheries is threatened by hydropower dams. To investigate the potential impact of population fragmentation, four fish species important to fisheries production were sampled at various locations around the 3-S basin and populations genotyped using double digest restriction site associated DNA (ddRAD) sequencing. This includes the small migratory shark catfish *Helicophagus leptorhynchus*, the small and highly abundant and migratory mud carp *Henicorhynchus lobatus*, the highly abundant bagrid catfish *Hemibagrus spilopterus*, and the typically deep dwelling sicklefin barb *Puntioplites falcifer*. A wide variety of population connectivity patterns were observed in these species. This includes isolation of populations across the Khone Falls (*H. leptorhynchus* and *H. lobatus*), connectivity across the 3-S Basin (*H. lobatus*) and isolation of populations within the 3-S basin (*H. spilopterus* and *P. falcifer*). Very low effective population sizes of *H. spilopterus* populations isolated by dams in the upper reaches of the Srepok in Viet Nam question their long-term viability. Further fragmentation by dams within the 3-S basin may disrupt migratory behaviour and further decrease the effective population sizes and subsequent fisheries productivity of some species.

**Biography**

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For Dr. Kent Carpenter’s biography please see page 7

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2.3 Harnessing the Power of Genomics in Aquatic Biodiversity Research

**Presenter:** Dr. Gregory Maes

1Laboratory for Cytogenetics and Genome Research, University of Leuven, Belgium

**Abstract:** The advent of Next Generation Sequencing (NGS) technologies has seen a transition from conservation genetics to conservation genomics (from gene to genome scales), providing access to thousands of genome-wide markers, collectively capable of providing reliable inferences about demographic patterns (connectivity and population size) and enabling the detection of local adaptation. Including genomics tools to investigate aquatic biodiversity questions is therefore an important step towards improving management and conservation actions. In this talk, I will discuss the power of using genomics as a cost-efficient next step for aquatic biodiversity studies, supported by various case studies, such as environmental DNA (eDNA), metagenomics and population genomics applications in temperate and tropical aquatic organisms.

**Biography:**

Dr. Gregory Maes did his postgraduate training at the University of Leuven (Belgium) on population and conservation genetics of aquatic organisms, focusing on exploited and endangered species such as eels, flatfishes, pikes, hybridogenetic frogs and polyploid invasive carps. He spent 6 years doing various postdocs in Belgium, Finland and Canada, examining the applications of population/conservation genomics approaches to exploited freshwater and marine fishes at various spatio-temporal scales. His main interest lies in multidisciplinary connectivity assessments, molecular traceability and the genomic basis of fisheries induced evolution in exploited species. Over the past 15 years he published more than 80 research papers and six book chapters in various fields, ranging from evolutionary biology, population genetics/genomics, conservation genetics, phylogeography, aquaculture genetics, metagenomics to ecotoxicogenomics of aquatic organisms. As an Adjunct senior lecturer in Evolutionary and Applied Genomics at JCU (Australia), he continues to apply various concepts developed on temperate species to tropical systems to tackle questions related to in aquaculture and fisheries genomics. He is now based in Leuven (University Hospital), working as a innovation and project manager in Genomic Medicine and applied genomics, where he continues to explore the power of genomics in health care, agrigenomics and evolutionary biology.
2.4 The Smithsonian's National Museum of Natural History and Its Critical Role in Fish Biodiversity Research

**Presenter:** Dr. Jeffrey T. Williams

1 *National Museum of Natural History, Smithsonian Institution, United States*

The Smithsonian Institution was chartered by the United States Congress in 1846. The first museum building was completed in 1855 and the National Museum of Natural History, originally named the United States National Museum (USNM) building was finished in 1881. The Division of Fishes came into existence in 1856 when the first fish specimen was catalogued into a catalogue ledger. Over the next 162 years, the USNM fish collection has grown to be the largest fish collection in the world and the world’s most important resource for biodiversity research. The USNM now houses specimens representing over 24,000 species worldwide. From the SE Asian region, the USNM fish collection has over 259,000 specimens representing over 5,900 species of marine and freshwater fishes. In 2006, we started building a vouchered tissue collection and there are now 40,000 genetic samples representing almost 4,000 species in the Smithsonian’s Tissue Biorepository. We are continuing add vouchered tissue samples to the Biorepository with the major geographic areas of interest being SE Asia marine and freshwater fishes, the Pacific Ocean and the Atlantic Ocean. I will discuss some of the ongoing biodiversity projects being undertaken by Smithsonian researchers and our international collaborators.

**Biography:**

**Dr. Jeffrey T. Williams,** Ichthyologist/Collections Manager of Fishes, National Museum of Natural History (USNM), manages the largest fish collection in the world and conducts research on the biodiversity, systematics, taxonomy and biogeography of fishes. He received his B.Sc. from Florida State University, M.S. from University of South Alabama and Ph.D. from University of Florida. He has collected and studied marine fishes around the world and is an authority on the cryptic (hidden) fishes, particularly in the Indian and Pacific Oceans. He has described 61 new species of fishes and has led/ participated on fish collecting expeditions to the Atlantic, Caribbean, Hawaii, Ryukyu Islands, Philippines, Seychelles, Fiji, Tonga, New Caledonia, Loyalty Islands, Australia, Vanuatu, Solomon Islands, Wallis & Futuna, French Polynesia and Palau. He has been with the USNM since 1983, where he continues to focus his research on tropical fishes from remote and poorly surveyed areas around the world.
2.5 Connecting climate change, hydrology and fisheries for energy and food security in Lower Mekong Basin: a baseline study

Presenters: Vilas Nitivattananon & Sangam Shrestha

1Asian Institute of Technology, Thailand

Abstract: This presentation provides an overview and a part of the results from the initial implementation of the USAID supported project “Connecting climate change, hydrology and fisheries for energy and food security in the Lower Mekong Basin (LMB)”. The main objective of the project is to develop and evaluate sustainable dam operation scenarios that optimize hydropower production and total fish catch in the context of proposed build out hydropower facilities including climate change within the 3S basin, a transboundary river basin in the LMB. The project also aims to develop the capacity of young professionals who are working in relevant agencies and are responsible for dam operation, water resources management and fisheries in Cambodia, Lao PDR, Thailand and Viet Nam. A total of 4 project components, to be implemented during 2018-2020, include: 1) developing high resolution climate change scenarios; 2) assessing the climate change impact on river flows, inflows to dam and fish production; 3) optimizing hydropower production and fish catch under climate change and dam operation scenarios; and 4) building capacity and knowledge sharing. The project’s scoping study results are being used for developing climate and hydrological models, driven by scientific understanding of the phenomenon of climate change, its effects on river flows, and subsequently fish production, to be able to arrive at the optimum dam development and operation scenarios.

Biography:

Dr. Sangam Shrestha is an Associate Professor and Chair of Water Engineering and Management Program at the Asian Institute of Technology (AIT), Thailand. He is also a Visiting Faculty of the University of Yamanashi, Japan, National University of Laos, and Research Fellow of the Institute for Global Environmental Strategies (IGES), Japan. His research interests are within the field of hydrology and water resources including, climate change impact assessment and adaptation in the water, integrated water resources management and groundwater assessment and management. Dr. Shrestha has published more than 75 papers in peer-reviewed international journals and presented more than 50 conference papers ranging from hydrological modelling to climate change impacts and adaptation in the water sector. His recent book publications include Climate Change and Water Resources (CRC Press), Managing Water Resources under Climate Uncertainty (Springer), Water-Energy-Food Nexus: Principles and Practices (AGU- Wiley) and Groundwater Environment in Asian Cities (Elsevier). His present work responsibilities at AIT include delivering lectures at the postgraduate and undergraduate levels, supervising research of postgraduate students (Masters and Doctoral), and providing consulting services on water and environment related issues to government and donor agencies and research institutions. He has conducted several projects related to water resources management, climate change impacts, and adaptation with awards from International organizations such as ADB, APN, CIDA, EU, FAO, IFS, IGES, SEI, UNEP, UNESCO, USAID, WB. He is also serving for the advisory committee of several international organizations. Dr. Shrestha has been awarded ‘Distinguished Research Leader Award 2014’ at AIT.
Dr. Vilas Nitivattananon is an Associate Professor of Urban Environmental Management, Department of Development and Sustainability, under School of Environment, Resources and Development, at Asian Institute of Technology (AIT). He is also a Visiting Faculty of Ho Chi Minh City University of Technology, Viet Nam. He has a strong background in engineering, economics and systems management. Furthermore, he has high skills in integrated and systems analysis focusing on environmental management and infrastructure development. Experienced on climate impacts and sustainable development and also as Principal Investigator (PI) (or Co-PI) of related projects, he has extensively managed projects from conception to completion and conducted integrated or multi-disciplinary researches for international, regional and local projects, supported by eg. UNEP, UNESCAP, WB, ADB, USAID, CIDA, MOFAID, MRC, and JICA, etc. He is an editorial board member of several international journals and has published more than 100 articles in peer-reviewed international journals, conference papers and book chapters.
2.6 Cryptic diversity of amphibians in the Lower Mekong uncovered by integrative approach

Presenter: Dr. Anchalee Aowphol
1Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand

Abstract: A major challenge for biodiversity conservation is the poor understanding of species diversity. Southeast Asian amphibians are highly threatened and the magnitude of cryptic diversity remains unknown. Herein, two genera of amphibians, Limnonectes, and Tylototriton are such examples, as many of their members have few diagnostic morphological characters. Intensive surveys were conducted in Thailand and Laos, and a combination of morphological, molecular and ecological data were used to detect cryptic species. The Caruncle-bearing frog genus Limnonectes formerly consisting of four species and the newly discovered species, L. lauhachindai were found in northeastern Thailand. The latter differs from its congeners by having males with a low-profiled, U-shaped caruncle with free a posterior margin that completely occupies, but does not extend beyond, the interorbital region. Phylogenetic analyses of 16S RNA sequences revealed that L. lauhachindai was identified as a sister to a clade containing L. dabanus and L. kohchangae, having distinct call types. In Laos, the salamandrid genus Tylototriton is poorly known. Samples from our fieldwork fell into four molecular and morphological groups, consisting of T. notialis, T. panhai, T. anguliceps, and a fourth lineage that was described as a new, T. podichthys. This species is distinguished from its congeners by having distinct mitochondrial DNA haplotypes and having the glandular skin on the head and body, the same shape of the rib nodules, and coloration of the body and limbs. This study expands the number of confirmed Tylototriton species in Laos from one to four. Moreover, the ecology of T. podichthys was also assessed in Xiengkhouang Province, Laos. The population size and natural history data of T. podichthys could be used for determining the conservation status. Therefore, the results suggest that the true diversity of amphibians is vastly underestimated and integrated taxonomic studies are needed for prioritizing conservation efforts.

Biography: Dr. Anchalee Aowphol is Assistant Professor at the Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand. She is a herpetologist and conducts research in the Lower Mekong in collaboration with researchers from Lao PDR and Viet Nam. She is interested in population ecology, population genetics, taxonomy and systematics of amphibians and reptiles. Her research requires obtaining DNA samples from localities throughout the ranges of species to determine gene flow among populations and to delimit the boundaries of species that are difficult to identify using morphology (cryptic species). She also performs mark-recapture studies to determine population sizes and obtains basic ecological data, including mode of reproduction, diet, and activity patterns. She has been developing a research network among herpetologists in Thailand, Lao PDR and Viet Nam through research exchange among these countries.
2.7 Using Multi data for inventorying woody tree species biodiversity in the Central Highlands of Viet Nam

**Presenter:** Dr. Nguyen Thi Thanh Huong

1 *Department of Forest Resources & Environment Management, Faculty of Agriculture and Forestry, Tay Nguyen University, Viet Nam*

**Abstract:** Loss biodiversity in the tropical forest including Viet Nam is mainly due to forest degradation and deforestation. More than 50% natural forest area at Daknong Province in the Central Highlands of Viet Nam has been replaced by other land uses/land covers last three decades. However, the woody tree species composition in the area is still very diverse. Evidence is that in about 100 plots size of 30x30m sampled in the area, there are about 400 species of woody tree belonging to 65 families, 150 genera of which 3 species are listed as Critically Endangered, 6 as Endangered and another 5 were listed as being Vulnerable according to IUCN Red List. The biodiversity indices show a high value with the Shannon Wiener Index (H) varying from 1.77 to 3.78 and Simpson (D) reaching from 0.75 to 0.97. A positive correlation between biodiversity indices of H, D, and Richness and basal area and elevation is found at a 5% significance level. In order to map biodiversity for the whole province, we calculated the Shannon Wiener Index and Simpson based on NDVI (normalized difference vegetation index) image which was calculated from a Sentinel 2A image using different size windows moving (e.g. 3x3; 5x5…). The initial result shows that only D appeared to have a statistically significant correlation with D, which was calculated from field data when estimated with 7x7 and 9x9 window moving, however, the correlation is weak. Therefore, further solutions will be investigated to improve the primary results.

**Biography:**

**Dr. Huong Thi Thanh Nguyen** is an associate professor of Forestry at the University of Tay Nguyen (TNU), Viet Nam. She received her Eng. in Forestry from TNU and her M.Sc. from the University of Viet Nam Forestry before eventually obtaining the Dr. rer. nat. from the Faculty of Forest and Environmental sciences, University of Freiburg, Germany in 2009. She is a lecturer engaged in teaching and studying in the field of Remote Sensing and GIS for natural resource management at Tay Nguyen University which is located in the South part of Viet Nam. Besides, she is the head of Department of Forest Resource and Environment Management (FREM) at Agricultural and Forestry Faculty. In 2016, she and her colleagues received a PEER award with a research related to using multi-data including remote sensing and society approaches for biodiversity conservation at a Province located in the Central Highlands of Viet Nam namely DakNong. The expectation of the research is to contribute biodiversity conservation strategies and policies in a context of global climate changes.
2.8 Biodiversity Conservation in Indochina: An Integrative Approach to Enhance Wildlife Trade Management in the Region

**Presenter:** Dr. Minh D. Le¹ & Dr. Seak Sophat²

¹ Central Institute for Natural Resources and Environmental Studies of Viet Nam National University, Viet Nam
² Department of Natural Resource Management and Development, Royal University, Phnom Penh, Cambodia

**Abstract:** Wildlife trade represents a major threat to endangered-species populations, especially in Indochina, where trade continues at high levels despite increased efforts to control illegal activities. Each year, tonnes of wildlife and their products corresponding to billions of dollars, are imported for local consumption, exported to other countries as pets or food/medicine or transited through this region. To identify management strategies that better mitigate the threat of this trade, research must address knowledge gaps about the complexity of established trade networks. This requires a comprehensive and interdisciplinary approach that integrates biological, anthropological, socioeconomic, and other kinds of data and involves multiple stakeholders among different sectors. In our PEER project, we tackled the outlined issue by developing an interdisciplinary research framework for enhancing wildlife trade management, including trade monitoring and law enforcement. Our integrative framework, based on the social–ecological systems framework by Ostrom, can be used to explore and untangle complex wildlife trade dynamics across scales and test hypotheses derived from different disciplines to provide robust recommendations for trade management. We also discuss the need for developing databases for trade-targeted species and outline steps to build and strengthen technical and interdisciplinary capacity to support the integrative framework as well as challenges in wildlife trade management in the region.

**Biography:**

**Dr. Minh D. Le** has been working on conservation-related issues in Southeast Asia for more than 15 years. His work focuses on biotic survey, wildlife trade, and conservation genetics of various wildlife groups in Indochina. He is currently working on projects which characterize genetic diversity of highly threatened reptiles and mammals in the region. He also pioneers the application of molecular tools in surveying critically endangered species in Viet Nam. Minh has long been involved in studying the impact of the wildlife trade on biodiversity conservation in Viet Nam, and is developing a multidisciplinary framework to address the issue in the country.
Dr. Seak Sophat is a natural resource management and biodiversity conservation specialist with more than 20 years implementing, teaching, researching and evaluating natural resource management, biodiversity conservation and climate change programming in Cambodia, especially in the Mekong and the Tonle Sap Lake region in addition to the coastal area. He is currently serving as vice dean for the Faculty of Development Studies, and Coordinator of Master of Science in Climate Change at the Royal University of Phnom Penh, Cambodia. Dr. Seak Sophat has worked extensively and collaborated with numerous projects throughout Cambodia to develop relevant programming for both university-level students and natural resource management, and climate change professionals. He has a strong background in research, and has worked throughout the country with numerous organizations and donors and numerous local NGOs. His current research interests focuses on participatory biodiversity monitoring linking to management intervention, hydropower development, rural livelihoods and climate change adaptation in the Mekong region with emphasis on conservation and livelihood improvement of rural community.
PEER Partners:

USAID

The United States Agency for International Development (USAID) is the U.S. Government’s preeminent foreign assistance agency. The agency is dedicated to helping nations meet the needs of their citizens by providing health-care, education, and economic opportunity to end extreme poverty and promote democratic, resilient societies. The U.S. Global Development Lab (The Lab) at USAID is bringing together a diverse set of partners to discover, test, and scale breakthrough solutions to address critical challenges in international development. A key element of this strategy is the support of scientific and technological research through the Partnerships for Enhanced Engagement in Research (PEER) program. PEER is a competitive awards program that invites scientists in developing countries to apply for funds to support research and capacity-building activities on topics of importance to USAID and conducted in partnership with U.S. Government (USG)-funded and selected private sector partners. The program is supported by USAID but implemented by the U.S. National Academies of Sciences, Engineering, and Medicine. Through PEER, the Lab leverages investments by other U.S. Government (USG)-supported agencies and private sector companies in scientific research and training in order to enhance the development priorities of USAID. USG-funded partners must be investigators who will contribute to the scientific merit and impact of PEER projects through expertise, skills, methodologies, laboratory access, and synergies with ongoing projects.

Ms. Kelly Robbins, Senior Program Officer, The National Academies of Sciences, Engineering, and Medicine

Dr. Cameron D. Bess, Senior Research Adviser
Center for Development Research, U.S. Global Development Lab, USAID

Dr. Shanni Silberberg, AAAS Science and Policy Fellow, USAID

Ms. Napak Tesprasith, Project Management Specialist (Sustainable Development), USAID
Regional Development Mission for Asia
The Mekong River Commission (MRC) is an intergovernmental organization, which works with the four riparian countries Cambodia, Lao PDR, Thailand and Viet Nam. It was established in 1995 with the signature of the 1995 Agreement.

The organisation aims to ensure the efficient and mutually beneficial development of the Mekong River while minimising the potentially harmful effects on the people and the environment in the Lower Mekong Basin. The MRC is a platform for water diplomacy and regional cooperation in which member states share the benefits of common water resources despite different national interests. It also acts as a regional knowledge hub on water resources management that helps to inform the decision-making process based on scientific evidence. Within its working scope, the MRC works within multiple sectors, including fisheries sustainability, identification of opportunities for agriculture, freedom of navigation, sustainable hydropower, flood management, preservation and conservation of important ecosystems. In providing its advice, the MRC aims at facilitating dialogue among governments, the private sector, and civil society.

For the PEER Project 3-100, MRC played an active role in giving strategic advice, participating in genetic analyses and helped to incorporating genetic data into the fisheries database for the Mekong River. Furthermore, the MRC is responsible to co-organise the final workshop of the PEER project 3-100 in June 2018 in Siem Reap, Cambodia.
Old Dominion University

The molecular ecology laboratory at Old Dominion University, located in Norfolk, VA, USA, contributed their time and expertise to the PEER Project 2-7 under USAID Cooperative Agreement AID-OAA-A-11-00012 in collaboration with colleagues at Nha Trang University and Texas A&M Corpus Christi. The effort was led by PI Dr. Kent Carpenter, and also involved were PhD students Amanda Ackiss and Brian Stockwell and Masters student Ellen Biesack. The PEER-funded project aimed to utilize next-generation sequencing – specifically restriction site-associated DNA sequencing, or RADSeq – to identify patterns of genetic structuring of several important Mekong River fishes in the main waterways of the Lower Mekong Delta in context of hydrological changes resulting from dam construction on the Mekong River and its tributaries. The research team received RADSeq-generated sequences that had undergone the standard Illumina quality filtering from the sequencing facility at New York University’s Genomics Core Laboratory for a total of four Mekong River species. These included Helicophagus leptorhynchus (family Pangasiidae, the shark catfishes), Hemibagrus spilopterus (family Bagridae, the Bagrid catfishes), Henicorhynchus lobatus, and Puntioplites falcifer (both of the family Cyprinidae, the carps). The team was responsible for data analysis, which included de novo reference assembly, mapping of RAD tags to the reference, SNP (Single Nucleotide Polymorphism) calling, quality filtering of SNPs, development of neutral SNP panels, and statistical analysis of population structure for each species. The team also collaborated on the composition of four separate manuscripts to disseminate the findings, three of which have been submitted for publication in various international journals.

Clockwise from top left: PI Kent Carpenter, Brian Stockwell, Amanda Ackiss, Ellen Biesack.
Can Tho University
The Mekong Delta (MD) is located in the lower part of the Mekong River Basin where the two main tributaries of the river (Bassac and Mekong) end in the East Sea. It has generated a highly dense water body system and thus created diverse habitats for aquatic organisms, especially fish which makes the MD becoming one of the most productive areas in Vietnam as well as in the region. Can Tho University (CTU) is situated right in the middle of the Mekong Delta (MD). In addition to the important role of training and educating human resources for development of socio-economics of the MD, CTU is responsible for the protection and conservation of this rich aquatic resource. Besides many other fields related to aquaculture development, CTU has implemented numerous researches on aquatic biodiversity in which fish diversity is the most important issue taken very much concerns of scientists in the region.

CTU was the Principal Investigator in this project. The aim of this project was to enhance biodiversity conservation and fisheries resource management capabilities through creation of a research network that examines the population genetics of selected Mekong River fishes using advanced genomic methods. The project partners involved including CTU were Nha Trang University (NTU-Viet Nam), Inland Fisheries Research and Development Institute (IFReDI - Cambodia), Living Aquatic Resources Research Centre (LARReC - Lao PDR), Ubon Ratchathani University (Thailand) and the Mekong River Commission (MRC).

Administratively, as a PI of the project, CTU was responsible for coordinating project activities and also for reporting (quarterly, yearly and final reports) to PEER/USAID. Scientifically, CTU was participating in sampling and analysing 8 fish species distributed in both two tributaries of the Mekong River in the MD. Among 8 species collected, 5 of them were analysed by CTU and the remaining by NTU. Along with 5 species sampled in the MD, CTU was also helping LARReC in analysing their specimens collected from Lao PDR.

International conference on genetic biodiversity organized at CTU
Dr. Vu Ngoc Ut, PI – CTU was presenting at the International conference
Sampling on the Bassac River

Sample preparation at CTU
The Inland Fisheries Research and Development Institute (IFReDI) was established in October 2002 by virtue of Declaration No. 357 of the Ministry of Agriculture, Forestry and Fisheries (MAFF) as a Cambodia national research and development institute under the supervision of the Fisheries Administration of MAFF. IFReDI is located in Building 186, Preah Norodom Blvd., Sangkat Tonle Bassac, Khan Chamkarmon, Phnom Penh, Cambodia. IFReDI has been involved in the Building a Mekong Genetic Diversity Research Network Project through Partnerships for Enhanced Engagement in Research (PEER) cycle 3-100, which was funded by USAID. IFReDI conducted fish specimen collections in the Mekong River and Tonle Sap Lake for molecular analysis and carried out genetic analysis in our laboratory.

IFReDI is working on scientific collection, analysis and dissemination of biological and socioeconomic data, development and upgrading of national capacity for the rational management of inland fisheries, Maximization of the income of fishermen and farmers, and sustainable utilization of the fishery resources. To achieve goals, our institute is implementing significant mandates such as; (1) Monitor status and trends of fisheries and aquatic resources, and identify aquatic fauna and flora for supporting conservation, management and development of the fisheries and aquaculture sub-sector; (2) Conduct fisheries ecology, biology and socio-economic, and aquaculture technology research; (3) Study effectiveness and impact of flooded forests on fisheries resources; (4) Study effectiveness and impact of inland fishing gears on fisheries resources; (5) Study impact of water development on fisheries resources; (6) Research to ecological friendly develop appropriate fishing technologies; (7) Monitor, survey and control aquatic animal diseases and fisheries ecology; (8) Develop and manage fish breeders for domestication breeding; (9) Research and produce good genetic quality seed of aquatic animals for aquaculture development; (10) Develop spawning, hatching and nursing technologies for aquatic animals, including fishes; (11) Develop pond, cage and rice-cum-fish aquaculture technologies for commercially high value fishes; (12) Study impact of carnivorous fish species on aquatic resources; (13) Research and develop live feed and artificial feed production technologies for enhancing aquaculture development; (14) Research into water quality, feed nutrition, fish diseases, and disease diagnosis and treatment/prevention; (15) Provide on-the-job and educational/academic trainings on fish breeding, hatching, nursing and growth-out technologies to fisheries extension officers and farmers; (16) publish and disseminate data on inland fishing and aquaculture technologies, fish- ecology and biology and socioeconomics of inland fisheries; (17) Implement other necessary tasks required by the FiA management.
The Living Aquatic Resources Research Center (LARReC) has been established in April 19th 1999 by combining existing research units and stations and involving of several research fields e.g, Aquaculture, Aquaculture Health Care and Capture Unit in Lao PDR.

The mission of LARReC is to provide a center, which has human, and scientific resources, to the government and to a wider spectrum of stakeholders and development partners, donors, and the private sector for carrying out systematic research for development. Solutions have to be found for specific problems caused by a limiting production and degradation of natural resources and biodiversity, whilst developing suitable methodologies as a response to climate change. LARReC works closely with different levels of policy-makers and planners to provide advice and feedback accommodating a conclusive policy environment; strengthening a culture of research, moving towards further capability building and enhanced collaboration, and developing effective communication and information systems, allowing actors on national, provincial and district levels, and farmers a better access to information and knowledge.

This collection of bony fish tissues was undertaken as part of a joint collaborative research effort between Can Tho University, Nha Trang University, IFReDI, Old Dominion University and the LARReC. The project is sponsored by USAID for International Development through the U.S. Being one of the key partners, the project in Lao PDR was led by Co-PI Dr. Latsamy, Phounnapaht. The other active member was Mr. Soukphamixay Xouimanivong who is another researcher at LARReC.

Fish Bone Tissue Collection and sorting

Dr. Latsamy Phounvisouk sampling fish for further analysis
Lao PDR Research team with MRCS staff on sampling mission

PEER Project Annual Workshop in Pakse, Lao PDR 2017
Ubon Ratchathani University

The Faculty of Agriculture was established as the Department of Agriculture in Ubon Ratchathani College, Khon Kaen University in 1987. In 1990, Ubon Ratchathani University was established and the Department of Agriculture changed to the Faculty of Agriculture. The faculty offers five majors at Bachelor level: Agronomy, Horticulture, Animal Science, Agro-Industry, and Fisheries. It also offers three Master degrees in Integrated Farming, Agricultural Science (majoring in Plant Science, Animal Science or Fisheries Science), and Information Technology for Agriculture and Rural Development. In addition, the faculty offers a Ph.D. degree majoring either in Plant Science, Animal Science or Fishery Science.

Research and development of the Department of Fisheries, UBU, includes the culture techniques for Mekong indigenous species both as for aquarium and production purposes. Works on aquaculture are covered both the smart farming and organic approaches. The research team also studies the biology and ecology of the Mekong fishes, in particular the impacts by infrastructure developments in the basin. Conservation of the Mekong fishes and aquatic animals is also conducted through the research and extension programs. For the PEER Project 3-100 UBU was responsible for the participation of meetings, fish collection and analyses.
Nha Trang University

The Institute for Biotechnology and Environment (IBE) from Nha Trang University was part of building the genetic biodiversity research network through a collaboration on method design, sampling and analysis of population genetic data of 8 species at MRB localities in each of the partner countries. Nha Trang University was responsible in organizing the initial training workshop (in collaboration with the US partners) for all project members in October 2015, with two goals: 1) training scientific collaborators, staff and students from Viet Nam, Laos, Cambodia on the methods that can be employed in their home labs for population genetic analysis of both the currently proposed research as well as any future work in fisheries and conservation and 2) generating genetic data from collected tissues from the Mekong sampling localities during the 2014 – 2015 field season. NTU was also responsible for fish sampling in the Vietnamese highland (Serepok and Sesan (2S) rivers. As the leader for advanced genomic techniques, NTU has supported the other partner institution in using standard sampling protocols for the first three species (Pangasius conchophilus, Ompok bimaculatus, and Trichopodus trichopterus) collected across the LMB, and 5 additional species, which were only collected in Thailand as well. To further support genetic works, in 2017, NTU hosted 5 project staff from CTU (Viet Nam), IFReDI (Cambodia) and UBU (Thailand) for a 1-2 weeks’ training at the Molecular laboratory followed by sending consultants to the partner labs. Additionally, NTU has implemented genomic analyses for studies on fish species, and help project partners to interpret the results for the final workshop held in June, 2018. Last but not least, NTU has and will collaborate with all project members and US partners to gather data for analysis and publication of international articles.
| Field Work with Dr. Kent Carpenter from United States. | Advanced laboratory equipment to analyse the collected samples. |