

3RD EDITION OF WORLD
AQUACULTURE
AND FISHERIES
CONFERENCE

WAC 2023

24-25

MAY, 2023

TOKYO, JAPAN
HYBRID EVENT

Venue:

Ana Crowne Plaza Narita 68, Horinouchi, Narita-Shi, Chiba, 286-0107
Tokyo, Japan

24-25^{MAY}

BOOK OF
ABSTRACTS

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WORLD
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Welcome Message

Dear congress visitors,

It is an honor to welcome you to this Congress which will hopefully allow you to approach aquaculture and fishing with a new vision, more modern and more respectful of the environment and its resources that are becoming increasingly rare, thanks to all the innovations you will discover there. I have also been invited to present innovative work on the contribution of aquaculture to the management of natural resources. Restoring degraded ecosystems, cleaning up environments, developing more environmentally friendly aquaculture and more responsible fishing are all challenges we face today. To answer this, more and more reflections and practices are turning to marine and coastal ecological engineering, solutions that are said to be "nature-based". This is what we will share throughout this event.

Sylvia Agostini

Yours Sincerely

Sylvia Agostini

University of Corsica, France



Welcome Message

Total fisheries and aquaculture production globally reached a record 214 million tonnes in 2020, comprising 178 million tonnes of aquatic animals and 36 million tonnes of algae, largely due to the growth of aquaculture, particularly in Asia. Sustainable aquaculture development remains critical to supply the growing demand for aquatic foods. FAO's outlook for fisheries and aquaculture to 2030 projects an increase in production, consumption and trade, albeit at slower growth rates. Total production of aquatic animals is expected to reach 202 million tonnes in 2030, thanks mainly to sustained growth of aquaculture, projected to reach 100 million tonnes for the first time in 2027 and 106 million tonnes in 2030. World capture fisheries is projected to recover, increasing by 6 percent from 2020 to reach 96 million tonnes in 2030, as a result of improved resource management, underfished resources, and reduced discards, waste and losses.



The Russia-Ukraine war has impacted many industries created uncertainty for various projections but also opening the opportunities for the unexplored arenas. Atlantic Salmon & Shrimp are two candidate species among the global seafood sector driving huge trade. The announcement of an introduction of resource tax in Norway at aquaculture sector has created the chaos however government is firm to implement it from 1st Jan 2023. This may create the impact on temporary basis but may probably open up some hidden opportunities on longer perspectives considering sustainable domestic production development. India is the dominant producer of shrimp and though facing some tough situations presently, it will come out of the difficult scenario giving stability to the sector in coming time in spite of challenges from the competition shrimp producing countries.

Many large-scale companies in the segment showing seriousness towards implying ESG initiatives in the ongoing business and some are ahead of the curve. Slowly developing "Alternative Seafood" are expected to grow significantly in next 8-10 years & shall become visible across shelves in different markets. Seafood is one of the important proteins and shall continue to hold its importance in the global food supply chain. The sector will experience hit because of recession same as other sectors but will pass through it recovering in post-recession phase.

I hope the 3rd Edition of "World Aquaculture & Fisheries Conference" 2023 will witness one of the challenging & innovative brainstorming discussions & themes revolving around growing Global Fisheries & Aquaculture segment. I wish every speaker, audiences, participants a very best wishes to make the event grand success.



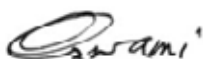
Regards,
Amod Ashok Salgaonkar
A2S2 Enterprises India

Welcome Message

Dear Erudite participant,

It's my privilege to welcome you all at "3rd Edition of World Aquaculture and Fisheries Conference" (WAC-2023) during May 24-25, 2023, in Tokyo, Japan, in the honored capacity of Committee Member and Keynote Speaker at the 'Aquatic Pollution and Toxicology' Session, during UN-Decade of Ocean Science for Sustainable Development, began in 2021. We as a scientific community are here not only to raise awareness of the truly global dimension of the ocean, address environmental challenges, and set forth on a path towards a resilient planet but to develop physicochemical and spectroscopic methods to characterize the in-situ chemical speciation of the inorganic contaminants and save the underwater marine life through innovative technologies for remediation of water pollution by catalytic oxidants.

Next, to discuss strategies to control Toxic Aquatic pollution resulting due to toxins, toxic gases, and GHG (Green House Gases), by making use of Catalytic oxides. Also, to understand air-sea exchange during extreme atmospheric forcing, biophysical interactions on Air-Sea CO₂ exchange with Climate Variability, Marine Biogeochemistry, Ocean-Air interactions to develop 'Aquatic-Climate Prediction Models (ACPM), for estimating energy and material (e.g., carbon, nitrogen) exchange between the upper and deep ocean, and to understand spatial and temporal non-homogeneity in deep ocean mixing; distribution of deep-ocean mixing intensity, as well as the physics that drives that distribution, and the energetics of the ocean and reducing the uncertainties in global circulation and climate models by making use of Artificial Intelligence(AI) Remote Sensing.



Yours Sincerely

Virendra Goswami

Indian institute of Technology & Environment and Peace
Foundation, India



Keynote Speakers



Linder Michel
Universite De Lorraine,
France



Sylvia Agostini
University of Corsica, France



Amod Ashok Salgaonkar
Co-founder & Chief Operating
Officer, A2S2 Enterprises, India



Virendra Kumar Goswami
Indian institute of Technology &
Environment and Peace Foundation,
India

*Thank You
All...*



ABOUT MAGNUS GROUP

Magnus Group (MG) is initiated to meet a need and to pursue collective goals of the scientific community specifically focusing in the field of Sciences, Engineering and technology to endorse exchanging of the ideas & knowledge which facilitate the collaboration between the scientists, academicians and researchers of same field or interdisciplinary research. Magnus Group is proficient in organizing conferences, meetings, seminars and workshops with the ingenious and peerless speakers throughout the world providing you and your organization with broad range of networking opportunities to globalize your research and create your own identity. Our conferences and workshops can be well titled as 'ocean of knowledge' where you can sail your boat and pick the pearls, leading the way for innovative research and strategies empowering the strength by overwhelming the complications associated with in the respective fields.

Participation from 120 different countries and 1090 different Universities have contributed to the success of our conferences. Our first International Conference was organized on Oncology and Radiology (ICOR) in Dubai, UAE. Our conferences usually run for 2-3 days completely covering Keynote & Oral sessions along with workshops and poster presentations. Our organization runs promptly with dedicated and proficient employees' managing different conferences throughout the world, without compromising service and quality.



ABOUT WAC 2023

Magnus Group is ecstatic to invite you to its **“3rd Edition of World Aquaculture and Fisheries Conference”** (WAC 2023) which is going to take place during May 24-25, 2023 as a Hybrid Event having both online and in-person versions at Tokyo, Japan.

The congress will be centred on the theme **“Panoramic view of innovations that impact life below water.”**

WAC conference was established as a knowledge-sharing platform to highlight the possibility and distinctiveness of small-scale artisanal fisheries and aquaculture, as well as the advantage that can be gained by fostering collaborations and cooperation with fish farmers and workers, as well as the Sustainable Development Goals (SDGs). WAC conference has a reputation for being a welcoming gathering where old friends are reconnected and new ones are created. We hope you will join us at WAC 2023 to share your expertise, expand your professional networks, and form collaborative relationships with those who are enthusiastic about ‘aquaculture, fisheries, its well-being and seafood.’

Since this conference provides an opportunity for new ideas to be shared, our conference goers include professionals from all around the world, ranging from researchers, scientists, academicians, marine biologists, aqua culturists to fishermen, fish care experts and industry representatives. The mission of this two-day congress is to increase awareness of, and support small-scale and artisanal fisheries and aquaculture's contributions to global sustainable development, particularly their role in food security, nutrition, alleviating poverty, and natural resource sustainability.

24-25^{MAY}

DAY 01
IN-PERSON
KEYNOTE
FORUM

3RD EDITION OF
**WORLD
AQUACULTURE AND
FISHERIES CONFERENCE**

Valorization of marine co-products: From lipid extraction using green processes to nutraceutical and food applications

Total fisheries and aquaculture production reached a record 214 million tons in 2020 (FAO, 2022). The expansion of fisheries processing and aquaculture production has resulted in increasing quantities of by-products, which may represent up to 60% of total biomass, including heads, skin, flesh, and bones. These marine resources are rich in nutrients and bioactive substances, such as proteins and Long-Chain n-3 Polyunsaturated Fatty Acids (LC-PUFAs) that Global Health Authorities recommend consuming for their health benefits to prevent diseases. Different marine sources, including fish by-products, sea cucumber, scallop, squid, and fish roe, can be valorized by conventional and non-conventional extraction techniques (solvents, supercritical fluid extraction, enzyme-assisted extraction...). Salmon by-products (*Salmo salar*) generated by the food chain represent a source of eicosapentaenoic Acid (EPA 20: 5n-3) and docosahexaenoic acid (DHA 22: 6n-3) and peptides that can be used as supplements in food for nutraceutical or health applications. The extraction of polar lipids naturally rich in PUFAs by enzymatic processes without organic solvent (controlled by pH-Stat method at laboratory and industrial scale), coupled with the production of 1 kDa salmon peptides by membrane filtration, allowed the formulation of nanocarriers. The physicochemical properties of the nanoliposomes (size, zeta potential, encapsulation efficiency) were measured, and the bioactivity of salmon hydrolysate peptides was assessed (antioxidant and antiradical activity: ABTS, ORAC, DPPH; iron metal chelation). Examples of encapsulation of various molecules will be presented to illustrate the interest of these dual-functional vectors attributed to the composition of LC-PUFAs, as well as encapsulated bioactive substances (antioxidants, vitamins, calcein, curcumin, enzymes, peptides...), which have proven to have a beneficial or protective physiological effect against chronic diseases. These valorization techniques through green processes could be of interest to some aquaculture farms to valorize co-products and/or to have vectors whose composition in peptides and lipids would adapt to the growth of the fry.



Cyril J. F. Kahn, Maureen Gerlei, Elmira Arab Tehrani, Michel Linder*

Universite de Lorraine, LIBio,
F-54000 Nancy, France

Biography

Dr. Michel Linder is a professor at the University of Lorraine at the Laboratory of Biomolecular Engineering (LIBio). He specializes in marine lipids, using enzymatic extraction processes of lipids and marine hydrolysates. He has been interested in marine lecithins for 20 years, studying their physicochemical properties and the formulation of nano vectors. The liposomes formulated from marine resources allow the delivery of naturally occurring LC-PUFAs and molecules of interest, sought after in many fields. He is the author of several patents and licenses in the microalgae and salmon heads valorization fields and more than 160 articles in international journals and 80 international conferences. In January 2023, he was awarded the Chevreul Medal.

When sustainable aquaculture comes to the rescue of environmental preservation: Concrete actions of marine ecological restoration on the French coasts (Mediterranean Sea)

In a current global context of marine biodiversity loss and fishery resource overexploitation, the French University of Corsica has acquired a new tool to combine research with ecological and coastal engineering: The marine platform STELLAMARE (Sustainable Technologies for Littoral Aquaculture and Marine Research). Implemented since 2011, this structure with the support of fishing professionals and specific European funding, allows to initiate in France direct actions in favor of responsible fishing, sustainable aquaculture and restoration of damaged ecosystems. This innovative concept involves a network of researches working in different areas in an objective of sustainable economic development while preserving the most of fishery resources and marine biodiversity using sustainable aquaculture techniques. Advances on these concrete actions will be presented and discussed in the meeting through different examples of applications on: (i) Ecological restoration on overexploited stocks (Sea urchin *Paracentrotus lividus*, Red lobster *Palinurus elephas*, European oyster *Ostrea edulis*), (ii) Reduction of the marine biodiversity loss (using Mediterranean fish post-larval stages, creation of artificial nurseries and habitats) and (iii) Biopurification of human-polluted activity areas (marina, aquaculture farms) by the use of organisms from aquaculture.



Sylvia Agostini*, Paul-Antoine Bisgambiglia

UMR 6134 CNRS Sciences for Environment, 2UAR 3514 CNRS Stella Mare, University of Corsica, BP 52, 20250 Corte, France

Biography

Dr. Sylvia Agostini is a researcher in marine ecology at the "Science for Environment" Laboratory of the University of Corsica (French) since 2005, and President of the Scientific Council of the Corsican fishermen since 2007. She has been in charge the creation of the first platform on the marine ecological engineering in Corsica Island in 2009: STELLA MARE (Sustainable Technologies for Littoral Aquaculture and Marine Research). Certified in 2011 by the French National Research Center (CNRS), she becomes the scientific head of the structure. Since 2017 member of the National Council for the Protection of Nature (CNPN) at the French Ministry of Ecological and Solidarity Transition, she specializes in marine and coastal ecological engineering and marine ecological restoration.

24-25^{MAY}

DAY 01
IN-PERSON
SPEAKERS

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Monea Kerr

The Nature Conservancy Washington Chapter, Washington Sea Grant Fellow,
Seattle, WA, USA

A situation analysis for Washington state's emergent seaweed aquaculture industry

When done well, seaweed aquaculture has benefits for nature and people. Restorative seaweed aquaculture can provide local economic opportunities and jobs, while also having positive impacts on the environment like improving water quality, combating impacts of ocean acidification, providing habitat, and serving as a sustainable food source in an increasingly food insecure world. While established globally, seaweed aquaculture has more recently emerged in the United States. The industry was initiated on the U.S. East Coast, but interest along the West Coast is growing. As the fastest-growing aquaculture sector, considerations must be made regarding site requirements, designs, infrastructure and best management practices. Efficient permitting processes must also balance seaweed aquaculture development with environmental considerations. This poster presentation will highlight the findings of a situation analysis conducted on the status of Washington State's seaweed research and industry and its relationship to the rest of the Pacific Northwest region (Oregon, British Columbia and Alaska), the regulatory landscape, considerations for future development of seaweed aquaculture, current markets and analysis of emerging markets that intersect with conservation interests, key infrastructure gaps, and financial needs.

Audience Take Away Notes

- The audience will learn the process of conducting a situation analysis and understand the state of seaweed aquaculture in the Pacific Northwest of the United States, an up-and-coming industry
- The audience will gain an understanding of important considerations in seaweed aquaculture that may help them to make decisions in their own jobs
- The poster presentation will discuss a suite of applications that can be used in a developing seaweed aquaculture industry, and while it will be Pacific Northwest specific, can be used for areas around the globe
- The research presented can be used to expand other's research or teaching by providing a framework for discussing seaweed aquaculture and the multitude of facets that must be considered, such as site requirements, designs, infrastructure, best management practices, permitting, and economic and environmental sustainability

Biography

Monea Kerr studied Environmental Policy at the University of Washington, USA and graduated with her Masters of Public Administration in 2022. She then joined The Nature Conservancy for a yearlong fellowship focused on seaweed aquaculture in Washington State and beyond. She is part of the Jamestown S'Klallam Tribe that resides on the Olympic Peninsula in Washington State, where her passion for the marine environment developed and blossomed. While her fellowship is focused on seaweed aquaculture, she is interested in restorative aquaculture of all kinds, as well as conservation and restoration.



Papungkorn Sangsawad^{1*}, Saranya Suwannangul², Chompoonuch Khongla³, Jarunan Chainam⁴, Supaluk Sorapukdee⁵

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³Department of Applied Biology, Faculty of Sciences and Liberal Arts, Rajamangala University of Technology Isan

⁴Faculty of Agricultural Technology, Animal Science, Valaya Alongkorn Rajabhat University, Thailand

⁵Faculty of Agricultural Technology, King Mongkut's Institute of Technology Ladkrabang

Bioactive peptides derived after simulated gastrointestinal digestion of cooked catfish fillet for human health-promoting

Catfish fillet (CFF) has 30% protein, making it an interesting human protein source. Reports of bioactive peptides have been generated from the enzymatic hydrolysis of many fish proteins. However, the bioactive peptides generated from CFF digestion for health promotion are still unknown. The goal of this study was to investigate the bioactivity of the peptide from cooked CFF after being simulated by in vitro gastrointestinal (GI) digestion at different temperatures (raw meat, 50 °C, 70 °C, 90 °C, and 110 °C for 10 minutes). Cooked CFF GI digests had better degree of hydrolysis, antioxidant activity, DPP-IV inhibitory activity (antidiabetic), and ACE inhibitory activity (antihypertensive) than raw meat (uncooked). In indicating that thermal treatment could be improved the release of the potent bioactive peptide. In term of thermal treatment, at 70°C, the GI-digested CFF demonstrated the highest antioxidant activity, DPP-IV inhibitory activity (antidiabetic), and ACE inhibitory activity (antihypertensive). On the other hand, the digest at 110 °C for 10 minutes showed the least inhibitory activity. Furthermore, blood proteases can hydrolyse transported peptides when they enter the bloodstream via intestinal (epithelial) cells. Thus, to ensure the bioactivity of the GI-digest CFF/70 peptides, it was subjected to in vitro human blood plasma hydrolysis using plasmin. CFF/70 from GI digestion was slightly degraded but retained its bioactivities. As a result, our findings provided the first evidence that CFF is a new functional food with antioxidant activity, DPP-IV inhibition, and ACE inhibition following absorption via GI digestion and blood circulation.

Audience Take Away Notes

- The degree of hydrolysis of CFF after GI digestion can be improved by thermal treatment
- The health-promoting peptide can be released after consuming the cooked CFF
- The CFF subjected to cooking at 70 °C for 10 minutes could provide an excellent source of antioxidant, ACE, and DPP-IV inhibitory peptides upon GI and blood protease digestions, which could exert some health benefits in addition to its nutritional value

Biography

Dr. Papungkorn Sangsawad received his Ph.D. from the School of Food Technology at the Suranaree University of Technology in Thailand in 2016. He is a lecturer at the Suranaree University of Technology in Thailand's School of Animal Technology and Innovation. He studies bioactive peptides from natural sources, such as antioxidants and ACE-inhibitory peptides derived from animal waste, fish, and chicken meat. He has over 13 research articles in Scopus.



Kieu Thi Huyen¹, Ha Thi Hue¹, Vo Van Phu², Tran Nguyen Ngoc², Nguyen Anh Tuan¹, Vo Duc Nghia¹, Nguyen Quang Linh^{3*}

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Eel (*Anguilla marmorata*), gene diversity, and new marine and freshwater bodies discoveries

Grass – eel (*Anguilla marmorata*) migrates from the ocean into the mainland through the estuaries in Central Vietnam; during fresh and marine water waves, temperature, and lunar season, as dark times at night as natural resources for aquaculture in fresh and marine culture. The evaluation of the seasonal appearance of eel (*A. marmorata*) related to migrant and biological characteristics. Two groups of baby eels (0.1-10g and 10-100g) appear only once in the year, from January to May. The eels with a size from 100g appeared from March to December. The group of eels above 500g appears from January to December. In the subareas in Central Vietnam, groups of eels with different sizes differ in the time sequence of appearance and there are 5 groups. The giant mottled eel is a species with high commercial value so overfishing, river management, and water pollution have negatively affected its movement and population numbers. This study used a barcode technique to analyze molecular characteristics and build genetic plants based on the cytochrome c oxidase I (COI) gene segment isolated from the mitochondrial genome of 48 individuals. The isolated cytochrome c oxidase I sequence has a length of 843 nucleotides, four base nucleotides of 30.03% Thymine, 25.15% Cytosine, 27.49% Adenine, and 17.43% Guanine. The percentage of Guanine + Cytosine content (42.58%) is acceptable, lower than the Adenine + Thymine content. The replacement capacity of Adenine and Guanine is 22.45% highest, and the ratio between Thymine and Guanine, Cytosine, and Guanine is the lowest at 2.72%. Random Amplification of Polymorphic DNA (RAPD) molecular marker was used to evaluate the genetic diversity of 48 eel samples. There were 8 random primers via PCR, 77 DNA tapes with 76 polymorphic tapes were obtained, size ranged from 170-2,500 bp, in which primer S10 showed the highest diversity with an average value of 0.563, followed by primer S8 (Ho = 0.558). There were a high diversity of genes in the OPD5 primer (Ho = 0.300). The OPG17 primer is the primer that produces the most polymorphic tapes (13/13 tapes) and the S3 primer for the least amplified tapes polymorphism (9/10 DNA tapes). The diversity coefficient in each random primer ranged from about 0.300 to 0.563, with an average of 0.433. Genetic similarity coefficients among the eels varied from 0.660 to 0.910. This is the first time both cytochrome c oxidase subunit I (COI) and 16S ribosomal RNA (rRNA) genes were used to identify *Anguilla* eels in water bodies, where the eels can migrate downstream and upstream. Based on the DNA sequence analysis of six specimens, two species (including subspecies) were confirmed as *A. marmorata* and *A. bicolor* but had not been identified on morphological characteristics. Phylogenetic analysis showed regions belonging to the Indo-Pacific line age and helped build phylogenetic trees generated from mtDNA data from GenBank for these eels. Another discovery there was that 350 individuals of sizes from 120 to 1137 mm were analyzed on characteristic morphology at 4 stages: juvenile, fingerling, pre-adulthood, and adulthood. Cluster 1 corresponds to the morphological characteristics at the fingerling stage (TL = 260–552.0 mm); cluster 3 is the pre-adult stage (TL = 324.6–

533.9); Cluster 4 is the juvenile stage (TL = 120.0–255.0), and clusters 2 and 5 for pre-adult and adult at reproductive migration (TL > 400 this study investigated the dietary component and morphology of the digestive tract of *Anguilla marmorata* during its yellow stages (non-migrants). *Anguilla marmorata* is also widely distributed, exploited, and cultivated with high economic value. The gastrointestinal tract structure indicated typical characteristics of carnivorous fish such as a wide mouth, small teeth in bands; a free tongue; a short esophagus, a stomach, and intestines made up of folds. The mouth size of fish ranged from 1.81–6.6 cm and increased with the fish's body weight. *Anguilla marmorata* is an animal-eating species with an RLG (relative length of the gut) ranging from 0.34 to 0.41 (RLG <1). Crustacea is the preferred food of eels with the highest proportion of the number, weight, and frequency of crustaceans in the gastrointestinal tract, with 65%, 64% and 80%, respectively. The most essential food of *Anguilla marmorata* in the wild with an index of relative importance (IRI %)=79%. There was a correlation equation between length (L=17–108 cm) and the fish's weight (W=10–3200 g) $L=9.948W^{0.0622}$ with a correlation coefficient $R^2=0.93$. Our report provides new dietary information for aquaculture potential. In addition, the content of lipids in skin and tissue was also examined. The results show that eel flesh has relatively high nutritional values. The water, protein, lipid, and total sugar content of the fish meat is $60.4 \pm 0.94\%$, $19.54 \pm 4.31\%$, $18.2 \pm 1.02\%$, and 1.34 ± 0.34 (mg/g), respectively. The nutritional components of the eel have a reasonable correlation with the weight according to the equation: $Y = a \times \ln(W) + b$ (where W is the weight of eels; Y is the content of nutritional components; a is the correlation coefficient b is a constant) with $r > 0.9$. The lipid content of fish skin is higher than that of muscle and meat.

Keywords: Migration, distribution, Morphology, Gene sequence, Polymorphism, and Acid nucleic.

Biography

Prof. Dr. Linh studied Animal Sciences and Veterinary Medicine, Aquaculture at Wageningen University, Utrecht University, The Netherlands, and Humboldt University, Germany, and graduated with an MSc in 1996, and Ph.D. in 2001, and a Postdoc in 2003. He then joined the Faculty of Animal Sciences and Faculty of Fisheries in Vietnam, under-supported by FAO, WB/ACP, ADB, ACIAR, JEBIC, and other funds; He led many groups and projects for International and national forums. He has published over 50 research articles in WoS/Scopus indexing and 70 research articles in national journals belonging to National science and technology. He has 4 GenBank notations (2019 –2022) and 9 patents (2009 – 2021).



Kieu Thi Huyen^{1*}, Dang Thanh Long², Nguyen Quang Linh³

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Application of high-performance liquid chromatography technology to determine some biological components in natural Eel collection in Thua Thien Hue, Vietnam

A species of catfish belonging to the *Anguilla* genus called *Anguilla marmorata* has long been exploited and grown in Vietnam. Marbled eels are regarded as a specialty seafood species with several therapeutic and nutritive benefits. In this study, we used High-Performance Liquid Chromatography (HPLC) to identify various biochemical and nutritional ingredients in *A. marmorata* collected in its natural habitat. According to the research results, 16 different amino acids were analyzed in meat of marbled eels at the rates of 14.01% (w/w). Glutamic acid has the highest percentage with 2.34%. Twenty-four different types of fatty acids were found with proportions of 11.93 g/100g. Six different vitamins (A, D3, E, C, B3, B5) are found in the meat of the eel. Vitamin K1 was not detected in *A. marmorata*. Using HPLC analyzes has shown remarkable effectiveness in micronutrient analysis in nutritional research. The results will increase our knowledge of the nutritive benefits makeup of the *A. marmorata*.

Key words: HPLC, marbled eel, Amino acids, Fatty acid, Vitamins, Thua Thien Hue.

Biography

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Prevalence and molecular characterization of novel DHPV in Korean shrimp farms

A Decapod hepanadensovirus 1 (Decapod hepanhamaparvovirus 1, DHPV) is a viral pathogen causing growth retardation and decreased feed conversion efficiency in penaeid shrimp. The virus exhibits high genetic variation between different hosts and geographical locations. Primarily, it has been reported in cultured *Penaeus monodon*, *P. chinensis*, and *P. merguensis*. Recently, a new type of DHPV has been identified in *P. vannamei* cultured in Korea and Taiwan. This study reports the result of DHPV screening test in shrimp farms and the genome of this new type of DHPV. This study is the first to report the complete genomic sequence of DHPV identified in *P. vannamei*. To screen for DHPV, 113 specimens of cultured shrimp were collected from 14 shrimp farms in Korea. Among the collected shrimp samples, DHPV was detected in 98 samples (86.7%) from all 14 shrimp farms. The full genome was successfully amplified using a combination of conventional Sanger sequencing and next-generation sequencing approach. The newly identified DHPV in *P. vannamei* contained a linear, single-stranded DNA genome of 6,173 bp comprising three major open reading frames, similar to other types of DHPVs that infect several shrimp species other than *P. vannamei*. However, detailed comparative genome and phylogenetic analysis revealed that the virus did not cluster with the pre-existing genotypes, suggesting the emergence of a novel genotype of DHPV in cultured shrimps. The high prevalence of DHPV in the sampled shrimp farms highlights the need for efficient management strategies to control the spread of the virus in aquaculture farms. The emergence of a new genotype of DHPV in *P. vannamei* poses a significant threat to the shrimp aquaculture industry, as it may exhibit different virulence and pathogenicity characteristics. The complete genomic sequence of the newly identified DHPV provides a basis for further research on the virus's biology, pathogenicity, and epidemiology. In conclusion, this study presents significant insights into the genetic diversity of DHPV in *P. vannamei* and emphasizes the need for continued monitoring and management strategies to control the spread of the virus in shrimp aquaculture.

Audience Take Away Notes

- Understand the genetic diversity of DHPV in different shrimp species and implement effective management strategies to prevent and control DHPV infection in shrimp aquaculture
- The high prevalence of DHPV in cultured shrimp highlights the need for continued monitoring of DHPV
- The complete genomic sequence of the newly identified DHPV, which sheds light on the virus's biology, pathogenicity, and epidemiology and expand research on DHPV and its impact

Biography

Mr. Kim studied Veterinary medicine at Kyungpook National University, Korea, in 2022, and is currently on a combined MS/Ph.D. course at the same institution. He is conducting research regarding major aquatic disease monitoring and genomic sequence analysis. He has published 5 research articles in SCI/E journals. Dr. Han studied Veterinary medicine at Kyungpook National University, Korea, and received her Ph.D. degree in Aquatic animal medicine in 2013 at Seoul National University. After one-year postdoctoral fellowship at Medical College of Georgia, Augusta, GA, USA, and three years of research associated at the OIE Reference Laboratory for Crustacean Diseases at University of Arizona, USA. And she obtained the position of an Assistant Professor at the Kyungpook National University. She has published over 50 research articles in SCI (E) journals



Nguyen Thi Tinh, Nguyen Le Hoang Loan, Tran Nguyen Ngoc, Ho Thi Thu Hoai*

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Thalassiosira subitis was isolated from Tam Giang Lagoon, Vietnam as a feed for the rotifer *Branchionus plicatilis*

A microalgae strain of *Thalassiosira subtilis* was isolated from Tam Giang Lagoon in Thua Thien Hue, Vietnam, using a single-cell micropipette technique in F2 medium. Microalgae and rotifers of medium size (*Branchionus plicatilis*) were cultured in the plastic cans with 12-h light/12-h dark and air bubbling. To test the effect of salinity and light intensity on the growth of *Thalassiosira subtilis*, the salinity was tested at three levels: 25, 30 and 35‰. A total of three distinct light intensities were tested, including 2510 lux, 2733 lux, and 3450 lux. After 14 days of culture, the microalgae reached its highest concentration at 25‰ of salinity, with a growth rate of 0.43 and a maximum density of 301×10^6 cell.mL⁻¹. Our data indicate that microalgae were efficient at high light intensities of 2733 lux. In addition, the rotifer shown consumes *Thalassiosira subtilis* better than yeast feeding. This indicates that the local microalgae *Thalassiosira subtilis* is a high-potential candidate for rotifer feed.

Keywords: Microalgae, *Thalassiosira subtilis*, *Branchionus plicatilis*, Rotifer, Feed, Salinity, Light intensity.

Audience Take Away Notes

- This presentation provides information on live food for aquaculture. The study focused on microalgae as a rotifer feed
- The primary data in this research can open up further research into improving and diversifying the feed sources for aquatic animal

Biography

Dr. Ho Thi Thu Hoai studied Master in Biology at Hue University of science in 2008. She graduated of Ph.D. at Institute of Plant Biology and Biotechnology University of Muenster Germany in 2022. She has worked at Hue University since 2010 as a lecturer on aquatic plants and aquatic toxicology. Furthermore, her studies was interesting on live food, photosynthesis in microalgae, harmful algae blooms and waste water treatment based on aquatic plants as the researcher's position. She published 4 research articles in WoS/Scopus and 7 research articles in national journals.



Hye Jin Jeon*, Jee Eun Han

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Evaluation of *Bacillus* strains as an alternative to antibiotics against vibrio strains and vibrio-associated Acute Hepatopancreatic Necrosis Disease (AHPND) in *penaeus vannamei*

Acute HepatoPancreatic Necrosis Disease (AHPND) is a bacterial disease caused by *Vibrio* spp. carrying toxin genes (*pirA* and *pirB*) located in a large plasmid (69 kb). The disease is responsible for causing 100% mortality in shrimp farms within a few days. Previously, *Vibrio parahaemolyticus* (*V. parahaemolyticus*) was believed to be the primary causative agent of AHPND, however, it has been reported that various *Vibrio* strains, including *V. campbellii*, *V. owensii*, and *V. harveyi*, are identified as pathogens associated with AHPND. Antibiotics have been extensively used to treat bacterial diseases in aquaculture for a long time, however, the excessive use of antibiotics and their wrong utilization such as misuse or overuse has led to antibiotic resistance, making the use of antibiotics less effective in treating bacterial infections. Therefore, there is a need for alternative treatments, such as probiotics, to control bacterial infections, particularly those caused by pathogenic *Vibrio* and AHPND. This study aims to evaluate of the antimicrobial activity of five *Bacillus* strains (B1, B3, B5, B7, and B8) isolated from seawater in Jeju, Korea, against 12 *Vibrio* strains including 10 AHPND strains and 2 non-AHPND strains. The dot-spot method was used to evaluate the inhibitory effects of *Bacillus* strains on *Vibrio* strains. All tested *Bacillus* strains inhibited the growth of at least one *Vibrio* strains. Among tested *Bacillus* strains, B1 and B3 were the most effective against the tested *Vibrio* strains, particularly against AHPND-causing *V. campbellii* (VcAHPND), and were used in a further shrimp challenge test. After immersing shrimp in VcAHPND for 48-60 h, a significantly higher survival rate was observed in the B1- treated group (100%) compared to non-*Bacillus*-treated group (64.3%). Quantitative PCR analysis of AHPND revealed that the cycle threshold values were 31.63 ± 0.2 (B1-treated group) and 38.04 ± 0.58 (B3-treated group), compared to 28.70 ± 0.42 in the non-*Bacillus*-treated group. Genome sequencing and phylogenetic analysis revealed that B1 and B3 were classified as *B. velezensis*. The 16S rRNA sequences and complete genome sequences of B1 and B3 were deposited in GenBank. In conclusion, this study suggests that *Bacillus* strains, particularly B1 and B3, could be used as an effective alternative to antibiotics for controlling *Vibrio* infections and AHPND in shrimp aquaculture. The use of probiotics in aquaculture is an eco-friendly approach that does not harm the environment or have any adverse effects on human health. Further studies are warranted to investigate the mechanisms underlying the inhibitory effects of *Bacillus* strains on *Vibrio* strains and their potential use in other aquatic organism species.

Audience Take Away Notes

- The positive effect of probiotics (*Bacillus* strains) for controlling AHPND in aquaculture
- Moreover, probiotics (*Bacillus* strains) expected to be effective in controlling *Vibrio* infections caused by various strains of *Vibrio* in aquaculture
- The use of probiotics (*Bacillus* strains) can reduce the use of antibiotics, thereby preventing drug residues and the development of antibiotic resistance

Biography

Miss Jeon graduated Veterinary Medicine, Kyungpook National University, Daegu, Korea, as MS in 2022. She then after that, she is currently advancing to the same graduate school as a Ph.D. student. She is conducting major disease monitoring and diagnostic method development research in farmed shrimp. She has published 10 research articles in SCI (E) journals. Dr. Han studied Veterinary medicine at Kyungpook National University, Korea and received her PhD degree in Aquatic animal medicine in 2013 at Seoul National University. After one-year postdoctoral fellowship at Medical College of Georgia, Augusta, GA, USA, and three years research associated at OIE Reference Laboratory for Crustacean Diseases at University of Arizona, USA. And she obtained the position of an Assistant Professor at the Kyungpook National University. She has published over 80 research articles in SCI (E) journals.



Nguyen Ngoc Phuoc^{1*}, Phan Cong Hoang², Do Viet Phuong², Tran Vinh Phuong^{1,3}, Nguyen Thi Xuan Hong¹, Nguyen Thi Hue Linh¹, Nguyen Quang Linh¹

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Efficacy of quorum quenching on the prevention of Acute Hepatopancreatic Necrosis Disease (AHPND) in white leg shrimp

Aquaculture is an important food producing sector to fulfill nutritional food demand of a continuously growing population, accounted for 46 percent of the total production and 52 percent of fish for human consumption (FAO, 2020). However, disease outbreaks especially Acute Hepato-pancreatic Necrosis Diseases (AHPND) causing by *Vibrio parahaemolyticus* is now considered to be the limiting factor in the shrimp culture subsector. Due to the widespread resistance and the current poor effect of antibiotics consumed to treat *V. parahaemolyticus* infections, finding some novel alternative therapeutic methods are necessary for the treatment of infections. Bacterial communication through signaling molecules known as “Quorum Sensing” (QS) has gained a lot of attention due to its applicability in different fields of study. Quorum Sensing Inhibitors (QSIs) or Quorum Quenchings (QQs) are now considered as potential therapeutic alternatives and/or adjuvants to the current failing antibiotics. The aims of this study were assessing the efficacy of QQ product on the prevention of AHPND in white leg shrimp. In this study, the effect of QQ on the outcome of experimental challenge of white leg shrimp with *V. parahaemolyticus*, shrimp were held at a stocking density of 30 shrimp per tank for 2 days before challenge. Challenges were conducted with 8 treatments in triplicate (three tanks per treatment) at day 2 by immersion with 10L of the LD50 for 30 min. Shrimp were fed with a commercial diet (N1, CP, Vietnam) with or without addition of (0.5 or 1%) QQ for 8 days. This study showed that QQ increased the THC, phagocyte, phenoloxidase and Lysozyme activity in shrimp. The addition of 0.5 or 1% QQ in the feed can reduce the mortality of white shrimp when infected with *V. parahaemolyticus*. These results showed that QQ (in both 0.5 and 1% QQ addition) was beneficial for white shrimp in terms of resisting challenge by *Vibrio parahaemolyticus* and enhancing cellular and humoral immune responses.

Audience Take Away Notes

- Due to the widespread resistance and the current poor effect of antibiotics consumed to treat *V. parahaemolyticus* infections, this study provides the novel alternative therapeutic method which is necessary for the treatment of infections. Besides, this study provides the scientific information about the immune response and disease prevention of shrimp to the researchers and practical methods to the farmer in the bacterial disease prevention

Biography

After completing his MSc at Ghent University, Belgium in 2002 and PhD at Stirling University, Scotland in 2014, Dr. Nguyen Ngoc Phuoc has continued to develop his work in bacterial fish diseases to support sustainable aquaculture in Vietnam. His research focuses on aquatic microbiology and novel bacterial diseases within existing and emerging aquatic animal production systems. He has been PI or co-investigator on several GCRF-funded projects (e.g. Of Fish and Men – Public Health Risks Posed by GBS in Aquaculture in Southeast Asia; Proving the feasibility of field-enabled pathogen detection in fish farms in Vietnam). He obtained the position of an Associate Professor at the University of Agriculture and Forestry, Hue University, Vietnam. He has published more than 10 research articles in SCI (E) journals.)

**Charles Pan**

Shark Bay Aquaculture Pty Ltd, Australia

World heritage oysters – A cultural story from regional Australia

Shark Bay, Western Australia is one of the World's most biodiverse regions and it is one of the few places in the World that have met all four natural criteria for World Heritage listing. This pristine natural environment is located approximately 800km north of Perth, the capital city of Western Australia. The project site consists of a 400ha Aquaculture Site and approximately 544ha (1345 acres) of Freehold Land, with around 4.5km of ocean frontage. Two species of Rock Oysters are currently farmed – *Saccostrea cucullata* (Tropical Rock Oyster) and *Saccostrea glomerata* (Sydney Rock Oyster). The oyster spats are obtained from Albany Shellfish Hatchery, located alongside the cool waters of the Southern Ocean, on the remote southern coast of Western Australia, and are translocated to the project site by air and road. Longlines are used with Oyster Baskets in an intertidal setup. Various density trials have been conducted to determine ideal stocking densities. This aquaculture project is unique because it uses timeless cultural values to create a modern story for Regional Australia. It brings together land and sea with an innovative interpretation of culture and marine science to enable the story of the World Heritage Oyster to evolve and succeed. The entire project is the catalyst for a uniquely produced, and located, Rock Oyster industry in Western Australia.

Audience Take Away Notes

- A brief overview of Rock Oyster farming in a World Heritage Area
- How cultural values can help craft a story for future generations
- Why it is important to teach young people to look after the land and sea

Biography

Mr Charles Pan has a background in Electrical and Electronic Engineering, and is the Founder of Shark Bay Aquaculture Pty Ltd. He is one of the pioneers of Rock Oyster Aquaculture in Western Australia and owns and operates one of the most significant Rock Oyster Aquaculture projects in Western Australia. Charles also has an interest in aviation, is a commercial drone operator and holds a Private Pilot License from CASA in Australia.

24-25^{MAY}

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Chatsirin Nakharuthai*, Surintorn Boonanuntanasarn

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Production of recombinant *Bacillus subtilis* expressing L-gulonolactone oxidase and its efficacy on innate immune responses in Nile tilapia

In recent years, various probiotic strains have been applied in the aquaculture industry as acceptable strategies for prevention and treatment of aquatic animal diseases. However, conventional probiotic applications have limitations. Therefore, in this study, the recombinant probiotic *B. subtilis* expressing L-gulonolactone oxidase was constructed to provide a promising approach to stimulate an immune response in Nile tilapia. Three experimental diets, including 1.) Basal diet as a control, 2.) Basal diet supplemented with native *B. subtilis* and 3.) basal diet supplemented with recombinant *B. subtilis* expressing L-gulonolactone oxidase were fed to Nile tilapia for 30 days, and its efficacy on innate immune responses were evaluated. The results showed that total immunoglobulin and alternative complement 50 activity (ACH50) of fish fed with diets supplemented with native *B. subtilis* and recombinant *B. subtilis* expressing L-gulonolactone oxidase were significantly higher than those of the control ($P < 0.05$) but had no significant effects on lysozyme activity. Therefore, our results suggest that feed supplemented with *B. subtilis* and recombinant *B. subtilis* expressing L-gulonolactone oxidase could promote health in Nile tilapia. Further study should be explored their probiotic effects under pathogen challenge conditions.

Audience Take Away Notes

- This research will provide a perspective on the future potential of these technologies. These expected outcomes can apply to other animals that confront a problem of vitamin c deficiency

Biography

Chatsirin Nakharuthai is from Suranaree University of Technology, Thailand.



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Effect of preservation method and disinfectants on the hatching of freshwater rotifer resting eggs *Brachionus calyciflorus*

With the development of larval-rearing technology for freshwater fishes, the demand for rotifers is increasing. The use of resting eggs is also highly recommended to prevent pathogen contamination from live feed routes, as well as to significantly reduce labor costs and algae production costs for scaling up farming. Two experiments were carried out to determine the quantitative effect of preservation methods and disinfectants on the hatching rate of freshwater rotifer resting egg *Brachionus calyciflorus*. The first experiment examined the effect of storage methods on the hatching rates of resting eggs. After 120 days of storage, resting eggs preserved by dry, cold and dark methods have hatching rates ranging from 6.76% to 22.15%; resting eggs held by wet, cold, and dark methods had higher hatching rates from 25.28% to 46.4%. The second experiment examined the effect of preservatives on the hatching rate of resting eggs in combination with wet, cold and dark methods. For the antibiotic Doxycycline (20µg/ml), the hatching rate was $31.87 \pm 5.27\%$. When disinfecting with Anolyte (10%; 20%; 30%; 50%; 100%), the hatching rate of rotifer resting eggs was 12.38%; 17.95%; 4.71%; 2.36%; 0%, respectively. At the concentrations of Nanosilver 1, 2, 3, and 4ppm, the hatching rate was 30.5%, 23.6%, 27.47% and 17.64%, respectively. In conclusion, preserving freshwater rotifer eggs *Brachionus calyciflorus* is done by wet, cold, and dark methods. It can use disinfectants Doxycycline (20µg/ml) or Nanosilver with a concentration of 1 ppm to 3 ppm to disinfect resting eggs before incubation effectively increasing the hatching rate of resting eggs.

Audience Take Away Notes

- This study provides some additional information on preservation methods and the selection of suitable disinfectants to increase the hatching rate of freshwater rotifer resting eggs *Brachionus calyciflorus*
- The present research of this study can assist in cultivating freshwater rotifers for application in the hatchery of freshwater aquatic species
- In Vietnam, there are not many studies on freshwater rotifers *Brachionus calyciflorus*; this is also a research direction that can be exploited in the future

Biography

I graduated with a bachelor's degree in Aquaculture at the Vietnam National University of Agriculture in 2021. After that, I worked at the Genome Research Institute, Vietnam Academy of Science and Technology.



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³PhD student in Hue University

The possible agents causing a low survival rate of the marine rabbitfish larvae in artificial reproduction

Rabbitfish is a tropical marine species in Vietnam, known as the specific species in Tam Giang Cau Hai lagoons. In hatcheries, the survival rate of this species is relatively low, especially from day 8 to day 15 after hatching. Several possible reasons that caused the dramatic decrease in the survival rate of rabbitfish (*Siganus guttatus*) larvae even the fish already changing successfully from endogenous to exogenous feeders on days 3 and 4 are malformations, lacking digestive enzymes for exogenous feed and infection of agents like *Vibrio* and *Aeromonas*. By analyzing the Chitinase enzyme activity and other enzymes: Cellulose β -glucanase, xylanase and phytase, protease and lipase are all insufficient in the intestine of *S. guttatus* larvae, we accidentally found the genome of the *Aeromonas* bacteria which is known as freshwater pathogens in freshwater fishes. The 16S rRNA gene was operated for studying taxonomic and phylogenetic relationships at the species level. The first finding of *Aeromonas* from the intestinal microflora of *S. guttatus* at length 22 – 23 mm and weight 144 – 170 mg poses a particular problem how a freshwater *Aeromonas* presented in the gut of a marine species, what role of *Aeromonas* might have related to the interaction with other intestinal microorganisms and the low survival rate of *S. guttatus* in artificial reproduction that will be interested by the audience and marine scientists.

Audience Take Away Notes

- The scientists could be interested in opening up a new research direction on freshwater pathogenesis in marine species
- The audience could investigate the present of *Aeromonas* in marine species and the impact of this microorganism to fishes
- Further studies could investigate the survival rate of fish larvae and juveniles related to the *Aeromonas* pathogenesis and how to increase the survival rate in artificial reproduction

Biography

Ngo Thi Huong Giang is from University of Agriculture, Hue University, Vietnam.



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Antibiotic resistance of *Vibrio parahaemolyticus* isolated from cultured groupers (*Epinephelus* spp) in Phu Yen, Vietnam

Phu Yen is a coastal province in the region Central, Vietnam, where there are marine fish farming cages and ponds are quite developed. Here, grouper (*Epinephelus* spp) is one of the subject of rearing. However, the disease and its harmful effects are still a big obstacle to raising this animal locally scattered or mass deaths often occur and cause damage to farmers. *Vibrio parahaemolyticus* is a major cause of foodborne infections and is responsible for significant losses in marine aquaculture in worldwide. However, the prevalence and antibiotic resistance of *V. parahaemolyticus* in cultured groupers in Vietnam are still poorly understood. In the present study, 23 *V. parahaemolyticus* isolates were recovered from 102 samples from 10 ship farms in Phu Yen province. Most of isolates exhibited resistance to tetracycline (95.65%), erythromycin (91.3%), ampicillin (78.26%) and amoxicillin (65.23%). Conversely, enrofloxacin, ofloxacin and chloramphenicol were the most effective drugs for the treatment of *V. parahaemolyticus* with more than 90% efficiency. These results indicate the need for prudent use of antibiotics on fish farm in Vietnam and to develop effective treatment strategies for *V. parahaemolyticus* including vaccine development based on virulence genes in the near future.

Keywords: *Vibrio parahaemolyticus*, Antibiotic resistance, Cultured grouper, Phu Yen.

Biography

Dr. Nguyen Thi Kim Cuc studied Biotechnology at Thai Nguyen University, Vietnam. She got a Master of Science in molecular biology at Kyonggi University, South Korea in 2010, and she received her PhD degree in 2016 at the Chonnam National University, South Korea. She has worked intensively on various models including mouse and rat. She has had experience working at vaccine development and cancer drug. In recent 5 years, she has interested in probiotics and fish vaccine.



Pham Thi Hai Yen*, Nguyen Duy Quynh Tram, Nguyen Quang Linh

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Isolation and determination of *Vibrio* spp. pathogen from *Sciaenops ocellatus* suffering from hemorrhagic disease under cage culture in Vietnam

This study was carried out to isolate and determine the *Vibrio* spp. from the Red drum fish (*Sciaenops ocellatus*) suffering from hemorrhagic disease in Vietnam. In this study, 18 strains of *Vibrio* bacteria were identified from 27 samples of Red drum fish. The isolate bacterial strains were identified with the 16S rRNA sequencing method and checked for morphological, physiological, and biochemical characteristics by using the API 20E KIT. Result of the study revealed the presence of twelve strains of *V. alginolyticus*, three strains of *V. fluvialis*, and three strains of *V. orientalis*. All *Vibrio* strains have gene similarities with those on the genbank ranging from 98.05 to 100%. The biochemical characteristics of these 18 isolates were similar and these are susceptible to tetracycline and doxycycline and entirely resistant to ampicillin, amoxicillin, and erythromycin.

Audience Take Away Notes

- The audience will know the method of isolating and identifying strains of *Vibrio* spp. causing hemorrhagic disease in Red drum (*Sciaenops ocellatus*) using PCR and biochemical characteristics by using the API 20E KIT
- The results of the study are of reference value, a premise for further studies related to *Vibrio* disease on marine fish in general and Red drum in particular

Biography

I studied Aquaculture at University of Agriculture and Forestry, Hue University, Vietnam and graduated as Bachelor in 2010 and MS in 2012. I then joined the research group of prof Linh at Hue University to research about common aquaculture and fish disease. I have just defended my thesis in Aquaculture in September, 2022 at Hue University under supported by Prof Linh and Prof Tram. They are my advisors. I have published more than 10 papers, in which two research articles in Scopus/WoS journals and 8 in domestic journal.



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Antibacterial effect of wedelia grass extract (*wedelia chinensis*) toward *Vibrio parahaemolyticus* isolated from infected white leg shrimp (*Litopenaeus vannamei*) of acute hepatopancreas necrosis disease

This study aims to investigate the antibacterial effect of *Wedelia* grass (*Wedelia chinensis*) extract on *Vibrio parahaemolyticus* isolated from infected white-leg shrimp. The extracts of this herb were prepared in distilled water, ethanol 96% or methanol 99.8%, which were subsequently subjected to heat treatment and vacuum evaporation to remove the solvents. The diffusion method on agar was applied for the antimicrobial activity of *Wedelia* grass extract against *V. parahaemolyticus*. The diameters of the antibacterial zone of *wedelia* grass extract in the distilled water, ethanol 96% and methanol 99.8 % were 12.1mm, 11.7mm, and 14.7mm, respectively. The Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC) results of the *wedelia* grass extract in methanol 99.8% exhibited the most potent antibacterial activity against *V. parahaemolyticus* at 15.5 mg/mL and 31.25 mg/mL, respectively. *Wedelia* grass extract in methanol 99.8% was non-toxic and non-lethal when feeding shrimps at the dose of MBC (31, 25 mg/mL). This study demonstrates the potential of using the extraction of *wedelia* grass in the prevention and treatment of *V. parahaemolyticus* infection in shrimp.

Keywords: White leg shrimp, *Wedelia* grass extract, Antimicrobiology, Inhibitory concentration, and Safety.

Audience Take Away Notes

- Provide practical solution of using herbs (*Wedelia* grass extract) in the prevention and treatment of AHPND in white leg shrimp for the farmers to reduce the risk of this disease in shrimp farming
- Provide scientific information for other researchers to study the safe solution for the prevention and treatment of bacterial diseases in an aquatic animal to reduce the using antibiotics in aquaculture

Biography

Tran Nguyen Ngoc obtained Bachelor's in Aquaculture in 2010 and a Master's in Aquaculture in 2012 at the University of Agriculture and Forestry, Hue University. Since 2013, he has been appointed as a lecturer at the Faculty of Fishery, University of Agriculture and Forestry. He is giving a lecture on Fish Physiology to a second-year student of Aquaculture and Fish Pathology/Currently, and he is a first-year Ph.D. candidate in the Aquaculture program and studying the using herb in the prevention and treatment of bacterial diseases in shrimp.



Bumkeun Kim*, Jee Eun Han

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New qPCR method for identifying decapod hepandensovirus 1 in penaeus vannamei shrimp

Decapod hepandensovirus 1 (Decapod hepanhamaparvovirus 1, DHPV) is a viral pathogen that infects various captured or cultured penaeid shrimp species, causing digestive disruption by targeting the hepatopancreas of the host. Our recent study has detected DHPV in farmed *Penaeus vannamei*, a species widely cultivated in the shrimp aquaculture industry. Given the prevalence of DHPV in shrimp farms across different regions, it is crucial to develop effective diagnostic methods to identify and manage the virus. In this study, we present a diagnostic quantitative PCR (qPCR) method targeting DHPV in *P. vannamei*. The qPCR primers and TaqMan probe were designed from the partial DHPV sequence identified in Korea. To determine the qPCR's specificity, we performed a test with the DNAs of four major shrimp pathogens, including Infectious Hypodermal and Hematopoietic Necrosis Virus (IHHNV), White Spot Syndrome Virus (WSSV), Acute HepatoPancreatic Necrosis Disease (AHPND), and Enterocytozoon hepatopenaei (EHP). The result showed no cross-reaction of the primers with other shrimp pathogens or the host genome. The newly developed qPCR method was applied to various samples obtained from shrimp farms, including shrimp, water, feces, crab, and barnacle samples, as well as samples from laboratory bioassays the qPCR assay was able to detect DHPV from all of the shrimp farm samples, indicating its practical utility in identifying DHPV. The laboratory bioassay confirmed the possibility of horizontal transmission and showed that although the shrimp survived without notable gross signs, they continued to carry a significant amount of the virus, potentially acting as vectors that hinder growth rates and spread disease in long-term farming practices. In addition, qPCR was performed on four types of shrimp tissue sampled from six specific individual shrimps, including the hepatopancreas, gill, body muscle, and cuticle. The qPCR result showed that the hepatopancreas had the highest copy number among the four tissues, except for one shrimp. Thus, while the qPCR method can detect DHPV in any examined tissue, it is advisable to use hepatopancreas tissue for viral diagnosis due to its comparatively higher copy number and the virus's known tendency to infect the epithelial cells of the hepatopancreas. Overall, the development of the DHPV qPCR assay is a crucial step toward implementing appropriate measures to prevent the spread of DHPV in the aquaculture industry. This assay can be used to screen shrimp populations for DHPV infection, allowing for early detection and the application of quarantine protocols to prevent further spread within and between shrimp farms. However, to protect the sustainability of the aquaculture industry, further research is needed to fully understand the potential implications of DHPV spread and to continue to develop effective DHPV control and prevention measures.

Audience Take Away Notes

- Use of developed qPCR assay to screen shrimp populations for DHPV infection, allowing for early detection and the application of quarantine protocols to prevent further spread within and between shrimp farms
- Understand the potential implications of DHPV spread in the shrimp farming industry and develop effective control and prevention measures

- As a case study, teach students about virus detection, diagnosis, and prevention in aquatic animals.
- The development of effective control and prevention measures for DHPV and other viral pathogens can contribute to global efforts to ensure food security and public health

Biography

Mr. Kim studied Veterinary medicine at Kyungpook National University, Korea, in 2022, and is currently on a combined MS/Ph.D. course at the same institution. He is conducting research regarding major aquatic disease monitoring and genomic sequence analysis. He has published 5 research articles in SCI/E journals. Dr. Han studied Veterinary medicine at Kyungpook National University, Korea, and received her Ph.D. degree in Aquatic animal medicine in 2013 at Seoul National University. After one-year postdoctoral fellowship at Medical College of Georgia, Augusta, GA, USA, and three years of research associated at the OIE Reference Laboratory for Crustacean Diseases at University of Arizona, USA. And she obtained the position of an Assistant Professor at the Kyungpook National University. She has published over 50 research articles in SCI (E) journals.



Hye Jin Jeon*, Jee Eun Han

Laboratory of Aquatic Biomedicine, College of Veterinary Medicine, Kyungpook National University, Daegu 41566, Korea

Evaluation of microplastics (MP) as a risk factor for White Spot Syndrome Virus (WSSV) in white leg shrimp (*Penaeus vannamei*)

Plastic wastes have become a prominent environmental concern in recent years. Unfortunately, a substantial amount of plastic wastes are being discharged into the marine environments, eventually accumulating in aquatic organisms in the form of microplastics (MP). Existing studies have reported detrimental impacts associated with MP exposure to aquatic organisms, such as reduced feed intake, nutrition-related problems, and weakened immune system. White spot syndrome virus (WSSV) is a viral pathogen that poses a significant threat to shrimp, environmental stress factors, such as physical and chemical changes in water, can accelerate viral replication and thus increase infection. This study was conducted under the assumption that MP could be a risk factor for infectious diseases. To investigate the potential role of MP as a risk factor, an experiment was conducted using shrimp as a model organism. Thirty-two experimental shrimp with an average weight of 1.5 ± 0.05 g were divided into four groups, each with duplicates. The first group (group 1) was not exposed to either WSSV or MP. The second group (group 2) was exposed solely to MP. The third group (group 3) was exposed only to WSSV, and the fourth group (group 4) was exposed to both WSSV and MP. Group 1 and group 2 were fed specific pathogen-free (SPF) shrimp tissue once, whereas group 3 and group 4 were fed WSSV stock once to induce WSSV infection. Following this, group 1 and group 3 were injected with 50 μ L of 1X PBS, both orally and anally, whereas group 2 and group 4 were injected with 50 μ L of MP, both orally and anally, for MP exposure. The result showed that group 4 (exposed to both WSSV and MP) experienced mortality within 24 hours of MP exposure, with a 50% accumulative mortality rate at the experience termination day. In contrast, no mortality was observed in group 1, 2, and 3. Histological examination showed that shrimp in group 2, exposed solely to MP, showed collapsed tubule structures, and loss of B-cells (large vacuole in tubule) in hepatopancreas. Additionally, many nuclei showing abnormal shape and slight lysis were observed in muscle fibers. Group 3, exposed only to WSSV, exhibited basophilic inclusion body in hepatopancreas epithelial and gill tissue, along with many abnormally shaped nuclei in muscle fibers. Group 4, exposed to both WSSV and MP, showed basophilic inclusion body and separation of basement membrane in hepatopancreas, along with numerous basophilic inclusion bodies in gill tissue. Also, many abnormal shaped nuclei along with infiltrated and dissolved muscle fibers were observed. In conclusion, this study highlights the increased risk of disease infection that may result from exposure to MPs in shrimp. Furthermore, it suggests that this elevated risk could cause significant economic losses in the aquaculture industry.

Audience Take Away Notes

- It can be helpful for research on the correlation between microplastics exposure and diseases in shrimp
- It warns that exposure to microplastics can potentially harm aquatic organisms

Biography

Miss Jeon graduated Veterinary Medicine, Kyungpook National University, and Daegu, Korea, as MS in 2022. She then after that, she is currently advancing to the same graduate school as a Ph.D. student. She is conducting major disease monitoring and diagnostic method development research in farmed shrimp. She has published 10 research articles in SCI (E) journals. Dr. Han studied Veterinary medicine at Kyungpook National University, Korea and received her PhD degree in Aquatic animal medicine in 2013 at Seoul National University. After one-year postdoctoral fellowship at Medical College of Georgia, Augusta, GA, USA, and three years research associated at OIE Reference Laboratory for Crustacean Diseases at University of Arizona, USA. And she obtained the position of an Assistant Professor at the Kyungpook National University. She has published over 80 research articles in SCI (E) journals.



Jee Eun Han

Laboratory of Aquatic Biomedicine, College of Veterinary Medicine, Kyungpook National University, Daegu 41566, Korea

First report of detection and confirmed infectivity of White Spot Syndrome Virus (WSSV) in crayfish imported to Korea

White spot syndrome virus (WSSV) is a highly virulent virus affects crustaceans, causing up to severe mortality within 3–10 days of symptom onset, resulting a substantial losses in the global shrimp industry. Recently, WSSV was detected in imported whiteleg shrimp (*Penaeus vannamei*) from Vietnam to Korea, highlighting the need for strict monitoring of imported crustaceans. This study aims to detect the presence of WSSV in the freshwater crayfish imported to Korea, and assess it's the potential infectivity. The samples are two species of crayfish, *Cherax quadricarinatus* (total samples of 320 in eight batches) imported from Indonesia and *Procambarus clarkii* (total samples of 40 in two batches) imported from China, obtained from fishery markets in Korea. Five representative samples per batch ($N = 50$) were screened for WSSV using PCR assay. The virus was detected in five *C. quadricarinatus* samples and one *P. clarkii* sample. Among the WSSV-positive samples, the highest virus titer (corresponding to the load of 4.93×10^5 – 8.36×10^6 copies/ μL) was detected in the *P. clarkii* samples, while *C. quadricarinatus* samples showed a comparatively lower titer (corresponding to the load of 5.94×10^1 – 3.86×10^5 copies/ μL). The virus infectivity test was conducted by feeding feeding WSSV-positive crayfish tissue (3.46×10^7 WSSV copies/ μL) to *P. vannamei* ($N = 42$) at 5% shrimp biomass. The test confirmed WSSV infection in the shrimp, indicating that the virus-infected frozen crayfish could serve as a potential transmission source of viral disease. This is the first report of confirmed infectivity of WSSV from the crayfish imported into Korea, highlighting the importance of accurate and strict monitoring of crustacean viruses in imported crustaceans from foreign countries. In conclusion, the detection of WSSV in crayfish imported to Korea and its infectivity in shrimp emphasizes the need for strict monitoring of imported crustaceans to prevent the spread of viral diseases in aquaculture. This study provides valuable information to policymakers, importers, and regulators in the shrimp industry, enabling them to make informed decisions regarding the importation and management of crustaceans. The findings of this research can also serve as a foundation for further studies on WSSV infectivity and management strategies in crustaceans.

Audience Take Away Notes

- The potential threat of White Spot Syndrome Virus (WSSV) in crustaceans, especially in the shrimp industry, and the importance of strict monitoring of imported crustaceans
- Potential transmission source of viral disease in Korean shrimp aquaculture through virus- infected frozen crayfish, and the need for accurate and strict monitoring of crustacean viruses for imported crustaceans from foreign countries

Biography

Dr. Han studied Veterinary medicine at Kyungpook National University, Korea and received her PhD degree in Aquatic animal medicine in 2013 at Seoul National University. After one-year postdoctoral fellowship at Medical College of Georgia, Augusta, GA, USA, and three years research associated at OIE Reference Laboratory for Crustacean Diseases at University of Arizona, USA. And she obtained the position of an Assistant Professor at the Kyungpook National University. She has published over 80 research articles in SCI (E) journals.



Tran Vinh Phuong^{1,3} Hoang Tan Quan², Nguyen Quang Hoang Vu², Nguyen Xuan Huy¹, Nguyen Ngoc Phuoc^{3*}, Nguyen Quang Linh^{3*}

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³University of Agriculture and Forestry, Hue University, 102 Phung Hung St., Hue, Thua Thien Hue, Vietnam

Cloning and expression of the LvCTL4 encoding gene c-type lectin from white leg shrimp (*litopenaeus vannamei*)

WC-Type Lectins (CTLs) is a protein superfamily of glycan binding receptors, they have play important role in the host defense against pathogens and the maintenance of immune homeostasis of crustacea and higher animals even to against bacterial infection by serving as pattern recognition receptors. Especially, shrimp which is species with only innate immunity, no specific immunity. So, CTLs as a complement protein to increase phagocytosis. This study aimed to cloning and expression of LvCTL4 encoding gene from white leg shrimp (*Litopenaeus vannamei*) in *Escherichia coli*. The result showed that LvCTL4 gene had 417 nucleotides in length, the rate of 99,52 % similar to the published LvCTL4 gene (with code KM387560). The deduced polypeptide sequence has 138 amino acids, which is 100% similar to the reference sequence (AKA64754). Characterization of predicted LvCTL4 protein showed that they only have one domain (C-type lectin domain) from amino acid position 1 to 137 based on inferred sequence. Predicted LvCTL4 protein has a molecular 15.75 kDa in weight, point of Isoelectric was 4.58. The gene was cloned into the expression vector pET200 - TOPO. The resulting plasmid containing LvCTL4 was transformed into the bacterial strain *E. coli* BL21 (DE3) and successfully expression. Recombinant LvCTL4 will be agglutinate *Vibrio parahaemolyticus* bacterial causing Acute Hepatopancreatic Necrosis Disease (AHPND) in shrimp. In addition, the CTLs recombinant protein has the potential to be added to aquatic feeds to increase the innate immune response though immunity factor such as: PhenolOxidase (PO), phagocytic activity and Total Hemocyte Count (THC) and prevent and treat shrimp diseases in the future.

Audience Take Away Notes

- Audience can know about a C-type lectin (LvCTL4) information that isolated from white-leg shrimp, this sequencing had published in genbank
- This research that other faculty could use to expand their research or teaching because CTLs recombinant protein has the potential to be added to aquatic feeds to increase the innate immune response.
- This help the audience who have research in aquaculture to expand their research direction on recombinant protein production to prevent Acute hepatopancreatic necrosis disease in shrimp.

Biography

Mr Tran Vinh Phuong studied Aquaculture at University of Agriculture and Forestry, Hue University, Vietnam and graduated as Bachelor in 2008 and MS in 2012. Now I am studying PhD student in Aquaculture at the same University. Prof Nguyen Ngoc Phuoc who works at Hue University is my advisor. Beside that I still was supported by Prof Nguyen Quang Linh. I then joined the research group of Prof. Linh at the Hue University, Vietnam since 2012 to now for aquaculture project. I have published more than 15 research articles, in which only 6 international journals (3 papers (Scopus/WoS) and 3 other international journals) and domestic journal is remaining.

24-25 ^{MAY}

DAY 01
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Claire L. A. Dell^{1*}, Guilherme O. Longo², Deron E. Burkepile³

¹ Faculty of Sciences and Humanities, State University of New York, Incheon, South Korea

² Marine Ecology Laboratory, Department of Oceanography and Limnology, Universidade Federal do Rio Grande do Norte, Natal, Brazil Marine Science Institute

³ University of California, Santa Barbara, Santa Barbara, CA, United States

Assay methodology to determine key herbivores on coral reefs

Coral reefs have changed radically in the last few decades with reefs in the Caribbean now averaging 13% coral cover and 40% macroalgal cover (mostly Dictyota and Lobophora). So, the herbivore species that consume these algae are vital to promoting reef health. The role herbivorous fishes play in controlling macroalgae is often considered by managers and researchers at a guild or family level, but greater resolution is needed to understand the impact of herbivores more fully. Furthermore, the methodology used to determine key herbivores is often observational, whereby observers (often on SCUBA) follow individual fish and record the number of bites taken and which substrate they are removed from. While this methodology has merit, it does not distinguish between those fish consuming the algae and those consuming epiphytic growth, thus does not identify the species specifically consuming macroalgae. We performed feeding assays and behavioural observations of fish feeding to quantify the removal of the most common macroalgae by different herbivorous fish species. In total, we ran 34 h long trials using Dictyota and Lobophora across two sites and conducted over 34 h of observation of 105 fish from eight species in the Cayman Islands, Caribbean. We show that many nominal herbivores did not consume macroalgae but instead targeted the epibionts on macroalgae and other substrates. In fact, only three fish taxa consumed macroalgae as a significant proportion of their feeding: one species of surgeonfish (*Acanthurus coeruleus*), one species of parrotfish (*Sparisoma aurofrenatum*), and the third, the chubs (*Kyphosus* spp.), is a group of species which is not consistently considered as part of the herbivore community in the Caribbean. From our observations, an individual *A. coeruleus* can consume ~44 g of Dictyota per day, while *S. aurofrenatum* can consume ~50 g and *Kyphosus* spp. can consume ~100 g. These values are significantly more than all other herbivorous fish species and suggest these three taxa are key macroalgal consumers in the Caribbean. These results highlight that disentangling the role of individual herbivore species is necessary for critical species to be identified and protected. Furthermore, observational studies may miss the nuance of herbivore consumption, and feeding assays could be necessary to identify the species that consume macroalgae specifically. As reef conditions change, we need to re-evaluate the key functions and species to be more effective at protecting and managing these important ecosystems. With far higher macroalgal coverage than in the past, the few browsing species that remove macroalgae may be increasingly important in promoting reef health.

Audience Take Away Notes

- Herbivores perform a critical function on coral reefs by promoting conditions that support coral growth and reproduction
- Observational studies of herbivores are not suitable for distinguishing between the different feeding behaviours so can mis-identify the key herbivore species
- Here we introduce the methodologies we used to separate those species that consumer the macroalgae from those that consume the epiphytes growing on the surface of the macroalgae
- Species relatedness is not a proxy for ecological role! Species within a genus can perform

- vastly different functions
- As reef conditions change, the identity of 'key' herbivores on those reefs have also changed.
- We need species-level understanding of the different roles these species play if we are to give reefs the best chance of persisting under changing conditions.
- This talk will introduce the audience to the issues facing coral reefs and the role herbivorous fish play in giving reefs the best chance of persisting in the face of major global changes.
- Thus, this information will be useful to everyone who teaches or conducts research on global changes, human impacts, ecosystems and environmental problems, conservation, marine systems, field methodology, etcetera. Here we provide a practical solution to distinguishing between the different feeding behaviours of herbivores and for discerning the browsing species that consume macroalgae, rather than epibionts. The audience will be stimulated to consider assumptions that can result from taxonomic relatedness. This will improve the accuracy of identifying the functional role of coral reef species and aid the effective management of these threatened ecosystems.

Biography

Dr. Dell graduated with an M.S in Aquatic Bioscience from Glasgow University and then a PhD in Marine Ecology from Georgia Institute of Technology (USA) under the guidance of Prof. Mark Hay. Her dissertation focused on the adaptations that allow some species to survive in degraded reef habitats on Fiji's coral reefs when so many species are unable to. After completing her PhD, Dr. Dell joined the research group of Professor Deron Burkepile at the University of California, Santa Barbara. During this time, she worked in the Cayman Islands conducting research on the ecological links and species that should be managed locally so that the reefs are best able to withstand global stressors. Dr. Dell now teaches biology at the State University of New York, Asia campus.

**Rosa Merino**

Aquaculture Unit, HIPRA, Amer, Spain

The need for autogenous vaccines in aquaculture

Given the growth of aquaculture, the risk of AMR during fish farm production is becoming increasingly important from the 'One Health' perspective. However, only a limited number of commercially licensed vaccines are available, mainly for the salmon industry, posing not only a threat to lower-valued fish farmed species, but also to human health, as antibiotic treatments are needed to combat new emerging bacterial pathologies. Together with other prophylactic measures, autogenous vaccines represent a flexible and cost-effective solution against bacterial pathologies in terms of fish and human welfare.

Audience Take Away Notes

- Antibiotics have a negative impact on fish health, therefore on overall farm production
- Learn from our global experience and perspective

Biography

Rosa Merino is a biologist with more than 13 years experience in the aquaculture sector. For a period of 7 years she ran a small lab near Glasgow, Scotland, specialising in salmon readiness analyses for sea water transfer and salmonid pathogen identification, always with one foot in the lab and another in the field. In 2017 she joined HIPRA, a top pharmaceutical company, as part of its Aquaculture Unit. As Global Technical Manager she has gained a broad perspective and field experience, visiting farms around the world, understanding and dealing with the idiosyncrasies of several farmed fish species.



T.V. Anna Mercy^{1*}, Eapen Jacob², Raju K Thomas³

¹Kerala University of Fisheries and Ocean studies, Panangad, Kochi, Kerala, India

²Department Asst. Professor Department of Zoology, University College, Trivandrum, Kerala, India

³Asst. Professor, Department of Zoology, Mar Thoma College, Thiruvalla, Kerala state, India

²Computer Science Department, FCEN, UBA and CONICET, Argentina

³Department of Computing, FCEN, UBA, Argentina and Institute of Sciences, National University of General Sarmiento, Argentina

Captive breeding technology and developmental biology of the indigenous ornamental fishes of the Western Ghats of India with view to their conservation and sustainability

The Western Ghats is one among the four hotspots biodiversity of India. The WGs cover an area of about 129,037 km² stretching to a length of 1,490 km along the western coast of India from Tapti Valley in the north (about 21°16' N) to Kanyakumari in the south (8°19' N), traversing through six coastal states of the country, viz., Gujarat, Maharashtra, Goa, Kerala, Karnataka, and Tamil Nadu. The southern and central division of WGs, which includes rivers and streams of Kerala, has been identified as one of the few sites in the world showing exceptional biodiversity and a high degree of endemism with respect to freshwater fishes. A comprehensive document of the freshwater fish diversity of WGs showed that about 300 species of freshwater fishes available in the system, 197 (about 67%) are endemic and 117 species are endemic ornamental fishes. Even though India is blessed with a rich diversity of fresh water fishes that are endemic to WG, the resource is not yet tapped properly for the purpose due to obvious reasons. The export trade of ornamental fishes in India is largely based on the indigenous ornamental fishes collected from the wild. Due to the indiscriminate exploitation, many of the fishes have become endangered. In this context arises the need of development of captive breeding technology for their hatchery production. So far breeding technology of 10 prioritised species of ornamental fishes have been developed and the details of them are presented in this paper. The fishes are *Puntius denisonii*, *P. filamentosus*, *P. melanampyx*, *P. pookodensis*, *Garra mullya*, *Danio malabaricus*, *Pristolepis marginata*, *Chela fasciata*, *Nemacheilus traingularis*, *Nemacheilus semiarmatus*. Biological parameters, water quality parameters and reproductive strategies of each species are discussed in the paper. Suggestions are also made on their in-situ and ex-situ conservation and sustainable harvest.

Audience Take Away Notes

- The audience will get information about the indigenous ornamental fishes of the Western Ghats of India
- They will get an idea about how to breed the particular species of fishes using the captive breeding technology developed
- Those who are working in the area of ornamental fishes, this finding will be an eye opener to them
- They can use the captive breeding technology for breeding the species under captivity
- Yes, the faculty can make use of the methods for other similar fishes
- Yes, those who are trying to breed new species of fishes under captive conditions, this will be useful
- List all other benefits
 - o The technology can be popularized
 - o Promote the market of indigenous ornamental fishes of the WG of India
 - o Create an awareness about the conservation of indigenous ornamental fishes of the WG of India
 - o Enable the people who are working in this field for their sustainable harvest from wild

Biography

Dr. T.V. Anna Mercy studied Marine Biology and graduated as M.Sc. in 1976. She joined the Department of Aquatic Biology and Fisheries, Kerala University, Trivandrum under the guidance of Dr. N. Krishna Pillai. Her Ph. D work was on a unique fish, the Indian blind clariid fish *Horaglanis krishnai* Menon that dwells in the subterranean wells at Kottayam, Kerala and received her Ph.D in 1982. She progressed to become the Junior Assistant Professor in Aquaculture at the College of Fisheries, Kerala Agricultural University, and Panangad during the year 1984. In 2002 she became Professor. She pioneered research on Indigenous fresh water Ornamental Fishes of the Western Ghats of India and developed captive breeding technology for 15 prioritized fresh water species including *Sahyadria denisonii* popularly known as "Miss Kerala", first of its kind in India. *Sahyadria denisonii* is a much sought after ornamental fish in the international market. She was instrumental in conducting innumerable training programmes on ornamental fish culture for the rural people at state level and national level. Based on her experience, she is by default a valued resource person on ornamental fish culture at the state, national and international levels. She has published about 100 research papers including 50 in peer reviewed journals. She has authored/co-authored the many books/chapters; Presented research papers on different aspects of ornamental fishes in several international conferences at Brazil, Oregon, USA, China, South Africa, Ethiopia, Iceland, Netherland, China, Srilanka, Singapore, Malaysia, Indonesia and Australia. She was instrumental in developing Kumbhm Panchayt (where KUFOS is situated) in to an ornamental fish village where 300 families were trained for ornamental fish culture. For this work she received the International Award as one of the Eleven laureates of Women's World Summit Foundation (WWSF) Geneva, Switzerland 2010 for the "Women's creativity in rural life". The award consists of US \$1000 and a certificate. She retired from service of Kerala University of Fisheries and Ocean studies, Cochin after 32 years of teaching, research and extension activities. At present she is the Director of the Department of Aquaculture, Sacred Heart College (Autonomous), Mahatma Gandhi University, Thevera, Cochin, Kerala.

**Yutaka Kawakami**

Kamihata fish, Kagoshima, Kagoshima, Japan

Earlier induction of metamorphosis in Japanese eel leptocephali stimulated by thyroid hormone

Metamorphosis of teleosts, including Anguilliformes, is well known to be induced by thyroid hormone (TH), although the underlying mechanism is not fully understood. In this study, we investigated the experimental conditions needed to induce normal metamorphosis in artificially spawned Japanese eels (*Anguilla japonica*), including initial larval size, TH concentration, and timing of TH immersion. We found that around 37 mm TL was the minimum size of larvae that underwent successful metamorphosis induced by L-thyroxine (T₄), suggesting that small leptocephali are not sufficiently responsive to TH. Furthermore, successful completion of metamorphosis depended on sensitivity to TH, which changed with the metamorphic stage. Prolonged exposure to higher TH concentrations led to morphological defects. Our results reveal that the induction of metamorphosis by TH is dependent on larval size and that the concentration of TH must be adjusted in line with the metamorphic stage to achieve successful progression of metamorphosis. While metamorphosis of the leptocephali of 50 mm TL or more is a well-recognized phenomenon in normal breeding, we found that even leptocephali of around 40 mm TL have the potential to undergo metamorphosis in this study. The problems with current eel seedling production are that it is not possible to raise large numbers of eels in a tank, and that the growth speed is slow. As a result of this research, it is possible to shorten the production period of glass eels to the same period as that of wild glass eels. Our findings will contribute to improving production technology in the aquaculture of Japanese eels by facilitating the earlier induction of metamorphosis in artificial leptocephali.

Audience Take Away Notes

- Given that eel seedling production is different from that of other fish species, it requires a unique perspective.
- Research and development for eel seedling production require personnel with specialized skills.
- We were able to elucidate a portion of the metamorphosis mechanism in eels.

Biography

Dr. Kawakami conducted research on the Japanese eel migration mechanism at Kyushu University, Japan. He received his PhD degree in 1998, with SEM and EPMA analyses of Otoliths. He then joined the eel reproductive research group at Hokkaido University, using molecular biological methods to study the metamorphosis mechanisms of Anguilliformes. Next, he was involved in aquaculture research at Kinki University, research on Germline chimeras at the Nanae Station, Hokkaido University, and eel seedling production and development at the Research Institute for Aquaculture, Japan. From 2012, he led the development of a research environment for eel seedling production at Shin Nihon Kagaku Ltd., Japan.

24-25 MAY

DAY 02
VIRTUAL
KEYNOTE
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Role of artificial intelligence and remote sensing to control aquatic pollution and toxicology through physicochemical and spectroscopic methods by using catalytic oxidants & develop Aquatic - Climate Prediction Models (ACPM)

During UN-Decade of Ocean Science for Sustainable Development, begin in 2021, it is increasingly important to gather as a scientific community to raise awareness of the truly global dimension of the ocean, address environmental challenges, and set forth on a path towards a resilient planet. By using Artificial Intelligence to explore the deep seas, and High-Resolution Satellite imageries, data access, assimilation; HPC and cloud computing for real-time analysis, efforts are focused to develop physicochemical and spectroscopic methods to characterize the in-situ chemical speciation of the inorganic contaminants and save the underwater marine life through innovative technologies for remediation of water pollution by catalytic oxidants. Next, to discuss strategies to control Toxic Aquatic pollution resulting due to toxins, toxic gases, and GHG (Green House Gases) by making use of Catalytic oxides of first-row transition metal oxides. Water gets polluted due to toxins & toxic gases. There are generally four types of toxic entities: chemical, biological, physical, and radiation. The oxidation process would be employed to treat Groundwater contaminants by making use of the chemical oxidants viz. hydrogen peroxide, persulfate, permanganate & ozone. These oxidants have been able to cause the rapid and complete chemical destruction of many toxic organic chemicals. The other organics are amenable to partial degradation as an aid to subsequent bioremediation by involving chemical oxidation to be applied in subsurface systems and in above-ground water treatment systems involving chemical oxidation regeneration of Granular Activated Carbon (GAC). Also, to understand air-sea exchange during extreme atmospheric forcing, biophysical interactions on Air-Sea CO₂ exchange with Climate Variability, Marine Biogeochemistry, Ocean-Air interactions to develop 'Aquatic- Climate Prediction Models' (ACPM), for estimating energy and material (e.g., carbon, nitrogen) exchange between the upper and deep ocean and to understand spatial and temporal non-homogeneity in deep-ocean mixing; distribution of deep-ocean mixing intensity, and the physics that drives that distribution, and the energetics of the ocean and reducing the uncertainties in global circulation and climate models.

Keywords: Toxins, Climate Change, chemical oxidants, Aquifer materials, Target and non- target contaminants, Granular Activated Carbon (GAC) and 'High Affinity Toxin Receptors' (HART), and Aquatic - Climate Prediction Models (ACPM).



Prof. (Dr.) Virendra Kumar Goswami

Indian Institute of Technology (IIT) & Environment and Peace Foundation, India

Biography

Dr Virendra Goswami, Ph. D Indian Institute of Technology (IIT), Kharagpur, MS from the University of Wisconsin, USA. Post Doctorate Fellow (PDF) at the University of Illinois, Chicago, USA. 'Visiting Scientist' to UNIDO, ICTP, Italy & International Civil Aviation Organization (ICAO), Canada. Founder President 'Environment & Peace Foundation, and Wing Commander (Retd), with 550 hours of flying as a supernumerary Aircrew. Virendra Goswami worked at Space Science Engineering Centre, NOAA (NASA) at the University of Wisconsin, USA. Former Vice-Chancellor (Rector): Sangam & Sunrise Universities. Had been Director General/ Director of Management/Engineering Institutes. More than 44 years of teaching, research, and administrative experience at Home and abroad. Member: American Geophysical Union, American and Indian Meteorological Societies. Special Invitee by the World Meteorological Organization (WMO) in 2001& 2016. Invited Speaker in Apr'15 at NPW: NSF, NCAR, USA, Meteo-France, WMO, CLIVAR, and Lomonosov Moscow State University, 'Globalistic-17'&'Globalistic-20 TROPMET-20, Euro-Marine2021, WAC2022'. Lately, Appoint-

Audience Take Away Notes

- About Toxins, chemical oxidants, aquifer materials, target and non-target contaminants, Granular Activated Carbon (GAC) and 'High Affinity Toxin Receptors' (HART), Climate Change and Aquatic-Climate Prediction Models (ACPM)

ed Reviewer/Member of Editorial Board of Royal Meteorological Society (R. Met. S), Atmospheric Science Letters (R. Met. SAL) as well as Prof. Emeritus: Sharda Univ, and GNEC, Medical College, New Delhi. Presented Papers in the field of Chemical Technology, Atmospheric, Marine, Oceanic, Space, Medicinal, and Lunar Sciences. Satellite Application, Climate Variability, Global Control of Warming & Quality Higher Education at International and National Conferences held in India, USA, UK Latin America, South Africa, Canada, and Europe (more than 32 countries of all the Continents) in the capacity of 'Visiting Scientist'. Besides, headed various delegations at the National & International levels.

Can tilapia become the main fish animal protein to feed billions in global scenarios amid crisis: Trade perspectives

Tilapia is among one of the popular seafood trade commodities in the world. It is also named as “Aquatic Chicken” and it has a power to satisfy the taste buds of the consumers in various ways. In comparison with Salmon & Shrimp, its quite much affordable to the consumer if thought on cost perspectives whereas nutrient wise, it is one of the better seafood to consume with high level of protein in it. Last few years especially 2019, World saw the Covid-19 impacts on every sector and Russia-Ukraine war in 2022 has reduced the global economy rate at certain extent in the then prevailing slow situations. In a time of difficulties, recession phase or in a global economic slowdown, consumers usually tend to shift their food choices towards the low budget foods without compromising the nutritional intakes. Tilapia among the available global seafood choices seems to be one of the most potential candidate fish products which is affordable, tasty, nutritious & most important - strong alternate to the high-cost food products in high economic crisis scenario. The present situation demands such food and one should not surprise if tremendous growth in sales of this fish product can be seen in next couple of years. It shall be worthy to monitor how the trade of this fish may support feeding billions of people in a world in coming time.

Audience Take Away Notes

- Present situation of global seafood trade
- What is the importance of tilapia in global seafood trade
- How the tilapia trade can support feeding billions for next few years in crisis situation



Amod Ashok Salgaonkar

Co-founder & Chief Operating Officer, A2S2 Enterprises, India

Biography

Mr Amod Ashok Salgaonkar is a diversified industry professional wearing multiple hats in his professional endeavor. He is having a mix bag of various experiences right from buying & merchandising, strategy & negotiations, marketing, planning & development of the businesses in different verticals of food & especially seafood business which involves modern trade, cash & carry, HoReCa, general trade & online segment. He views the industry by being involving directly through engagements in trade aspects & promotions, sustainability, climate change impacts etc. He is a seasoned management professional worked previously with a reputed organizations like Reliance Retail, Bharti-Walmart, METRO Cash & Carry India, HyperCITY Retail where he headed categories like seafood, meat, dairy & frozen. Core strength lies in bringing effective solutions to business challenges & building differentiation for strategic advantages for the business. He is presently involved in food business with a focus on seafood through a start-up besides having engagements at various national & international organizations.

24-25^{MAY}

DAY 02
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**Shixi Chen**

Neijiang Normal University, China

Sequence analysis of nuclear ITS1-5.8S-ITS2 of white *Channa argus*

Channa Argus is widely distributed and extremely resistant to hypoxia, it is now an aquaculture species in China, and has heritable white body color populations with two phenotypes of "gray fin rays" and "gold fin rays". In this study, the genetic diversity and molecular phylogenetics of *C. Argus* with different body colors and geographical distribution are investigated based on their nuclear ITS1-5.8S-ITS2 sequences. The ITS1-5.8S-ITS2 sequences of the *C. Argus* are conservative, with 1/1000 of mutation sites and 0.000-0.014 genetic distance indicates the *C. Argus* that was studied has the same ITS1-5.8S-ITS2 sequences and genetic distance, all of which show that it is the same species. The intraspecific variation sites shows that it was mainly transformation, white *C. Argus* with "gray fin rays" individuals has more variation sites than "gold fin rays" individuals. And the variation associated with different geographical distributions is smaller than that associated with different body colors. Therefore, these sequences can be used to identify the differences between *C. Argus* in different areas, which shows that nuclear ITS1-5.8S-ITS2 sequences can be used to study molecular phylogeography.

Biography

Dear academics and professors, as a lecturer at Neijiang Normal University in Neijiang, Sichuan Province, 641100, China, Dr. Shixi Chen researched about fish hypoxic stress, fish genetics, particularly the recent discovery of two types of albino body color populations in *Channa argus* (snakeheads), and the mitochondrial genomes of gigantic clams (*Tridacnidae* spp.), chloroplast genome plants (*Thalictrum fargesii*) are also involved in his study. If interested in his research.

24-25^{MAY}

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Banikalyan Swain*, Roy Curtiss III

University of Florida, Department of Infectious Diseases & Immunology, College of Veterinary Medicine, Gainesville, Florida

Design and construction of generalized vaccine-vector system to protect teleost fish against multiple bacterial, viral and parasitic infectious diseases in aquaculture

We have successfully designed and constructed a RAEV vector system with regulated-delayed attenuation in vivo attributes that synthesizes *Ichthyophthirius multifiliis* (Ich) protective antigen IAG52B to enable vaccination of fish susceptible to edwardsiellosis and white spot disease. The first feature of this vaccine delivery system is an *Edwardsiella piscicida* strain carrying genomic deletions of *AsdA*. *AsdA* is an enzyme necessary for the synthesis of diaminopimelic acid (DAP), which is an essential component of the peptidoglycan layer of the cell wall of Gram-negative bacteria. *AsdA* mutant strains have obligate growth requirements for DAP in the medium or a plasmid vector with the wild-type *AsdA* gene enabling synthesis of DAP. This balanced-lethal plasmid vector-host system in *E. piscicida* enables as a second feature the synthesis of recombinant antigens to induce protective immunity against fish pathogens. Recombinant protective antigen IAG52B from the fish pathogen *I. multifiliis* was synthesized by RAEV strains harboring the *ASDA+* plasmid pG8R8029. The third feature of this vaccine strain is a regulated-delayed attenuation in vivo phenotype that is based on the replacement of an arabinose-regulated *araC* ParaBAD cassette for the promoters of the *fur* and *crp* genes of *E. piscicida* such that the expression of these genes is dependent on arabinose provided during growth. Thus, following colonization, the Fur and CRP proteins stop being synthesized due to the lack of arabinose and attenuation is progressively achieved in vivo to prevent generation of diseases symptoms. Our vaccine strain χ 16022 with the genotype Δ *asdA*10 Δ *Pfur*170::TT *araC* ParaBAD *fur* Δ *Pcrp*68: TT *araC* ParaBAD *crp* contains the *AsdA+* plasmid, pG8R8029, which encodes the IAG52B antigen. Vaccine strain χ 16022 (pG8R8029) is attenuated and induces systemic and mucosal IgM titer against *E. piscicida* and Ich in zebrafish. In addition, transcript levels of *tnf- α* , *il-1 β* , *il-6* and *il-8* were significantly increased in different tissues of vaccinated zebrafish compared to unimmunized fish. Zebrafish vaccinated with χ 16022 (pG8R8029) showed 60% survival upon intracoelomic (i.c.) challenge with a lethal dose of virulent *E. piscicida* strain J118. We also constructed and synthesized Tilapia Lake Virus (TILV) antigens (Segment 5 and 6) and *Aeromonas hydrophila* antigens in RAEV, with the expression vector pG8R114. Use of pG8R114 vector with the fusion of antigens to the *bla* SS (T2SS) leads to the delivery of antigens to the periplasm, resulting in an increased production of outer membrane vesicles (OMVs) that enhance immunogenicity and antibody production against delivered antigens. Zebrafish immunized with RAEV harboring pG8R114-TonB showed 60% higher survival compared to the control groups against virulent *A. hydrophila* challenge. We developed a new mucosal antigen delivery RAEV system for aquaculture that will prevent important infectious diseases and therefore increase the sustainability and profitability of the finfish aquaculture industry.

Audience Take Away Notes

- Development of an innovative antibiotic-sensitive Recombinant Attenuated *Edwardsiella* Vaccine (RAEV) vector system with in vivo display of regulated-delayed attenuation
- Design and construction of generalized vaccine-vector system to protect teleost fish against multiple bacterial, viral and parasitic infectious diseases in aquaculture

- Technique to study the systemic and mucosal immunity in vaccinated fish
- Using of cutting-edge technologies to address the sustainability challenges of aquaculture, which will increase the food security

Biography

Dr. Banikalyan Swain obtained his Ph.D. in Biotechnology from Utkal University in 2015, Bhubaneswar, India. He joined University of Florida as a Postdoctoral Associate in 2015. Currently he is working as a Research Assistant Professor in Department of Infectious Diseases and Immunology, University of Florida. Dr. Swain focused on innate and adaptive immune mechanism of fish and he has published his research in different reputed peer reviewed journals. He is working on the design, construction and evaluation of genetically modified derivatives of *Edwardsiella piscicida*, as vaccine vectors to deliver protective antigens encoded by genes from other pathogens as well as DNA vaccines encoding such protective antigens. Dr. Swain and his group has designed a regulated delayed attenuation and programmed self-destructing *Edwardsiella piscicida* strains that efficiently colonize fish lymphoid tissues allow release of the bacterial cell contents after lysis and exhibit complete biological containment. These technologies are being used to reduce morbidity and mortality caused by bacterial, viral and parasite infectious disease agents of fish.

Shany Cohen, Mahde Hasan, and Isam Khalaila*

Avram and Stella Goldstein-Goren Department of Biotechnology Engineering, and the National Institute for Biotechnology in the Negev, Ben-Gurion University of the Negev, 84105 Beer Sheva, Israel

Biotechnology in aquaculture: A crustacean oocytes delivery tool for large-scale gene silencing

Oviparous animals are characterized by an elaborated yolk production process and packaging in the oocytes before egg-laying. The major yolk protein (vitellin) is usually produced as vitellogenin outside the egg (Vg) and internalized into oocytes by receptor-mediated endocytosis (RME). Like many other crustacean species, *M. rosenbergii* vitellogenin is expressed in the hepatopancreas. *M. rosenbergii* vitellogenin possesses 2537 amino acids and shares at least 33% identity with other decapod crustacean vitellogenin, such as shrimps, crabs, and crayfishes. Vg contains several domains, including the lipid-binding domain involved in yolk-lipid vesicle formulation. Upon arrival at the oocytes, the Vg-receptor (VgR) extracellular domain interacts with a distinct amino acid sequence of the Vg and internalizes it to form yolk droplets. One distinctive characteristic of the VgR family is their role in the massive internalization and accumulation of lipoproteins. Vitellogenesis is recognized by an immense accumulation of the Vg in the oocyte that will serve the embryo's metabolic needs for development and growth. For that reason, we predicted that Vg endocytosis could be used as a valuable tool for oligonucleotides' high throughput delivery into the oocyte. Indeed, a specific Vg-derived peptide sequence (Vg24) was found capable of oocytes' specific entry by in vitro and in vivo means. However, a peptide with the same amino acid composition but scrambled order (scVg24) could not enter the oocytes. Vg24 synthesized with nine Lysine-Histidine repeats successfully induced dsRNA electrostatic interaction and piggybacked the bound dsRNA into *M. rosenbergii* oocytes. When PAX6 (eye development transcription factor) dsRNA was piggybacked, that led to eye development retardation in embryos of the treated mothers. Alignment analysis of the *M. rosenbergii* Vg24 shared 85% identity with the corresponding Vg peptide sequences from other decapod species. The peptide similarity proposes cross-reactivity between the *M. rosenbergii* peptide and the VgR of other decapod species. The developed tool might serve to deliver other than dsRNA molecules into crustacean oocytes and might be a powerful asset for large-scale silencing or editing aquaculture-relevant genes of crustacea.

Biography

Dr. Khalaila studied Biology at Ben-Gurion University, Israel and received his PhD in 2001 at the same institution. After two years of postdoctoral fellowship supervised by Dr. Jasna Peter Katalinic at the Institute for Medical Physics and Biophysics, Muenster, Germany, and one and a half years supervised by Dr. Paul Dyson at the Swiss Federal Institute of Technology, EPFL, Lausanne, Switzerland, he obtained the position of a Lecturer at the department of Biotechnology engineering in Ben-Gurion University. He has published over 50 research articles in SCI(E) journals.



Bruno Moraes Braganholo, Heyde Francielle do Carmo França*

IF Goiano – Campus Rio Verde, Rio Verde, Goias, Brazil

Counting fish system using artificial intelligence

This article is about a counting fish system using artificial intelligence. We trained a neural network to count fry (fish in its young state) in controlled tanks. The neural network was developed using the YOLO (You only look once) architecture. It is able to identify fish and count them, this is done from images used as input to the network. Together with the neural network, with the addition of a graphic interface, the user can send photos taken with his smartphone and know the amount of fish he is raising in each tank, which gives him greater control of his production, whether in relation to the amount of food, medicine or data collection. The neural network can be used to optimize the task of manually counting fish, a task that is subject to human errors. The counting made by people, besides being slower, causes stress to the fish. When fish are stressed a lot, they end up developing problems in their growth and increasing the chances of diseases, which compromises production. This article will address important information about the neural network training process, such as: the importance of the quality of the input images, the functioning of the YOLO architecture (you only look once), evaluation metrics used, evaluation of the results obtained. Currently the network presents good results, reaching an effectiveness of 99% of hits. Initially, the neural network can identify and count fish in controlled tanks, but this could be the first step to take the idea further to natural environments, such as rivers, thus promoting an analysis of the local fish population in a given region.

Audience Take Away Notes

- Explain how we create the fishes dataset
- What is a neural net and how works
- Show the graphic interface and how the counting works
- Present the results

Biography

Heyde Franca Graduated, master in computer science and doctor in computer science in the line of artificial intelligence applied to genomics. Currently working as a University Professor at the Instituto Federal Goiano and mentor at Startup On-Peixes.



Spirina Anastasia Alekseevna^{1*}, Makeev Alexander Aleksandrovich², Loshenko Vitalina Igorevna³, Sakharov Andrey Valentinovich⁴, Shestopalov Alexander Mikhailovich⁵

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⁵Doctor of Biological Sciences, Director of the Research Institute of Virology "Federal Research Center for Fundamental and Translational Medicine", Novosibirsk, Russian Federation

Morphological picture of an atypical disease in fish from an area with a high level of anthropogenic load

Siberia is a large geographic area of Russia, rich in various flora and fauna. Due to the high-level metropolis expansion many suburban reservoirs are found in the urban environment structure. Adapting aquatic organisms to the rapidly changing environmental factors action leads to a chronic stress of the body's major systems activity. It is prone to various pathogens. Data on monitored natural water bodies show that in the past three years, individuals with unknown disease forms have occurred in fish catches. Fish (*Carassius Gibelio*) with signs of a neoplasm in the head area were caught in the winter period of 2020 using nets in the amount of 23 individuals of both sexes, aged 3–5 years and with an average weight of 1370 ± 28 g. The reservoir is in a large metropolis, bordering on a highway and a large agroindustrial company. The study material was pathologically altered soft tissue in fish branchial cover. It was cut for analysis in combination with bony tissue. The material was fixed in a 10% buffered neutral formalin solution, decalcified in a saturated solution of Trilon B. The test samples were dehydrated in isopropyl alcohol and poured into a histomix. Sections 5–10 µm thick were prepared on a rotary semiautomatic microtome. Survey preparations were stained with Behmer's hematoxylin and eosin. Total acid GlycosAminoGlycans (GAGs) were detected in a histochemical reaction with Steedman's alcian blue. The collagen fibrils localization was carried out by the Mallory reaction. The pathomorphological analysis results help to identify the neoplasm detected as an epithelioma. It was found that tumor growth morphogenesis, epithelium hyperplasia and dysplasia occur naturally. The study results show that tumor growth is carried out mostly due to the proliferation of basal layer keratinocytes and differentiated epithelial cells. This can be a stereotyped response to pathogen damage. In addition, the cells with signs of malignancy, areas of hyperkeratosis of the epithelium and the growth of the stroma with its abundant vascularization reflect a high level of tissue atypia. And it also indicates the development of squamous cell carcinoma in situ. The actively proliferating cells located in the structure of the basal layer with an enlightened perinuclear zone and a narrow rim of oxyphilic cytoplasm are morphologically similar to koilocytes. Koilocytes are believed to be a pathognomonic sign of a virus damage to human epithelial cells. Increasing atypia and tissue malignancy are related to these cells. Furthermore, the abundance of lymphocytes in the capillaries of the stroma, as well as the location in the perivascular region of the basement membrane, indicate the viral pathogens involvement in the pathological process. Thus, the detected epithelioma has features similar to the pathomorphology of the human papillomavirus infection and stomatopapillomatosis of fish. It is not typical for the cyprinid family. The stomatopapillomatosis acne virus is believed to represent a large group of viruses with an RNA

genome. The Orthomyxoviridae family includes influenza viruses that caused the fatal disease epidemics. Although species-specific the main spreaders were animals. In this respect, the possibility of exceeding species specificity by viral pathogens and extending the spread of infection ways is not ruled out.

Audience Take Away Notes

- The metropolitan expansion influence on the main body systems activity of the aquatic organisms and the appearance of atypical diseases are expressed. The common morphology of certain viral diseases in humans and animals suggests the potential for a viral pathogen to overcome interspecific barriers and spread further into the wild
- Infectious fish diseases, especially viral ones, remain a misunderstood problem, compromise the fish farming economy and cause social tensions in society

Biography

Spirina Anastasia Alekseevna graduated from the St. Petersburg State University of Veterinary Medicine in 2022 with a bachelor's degree. Diploma topic was "Laboratory control of antibiotic resistance of bacteria obtained from rainbow trout (*Oncorhynchus mykiss*)". In the fall of 2022, entered the Novosibirsk National Research State University, Faculty of Natural Sciences, majoring in biotechnology. Institute practice takes place at the Research Institute of Virology "Federal Research Center for Fundamental and Translational Medicine". Works in the field of viral diseases of fish, the topic of the master's thesis is "Sensitivity of fish cell cultures to influenza viruses".



Christos Stefanakos, Oyvind Knutsen*

Dept of Fisheries and New Biomarine Industry, SINTEF Ocean, Trondheim, Norway

High-resolution physical and biological modelling in the Gulf of Patras, Greece

In the present study, physical and biological modelling has been implemented in the Gulf of Patras, Greece by means of our inhouse hydrodynamic 3D ocean model SINMOD. The model is a fully coupled ocean model with hydrodynamics, ecology, and sea ice, and it has been developed at SINTEF since 1987. SINMOD resolves sufficiently well the circulation dynamics of the oceans. Validation of the model has been performed throughout all these years using not only measurements of current, salinity and temperature but also data of primary production. The present implementation of the model is part of a cascade of implementations with final aim the area of Aitolikon lagoon, Greece. First, the model has run in a double nested setup with an outer grid of 20 km resolution for the North Atlantic, which gave input to another grid for the Mediterranean with 4 km resolution, which again gave input to a finer grid with resolution 800 m of the Ionian Sea. The new grid for the Gulf of Patras has 160 m resolution, and the final grid in the Messolonghi and Aitolikon lagoons will be 32 m. Other input includes ERA5 atmospheric forcing, as well as information concerning freshwater influx (main rivers). In addition, detailed bathymetry of the area has been used from GEBCO database with additions of some areas with higher resolution (Gulf of Patras, Messolonghi-Aitolikon lagoons) from other sources. An ecosystem model based on light and nutrients supply calculates biological production. The fate of the produced organic material and its degradation and use of oxygen is simulated and presented. The analysed results include general circulation and monthly, annual and interannual variability of fields of temperature, salinity, currents and wind, as well as oxygen and chlorophyll.

Audience Take Away Notes

- Oceanographic conditions for the Gulf of Patras, Greece (high resolution)
- Biological conditions for the Gulf of Patras, Greece (high resolution)
- Input to studies of hypoxic/anoxic environments
- Long-term model data (10 years)

Biography

Dr. Oyvind Knutsen studied physical oceanography at the University of Bergen, Norway, graduating as MSc in 2003 and PhD in 2009. He then joined SINTEF Fisheries and aquaculture as a research scientist and now works as a senior research scientist at SINTEF Ocean. Working mainly with the SINTEF-developed ocean model system SINMOD, he has done lots of high-resolution ocean modelling for the aquaculture industry in Norway and Chile, and also for various research projects.



Margarita Collazo-Ortega^{1*}, Karina Jimenez-Duran², Monica Perez-Pacheco¹, Ricardo Wong¹, Judith Marquez Guzman¹

¹Comparative Biology, Department Sciences, Faculty National Autonomous University of Mexico, Mexico City

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Biology and conservation of Mexican podostemaceae

Podostemaceae is the largest family of strictly aquatic angiosperms. They grow in fast-flowing oligotrophic rivers or waterfalls. They adhere strongly to rocks by means of unicellular and hapterous hairs, which secrete a mucilaginous substance, once fixed they form a biofilm. They differ from angiosperms, among other things, because there is no double fertilization, nor endosperm formation. Its distribution is mainly tropical and subtropical. Worldwide it has 54 genera and 310 species. They have a high level of local endemism and some species are known from only a small geographic area or even a single river. In the New World there are 135 species and 21 genera. Mexico has 4 genera and 7 species: *Marathrum foeniculaceum*, *Marathrum plumosum*, *Marathrum tenue*, *Noveloa coulteriana*, *Noveloa longiflora*, *Podostemum rutifolium*, *Tristicha trifaria*. Due to their restricted distribution, endemism and the anthropogenic threat to their habitats, *M. foeniculaceum*, *M. plumosum*, *N. coulteriana*, *P. riciforme* and *N. longiflora* are species protected by Mexican law. Podostemaceae play an important role in the ecology of rivers, they are involved in primary production (carbon source), they are an important food source for some aquatic herbivores, as well as for the absorption and release of nutrients. They are substrate for diverse microscopic epiphytic flora and as a habitat for aquatic fauna. They are also used in traditional medicine. Freshwater ecosystems are subject to severe impacts from human activities such as industrial, agricultural or urban discharges, which promote habitat loss, threatening their biodiversity, which is worse in tropical regions where most of the biodiversity is found. It is essential to promote conservation programs. That is why we have studied the biology of these plants for more than 15 years. Megasporogenesis and megagametogenesis processes occur very early during the development of flower buds when they are immersed within the thallus and during their early emergence. Once the embryo sac is formed, the rapid degeneration of the central cell begins, where morphological and physiological characteristics of a process of programmed cell death are presented. This process occurs before fertilization, which means that double fertilization does not take place, causing the absence of endosperm in the seeds, which has implications for embryogenesis, germination and early development of seedlings. Field and laboratory experiments indicate that pollination is mainly by anemophily, although zoophily is not ruled out. Embryonic development is carried out by a series of divisions that do not match the normal pattern, causing the loss of the apical and/or root meristem. The seeds are positive photoblastic, their response to light is strongly regulated by phytochrome, and they remain viable for up to seven years. The development of the seedlings has been followed in vitro and ex vitro condition, which is difficult since they cannot be maintained in vitro for more than 30 days. These studies provide important information to develop conservation and maintenance programs for those plants in the field and in seed banks.

Biography

She studied Biology at the Faculty of Sciences, UNAM; she has a Doctorate in Sciences from the University of Havana, Cuba. She is currently Full Professor in the Faculty of Sciences, attached to the Plant Development Laboratory. She has taught more than 200 undergraduate courses in various subjects at the Faculty of Biology of the University of Havana and the Faculty of Sciences, related to angiosperm biology, plant physiology, plant anatomy and histology, growth and development, mathematical analysis of growth, vegetal biology. She has taught more than 20 graduate courses. She is Tutor and professor of the Postgraduate in Biological Sciences and has participated in 5 more postgraduate programs. She has produced more than 29 research articles, 14 book chapters and 5 Manuals. The lines of research that she carries out are: ecophysiology and conservation of aquatic plants and xerophytes; study of contaminant capture in plants, soil and water, conservation of flora and fauna on green roofs; capture of contaminants by plants from urban gardens in Mexico City.



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Enhancing productivity and sustainability of aquaculture by developing feasible technological interventions

Aquaculture has the potential to transform local economies and livelihoods by providing a sustainable source of food, creating jobs, and promoting economic growth. For the sustainable growth of the aquaculture industry, it is vital to reduce the dependence on land cover, as the area is a scarce resource and its overuse causes various negative impacts on the environment. As total production is proportional to both the area and the productivity, higher production can be achieved with higher productivity without increasing the land cover. A digital tool being devised is an effort to bring the power of machine learning via an end-to-end solution that covers the complete monitoring of the farm and returns insights and recommendations for increasing productivity. The tracking of the aquaculture system will yield crucial environmental parameters that affect the growth of a particular organism. Literature reveals a set of environmental parameters that have a significant impact on the growth of shrimp and seaweed organisms. Various pieces of literature have discretely provided evidence of variations in growth patterns with changing environmental parameters. The paper discusses the developed framework that accomplishes the goal of improving productivity with the help of machine learning by collectively applying the evidence and knowledge gained from literature into a mathematical model. This mathematical model is a non-linear function developed using the ideas of probability and machine learning that maps the environmental parameters, considering them as input variables for the expected growth rate of the organisms in these conditions. The robust framework will help farmers get the most returns from their efforts and increase their income. Added benefits include that it will help stakeholders demarcate geographical locations that favor high productivity based on climate data and reduce the mortality rate of cultivated organisms by maintaining the farm conditions in which they flourish. This is a strong move to mitigate the adverse effects of climate variability. Digital intervention in aquaculture can enhance economic benefits by improving production efficiency and reducing risks.

Audience Take Away Notes

- The audience will learn the formulation of area, production, and yield analysis in the aquaculture domain. This is important, seeing the increase in demand for aquaculture-related products soon, as it helps analyse the current status and enhance production and productivity by identifying parameters that affect the productivity of aquaculture units. The talk will describe how the technological intervention will help aquaculture industry to get the most out of the investments being made and can ideate them for developing such solutions in other areas for human benefit. They will learn the sustainability study of growth of aquaculture and how it can be combated
- For the research community and academia, the open-source framework development and research work will help them gain subtle knowledge about the need to increase productivity and sustainability issues with shrimp farming. This talk will provide them with an overview of how IoT can completely transform the aquaculture industry

- Faculties can extend the research methodology to be applicable to many more species in the area of aquaculture, and that is how the concept of integrated multi-trophic aquaculture can also be looked at by the results of the framework.
- It helps farmers predict and analyse: are their farm conditions ideal for growing the organisms they are cultivating, and how can they improve upon those? It helps a large chunk of the population, who lack skill and are driven to aquaculture by the virtue of seeing it as a source of livelihood and income
- It collectively investigates the complete variation of the growth rate of organisms with input parameters and thus combines various commendable literatures into a single source of concrete information. This helps biologists and faculty gain an overview of the stress-response metabolism of shrimp and seaweed
- It discusses the merits of seaweed as a seafood of the future, and thus, for entrepreneurs, it gives them an opportunity to learn how seaweed can be a pioneer in the sustainable food product category and could encourage them to take the idea further for good

Biography

Shlok Nemani is studying Electrical Engineering at Indian Institute of Bombay, India and currently is in his fourth year of study. In 2021, he has been a Teaching associate for the online MOOC platform IITBX. In 2022, he worked as a research intern at Maritime Research Center, India. In the beginning of fourth Year, he has worked as Electronic Design Automation engineer at Texas Instruments, India. He has completed Research projects encompassing hardware acceleration for cryptography and blockchain, and app design for fingerprint recognition. In 2023, he started his fellowship at Maritime Research Center, India.



Medy Ompi^{1*}, Farrel Wagiu¹, Farnis B. Boneka¹, Erly Y. Kaligis¹, Stella T. Kaunang²

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Settlement of box tropical mussel, *septifer bilocularis*: Effect of site, position in the patch, and substrate

Settlement of box mussels to the availability of a preferred substrate can be a dynamic process where it is not clear what factor affects settlement in the position among patch sizes in the intertidal mussel bed. The objectives of this study were to explore the influences of substrates, position in the patch, and sites on the settlement of box mussels. The studies were located in two natural box mussel beds. Four types of substrates, each had 4 replicates were distributed randomly into each of the 16 PVC plate holes. Then, the large and small patch sizes were chosen arbitrarily, each had 3 replicates. The PVC plate was lied in the edge, middle of a large patch and a small patch in the two intertidal mussel beds. The data were analyzed by a three-factorial ANOVA, where stations, position in aggregations, and substrates were used as the main factors. The results showed that settlement varied among substrates and the position of the patches. No differences in the mean number of new settlers between stations, while large differences in the mean number of new settlers at isolated patches than along the edge and the middle of large patches irrespective of stations occurred. Differences in the settlement between substrates were evident and an even larger number of settlers on coconut Fibre than others substrates such as palm fibre and adult shells with byssus occurred. Our study showed for the first time that the tropical mussel has the capability of choosing and attaching to suitable and attractive substrates of coconut fibre in the varied positions of patches in the tidal field. The sizes of new settlers attached to fibres of coconut and palm, polypropylene rope, and shells with byssus threads were < 1 mm, while new settlers attached on the substrates of adult shell mussels with byssus threads ranged from 1 mm up to 3 mm. The settlement of box mussels in this study shows patch sizes and substrate dependence, where the physical character of substrates and the behaviour during settlement determined the settlement pattern in this study.

Biography

Medy Ompi is the head of the Aquatic Bio Ecology Laboratory, Faculty of Fisheries and Marine Sciences, Sam Ratulangi University, Indonesia. Medy Ompi teaches Marine Biology, Marine Invertebrates, Marine Larvae, and Ecology. His research focuses on the early development of marine invertebrates to support and sustains marine biodiversity and ecosystems. He got his master's in Marine Sciences from Aarhus University, Denmark in 1992, and got his Ph.D in marine biology from Flinders University, Australia in 2005.



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Applied or in the salmon industry

Salmon farming is one of the main pillars of Chile's economy and the main source of income of the southern regions of the country. The industry is a complex and long process chain, going from the hatcheries where the eggs are produced, the sweet water stage where the smolts are grown, salt water stage where the salmons are fattened in the ocean in special purpose cages, the processing plants where different cuts and products are produced and the export of the final product. Industrial facilities include hatcheries, sweet water farms, ocean farms, and processing plants. All water facilities are located in rivers and fjords of the Chilean Patagonia and a big portion of the time the logistics consider a combination of vessels and trucks. Transportation must include salmons at the different stages in the chain as well as final products. One of the main challenges for the salmon companies is the planning of the different problems the industry faces. These problems include the logistics of delivering the feed, the collection of the garbage, the harvest of the fish allocated in the farms all around the patagonian sea, the planning of the smolt production in the sweet water stage and the harvest plan, the planning of the processing plants where a model could help choose the best cuts and markets to sell, etc. Each and every one of these processes is a complex problem that involve millions of dollars, generally performed by a planner with suboptimal results. The industry provides a vast number of problems and companies where OR is starting play major role in decision, leading to substantial efficiencies that will help save millions of dollars and be environmentally friendlier.

Audience Take Away Notes

- The audience will learn about the application of OR in the salmon industry in Southern Chile. The presentation may give the audience ideas about possible applications of OR techniques in their own industries or fields

Biography

Juan Ignacio Villasante studied Industrial Engineering at Universidad de Chile and graduated as MS in Operations Research at the same University in 2013. He has been working since with Prof. Andres Weintraub and ISCI in operations research problems in the Salmon Industry. He is also a board member of companies in the aquaculture and agriculture business.



Sinare Yamba^{1,2*}, Bounbou Magloire¹, Soubeiga Patricia¹, Chabi A. Bertrand¹, Gneme Awa¹

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Helminth parasites relationship with the cut fish *Clarias anguillaris* (Linnaeus, 1758) from Burkina Faso, West Africa

Clarias anguillaris is specie liked by population in Burkina Faso and it is consumed fresh, fumed and dry. But more information on its pathologies and parasites are not enough known. Whereas fish parasites are ecologically important in managing the biodiversity of ecosystems. In this work, the helminthes parasites of the cut fish (*Clarias anguillaris*), widely consumed in Burkina Faso and used in fish farming, were studied. The host fish were sampled in three reservoirs in Burkina Faso; localized in the urban area (urban park Bangreweogo) and rural area (reservoirs of Loubila and Ziga). At each sampling, the host fish were examined for parasites. The gills were collected and observed to harvest ectoparasites. The digestive tract, for its part, was separated from the secondary organs after dissection, and each part was examined for the collection of mesoparasites and end parasites. Others organs such as muscle, gall bladder, liver and mesenteries were examined for parasites. Harvested parasites were kept in alcohol 70°. A total of 336 specimens of *C. anguillaris* on the studies sites were examined and 319 (94.94%) were infested. Twenty (20) parasites species were identified and these parasites are belonging to three families such as Nematoda, Cestode and Trematoda. The Different parasites harvested had specific localization according to their stage and their specificity. The larvae are intratissular and the adults are in the lumen of the organs. So Trematode larvae were very abundant in the muscle. Larvae of Nematoda were observed in the mesenteries and liver, cestodes were observed in intestine, gall bladder and bile duct.

Keywords: *Clarias anguillaris*, Nematoda, Trematoda, Cestoda, reservoirs, Burkina Faso.

Audience Take Away Notes

- The audience will be able to use what they learn to protect aquatic ecosystem and aquaculture system
- It will help the audience in their job to take care of their fish farming
- It is research that other faculty could use to expand their research or teaching

Biography

Dr. Yamba SINARE studied Biology at University of Ouagadougou, Burkina Faso and graduated as MS in 2009. She then joined the research group of Prof. Gustavo B. KABRE at the Laboratory of Animals Biology and Ecology, Joseph Ki-Zerbo University. She received her PhD degree in 2017 at the same institution. She employed at the Institute of Sciences and Technologies, Ecole Normale Supérieure. She continues her research and obtained the position of Assistant professor. Last year, 2022, she gets four months postdoctoral fellowship supervised by PR BAMA at the Applied Hydrology and Environment Laboratory, Togo. She has published more than 10 research articles.



Yassein A. Osman

National Institute of Oceanography and Fisheries, Hurghada, Red Sea, Egypt

Catch species and selectively of the most common species of the artisanal fishing from the Sothern Red Sea, Egypt

The Red Sea is narrow sea and elongated and one of the most resources for this meat and the most families have loved are considered the coral reef fish and they are the main target species for fishermen, tourist and consumers. The artisanal fishery is one of the common fishing gear were used in the Red Sea, fishing area. It is including longline, gill and trammels nets. The sampling was collected form the landing site at Shalatin and Abu-Ramad located at Southern Red Sea, form September 2021 to Jun 2022, the present study was interested with the common commercial species. The size of hook various form 4, 5, 6, 7, 8, 9 and 10 types, while gill net is 20 pieces and mesh size is 1.5 cm, while trammel net were inner layer 3 and outer layer 7 cm. The sampling fishes were identified, counted and measurements were taken (total length (TL) measured in to the nearest centimeter) of each locally caught fish. The per cent of the total sampling were estimated. The 9456 fish individuals were identified, recorded, and measured, belonging to 96 species, and 16 families. Sixteen families were represented in the current study landing site, namely; Serrinidae (23%) is the most occurrence in catch, then followed by Lethrinidae, Scaridae, while the less family Chanidae and Terapontidae were represented 0.846 and 1.015 respectively. The Pearson correlation between families were significant and non-significant for most species and no there any significant between others family which is less occurrence in this study, this will provide the basic data for the percentage catch of the most target species in 2022.

Audience Take Away Notes

- Type of fishing artisan fishing gear in the Southern Red Sea
- Most species were caught
- Percentage of these family were caught
- The fishery boundary area

Biography

From 2010, Yassein Abdel-Maksoud has been with the Red Sea branch of the National Institute of Oceanography and Fisheries at Hurghada, Egypt, where I have been a researcher since 2015. After graduating in marine Biology and Fishes in 2008 from Al-Azhar University, Assuit Branch, he received a M.Sc. in Marine Science in 2015 from Port Said University, and then a Ph.D. from Al-Azhar University in 2018 Marine biology and Fishes, Zoology Department, Faculty of Science, Al-Azhar University Egypt. I have been publishing more 24 papers in Scopus (H index 6), and more than 35 papers in Google scholar and Researchgate.



Aksha Kumar Sarkar*, Dr. M. Nazrul Islam

Technical Director, KMI International, Bangladesh, Department of Zoology,
University of Rajshahi, Rajshahi 6205, Bangladesh

Socio-economic and environmental impact of various shrimp farming practices in SW region of Bangladesh

Aquaculture has the potential to transform local economies and livelihoods by providing a sustainable source of food, creating jobs, and promoting economic growth. For the sustainable growth of the aquaculture industry, it is vital to reduce the dependence on land cover, as the area is a scarce resource and its overuse causes various negative impacts on the environment. As total production is proportional to both the area and the productivity, higher production can be achieved with higher productivity without increasing the land cover. A digital tool being devised is an effort to bring the power of machine learning via an end-to-end solution that covers the complete monitoring of the farm and returns insights and recommendations for increasing productivity. The tracking of the aquaculture system will yield crucial environmental parameters that affect the growth of a particular organism. Literature reveals a set of environmental parameters that have a significant impact on the growth of shrimp and seaweed organisms. Various pieces of literature have discretely provided evidence of variations in growth patterns with changing environmental parameters. The paper discusses the developed framework that accomplishes the goal of improving productivity with the help of machine learning by collectively applying the evidence and knowledge gained from literature into a mathematical model. This mathematical model is a non-linear function developed using the ideas of probability and machine learning that maps the environmental parameters, considering them as input variables for the expected growth rate of the organisms in these conditions. The robust framework will help farmers get the most returns from their efforts and increase their income. Added benefits include that it will help stakeholders demarcate geographical locations that favor high productivity based on climate data and reduce the mortality rate of cultivated organisms by maintaining the farm conditions in which they flourish. This is a strong move to mitigate the adverse effects of climate variability. Digital intervention in aquaculture can enhance economic benefits by improving production efficiency and reducing risks.

Audience Take Away Notes

- The audience will learn the formulation of area, production, and yield analysis in the aquaculture domain. This is important, seeing the increase in demand for aquaculture-related products soon, as it helps analyse the current status and enhance production and productivity by identifying parameters that affect the productivity of aquaculture units. The talk will describe how the technological intervention will help aquaculture industry to get the most out of the investments being made and can ideate them for developing such solutions in other areas for human benefit. They will learn the sustainability study of growth of aquaculture and how it can be combated
- For the research community and academia, the open-source framework development and research work will help them gain subtle knowledge about the need to increase productivity and sustainability issues

Biography

Dr. Aksya Kumar Sarkar (PhD in shrimp Aquaculture), has 27 years of experience in shrimp culture, processing, and marketing. I have worked in both development agencies (Fisheries Training and Extension Project-FTEP-II, UK govt. funded project as Team Coordinator, Shrimp Seal of Quality –SSOQ/WorldFish Center, US govt. funded project as Extension Specialist) and private sector (WAB Trading International (Asia) Limited, as Joint Managing Director, KM International, as Technical Director). WAB Trading & KM International is a German-based private trading company that is involved in organic shrimp production, processing, and export from Asia and marketing in Europe. I am experienced in organic shrimp certification and I am an Aquaculture Certificate Council Int. (ACC) certifier and member of the world aquaculture society. For three years I have worked as an international ICS manager in India to develop an organic shrimp supply chain and organic certification. I have seven articles on shrimp-related research topics which are published in different international journals. I have participated in more than ten countries organized aquaculture events (Thailand, Philippines, Vietnam, Hongkong, Indonesia, Belgium, Germany, Czech Republic, French, and India, etc).



Ndongo Ivan*, Onana Ngono Michel Thierry, Tombi Jeannette

Laboratory of parasitology and ecology, Department of Animal Biology and Physiology, Faculty of Science, University of Yaounde 1, Yaounde, Cameroon

Some biotic and abiotic factors which influence the distribution of monogeneans in gills of *Brycinus Kingsleyae* Gunther, 1986(Osteichthyes - Alestidae) from the Nyong river at Akonolinga (centre-cameroon)

The Alestidae or African Characins form the most represented family among the Characidea. These fish have a very important place in the diet of the riverside populations of the rivers in which they abound. The culture of fish of this family proves to be essential to ensure the necessary contributions of all these populations unable to obtain imported fish. One difficulty that arises in the cultivation of these species is their great parasitism coupled with their fragility in culture. Monogeneans are among the fish parasites that cause the most damage in the rearing environment. This is particularly about their direct and simple cycle and their mode of nutrition. The works carried out in Cameroon on the Alestidae are essentially focused on the systematic aspect. That present work was undertaken to determine some biotic and abiotic factors which influence the parasitic distribution of the gills monogeneans of *Brycinus kingsleyae* Gunther, 1986 from the Nyong River. From december 2017 to december 2018, each month thirty specimens of *B. kingsleyae* were caught with a gill net by a local fisherman. Each fish was then preserved in 10% formalin. In the laboratory, after a determination of the sex and the standard length of the fish, each gill was detached and placed in a Petri dish marked left or right and containing tap water. Using a stereomicroscope, the number of gill filaments was counted and using a mounted needle, each parasitic individual was isolated and mounted between slide and coverslip in a drop of water. The different species were identified under an optical microscope with the help of drawings of the sclerotized parts made by Birgi (1988). It emerges from this work that: 1°) Five species of monogeneans used the gills of *B. kingsleyae* is :*Annulotrema combesi* Birgi, 1988, *Annulotrema maillardi* Birgi, 1988, *Annulotrema nyongensis* Birgi, 1988, *Annulotrema bouixi* Birgi, 1988 and *Chracidotrema regia* Birgi, 1988; 2°) All these species are principal; 3°) The structuring of the infracommunities follows the same model as that of the gills filaments which is $A_2 > A_1 = A_3 > A_4$; 4°) it is during the rainy season that the prevalence and mean intensity are the highest; 5°) the parasitism is not modified by sex and size of the host. This work is therefore not only a good model for ecological studies but also a first step for the implementation of cultivation and conservation measures for Alestidea.

Keywords: A.bouixi, A.combesi, A. maillardi, A. nyongensis, B. kingsleaye, ecology, C. regia, Infracommunity, Nyong, Monogeneans.

Audience Take Away Notes

- This study makes it possible to determine the appropriate sampling periods for a fish farm of *B. kingsleyae*
- This study is a first step for the establishment of a means of conservation of some African freshwater species
- By this study, we can establish some models of species distribution in ecology
- Improvement of dietary condition (protein intakes) of the riparian populations of Cameroon and Africa

Biography

Ph.D. student NDONGO Ivan Studied Biology of Animal Organisms at the University of Yaounde I, Cameroon. He Joined the Research group of Prof Tombi Jeannette at the Department of Animal Biology and Physiology at the same institution in 2015. He received Master degree in Parasitology and Ecology (specialized in Ichtyoparasitology) in 2018 and actually makes his thesis work in monogeneans parasite of some African tetras. The objectives is to improve the farm of African fishes to improve dietary condition of poor people of Cameroon and Africa. She has published 02 articles as first author in SCI (E) journals.



Luigi Piper^{1*}, Maria Irene Prete¹, Antonio Mileti¹, Adriana Giangrande², Gianluigi Guido¹

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Integrated Multi-Trophic Aquaculture (IMTA) and sustainability-led innovations: The marine aquaculture market

The growth of the global marine aquarium market can be deemed to be one of the causes of the degradation of coral reef ecosystems. The need to balance economic interests and the protection of the biosphere has favored restrictive legislation on the importation of ornamental species used in the aquarium sector. This, consequently lead to the promotion of the breeding of local species, incentivizing the implementation of innovative systems for the recovery of production waste in a circular economy perspective. In the present study, an innovative Integrated Multi-Trophic Aquaculture (IMTA) system – in which the coexistence of different organisms improves bioremediation performance – implemented in the marine area of Taranto (Italy) was considered, as well as the potential of the commercial outlet market. The present study is intended to show how the local farming of polychaetas through the IMTA system represents a sustainability-led innovation and can: 1) lead to ecological forms of farming; 2) facilitate a new substitute product development; 3) stimulate collaboration among fisheries and farmers; 4) close the production cycle of fish farming with a view to circularity. The study confirms how the establishment of sustainable forms of farming can help the economic growth in depressed areas.

Audience Take Away Notes

This study has implications both for companies and managers and for international rulers and institutions responsible for improving the environment:

- First, from a managerial point of view, it confirms the importance of developing synergies among companies and organizations of different industrial sectors, and the convenience of enhancing the economic and image value of final production waste. In addition, the focus on a circular and environmentally friendly economy enhances the company's image and, especially in times of social media relevance, amplifies and enhances its reputation
- Second, from a governance perspective, the study recognizes that it is unlikely that any single organization alone can create and sustain positive social and environmental outcomes. Given the dynamism of sustainability-led innovations systems the scope and boundaries of a strategy must be continually reevaluated to recognize and manage relevant effects and ensure maximum impact on people and the environment. Both national and international institutions should, therefore, incentivize such dynamics by empowering companies to collaborate, promoting such synergies both through research and development programs and tax breaks and concessions

Biography

Luigi Piper is Senior Assistant Professor of Business Management at the University of Salento, Lecce (Italy) and Assistant Professor of Destination Management at the University of Bari, Bari (Italy). He also taught Quantitative Methods in the International Doctoral Programme in Intercultural Relations and International Management at International University of Rome (UNINT), Rome (Italy) and in the Doctoral Programme at the University of Salento. He is author of numerous articles published in national and international journals on topics such as consumer behavior, consumer psychology, and digital marketing, and two books on food marketing, and consumer psychology. He is involved in several European Projects with the Department of Biology of the University of Salento and of the University of Bari, and with the National Research Council - Water Research Institute (Italy).



Gopa Mitra

Department of Zoology, College of Basic Science and Humanities Odisha
University of Agriculture and Technology, Bhubaneswar, Odisha, India

Biological implications of Carotenoids in aquatic organisms

Natural pigment Carotenoids play key role in colouration, growth, metabolic activity, physiology, health and reproduction. Among more than 800 carotenoids so far discovered, the main two types such as Carotene and xanthophylls are found in animals and they are fat soluble derivative of 40 carbon polyene chain. However, animals cannot synthesize them denovo, only some bacteria, algae, fungi and plants can biosynthesize them. So, to maintain all physiological activity animals must obtain them from food. In this review various types of carotenoids, their sources, physiological aspects of their metabolism in respect of aquatic organisms' overall health and wellbeing have been documented.

Audience Take Away Notes

- Vibrant skin and flesh colouration: Natural carotenoids have beneficial effects over synthetic carotenoids. Some microalgae are rich sources of carotenoids. Through aquatic food chain, different organisms specifically ornamental fish can obtain them for vibrant skin colouration, food fish and prawn for flesh colouration
- Medicinal properties: Through edible fish and prawn and other aquatic organisms the consumers can get various beneficial effect of natural carotenoids on physiology and good health. Because carotenoids not only have advantageous effect as anticancer, antioxidant and provitamin A mediator, it lowers the risk of cardiovascular and degenerative disease, perk up cognitive and neuromotor health
- The presentation will help the faculty members and researchers and medical students to explore different carotenoid resources and do work on application of different carotenoids as food additive and nutraceuticals

Biography

Gopa Mitra is teaching Higher Secondary, Undergraduate and Post Graduate Zoology students in the Department of Zoology, College of Basic Science and Humanities, Odisha University of Agriculture and Technology, Bhubaneswar, Odisha, India. She was also teaching Zoology in R. D. Women's University and MSc. Fisheries and Aquaculture in Department of Zoology, Utkal University, and Bhubaneswar. Earlier she was working as Senior Research Fellow, Research Associate and DST Women Scientist A in the ICAR- Central Institute of Freshwater Aquaculture, Kausalyaganga, Bhubaneswar, with Dr. P.K. Mukhopadhyay, Dr. S. Ayyappan, Dr. J. K. Jena and Dr. P. Jayasankar.

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