

WORLD AQUACULTURE AND FISHERIES CONFERENCE



May 19, 2021 | 12:00-23:00 GMT

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WORLD AQUACULTURE AND FISHERIES CONFERENCE

MAY 19, 2021

Theme:
Sustainable Aquaculture: Challenges and Strategies

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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 conference 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 90 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 2021**

WAC 2021 is based on the theme "Sustainable Aquaculture: Challenges and Strategies". This gathering will cover the innovative methods, the most recent techniques and new research systems, developments, and the newest updates in Aquaculture , Fisheries and Marine biology

WAC 2021 provides the global Platform to the international scholars and researchers to voice their research discoveries in front of the world. With representatives from all the real aquaculture nations in participation the environment is energizing with open and amicable communication between participants. This is a gathering, giving a chance to the aquaculture and sea life science industry to find out about flow and up and coming issues, investigate new improvements in culture innovation, and interact with others with similar interest. The conference aims to bring all together like academicians, scientists, and business professionals, current and prospective fish farmers to share information and ideas about the development of aquaculture & fisheries

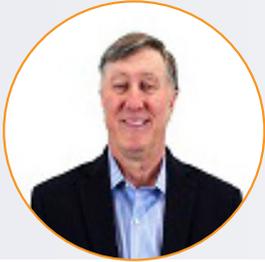
KEYNOTE FORUM

WORLD AQUACULTURE AND FISHERIES CONFERENCE

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WAC 2021





Tom Wedegaertner

Agricultural and Environmental Research, Cotton Incorporated, Cary, NC, USA

A new era of cottonseed protein utilization is about to begin

Each year the cotton crop on the planet produces about 11 million metric tons of plant-based protein, as a byproduct of cotton production. Unfortunately, almost all this protein must be used as a supplement for ruminant animals or used for fertilizer. This vast plant-based protein reserve is being grossly underutilized in the conversion of plant-based protein to high-quality animal protein due to a naturally occurring chemical known as gossypol. Gossypol is a cumulative toxin that severely limits the utilization of cottonseed protein. Researchers in China and the U.S. have simultaneously used two different molecular biology strategies to reduce gossypol in cottonseed to safe levels. Extensive aquaculture research with low-gossypol cottonseed protein has clearly shown that it can satisfy most, if not all, of the protein requirements of many important aquaculture species, where it can effectively replace or extend the use of fish meal. Cottonseed protein is a unique plant-based protein because it is highly palatable, nutritious and widely available. As this technology is integrated into cotton plants worldwide, over the next decade, it will help enable the aquaculture industry to continue to grow and become more sustainable.

- The extensive scientific background of this transformative technology will be briefly reviewed.
- Aquaculture research with this new source of protein will be summarized.
- The path forward for increased utilization of sustainable cottonseed protein will be explored

Biography:

Tom Wedegaertner has been involved in research and marketing activities in the cottonseed industry for the past 39 years. He is currently the Director of Cottonseed Research at Cotton Incorporated. Tom has graduate degrees in animal nutrition and marketing



**Christopher C. Parrish*¹, Stefanie M. Colombo²,
Mohamed Emam¹, Nigel Guerra¹, Judy Perry¹,
Matthew L. Rise¹, Minmin Wei², and JuDong Yeo¹**

¹Department of Ocean Sciences, Memorial University of Newfoundland, St. John's, Newfoundland, Canada

²Department of Animal Science and Aquaculture, Dalhousie University, Truro, Nova Scotia, Canada

Replacement of fish oil by a high-DHA microbial oil in Salmon diets: Effect on growth performance, lipid composition and gene expression

The omega-3 fatty acids eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) are essential nutrients for farmed fish and for their human consumers. Fish oil is one of the main sources of these long-chain polyunsaturated fatty acids; however, due to an increasing demand for EPA and DHA and with a limited supply from wild fisheries, there is a need for alternative sources that are sustainable and cost effective for aquaculture. Here we investigated replacement of fish oil with a high-DHA, low-EPA oil extracted from single-celled thraustochytrids. This provided a unique opportunity to determine how these dietary fatty acids independently influence lipid metabolism and physiological pathways in salmonids.

A 16-week feeding trial was conducted with Atlantic salmon fed diets with a complete or partial replacement of fish oil with microbial oil. There was no significant difference in growth performance among the dietary treatments but we observed differences in lipid composition and gene expression. We investigated total lipid class and fatty acid composition in liver and muscle tissues using thin-layer chromatography and gas chromatography with flame ionization detection and mass spectrometric detection. Our results showed no significant differences in total lipids and lipid class concentrations among the dietary treatments for both tissues; however, significant differences were observed in proportions of omega-3 and omega-6 total lipid fatty acids and phospholipid fatty acids. In addition, there were differences in the phytosterol composition and in triacylglycerol and phospholipid molecular species. These results correlated with hepatic lipid metabolism biomarkers, although some levels were the same with high dietary DHA (high microbial oil) and high EPA (fish oil) indicating successful replacement of fish oil with microbial oil.

Take Away Notes:

- Microbial oil can replace fish oil in salmon diets.
- There is a higher requirement for DHA than EPA in the diet.
- DHA is important in membranes.
- DHA was more variable in muscle than liver.

Biography:

Dr. Christopher C. Parrish has a B.Sc.(Hons) in Chemistry and Oceanography from Wales, and a Ph.D. in Oceanography from Dalhousie University, Canada. He is a University Research Professor and Interim Head of Department. He works at the interface of chemistry and biology in the area of marine lipid research studying food web connections, aquaculture nutrition, and environmental impacts on trophic ecology. He recently expanded into lipidomics and gene expression work focusing on alternative lipid sources for aquaculture that are sustainable and cost effective, and ways to maximize the healthfulness of the food product. He has published >190 refereed journal articles.



J. L. Giovanna Hesley

BASIS Tucson Primary, Tucson, Arizona, USA

Integrated aquaculture in the elementary school curriculum

The combination of aquaculture and hydroponics has found a strong support structure in Tucson, Arizona. Tucson has had the benefit of research professors, Kevin Fitzsimmons and Gene Giacomelli at the University of Arizona. Fitzsimmons championed aquaculture in local high schools and the Future Farmers of America clubs utilized the technology. Giacomelli ran the Controlled Environment Agriculture Center and fostered research in integrating the two systems. Local residents became interested and took up the concept in their backyards. James Ebeling moved to the area and supported local high schools as well as the community outreach programs. This author was involved in all the programs and assisted Ebeling in designing Tucson's first commercial aquaponics facility as well as its educational outreach program for Tucson Unified School District.

Biography:

J. L. Giovanna Hesley is working with elementary school children to develop and implement STEAM curriculum based on the aquaponic school garden.



Amod Ashok Salgaonkar

International Seafood Professional, India

Alternative seafood: Era of new potential segment

Carbon emission is one of the biggest challenge in most of the food producing industry mainly applicable to nonveg segment among which seafood / aquaculture is one of the important food category contributing significantly. The traditional ways of culturing seafood produce high emissions of carbon whereas professionals involved in the protein sector assure of reducing those carbon emissions to a large extent with the production of plant-based and cell-based seafood. Various reports and presently occurring new discussions, studies shows the emergence of Alternative seafood segment namely plant-based seafood and cultivated or cell-based seafood. It is interesting to see how this new segment will help to feed the growing predicted population size until 2050.

Take Away Notes:

- What is alternative seafood sector
- What is plant-based & cell-based seafood
- Present status, market size and future potential

Biography:

Mr Amod Ashok Salgaonkar has wide experience in strategy, procurement, merchandising, negotiations and customer service operations of various seafood businesses. He is known internationally mainly for sustainable seafood business practices and ecolabel segment. He is among the peers to establish and launched world's first sustainable ecolabel in plant-based seafood and meat (<https://www.fishfarmingexpert.com/article/plant-based-seafood-given-its-own-certificationstandard/#:~:text=A%20new%20certification%20programme%20has,a%20new%20%E2%80%9CGolden%20Standard%E2%80%9D.>) as main lead through collaboration of World Sustainability Organization & Good Food Institute. He represents an international board of Friend of the Sea (www.friendofthesea.org), Friend of the Earth (www.friendoftheearth.org) & World Sustainability Organization. He is the key business advisory board member precisely for seafood at Good Food Institute India. He is also known as International Seafood Writer and have published many articles in various seafood media and delivered talks at international and national conferences. He also represent advisory board of various food organizations in India.

SPEAKERS

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Takahiko Aoki

Mie University, Japan

Application of carp glycophorin from red blood cell membranes as an antibiotic reagent

Glycophorins (GPs) are transmembrane glycoproteins that contain sialic acid. These proteins are found in the red blood cell (RBC) membranes of mammals, birds and teleosts. We demonstrated that the teleost glycoprotein, isolated from carp (*Cyprinus carpio*), inhibits bacterial activity by attachment to the flagellum of *Vibrio anguillarum* or the cell surface of *Micrococcus luteus*. Moreover, the carp glycoprotein appears to be responsive to a broad range of bacteria. Carp glycoprotein is also responsive to a carp pathogen. The adsorbent properties of the glycoprotein was owed to the oligosaccharide moiety of glycoprotein fraction. The efficacy of carp glycoprotein as an antibacterial reagent was evaluated for the control of disease in rainbow trout (*Oncorhynchus mykiss*). The results suggest that intravenous administration of glycoprotein significantly delays the time of death following challenge with *Vibrio anguillarum*. The MIC value for carp glycoprotein against *E. coli* (2.5 µg/ml) was higher than that of oxolinic acid (OA) (0.2 µg/ml) and miloxacin (MLX) (0.39 µg/ml), whereas, the value against *M. luteus* (2.5 µg/ml) was lower than that of sulfamonomethoxine (SMM) (25 µg/ml). Thus, the glycoprotein fraction was more effective against Gram-positive than Gram-negative bacteria when compared with these antibiotics. The efficacy of carp glycoprotein as an adsorbing reagent was evaluated. We demonstrated the ability of carp glycoprotein to exclude bacteria from suspension using glycoprotein-binding column, which reacted to bacterium within the column bed. Test organisms was *V. anguillarum* as Gram-negative bacterium or *M. luteus* as Gram-positive bacterium. The culture medium of each bacterium was diluted with PBS following by application to the glycoprotein-binding column. The number of colony forming units (CFU) in bacterial suspension or elution was quantified by plating a 10-fold serial dilution on agar medium and counting the number of colonies after incubation at 25°C (*V. anguillarum*) or 37°C (*M. luteus*). In addition, we evaluated the ability of carp glycoprotein-binding column in the case of a 500 l polycarbonate tubs attached to a large-scale column. The large-scale experiment was carried out using *Escherichia coli* suspension as test organism.

Take Away Notes:

- Explain how the audience will be able to use what they learn?
- The efficacy of glycoprotein prepared from fish blood as an antibiotic reagent.
- How will this help the audience in their job? Is this research that other faculty could use to expand their research or teaching? Does this provide a practical solution to a problem that could simplify or make a designer's job more efficient? Will it improve the accuracy of a design, or provide new information to assist in a design problem? List all other benefits.
- Our experiment results suggested that the glycoprotein prepared from the waste from fish processing factory will be utilized as an antibiotic reagent. Furthermore, it also showed the efficacy as a degerming agent.

Biography:

Takahiko Aoki is working at the Mie University since 1989. He at first was appointed Research Assistant. He serving as a member in The Japanese Society of Fisheries Science, The Japanese Society of Fish Pathology and The Japanese Biochemical Society. He has completed his PhD at the age of 29 years from Kyusyu University, Japan. He studied on membrane proteins and detergents under Prof. H. Michel at Max-Planck-Institut für Biophysik at Frankfurt, Germany (1995-1996). Meanwhile, he was appointed Associate Professor in 1998 and then Professor in 2015.



Wen-Miin Tian

National Sun Yet-sen University, Taiwan

An acoustic technique for the evaluation of fish behavior in aquaculture pond

Information regarding abundance, growth status and behavior of fish in aquaculture ponds is needed for farmers in conducting proper management practices. Developing proper and reliable methodologies for determining inventory, length distribution, movement behavior and distribution pattern for these mobile objects involves four observational challenges, i.e., detectability, spatial coverage, temporal repetition rate and temporal coverage. An acoustic surveying system, with horizontally orientated and mechanically rotated beams, (i.e., mechanically scanned imaging sonar) under bottom-fixed deployment configuration was adopted to mapping and quantifying the occurrence, status and distribution of fish in aquaculture pond. The current investigation was conducted on a concrete pool of 8 x 6 x 1.7m in dimensions where 18 giant groupers (*Epinephelus tukula*) with current length of about 100cm were stocked for over 10 years. Multiple acoustic image frames collected at this pool, with three consecutive scanning range settings (i.e., 5, 7.5 and 10m), were processed and analyzed. Through visual observation and image intensity threshold procedure for the detection, identification, enumeration and measurement, spatial-temporal information regarding fish objects in this pool were derived, which include position of occurrence, orientation and acoustic trace length. Abundance (17 groupers), averaged length (96.9 cm), swimming speed (30 cm/sec RMS) as well as distribution pattern and movement characteristics of the groupers in this pool at the specific surveying time (lasted for 60 minutes) were derived and quantified thereafter. During this investigation, most of the groupers were distributed at the second and further half of the pool relative to the sonar deployment site and circling around the pool edge with two prominent meeting points. It should be emphasized that these giant groupers were able to detect the existence of the acoustic pulses from the sonar system and tried to avoid them actively. It is, therefore, concluded that the integrating of the proposed acoustic apparatus, deployment configuration and image processing procedures for the acquisition of spatial-temporal characteristics of fish species represents a potential candidate for the resolving of inventory and related problems in aquaculture for both fish as well as shrimp.

Take Away Notes:

- Proper spatial-temporal information are necessary for the resolving of inventory and related problems in aquaculture for both fish and shrimp.
- An integrating of the proposed acoustic apparatus (a scanning sonar), deployment configuration and image processing procedures for the acquisition of spatial-temporal characteristics of fish species were demonstrated and verified in a small concrete pool with 18 giant groupers (*Epinephelus tukula*).
- Further verifications for both fish and shrimp inventory and related characteristics are scheduled to conduct. An automatic image processing procedure is currently under developing to fulfill the requirement for promptly evaluation of fish/shrimp inventory and behavior characteristics.

Biography:

Dr. Wen-Miin Tian has his expertise in marine geotechnical engineering and underwater acoustic surveying on both stationary objects (e.g., artificial habitat) and mobile objects (e.g., fish and shrimp). For the last ten years, he has dedicated in integrating acoustic instruments, incorporating proper deployment capabilities and developing practical processing procedures for the acquisition of spatial-temporal characteristics of fish species as well as quantifying and describing the spatial ecology (processes that affect species distribution and dynamics) of fish and their habitat.



Tian-Xiang Gao¹, Shilpi Saha*^{2,3}, Mohammad Abdul Baki³, Zhengsen Yu², Na Song²

¹Zhejiang Ocean University, China

²Ocean University of China, China

³Jagannath University, Bangladesh

Three new species and one new record of Sillaginids (*Perciformes: Sillaginidae*) from Bay of Bengal, Bangladesh

Study on Sillaginids was conducted from October 2018 in the coastal region of the Bay of Bengal, Bangladesh. Four hundred and seventy-three individuals of 5 species of family Sillaginidae under two genera (*Sillaginopsis* and *Sillago*) were collected from 8 different landing stations of Bay of Bengal, Bangladesh namely Cox's Bazar (BFDC), Kuakata, Mangroover forest Sunderbans (Dublarchar), Bhola (Ghosher hat), Maheshkhali, Patharghata (BFDC), Saint Martin's Island, Shyamnagar (Kall bari). Morphological characters and DNA barcoding approach by partial mitochondrial cytochrome oxidase I subunit (COI), 12S rRNA, 16S rRNA, and Cytb were used to confirm their identification. However, these methods confirmed the misidentification of *Sillago sihama* in the Bangladesh sea area and identified three new species of *Sillago*. Furthermore, the first national record of *Sillago soringa* and re-description of *Sillaginopsis panijus* were also studied. *Sillago soringa* was only collected from the Saint Martin's Island as well as Chennai, India. The distinctive characteristics of *Sillago* sp.1 from known Sillaginids are X-XI spines in the first dorsal fin; I, 20-22 rays 2nd dorsal fin; II, 21-23 rays anal fin; 68-72 scales in lateral line; 4-6/10-13 scales above/below lateral line; 3-5+8-10=11-14 gill rakers first arch; 12-14+5-8+12-15=32-35 vertebrae; body greenish dorsally, yellowish ventrally and swim bladder short and broad with two anterior extensions, two posterior extensions with lacuna at the base, anterolateral extension extends into anterior short, blind tubule and posterior one kinked, long and about half length complex towards the beginning and 8-9 lateral processes (anterior 2-3 stout and horn-like, posterior 6-7 rather small and triangular). *Sillago* sp.2 can be identified from *Sillago* sp.1 by swim bladder that is long with two anterior extensions; two posterior extensions without lacuna at base; anterolateral extension extends into anterior short, blind tubule and posterior one kinked, long and thin; 9-10 lateral processes (anterior 3-4 stout and horn-like, posterior 5-6 rather small and triangular) along with other meristics characters. *Sillago* sp.3 can be easily identified from the former two by only light yellowish or whitish anal fin. *S. soringa* can be identified from the former three by transparent pectoral and pelvic fins. *Sillaginopsis panijus* distinguished from others by 2nd dorsal fin spine very elongated, eyes small and swim bladder absent. The mean genetic divergences of COI for the intraspecific level were 0.2%, 0.1%, 0%, and 0% for *S. sp.1*, *S. sp.2*, *S. sp.3*, and *Sillaginopsis panijus* respectively. Mean genetic divergences of COI for the interspecific level ranged from 3.8% to 25.5% between *S. sp.1*, *S. sp.2*, *S. sp.3*, *Sillaginopsis panijus*, and other 13 Sillaginids species. Furthermore, mean genetic divergence of 12S rRNA for the intraspecific level ranged from 0% to 1.2% and for the interspecific level ranged from 1.9% to 26.8% for the studied species included related 16 species downloaded from GenBank. This study increased the number of known species of *Sillago* in the world and extended the distribution of *S. soringa* from Visakhapatnam, Chennai, India (Eastern Indian Ocean) to the Northeastern part of the Bay of Bengal, Bangladesh.

Take Away Notes:

- Let to know the method to identify cryptic fish species correctly.
- Let to know the extended list of marine fish in the world.
- Let to know the upgrade checklist of *Sillago* spp. as well as marine fish in Bangladesh.

Biography:

Shilpi Saha studied Zoology at Jagannath University, Dhaka, Bangladesh, and graduated as B.Sc. in 2015. After that, She studied Zoology (Fisheries) and graduated as M.Sc. in 2017 from the same institute. She then joined the research group of Prof. Tian-Xiang Gao at the Key Laboratory of Mariculture (Ocean University of China), Ministry of Education, Shandong, China. In January 2020, She obtained the position of a Lecturer at the Department of Zoology, Jagannath University, Dhaka, Bangladesh. She has published two full-text articles in National and International journals and five abstracts in National and International conferences.



Abinawanto, A, T. A. Pratiwi, R. Lestari, A. Bowolaksono, and N. G. Zavitri

Universitas Indonesia, Indonesia

The effect of egg yolk as a natural cryoprotectant on viability and fertilization rate of giant grouper spermatozoa forty eight hours after freezing

Epinephelus lanceolatus (Bloch, 1970), is the largest groupers. The distribution of this species is throughout the Indo-Pacific region. The status of *E. lanceolatus* according to the International Union for the Conservation and Nature is vulnerable. There are some factors involved in declining the population of this species in the last 20 years, such as habitat destruction and overfishing. Re-stocking effort of this species has been conducted through aquaculture, at the moment. The obstacle in re-stocking grouper are having long spawning and protogynous hermaphrodites. Cryopreservation method, accordingly can be applied as an alternative way to solve the re-stocking problem. Cryopreservation is cell storage method conducted at low temperature at a certain time. A major factor supporting for success of cryopreservation is cryoprotectant. There are two types of cryoprotectant namely intracellular (permeating) cryoprotectant and extracellular (non-permeating) cryoprotectant. Therefore, the objective of present study is to evaluate the effect of combination glycerol (permeating) and egg yolk (non-permeating) on spermatozoa quality of *E. lanceolatus* (viability and fertilization rates) for 48 h. One level of glycerol (6%) combined with six levels of egg yolk solution (0%; 5%; 10%; 15%; 20%; and 25%) were tested in this study. Marine fish Ringer's solution was used as an extender. The diluted sperms were equilibrated for 10 min. at 4°C, and then kept at -20 °C for 48 h. Sperm was thawed at 45 °C for 30— 60 s. Spermatozoa viability and fertilization rates were then evaluated. The one-way ANOVA showed that combination glycerol and egg yolk solution had a significant effect on spermatozoa viability and fertilization rates ($P < 0.05$). The study revealed that the 15% egg yolk solution combined with 6% glycerol resulted in the highest rates of viability ($81.44 \pm 2.06\%$), and fertilization rates ($77.31 \pm 1.90\%$). Conclusion: A 15% egg yolk solution combined with 6% glycerol in marine fish Ringer's solution was the best cryoprotectant for *E. lanceolatus* spermatozoa preserved at -20 °C for 48 h. Short Description of what will be discussed during the presentation (about 250 - 500 words)

Take Away Notes:

- The audience will be able to apply some of natural cryoprotectant to preserve spermatozoa at frozen state for more than 24 hours.
- The audience will also can implemented the modified method from this research result to give an enrichment of the teaching module..
- The novel of natural cryoprotectant used in this study

Biography:

Abinawanto Abinawanto, PhD. was graduated from Nagoya University, Japan, in 1997. He joined the research group of Prof. John D. Melnick as a Visiting Researcher at Columbia University, New York in 1998-1999. He then joined research collaboration with the former supervisor, Prof. Kiyoshi SHIMADA at Nagoya University from June until August, 2000. He obtained the position of an Associates Professor at the Biology Department, Faculty of Mathematics and Natural Sciences, Universitas Indonesia, Depok, West Java, Indonesia. He has published more than 20 research articles in SCI(E) journals.)



Agnieszka Dabrowska

University of Warsaw, Poland

University of Warsaw Biological and Chemical Research Centre, Poland

The polymer materials and nanomaterials in the marine environment - from the microplastics to the Plastisphere

The constantly growing amount of microplastics in the environment and their gradual fragmentation led to the expanding surface of plastics available for biota. It has been already named the Plastisphere and considered to be the eighth continent. Although many researchers focus on the microbiological and ecological issues and, on the other hand, regard the material studies, one can point out the need for correlation between the morphology of surfaces and the type of biofilm. The aim of this paper is to provide a quantitative description of the Plastisphere based on numerical modelling and picture analysis. It is a new and important area of research that creates a bridge between material and biological perspectives. Moreover, one can discuss the various approaches to physical and chemical characterization of microplastics, such as Raman and FTIR spectroscopy. Finally, the ecotoxicological issues and the evidence of MMs in fishes will be presented.

Take Away Notes:

- Current knowledge in field of microplastics and nanoplastics
- Plastisphere
- Raman and FTIR Spectroscopy for marine microplastics characterization
- Case study and evidence of fish-MMs interaction

Biography:

Agnieszka Monika Dąbrowska, PhD is an assistant professor at the University of Warsaw. She carries out interdisciplinary research on the use of physicochemical methods (mainly Raman and IR spectroscopy, SEM-EDX, XRD) in ocean science. She has been involved in the nanomaterials design and nanocomposites studies. Currently, her scientific activity at the Laboratory of Spectroscopy and Intermolecular Interactions focuses on various aspects of the marine nano- and microplastics, ecotoxicology and Plastisphere. She was a member of the scientific polar expedition of Polish Academy of Science. From 2018 she is an honoured ambassador of Poland at European Maritime Day.



Wazir S Lakra

ICAR-Central Marine Fisheries Research Institute, India

Fisheries and aquaculture research and development in India

Fisheries and aquaculture development in India has exhibited tremendous growth in recent years. Fish production in India has reached an all-time high of 14.6 million metric tons during 2019-20. The gross value added (GVA) by the fisheries sector to the national economy stood at INR 2,12,915 crores, constituting 1.24 % of the total national GVA and 7.28 % of the agricultural GVA. India exported 12,89,651 MT seafood worth US\$ 6.68 billion (INR 46,663 crores). The seafood export is targeted to reach INR 1 lakh crore by 2025. The country is rich in aquatic genetic resources which are very varied and widely distributed extending from deep sea to the cold Himalayan rivers constituting about 10% of the global aquatic biodiversity. While the inland and marine capture fisheries production in the country have more or less stabilized, the growth in aquaculture has been tremendous. The freshwater aquaculture contributes to about 85-90 % of the farmed fish followed by brackish water shrimp farming contributing significantly. The marine aquaculture is in infancy stage in the country. The research and technological advances including rapid disease diagnostics and management, use of genetically improved seed, aquaculture species and systems diversification and above all the human resources development with new scientific skills of the farmers have enabled the country to significantly enhance the production and productivity particularly in the fresh and brackish water aquaculture sector. The recent progress in cage culture in reservoirs and mariculture in the coastal states offer new avenues and scope for further development. The major constraints in the capture fisheries production are depleted stocks due to habitat degradation, overexploitation, poor governance, climate change impacts and harvest and post-harvest losses. The key problems in culture fisheries include low productivity due to low adoption of technology, disease prevalence, non-availability of quality seed, cost effective feed for desired species. The cutting edge translational research and technology upscaling and dissemination, improved governance, fisher and farmer centric fisheries policy support and large scale capacity building for both aquaculture and marine sector including exploitation of deep sea fisheries resources are critical for achieving the targets of blue revolution in the country.

Biography:

Wazir S Lakra is currently NABARD Chair Professor of Fisheries under the ICAR-Central Marine Fisheries Research Institute with a research program related to the improved management of marine fisheries of the west coast. He has over 35 years of research and teaching experience in the fisheries sector including senior management position of Director/Vice Chancellor, ICAR-Central Institute of Fisheries Education, Mumbai and Director, National Bureau of Fish Genetic Resources, Lucknow. His major research interests pertain to aquatic biodiversity management, aquaculture, fish genetics and biotechnology. Dr Lakra has travelled widely in Asia, Australia, Europe and North America including expert member of the external review team of the WorldFish. He has several awards to his credit, published over 350 research papers, authored several books and guided 28 Ph.D students.



John Thomas

Centre for Nanobiotechnology, Vellore Institute of Technology (VIT), India

Efficacy of probiotic and seaweed polysaccharide on freshwater prawn *Macrobrachium rosenbergii* against *Aeromonas hydrophila* infection

Polysaccharide from red seaweed *Gracilaria folifera* has an interesting functional property of antioxidant activity and prebiotic effect. A feeding trial experiment was directed to examine the effect of probiotic bacteria *Bacillus vireti* 01 microencapsulated with *G. folifera* polysaccharide against freshwater prawn *M. rosenbergii*. Three different feeding trials were conducted for 15 days. The first group contained prawns fed with commercial diet. The second group was comprised of *Aeromonas hydrophila* challenged prawns fed with commercial feed. The third group consisted of *A. hydrophila* challenged prawns fed with microencapsulated probiotic-polysaccharide. Survival percentage was significantly decreased in prawns of group2 as compared to that of group1 and group3 prawns ($p < 0.0001$). The immunological parameters and antioxidant activities ($p < 0.001$) were found to be increased in group three prawns which were fed with encapsulated probiotic-seaweed polysaccharide and challenged with *A. hydrophila* as compared to that of group1 and group2. Tissue necrosis, fused lamella, haemocyte infiltration and damage of hepatopancreas lumen and tubule were noted in group2 prawns. There was no histological changes were observed in group3 prawns in which the histological architecture was similar to the control group1. The results suggested that combination of encapsulated probiotic *B. vireti* 01 and seaweed polysaccharide as dietary feed showed an enhancement of immune response, antioxidant activity and disease resistant of *M. rosenbergii* against *A. hydrophila*.

Audience Take Away:

The bacterial, viral infections are common in aquaculture. Nowadays antibiotics are being used to treat the infections. However the use of antibiotics can cause resistance. Probiotics are being used as an alternative to treatment of bacterial infections. Probiotics can also enhance the immune system. The audience will be able to understand the importance of probiotics in aquaculture and also know the feed preparation method (pellet feed) using probiotics

Biography:

Dr. John Thomas completed M.Sc Microbiology from University of Madras in 2004. He then Completed Ph.D in Microbiology (Aquaculture specialization) in the year 2010 from Thiruvalluvar University, Tamil Nadu, India. He is currently working as an Assistant Professor Senior in VIT, Vellore. He has published more than 30 research articles in Scopus indexed Journals. He also has 8 book chapters and one patent published.



Samar Saad Mohamed Mohamed Seoud

Department of Internal Medicine, Veterinary Medicine Mansoura University,
Egypt

Studies on *Amyloodinium* Infestation in European Seabass (*Dicentrarchus labrax*) with Special Reference for Treatment

A *myloodinium ocellatum*, adinoflagellate which causes one of the most serious diseases of warm water marine aquaculture. The parasite produces a powdery or velvety appearance on infected fish, and the resulting disease is commonly referred to as “marine velvet,” velvet disease, or *Amyloodiniosis*. The organism is a dinoflagellate ectoparasite and has been reported in a wide range of marine and estuarine fish. It is one of a very few organisms that can infect both teleosts and elasmobranchs (Alvarez-Pellitero, 2008). This makes it a concern for public aquaria. This ectoparasite can be found on gills and skin (body and fins) of host fish. It can cause devastating disease and mortality because the organism is able to reproduce quickly when fish are crowded, especially in closed systems. This parasite has a broad host and geographic range, causing fish mortalities in tropical and temperate environments. Rapid spread of the parasite and high mortality are common in cultured fish if the organism is not recognized and treated early in the course of an outbreak. One of the most important of the ectoparasitic protozoans. In this respect, the present study was aimed to investigate the occurrence of *Amyloodiniosis* among cultured European seabass (*Dicentrarchus labrax* L.; *Moronidae*; *Perciformes*) fishes. This work was carried out on 1065 European seabass fishes of different life stages (546 fry-222 fingerling and 78 adults) which were collected in different seasons of the year. Cultured fish were collected from different marine farms in Egypt during the period from April 2015 to April 2016 and subjected to full clinical parasitological and histopathological examination studying the environmental stressors surrounding examined fish and their association with *A. ocellatum* infestation. Study the ecological factors affects *Amyloodiniosis*. As well as examining the antiseptic activity of hydrogen peroxide against the ectoparasitic protozoan *A. ocellatum* as a trial for treatment.

Audience Take Away:

- Spotlight on that the severity of parasitic infestation is evaluated by interaction of the pathogenic parasite with variable environmental stressors.
- Shed light on that infestations of European seabass by *A. ocellatum* can be avoided if defined patterns of quarantine, biosecurity and disinfection protocols are kept in mariculture facilities.
- Drawing attention to hydrogen peroxide, As well as examining the antiseptic activity of hydrogen peroxide against the ectoparasitic protozoan *A. ocellatum* as a trial for treatment. It was cleared that, safe and excellent and that was confirmed through lower the load of parasitic infestation and recovery of infested fishes with no mortalities were recorded at the end of the treatment trial.

Biography:

Dr Samar Saad Mohamed Mohamed Seoud, I got the Bachelor of Veterinary Medical Sciences (B.V.Sc.). - Graduated from Faculty of Veterinary Medicine, Zagazig University, Egypt in (2009). Had got the Diploma in Fish Care and Production From: Fish Diseases and Management Department, Faculty of Veterinary Medicine, Zagazig University, Egypt in (2013). Had got the Master's degree of Veterinary Medical Sciences (M.V.Sc.) in (Fish Diseases & Management). - From: Internal Medicine, Infectious and Fish Diseases Department, Faculty of Veterinary Medicine, Mansoura University, Egypt in (2018). - The thesis entitled : (Studies on *Amyloodinium* Infestation in European Seabass (*Dicentrarchus labrax*) with Special Reference for Treatment) . I had International Publications: 1- a paper of thesis entitled “

Studies on Amyloodinium Infestation in European Seabass (*Dicentrarchus labrax*.) Fishes with Special Reference for Treatment ” , on the four following specialized international scientific journals:

1- International Journal of Marine Science. - (Canada)

2- American Journal of Marine Science. - (United States of America)

3- Journal of Agriculture and Veterinary Science . - (India).

4- International Journal of Fisheries and Aquatic Studies. - (India)

5- A paper of thesis entitled “ Correlation between Water Quality and Amyloodinium Ocellatum Parasitic Infestation in European Seabass (*Dicentrarchus labrax*) ” , at the 10th International conference in collaboration with the university of veterinary medicine, Hannover - (Germany), 2018. - Registered as an editorial member for INTERDISCIPLINARY JOURNAL OF FISHERIES AND AQUACULTURE RESEARCH online. (United States of America), From 2020 till now. Registered as an editorial member for Journal of Advances in Oceanography & Marine Biology(AOMB) online. (United States of America), From 2019 till now.

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Dickens P. Mahwayo

GS Foundation, Malawi

Aquaculture And Mari-Culture Development In Malawi: Gaps, Constraints and Unmet Needs

Background: Though there is great potential, the development of aquaculture and mari-culture in Malawi continues to lag behind though it is a sure and reliable alternative to the dwindling quantities of fish from capture fisheries.

Other studies have revealed that the volumes of fish caught from capture fisheries have been dropping every year. Realising this challenge government of Malawi formulated different policies and ratified some international frameworks and policies whose objectives are to promote intensive fish farming methods in aquaculture and mari-culture. However there are several gaps, constraints and unmet needs in aquaculture and mari-culture development in Malawi as highlighted below.

Study Objective(s) and Methodology: A Study was conducted to explore gaps, constraints and un met needs in aquaculture and mari-culture development in Malawi. The study used FGDs, IDIs) and a SITAN as data collection tools. Respondents included 8 aquaculture clubs and 13 individual smallholder fish farmers. In total the study had 42 respondents from five EPAs in Mangochi and Balaka districts respectively. Data was being analysed on a continuous basis using tally sheets.

Key Findings: The study documented the following as some of the gaps, constraints and unmet needs affecting the development of aquaculture and mari-culture in Malawi.

- Lack of Capacity: Fish pond construction requires special expertise of which many smallholder fish farmers lack capacity ranging from knowledge and lack of financial muscle as well as equipment.
- Extensive Pollution and Unreliable water supply: Upland agricultural activities in some cases pollute the water in the ponds with chemical fertilisers, pesticides and other pollutants.
- Lack of fingerlings and feeds: Smallholder fish farmers lack fish multiplication technologies and improved feeds

Conclusion: It is a fact that despite its economic and social importance, aquaculture development in Malawi is facing several challenges as such the government and its development partners should reinvigorate their efforts in the improvement of aquaculture and mari-culture development.

Biography:

Dickens P. Mahwayo holds a Bachelor of Business Administration, Bachelor Of Environmental Science majoring in Climate Change (California South University-US), Certificate in Public Relations and a Certificate in HIV/AIDS Management. He is the current Chairperson of the National Engagement Strategy Steering Committee. He is a Research Consultant and an Environmental Activist, has conducted several studies on Environment/Climate Change, Renewable Energy, Gender Equality and Women Empowerment , Population and the Built Industry, HIV/AIDS, Water and Food security just to mention a few. He is a 2020 Goldman Environmental Award Nominee for African Region. He has over twenty years working experience in both local and International NGOs



Otieno K. Oginga*¹, Dorothy W. Nyingi^{1,2}, Nathan N. Gichuki³, Francis Mwaura⁴, George F. Turner⁵ and Antonia Ford⁶

¹Kenya Wetlands Biodiversity Research Team (KENWEB), Kenya

²Ichthyology Section, National Museums of Kenya, Kenya

³School of Biological Sciences, University of Nairobi, Kenya

⁴Department of Geography and Environmental Studies, University of Nairobi, Kenya

⁵School of Natural Sciences, Bangor University, UK,

⁶Roehampton University, UK

Socio-economic dimension of aquaculture in Upper Tana River basin, Kenya

Socio-economic assessment and mapping data can be instrumental tools in fisheries management. We mapped the localities of fish farms and characterized socio-economic factors of fish farming in the Upper Tana River basin, Kenya. Structured questionnaires for fish farmers and traders were used to generate socio-economic data and management evidence. Fish farming was found to be a male dominated activity with many of the owners above 50 years (n=30; 62.5%). Kirinyaga county had the highest number of fish farms (n=23), followed by Nyeri (n=16) and Embu county (n=9). The presence of old government farms like the National Aquaculture Research and Development Centre (NARDC) may have promoted aquaculture activities in the area. The only tilapia species cultured intentionally was Nile tilapia (*Oreochromis niloticus*) as others were mainly accidentally introduced. Most traders were female (n=51; 93%), with Nile tilapia being the most preferred market fish with its demand (6420kg/month) being higher than the production capacity (4050kg/month) of the three counties. The increased number of fish farms in the area calls for strict adherence to the fisheries regulations to guide investments, protects farmers' economies through improved business practices for sustainable aquaculture in the area.



Judith G. Makombu¹, Guillaume L. P. Gaudin², Isabelle S. Motto², Janet H. Brown³, Jules R. Nguéguim⁴ and Eric Mialhe⁵

¹University of Buea, Buea, Cameroon

² Aquaculture and Solidarity Company, Cameroon

³Institute of Aquaculture, University of Stirling, United Kingdom

⁴Institut de Recherche Agricole pour le Développement, Cameroon

⁵Concepto Azul, Cdla vernaza Norte, Ecuador

Successful Larviculture of the giant Africa freshwater prawn *Macrobrachium vollenhovenii* in Cameroon

The African River prawn *Macrobrachium vollenhovenii* is the largest of the local Palaemonidae prawns along the Cameroonian coast and an important target species for fisheries and aquaculture. A preliminary study on larviculture of this species was carried out at the IRAD-AQUASOL hatchery in Kribi, Cameroon. Berried females *M. vollenhovenii* were obtained from the Lobe and Lokoundje Rivers in the Southern Region, typical Lower Guinea rainforest streams. The larval rearing system consisted of a single recirculation system of four 65 L cylindrical plastic containers connected to a submerged biological filter container (65 L). Experiments were conducted three times in the same condition, with two batches of larvae reared separately in duplicate per experiment, at a density of 40/L, temperature 26°C, and salinity 16‰. Larvae were fed from 1 day after hatching until metamorphosis to postlarvae (PL) with newly hatched *Artemia nauplii*, three times daily at the rate of 5 nauplii per mL water. The number of newly hatched larvae per female body weight unit was not affected by the female size and ranged between 531 to 1349 larvae g⁻¹. The six batches succeeded from hatching to metamorphosis, and the 11 distinct larval stages described for *M. rosenbergii* were found. Larvae in all the batches developed more or less at the same pace up to stage V. However, a clear difference in the timing of appearance of the developmental stages was observed between batches and individuals of the same batch during the subsequent stages. The transition from stage V to stage VI and from stage IX to stage X was longer than the passage to other stages and seems to be the critical rearing period of *M. vollenhovenii*. From day 20 onward to sampling, the larval stage index (LSI) showed that larval development of the batch 1 was significantly faster than for all other batches. The time for first appearance of postlarvae was variable between batches (41–74 days), and batch 1 larvae passed through metamorphosis within a shorter span of time (41 days). Survival up to postlarvae was variable among batches, ranging between 3%–9%, and was better in batch 1 (9.31 ± 1.09). The general poor performance in terms of survival and metamorphosis rates of larvae seems to be related to the wild condition of broodstock. To improve performance of larvae, domestication of stock may be necessary. This result is the first recorded success in larviculture of *M. vollenhovenii* in Cameroon.

Audience Take Away:

Specific items: *Macrobrachium vollenhovenii*; larviculture; postlarvae

Macrobrachium vollenhovenii is the largest of all the African Palaemonidae prawns and the main candidate for Africa prawn aquaculture as the equivalent of *Macrobrachium rosenbergii* massively culture in Asia. This species is very delicious and sustains a viable commercial fishery in most of the countries in the West Africa sub region.

Larviculture: production of postlarvae (seed). It is the hatchery phase of the production cycle. The main steps are: selection of broodstock, incubation of egg, hatching and culture of larvae till postlarvae stage. It is one of the prerequisites for commercial prawn culture and the most technically demanding of the production cycle.

Postlarvae (PL): this is the seed (end product of larviculture). For *M. vollenhovenii* they can only be produced in brackish water. After this phase, PL are transferred to freshwater for grow-out till table size.

The audience will learn that the natural stock of *Macrobrachium vollehovenii*, one of the staple food for the coastal community in Cameroon is reduced as well as the capture size because of over-exploitation. This resource was before available throughout the year, it's now seasonal and the price is increasing every year particularly during Christmas. They will know that the culture technique is being developed in the local condition of Cameroon with the main output to increase the production rate, reduce the price, transform some prawn fishermen to prawn aquaculturist and to have at least the establishment/development of one Africa prawn industry.

The outcomes of this research are a baseline to design with accuracy the protocol of larviculture of *M. vollehovenii*. They will help in the long term to increase the production of *M. vollehovenii* and reduce pressure on the natural stock.

Biography:

Dr. Judith Georgette Makombu is an Aquaculturist, faculty in the department of Fisheries and Aquatic Resources Management, faculty of Agriculture and Veterinary Medicine, University of Buea, Cameroon. She graduated as PhD in 2015 at the same institution. She has particular interest on characterization and culture of African prawns particularly fresh water prawn of the genus *Macrobrachium*. She has conducted several research works and she is author of 10 publications in peer-reviewed journal. She is currently an OWSD Early Career Women Scientists (ECWS) fellow.



Felaniaina M. S. LANTOVOLOLONA

Aquaculture Department, Ministry of Agriculture, Livestock and Fisheries,
Antananarivo, Madagascar

Perspectives on seaweed culture in Madagascar

In 2018, the international production of algae reached about 35 million annual wet tons, with a predominant application for food (75%) and to a less extent to the agro-food industry (15%), cosmetics and the pharmaceutical industry (10%) (FAO, 2018). In the same year, the seaweed market accounted for a total annual value of US \$ 13 billion, in which cultivated algae represented 96% of the total volume. Commercial culture of seaweed is present in around 35 countries, located in temperate and also in tropical waters such as Madagascar. The cultivation of red algae in the island started precisely in 1989 within its southwestern region under the aegis of the IHSM (Halieutic Institute of Marine Sciences). The first cultivation trials took place and will continue for several years with ups and downs. It is only in 1998 that an enhanced strain of *Euchema striatum* was introduced from Zanzibar to sustain a better resistance to diseases and maintain a higher growth rate compared to local strains. More than twenty years later, in 2020, the production reached 2,300 tons of dry algae, mainly from two species *Kappaphycus* sp. and *Euchema denticulatum*. Despite being promising, the annual production volume is subject to changing environmental conditions (warming or natural disaster) and mainly to diseases such as the Epiphytic Filamentous Algae. Despite a strong development potential, this sector remains weakened. It has been pointed out that Research, innovation and Biosecurity are to be taken into consideration rigorously in order to guarantee a sustainable development of the sector. Consistent with this, the development of private strain banks through the hybridization with local strains was developed with the funding from GlobalSeaweedSTAR.

Audience Take Away:

- The situation of seaweed culture in Madagascar
- Possibility of research and future collaboration within the mariculture in Madagascar
- The approach used in seaweed enhancement strategy used in Madagascar

Biography:

Felaniaina studied Aquatic Biosciences at the Tokyo University of Marine Science and Technology, Japan and graduated as MSc in 2018. She then joined the Aquaculture genetic enhancement service at the Aquaculture Department, Ministry of Halieutic Resources and Fisheries. She obtained a second Master of Science in Molecular Biology with Biotechnology at Bangor University, United Kingdom in 2020. She continued to be in charge of genetic enhancement at the Ministry while being the counterpart to a World Bank project and a IFAD unit within the very Ministry.

POSTERS

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Gunawan Muhammad*¹, Takuya Fujimura², Akira Komaru¹

¹Graduate School of Bioresources, Mie University, Japan

²Wakasa Otsuki Pearl Co., Ltd., Shima, Mie Prefecture, Japan

The effects of nacre microstructure on green and pink Akoya pearls interference colors

Despite the importance of both pearl body and interference colors in determining pearl quality, the mechanisms of how different interference color expressed in Akoya pearls has not been comprehensively studied. We report novel information on relationships between pearl nacre microstructure and interference color saturation and hue in pearls produced by *Pinctada fucata martensii*. The interference color saturation and hue of 60 round pearls was subjectively graded by eye by an expert. Nacre optical characteristics and microstructure of pearls of 1) high (grade A) and low (grade B) interference color saturation, and 2) pink and green interference hues are reported. Using electronic pearl quality measuring devices, grade A pearls have higher interference color values (0.050 ± 0.061) than grade B pearls (0.008 ± 0.039), consistent with subjective grading by eye. SEMs of surface microstructure reveal the nacre tablet area of grade A pearls, $4.079 \pm 2.173 \mu\text{m}^2$, to be generally greater than that of grade B pearls, $2.940 \pm 1.213 \mu\text{m}^2$ ($P < .001$), with the nacre surface of grade A pearls smoother than grade B pearls. Regardless of grade, the basal and middle regions of the nacreous layer of pearls with a pink interference color hue differ significantly in nacre tablet thickness ($p < .001$), but nacre tablet thickness does not differ significantly between their central and surface regions. The nacre tablet thickness of pearls with green interference color hue changes more consistently from the basal to surface regions, with only the basal and surface regions differing significantly in thickness ($p < .001$). We report pearl interference color to be greatly affected by nacre tablet microstructure. The saturation of pearl interference color is affected by the smoothness of the nacre surface, which is a function of the surface nacre tablet area. The hue of pearl interference color is affected by differing thicknesses of nacre tablets through the nacreous layer, from surficial to basal regions. Results of this study might benefit the pearl industry, particularly where *P. fucata* is cultured.

Take Away Notes:

- Pearl expert and instrumental grading of interference color values are comparable
- Pearl interference saturation color is affected by surface nacre tablet area
- Surface nacre tablet area determines nacre surface smoothness
- Nacre tablet stratification through the nacre layer affects interference color hue
- Results of this study might benefit the pearl industry, particularly where *P. fucata* is cultured

Biography:

Gunawan Muhammad began to study the Aquaculture of Akoya pearl oyster in 2015 when he joined the Master's program at Mie University, Japan. He is now undergoing a doctoral program at the same University to follow his passion for pearl aquaculture research. His doctoral research has been published in 3 scientific papers in a high-impact journal: Aquaculture, Elsevier. One more manuscript is under review in the same journal, and another one is under preparation to be submitted. He is expected to get his Ph.D. degree in March 2022.



Simone Smith-Godfrey

CSIR Smart Mobility, South Africa

Evolving from marine resources to blue economy resources

This paper confirms that a smooth transition of moving from traditional marine resource value chains to blue economy resource value chains are not just possible, but vital for the competitiveness and sustainability of the industry. It functions from the very definition of the blue economy to the extent that a decoupling between socio-economic development from environmental degradation is made a reality. The paper considers the minimum criteria for a successful transition from marine resources to blue economy resources. The components of the blue economy are identified based on type of activities, the oceans services, established industries, emerging industrial and its growth drivers. A functionary review of 18 potential blue economy resource exploitation and beneficiation are provided. The paper concludes by casting a look at the growth focus areas of blue economy resources. Lastly the paper refers to the possible implications for blue economy resources regarding the extension of traditional marine resource diplomacy into blue economy diplomacy, especially for the developing countries with underdeveloped coastlines.

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PARTICIPANTS LIST

Abinawanto. A Universitas Indonesia, Indonesia	16
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