Fish Health Section
Asian Fisheries Society

Message from the Chair

Greetings to all Fish Health Section of Asian Fisheries Society members!

It gives me great pleasure to welcome you into the Fish Health Section Newsletter Issue No. 20, January 2023. Sincere thanks to our new Editor Dr. Neeraj and his team for their efforts in this publication.

As you all know, the highlight of the Fish Health Section is the Disease in Asian Aquaculture Scientific Symposium or known as DAA series, held in every three years except the 11th Symposium on Diseases in Asian Aquaculture (DAA11) with the gap of 5 years due to the unprecedented crisis caused by the COVID-19 pandemic. In the beginning of 2020, we all experienced an unprecedented situation with global COVID-19 pandemic and by April 2020, 90 countries and territories have implemented lockdown to tackle the disease. Our lives were turned upside down, not only on health crisis but also on economics including which disrupted the preparatory process for the DAA11.

Sincere thanks to Malaysian government and support from local authority Department of Fisheries (DOF) under the Ministry of Agriculture and Food Industries (MAFI) and the Ministry of Modernization of Agriculture and Regional Development of Sarawak (MANRED), the DAA11 was successfully held on 23-26 August 2022 in Kuching, Sarawak, Malaysia. This was the first virtual symposium of DAA series with a high record of participation. Sincere appreciation goes to the previous and longest-serving Chairperson, Dr. Agus Sunarto, senior advisors and FHS Exe-Com 2017/2020 who have jointly managed a well-planned series of webinar starting from 2020 until June 2022 and successfully delivered them as "A path to DAA11". I strongly believe that the five webinars have benefited many members and non-members of this Society.

As a newly appointed chairperson of FHS, I will work closely with my executive members, continue to encourage more collaboration between our members from various institutions and agencies. To our members and readers, do continue to contribute articles and information relevant to our Society and to aquatic animal health management at both national and regional levels.

Thank you.

Dr. Kua Beng Chu
Chairperson of FHS Executive Committee (2022-2025)
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Fish Health Section
Asian Fisheries Society

Past-event the 11th Symposium on Diseases in Asian Aquaculture (DAA11)

The 11th Symposium on Diseases in Asian Aquaculture (DAA11) marks the 31 years of Fish Health Section of the Asian Fisheries Society (FHS-AFS) establishment and was successfully held on the 23-26 August 2022 with the theme 'Land of Adventure: Exploring Aquatic Animal Health for Sustainable Aquaculture'. It was our desire to conduct face-to-face DAA11 but the scheduled dates were disrupted due to the height of the COVID-19 pandemic in March 2020. As the count of event cancellations grew due to the COVID-19 crisis, the national organizing committee (NOC) has uncertainty over the participation especially from overseas as border travel was restricted during the Movement Control Order which has led to no public events until end of 2021.

However, in 2022 when the country opened its borders, DAA11 was held fully virtual with the opening ceremony held as a hybrid event. The symposium was organized by the FHS-AFS and hosted by the Department of Fisheries (DOF) under the Ministry of Agriculture and Food Industries (MAFI) with collaboration from the Ministry of Modernization of Agriculture and Regional Development of Sarawak (MANRED). The opening ceremony was officiated by Sarawak Deputy Premier, Datuk Awang Tengah Ali Hassan on the 23rd of August at Borneo Convention Centre Kuching. The welcoming speech was delivered by Minister of Agriculture and Food Industries (MAFI) Datuk Seri Dr. Ronald Kiandee and the introductory remark by FHS-AFS Secretary and Treasurer, Dr. Eduardo Leaño, who represented Dr. Agus Sunarto, Chairperson of FHS-AFS. The event was also attended by MANRED Minister Dato Sri Dr. Stephen Rundi Utom, MANRED Deputy Ministers Datuk Dr. Abdul Rahman Ismail and Maclaine @ Martin Ben, MANRED Permanent Secretary Datu Edwin Abit and DOF Malaysia Deputy Director-General (Management) Wan Muhammad Aznan Abdullah.

Sarawak Deputy Premier, Datuk Awang Tengah Ali Hassan, delivering the Opening Address.

Guests of Honour during the launching of DAA11

The press conference was conducted right after the closing ceremony, while the exhibition of R&D innovation products from Fisheries Research Institutes and private companies was held concurrently. Meanwhile under virtual platform, a total of 10 exhibitors participated and showcased their products under virtual exhibition. Apart from virtual DAA11 symposium and exhibition, two forums were also created on the virtual platform.

DAA11 Virtual Platform

Dr. Melba Reantaso, an invited speaker from the FAO gave her plenary address

The DAA11 was the first virtual symposium among all the DAA series since its establishment in 1990. The four days virtual symposium managed to gather a total of 608 participants registered with 580 (95.4 %) attendees from

Fish Health Section
Asian Fisheries Society

Contd…

22 countries. Like other DAA series, the virtual DAA11 provide a platform for experts, scientists, members and students to exchange scientific information, establish collaborations and networking opportunities. A total of 116 scientific papers were presented, of which 43 were oral, 46 were three-minutes presentations (3MP) and 27 were e-posters. The four-day event was conducted over eight sessions which included Biosecurity in Aquaculture, Epidemiology, Detection Method and Diagnostic, Prevention and Control Measures, and Fish and Shrimp Disease Management.

A press conference following the launching of DAA11

DAA11 plenary and keynote speakers

Our first plenary speaker was Dr. Melba B. Reantaso, an international renowned scientist from Food & Agriculture Organization of the United Nations (FAO), Italy. She delivered a plenary entitled "Drivers and pathways to disease emergence in aquaculture and possible solutions". In her speech, she stressed that a strategic planning through the progressive management pathway for improving aquaculture biosecurity (PMP/AB) by strengthening multi-sectorial engagement and collaboration for effective preparedness, early detection and response. Dr. Rohana Subasinghe, a specialist in aquaculture development and aquatic animal health management from Futurefish Aquaculture, Sri Lanka/United Kingdom delivered plenary address entitled "State of Aquaculture". The keynotes speakers were Dr. Edgar Brun (Norwegian Veterinary Institute, Norway), Dr. Kenton L. Morgan (Former Prof., University of Liverpool, United Kingdom), Prof. Dr. Karin Pittman (University of Bergen, Norway), Dr. Huang Jie (Network of Aquaculture Centres in Asia-Pacific (NACA), China/Bangkok), Dr. Kua Beng Chu (Fisheries Research Institute, Malaysia) and Prof. Chu-Fang Lo (National Cheng Kung University, Chinese Taipei).

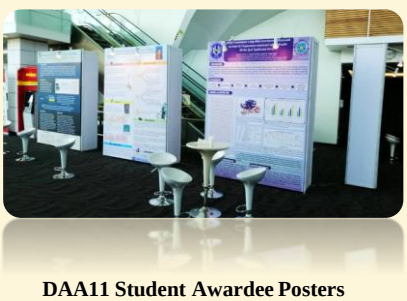
DAA11 Attendees

DAA11 Closing Ceremony Attendees

The event was sponsored and supported by 44 local and international companies. We had Platinum sponsors from Lab-Ind Resource Sdn Bhd, Charoen Pokphand Foods (Malaysia), Chembio Technology Sdn Bhd, Green Island Feed Mills Sdn Bhd, Borneo Eco Fish Sdn Bhd, Sea Horse Corporation Sdn Bhd and Tree Code Sdn Bhd. The organizer also received donations from private companies.

The student award winners for 3 categories, i.e. Best e-poster, Best Oral Presenter and Best three minutes-Presenter were announced during the last day of DAA11. A total of three best students from each category were selected by the Awards committee. The DAA11 Student Awardee Posters were exhibited during the DAA11 Opening Ceremony. Compilation of eight scientific papers presented during the DAA11 provides various updates of fish health aspects was published under a Special Issue of Malaysian Fisheries Journal (MFJ), Issue No 2, Volume 21, 2022 (http://www.fhs-afs.net/pdf/pub/4.Special_Edition_MFJ3eb754953a.pdf).

Trade exhibitions by aquaculture companies



DAA11 Student Awardee Posters

Fish Health Section
Asian Fisheries Society

Contd…

The launching of Malaysian Fisheries Journal (MFJ), Issue No 2, Volume 21, 2022 which was published as a special edition for the 11th Diseases in Asian Aquaculture (DAA11) Symposium.

The DAA11 virtual platform was still accessible to registered participants for one month after the event. Our post-symposium survey of the 106 virtual participants revealed that 81.8 % respondents were satisfied with the hybrid event while 18.2% would like the future DAA event should have been held in physical mode. The detailed report on the DAA11 was published in November/December 2022, vol168(6), 53-56 of AQUA CULTURE Asia Pacific (AAP) Magazine (https://issuu.com/aquacultureasiapacific/docs/aq22180_aap_novdec_22_fa_web?e=28637981/94681393)

In conjunction with DAA11, NOC organized Farmers Day for Malaysian farmers which enables the local farmers to interact with internationally recognized fish health experts from Malaysia, Vietnam, and Thailand on issues relating to fish and shrimp health management, biosecurity and antibiotic usage. A total of 300 participants consisting of local farmers and relevant government sectors attended the event immediately after the opening ceremony of DAA11 on 23 August 2022. A total of 13 inventors from Fisheries Research Institute showcased their R&D Innovations on Fish Health Management and Disease Control. The list of innovations are: 1. StrepToKit: Detection Method for Streptococcus agalactiae; 2. Break & Protect 2 (BP2): Leech Remover; 3. KRIPeK: Bloated Stomach Fish Treatment Kit; 4. SHOS-SpotterTM: Shrimp Health On-Site Spotter; 5. StrepToVax: Feed-based Vaccine; 6. Diagnosis Case Procedure Manual Kit; 7. Garlex©: Alternative Medicine for Fish; 8. Leech-Guard: Alternative Treatment for Leech Infestation; 9. SirehMax®: Alternative Medicine for Fish; 10. SitroPro®: Alternative Medicine for Fish; 11. Super Intensive Shrimp Culture; 12. Hygienic Moina sp. Production and 13. PrimEZeat: Prawn Broodstock Moist Feed. The ebook of these product can be downloaded at http://www.fhs-afs.net/pdf/pub/3.Innovation-Booklet-DAA11.pdf. The DAA11 and Farmers Day Launch Ceremony was live-streamed through the Malaysian Fisheries Department's Facebook page (Link: https://tinyurl.com/2j5epmvk).

On-site crew for the virtual platform team, Department of Fisheries Malaysia in Putrajaya, the venue host for this virtual conference.

A compilation of scientific papers presented in the DAA 11 and published in Special Issue of Malaysian Fisheries Journal (MFJ)

Fish Health Section
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Fish Health Section-Asian Fisheries Society Executive Committee (2022-2025)

Chairperson: Kua Beng Chu (Malaysia)

Vice-Chairperson: Pravata K. Pradhan (India)

Secretary/Treasurer: Eduardo M. Leaño (Philippines/Thailand)

Members: Agus Sunarto (Indonesia/Australia; Past Chair), Motohiko Sano (Japan), Neeraj Sood (India), Han-Ching Wang (Taiwan), Qingli Zhang (P.R. China), Siow-Foong Chang (Singapore), Varinee Panyawachira (Thailand), Dang Thi Lua. (Vietnam)

Observers: Jiraporn Jarungsriapisit (Thailand), Desrina (Indonesia), Stephen Pyecroft (Australia), Syed Shabib Hasan (India), Naveen Kumar B.T. (India)

FHS Electronic Newsletter Editors: Neeraj Sood, Imelda Rantty, Naveen Kumar B.T.

FHS Advisors: Rohana Subasinghe, Melba B. Reantaso, Supranee Chinabut

Chairperson

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Dr. Kua Beng Chu has been a Research Officer since 1996 and is currently a Deputy Senior Director of Research, Fisheries Research Institute under Department of Fisheries Malaysia. She obtained a Bachelor of Fisheries Science (Aquaculture) and Master of Science (Fish Health Management) from University Putra Malaysia (UPM) in 1993 and 1996 respectively. She completed her PhD in Fish Parasitology from University of Science, Malaysia (USM) in 2002.

Over the past 27 years, she has been involved in research on fish health, focusing on fish parasites, pathology, disease prevention and management. She has been a Project Leader for more than 10 grants and has written more than 80 technical papers. She has patented six innovations and one of them has won the Commonwealth Secretary-General's Innovation for Sustainable Development Awards in 2021. In addition, she has written a book on Ectoparasites in Aquaculture to assist farmers to overcome the ectoparasite problems, and a series of children books on diseases in fisheries with the purpose of creating awareness to the younger generation.

Fish Health Section
Asian Fisheries Society

Vice-Chairperson

Dr. Pravata K. Pradhan (India)
Principal Scientist
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Dr. Pravata Kumar Pradhan is presently working as Principal Scientist in Fish Health Management and Exotics Division of Indian Council of Agricultural Research (ICAR)-National Bureau of Fish Genetic Resources (NBFGR), Lucknow. Prior to his joining at ICAR-NBFGR, he worked as an Assistant Professor in Central Agricultural University (CAU), College of Fisheries (CoF), Agartala from 2002 to 2008. He was identified as one of the Best Teachers for the years 2003-2007 at CoF, CAU, Tripura. Dr. Pradhan has been working extensively on infection with oomycete pathogen *Aphanomyces invadans*. He and his team has been successful in developing treatment for oomycete diseases, which is being used by the fish farmers with promising results. Dr. Pradhan is a member of the India's National Surveillance Programme for Aquatic Animal Diseases. His current area of research include host-pathogen interaction, aquatic animal disease surveillance, and fish health management.

Secretary/Treasurer

Dr. Eduardo M. Leaño (Thailand/Philippines)
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Dr. Eduardo Leaño is a Senior Programme Officer of the Network of Aquaculture Centres in Asia-Pacific, and currently handling the Aquatic Animal Health Programme and Food Safety, Quality and Certification Programme. His specialization is on Aquatic Animal Health and Marine and Freshwater Mycology. Before joining NACA in April 2010, he has worked at the Fish Health Section of SEAFDEC Aquaculture Department, Philippines (1989-2001), and as Research Fellow at Taiwan Fisheries Research Institute (2002-2003) and National Taiwan Ocean University (2004-2010) in Keelung, Taiwan. Dr. Leaño obtained his PhD degree (Applied Microbiology) at the City University of Hong Kong (1999), his MSc (Fisheries) at the University of the Philippines in the Visayas (1993) and his BSc (Inland Fisheries) at Central Luzon State University (1989). He has co-edited six books and published more than 50 scientific papers on aquatic animal health and aquaculture.

Fish Health Section
Asian Fisheries Society

2022-2025 Executive Committee: Fish Health Section-Asian Fisheries Society

Members

Dr. Agus Sunarto
(Indonesia/Australia;
Immediate Past-Chairperson)
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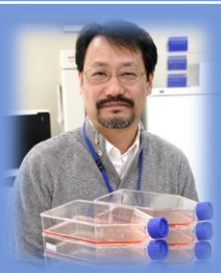
Dr. Agus Sunarto is a molecular virologist with PhD from the University of Queensland, Australia, where he studied latency of Koi herpesvirus (KHV) in carp. He was head of the Fish Health Research Laboratory within the Indonesian Ministry of Marine Affairs and Fisheries before joining the Commonwealth Scientific and Industrial Research Organization (CSIRO, Australia) in 2013. Currently, Agus is a senior research scientist in the Genome Engineering Team - exploring the application of gene editing technologies for improving aquaculture productivity and managing aquatic invasive species. Built on his experience on viral biocontrol for carp, Agus initiated and led tilapia biocontrol research https://invasives.com.au/research/tilapia-biocontrol/, https://doi.org/10.1016/j.biocontrol.2022.105020. He is also a project leader for Sperm Transfection Assisted Gene Editing (STAGE) in zebrafish model http://people.csiro.au/S/A/Agus-Sunarto. Agus is a review editor for Frontiers in Microbiology and guest lecturer at Australian (Deakin University and James Cook University) and Indonesian (IPB and UNDIP) universities, where he teaches aquaculture virology, viral biocontrol, and biotechnology. He is based in Geelong, Victoria.



Dr. Motohiko Sano (Japan)
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Dr. Motohiko Sano is currently a Professor at the Tokyo University of Marine Science and Technology. His field of specialization is on fish virology and bacteriology. He is in-charge of an OIE Reference Laboratory for Koi herpesvirus (KHV). Dr. Sano obtained his PhD (1990), MSc (1987) and BSc (1985) in Fisheries degrees at Tokyo University of Fisheries. He previously worked as Director of the Center for Aquatic Genomics, National Research Institute of Fisheries Science (2010-2013), the Aquatic Animal Health Division, National Research Institute of Aquaculture (2008-2010), and Diagnosis and Training Center, National Research Institute of Aquaculture (2007-2008). He is also an active member of the Japanese Society of Fish Pathology (2019-: Vice-President), Japanese Society of Fisheries Science (2020-: Executive Committee member), Japanese Society of Aquaculture Science, Asian Fisheries Society, and European Association of Fish Pathologists.

Dr. Neeraj Sood (India)
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Dr. Neeraj Sood is working as Principal Scientist in Fish Health Management and Exotics Division of ICAR-National Bureau of Fish Genetic Resources, Lucknow. He has doctoral degree in Veterinary Pathology. He has over 25 years of experience of working in the area of aquatic animal health and has published over 90 research articles. He has worked on understanding host-pathogen interaction of *Aphanomyces invadans* under Newton Fund Global Research Programme. He has been involved in development of new fish cell lines and monoclonal antibodies against fish immunoglobulins. He is the Consortium Principal Investigator of National Surveillance Programme for Aquatic Animal Diseases in India.

Fish Health Section
Asian Fisheries Society

Members (Contd…)

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Dr. Han-Ching Wang started her career as a shrimp researcher in 2000 as a Master student and continued to obtain her PhD in 2007 from National Taiwan University (NTU), Taiwan. She extensively used proteomics and structural biology to study the pathogenesis of white spot syndrome virus (WSSV) that caused white spot disease (WSD) in shrimps, and focused on shrimp immunity and transcriptomics during her post-doctoral stint at the Tokyo University of Marine Science and Technology. She joined National Cheng Kung University (NCKU) in 2008 and became a Distinguished Professor by 2020. Apart from research, she currently holds the University Library Curator position at NCKU (2019-2023). Dr. Wang and her team have published over 70 SCI research papers since 2008. Dr. Wang is recognized as an outstanding young researcher and has received several awards from her university, as well as from regional/international associations. Dr. Wang is currently an expert for OIE Reference Laboratory for White Spot Disease (WSD) and acute hepatopancreatic necrosis disease (AHPND), and is highly active in several international and regional organizations.

Dr. Siow-Foong Chang (Singapore)
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Dr. Siow-Foong Chang started work at the Agri-Food and Veterinary Authority (AVA) of Singapore where he served in various operational and strategic roles responsible for control of zoonotic diseases, disease surveillance, food safety and veterinary public health at national and regional levels. He was involved with control of major zoonotic disease outbreaks affecting the region, including Nipah virus, H5N1 avian influenza and H1N1 swine influenza. In 2010, he joined MSD as Site Lead for the MSD Animal Health aquatic animal disease research facility in Singapore, where he managed R&D activities focused on fish diseases and fish vaccine development for warmwater aquaculture. After 7 years in MSD, he returned to public sector as Group Director responsible for animal health and welfare policies, planning, and programmes. Dr. Chang graduated from Glasgow University with a degree in Veterinary Medicine and Surgery, and a MSc degree in control of infectious disease in animals from the Royal Veterinary College in London. His professional interest is focused on disease control, epidemiology and aquatic animal health, with special interest in fish viral diseases.

Ms. Varinee Panyawachira (Thailand)
Aquatic Animal Health Research and Development Division, Department of Fisheries, Kasetsart University Campus, Ladyao, Jatujak, Bangkok, Thailand
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Ms. Varinee Panyawachira is a Fishery Biologist of the Aquatic Animal Health Research and Development Division (AAHRDD). She is the Head of the Histology and Mycology Laboratory since 2004. Her laboratory is an OIE Reference Laboratory for Epizootic Ulcerative Syndrome (EUS) and she was appointed to be an OIE Expert on Infection with *Aphanomyces invadans* from 2013-2018. Her main professional focus is on aquatic animal health with specialization on fish pathology, farm export standard and health certificate issuance system. Ms. Varinee finished her MSc in Fisheries Science (2004) and BSc in Fisheries (1996) degrees at Kasetsart University.

Fish Health Section
Asian Fisheries Society

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Assoc. Prof. Dang Thi Lua is currently the Deputy-Director of Research Institute for Aquaculture No. 1 (RIA1), a national research institute under Ministry of Agriculture and Rural Development (MARD) in Vietnam. She has been an aquatic animal health specialist for more than 25 years and currently responsible as the leader of research group on aquatic animal diseases at RIA1. She obtained her PhD degree (Applied Marine Biosciences) in 2008 and her MSc (Aquatic Biosciences) in 2005 at Tokyo University of Marine Science and Technology (TUMSAT), Japan, and her BSc degree (Aquaculture) in 1998 at Nha Trang University of Fisheries, Vietnam. She also took postdoctoral fellowship program at TUMSAT during 2008-2010 and became a supervisor to many students. Dr. Lua has been an active manager and member of number of research and development projects related to her fields funded by international and national authorities. She published a book on diagnostics of aquatic animal diseases and more than 70 scientific papers on aquatic animal health and aquaculture.

Dr. Qingli Zhang (P.R. China)
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Dr. Qingli Zhang received his PhD in Marine Biology from the Chinese Academy of Sciences in 2007, and devoted himself on aquaculture diseases control. He invented on-site rapid detection kit for aquatic animal pathogens and >11,000 kits have been applied in over 10 countries. He identified three shrimp viruses, and proven the prevalence of covert mortality nodavirus (CMNV) in Asia and Latin America, as well as CMNV's cross species transmission in marine fishes. Recently, Dr. Zhang identified the pathogenic agent (VpTPD) of an emerging translucent post-larva disease (TPD), which caused closure of 50% *Penaeus vanmamei* nursery along the coastal areas of China in 2020. He has been designated as Expert of the OIE Reference Laboratory for White Spot Disease, and Expert of Network of Aquaculture Centres in Asia-Pacific (NACA) for VCMD from 2020.

Observers

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Dr. Jiraporn Jarungsriapisit finished her Bachelor of Science in Biology at Prince of Songkhla University (Thailand) in 2006, Master of Science in Aquatic Pathobiology at the University of Stirling (United Kingdom) in 2009, and Doctor of Philosophy on Fish Diseases at University of Bergen (Norway) in 2017. She is currently a fishery biologist of the Aquatic Animal Health Research and Development Division (AAHRDD) of Thai Department of Fisheries (DoF). Her group is responsible for disease control of aquatic animals, aquatic animal health certificates, and requirements for import and export of live aquatic animals. Dr. Jiraporn's research interests and experiences are on fish cell culture and application of fish cell line to fish health research

Fish Health Section
Asian Fisheries Society

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Dr. Desrina obtained her doctoral degree from Aquaculture and Fisheries Department, Wageningen University, The Netherlands. She is a fish pathologist with 20 years experience as a lecturer and researcher in the field of fish diseases and fish health management. Her areas of interest are bacterial diseases of fish especially Vibriosis and role of polychaetes as carrier of the white spot syndrome virus (WSSV) and *Enterocytozoon hepatopenaei* (EHP) in shrimp ponds. Currently, she is investigating blood cockle health assessment for seed production. She has been the principal investigator of research in above areas funded by Indonesian Ministry of Research, Technology and Higher Education through various funding schemes, Diponegoro University and JSPS core to core Project. She is also active in the Indonesian Network of Fish Health Management and currently the Head of Aquaculture Department, Faculty of Fisheries and Marine Sciences, Diponegoro University, Indonesia.

Dr. Stephen Pyecroft (Australia)
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Dr. Stephen Pyecroft is a Senior Lecturer in Veterinary Pathology at the University of Adelaide. He has worked in diagnostic veterinary pathology and research of animal disease for most of his 38-year veterinary career. He holds a PhD from the University of Queensland where he defined systemic granulomatosis in goldfish and is a member by examination of both the chapters of Pathobiology and Aquatic Animal Health of the Australian and New Zealand College of Veterinary Scientist. His research interest is wide in scope including stem cell research in Tasmanian Devils, development of clinical biochemistry reference ranges in Southern rock lobsters and Pacific oysters, and Black soldier fly production for fish nutrition. He has supervised PhD and Honours (by research) candidates, published in peer reviewed journals and textbooks, and regularly reviews journal submissions for publication. An active promotor of evidence-based science, his passion is aquatic animal health and management through sustainability.

Dr. Syed Shabih Hassan (India)
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Dr. Syed Shabih Hassan is working as Scientist (Fisheries) in the College of Fisheries, GADVASU, Ludhiana (Punjab) India and specializes on fisheries resource management, aquatic ecology, biodiversity, veterinary parasitology/immunology and disease diagnosis. Before joining in College of Fisheries in 2007, he has worked as Research Fellow in ODA (UK) funded MRAG/RRAG, Imperial College, London sponsored project (1993-1996), USWWF, (USA) sponsored project (1996-1998), as Project Coordinator of several national and international funded projects. Dr. Syed Hassan earned his graduate degree from Magadh University (Bodh Gaya) in 1989, his Diploma in Pisciculture from AMU, Aligarh in 1991 and his Masters (1993) and Doctoral (2000) degrees from Patna University, Patna (1993). He was involved in river, reservoir, wetland ecology & biodiversity, capture and culture fisheries, livestock disease diagnosis, parasitological/immunological research, and socio-environmental awareness works. He has published 55 scientific articles.

Fish Health Section
Asian Fisheries Society

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Dr. Naveen Kumar B.T. is presently working as Assistant Professor in the College of Fisheries, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, Punjab, India. He formerly held positions as an Associate Scientist at Abexome Biosciences Private Limited in Bangalore, Karnataka, and as an Assistant Professor (contractual) in the College of Fisheries, Mangalore, Karnataka. He has more than eight years of experience in the management of aquatic animal health. For the purpose of detecting pathogens in finfish and shellfish at the farm level, his team has developed monoclonal antibody-based diagnostic kits for farmers. Additionally, he developed vaccine against the *Aeromonas hydrophila* and nanoparticle-based immunostimulant. As part of India's National Surveillance Programme for Aquatic Animal Diseases, he is currently responsible for the Punjab state. Additionally, Dr. Kumar B.T. and his team are working on developing on-site diagnostic kit for shrimp pathogen and vaccine for broodfish and understanding the maternal immunity response in the offspring.

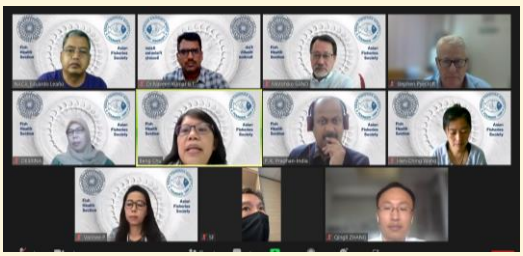
Fish Health Section Webinar 5 "Viral Diseases of Aquatic Animals"

The Fish Health Section (FHS) of the Asian Fisheries Society (AFS) organized the fifth webinar series on the path to the 11th Symposium on Diseases in Asian Aquaculture (DAA11). This webinar was held virtually on 1 June 2022 and focused on significant viral diseases of finfishes, molluscs and crustaceans. In the webinar, three renowned experts namely, Dr. Senapin Saengchan of BIOTEC, Thailand; Dr. Tomomasa Matsuyama of Japan Fisheries and Education Agency, Japan and Dr. Liang Qiu of the Yellow Sea Fisheries Research Institute, P.R. China made presentations on viral diseases of finfishes and shellfishes. It was attended by 229 participants from 21 countries around the world.

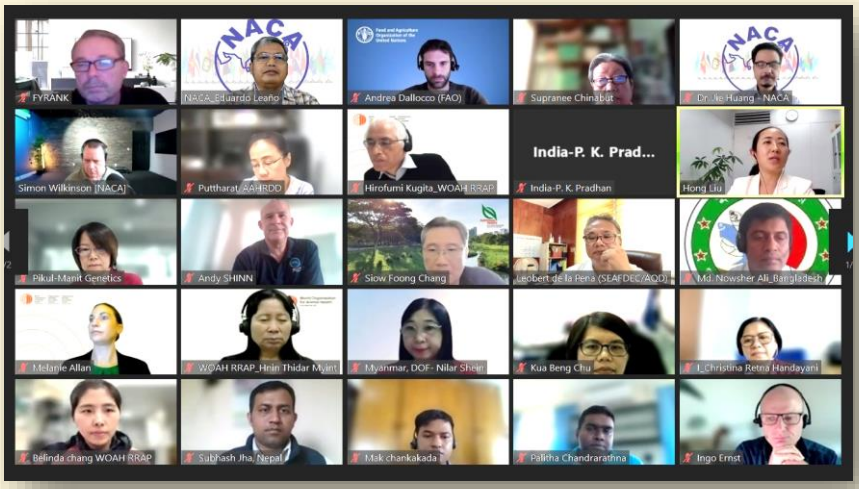
Fish Health Section
Asian Fisheries Society

FHS-AFS : Virtual 12th Triennial General Meeting

The FHS-AFS was able to conduct the virtual 12th Triennial General Meeting (12TGM) 2022 via Zoom Platform at 16:30 Malaysian Time (MYT), UTC + 8 on 25th of August 2022. The meeting was chaired by Dr. Agus Sunarto and the FHS Secretary's and Financial Reports (2017-2022) were presented by Dr. Eduardo Leano. The new FHS Executive Committee was appointed during the meeting which comprises 11 members and 5 observers

21st Meeting of the Asia Regional Advisory Group on Aquatic Animal Health



The 21st Meeting of the Asia Regional Advisory Group on Aquatic Animal Health (AGM 21) was organized by the Network of Aquaculture Centres in Asia-Pacific on 17-18 November 2022 via the Zoom platform. The meeting was attended by 13 members and co-opted members, and 14 observers comprising of representatives from 11 NACA member governments, WOAH HQ and RRAP.

Topics discussed during the two-day meeting include:

- Progress since AGM 20 (Dr. Eduardo Leaño, NACA)
- Updates from WOAH Aquatic Animal Health Standards Commission (Dr. Ingo Ernst, AAHSC, WOAH)
- Aquaculture Biosecurity (PMP/AB) and FAO's AAH Initiatives in the AP region (Dr. Andrea Dall'Occo, FAO)
- The WOAH Aquatic Animal Health Strategy 2021-2025: Implementation in the AP region (Dr. Melanie Allan, WOAH-HQ)
- Farm-level aquaculture biosecurity (Dr. Andy Shinn, INVE)
- Updates on aquaculture biosecurity assessment tool and possible collaboration in the region (Dr. Saraya Tavornpanich, NVI)
- Updates on WOAH Regional Collaboration Framework on AAH in AP region (Dr. Hirofumi Kugita, WOAH-RRAP)
- Recent Innovations on Disease Prevention and Control in Aquatic Animals (Dr. Kjetil Fyrand, PHARMAQ/Zoetis)
- Updates on preventive and control measures on important aquatic animal diseases in P.R. China (Dr. Dongyue Feng, NFTEC)
- Updates on QAAD Reporting and disease list (Dr. Eduardo Leaño, NACA)

The report of the meeting is being prepared and will be published at NACA website (www.enaca.org) within the first quarter of 2023.

Nano-vaccine: new strategies against diseases in aquaculture

Dr. Katawut Namdee
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Fish and seafood are an integral part of traditional cuisine in many parts of the Asian region. Most of the fish and seafood produced comes from aquaculture. According to the Food and Agriculture Organization, 52% of total human consumption in 2018 were from aquaculture. One of the most well-known fish, tilapia (both Nile tilapia and red tilapia), plays an increasingly important role in the Asian aquaculture industry annual production. However, several infectious diseases can cause great financial damage to tilapia producers. These include bacterial diseases in tilapia caused mainly by *Streptococcus* spp. and *Flavobacterium* spp., and viral diseases such as TiLV (Tilapia Lake Virus). Nowadays, preventive strategies such as breeding management, antibiotics and chemical treatment have been used. However, they have limited effectiveness and cause drug residues to accumulate in the fish. Therefore, the development of effective and affordable preventive measures and new strategies against diseases is necessary.

It is well known that vaccination is the most effective method to prevent infectious diseases in aquaculture before they break out. The three main routes of administration for fish vaccines are immersion, oral administration via feed, and injection. Although immersion and oral vaccination are more practical than injection in mass production, these methods are not very efficient due to limited uptake of antigens through the gills, skin, and gut. Nanotechnology is interesting platforms to overcome these limitations.

Nanotechnology platforms, particularly lipid nanoparticles, are a promising delivery system due to their biocompatibility, biodegradability, low toxicity, and ability to encapsulate both hydrophilic and lipophilic drugs. The properties of lipid nanoparticles can be customized by lipid composition, surface modification, size, and manufacturing method. These advantages have been extensively exploited for the controlled release and targeted delivery of drugs, vaccines, and biopharmaceuticals to enhance their efficacy in the prevention and treatment of human and animal diseases. In vaccination technology, lipid nanoparticle-based delivery systems play an important role in overcoming the problem of inefficient targeting of antigen to the site of action, which requires the administration of large doses of vaccine. The use of nanotechnology-based delivery systems has opened the possibility of developing new formulations of nano-vaccines that effectively and selectively deliver antigens to the site of action, stabilize antigens, and act as efficient adjuvants.

To support the vaccine in aquaculture, the innovative vaccine strategy of mucoadhesive lipid nanoparticles, whose surface modified with cationic polymers and targeted the mucosa of fish as pathogen-like nanoparticles, has been developed. Thus, the target site of the nanoparticles is mucous layer, which is the external component of the skin, gills, and gut. It is secreted by various epidermal or epithelial mucosal cells that form a layer of a gel-like substance covering the epithelial cells. More importantly, these organs are directly linked to mucosal immunity in fish. Since the gills of fish are considered as a mucosal surface associated with mucosal immunity, mucoadhesive vaccines targeting the mucosal surface are used as an effective route for immersion vaccination.

Fish Health Section
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Immersion vaccination (nanovaccine) in red Tilapia

Recently, many studies have successfully applied this strategy to develop immersion vaccines against various aquaculture diseases such as infections with *Flavobacteium columnaris, Aeromanas veronii, Francisella noatunensis*, and Tilapia lake virus (TiLV). In particular, for columnaris disease, the biomimetic nanoparticles have improved vaccine efficacy and can elicit a strong humoral immune response, leading to a significant increase in RPS against the disease. Despite these promising studies, a variety of clinical parameters need to be measured and monitored over time. In addition, studies should be conducted on cultured tilapia to determine the efficacy of the mucoadhesive nano-vaccine against the disease. In addition to associated clinical significances such as average daily gain (ADG), feed conversion ratio (FCR), and survival and mortality rates, side effects (pain and stress) and long-term safety should be evaluated in parallel. The immune response to the vaccine should also be evaluated.

In summary, the vaccine strategy presented here is an improved version of the conventional immersion vaccine that employs mucoadhesive nanoparticles to target the mucosal membrane. It can increase the effectiveness of direct immersion vaccination against diseases in aquaculture. This innovation radically reduces the labour and time required for fish vaccination.

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Microbiome of the rearing environment - a key for healthy shrimp

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Fish and seafood are an integral part of traditional cuisine in many parts of the Asian region. Most of the fish and seafood produced comes Microbiome plays important roles in various aspects of aquaculture. While early studies had focused on the microbiome associated with the host animal, its function, and its effect on health and disease resistance, microbiome of the aquaculture rearing environment and their influence gained more interests as recognition of the tremendous importance of the rearing environment on the health of the animals. Aquatic environment contains a large concentration of microorganisms. The involvement of these microorganisms in various aspects of the aquatic ecosystem such as the microbial food web, the biogeochemical cycle or the interaction with other organisms is important to the normal functioning of the ecosystem. Here I will give an overview of the rearing environment microbiome in aquaculture, its functions in the biogeochemical processes, and how they are connected to the health of shrimp.

Microorganisms that inhabit the rearing water environment of aquaculture also function in the same way as those in the natural body of water. Before the shrimp were even stocked into the pond, the microorganism in the rearing environment was already at work in the cycling of nutrients. These biogeochemical processes occur continuously, and their dynamics change throughout the production cycle due to various factors such as the accumulation of waste product, water quality parameter, and weather conditions. Photosynthesis activity during daylight of phytoplankton and photosynthetic bacteria contributed dissolved oxygen to the rearing water. Organic materials in the rearing water could be broken down by decomposer, a specialized group of heterotrophic bacteria. This decomposition is typically accomplished by aerobic respiration that requires oxygen resulting in carbon dioxide production. In ponds with high concentration of organic materials (such as those coming from uneaten feeds or waste products from shrimp), the demand of oxygen for this decomposition of organic materials, also known as biological oxygen demand (BOD), also increases. The oxygen demand of these bacteria cannot be overlooked especially as the later stage of culture with accumulated organic materials.

Another product of organic matter decomposition is ammonia, which comes from the decomposition of protein and is toxic to shrimp. Microorganisms play a crucial role in the nitrogen cycles, and there are several possible pathways for ammonia in the biogeochemical cycles in the pond environment. Autotrophic nitrification is the aerobic process to convert ammonia to nitrite and, subsequently, nitrate by groups of bacteria, collectively called nitrifying bacteria. The process was known to be a two-step process with ammonia oxidizing bacteria (AOB) converting ammonia to nitrite, and nitrite oxidizing bacteria (NOB) converting nitrite to nitrate, respectively. We still have much to learn about this process as a certain species of *Nitrospora* had been discovered to be able to perform both steps of aerobic autotrophic nitrification. Ammonia can also be removed via another pathway called heterotrophic nitrification where the bacteria use organic materials for growth and simultaneously convert ammonia to other compounds. Heterotrophic bacteria that can perform such tasks included some species of *Alcaligenes*, *Pseudomonas*, *Paracoccus*, and *Bacillus*. Another important process for the removal of dissolved organic materials including nitrogen (typically in the form of nitrate) from the rearing environment is assimilation, where the dissolved organic matters were incorporated into the cells of heterotrophic bacteria and phytoplankton. Typical aquaculture operations would focus on monitoring the two toxic forms of nitrogen, ammonia and nitrite. However, the dynamic of nitrogen cycles in aquaculture ponds is complex and will require the study of the microbiome in the rearing environment for better understanding. Without careful monitoring and proper grasp of the process, the need for water exchange to minimize the toxic effect of the ammonia and nitrite accumulation would still be required despite its potential negative consequence to the surrounding environment.

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Many strategies to utilize the microbiome capabilities or to control and manage them in the rearing systems had been in practice for some time. Two well-known rearing systems such as recirculating aquaculture system (RAS) and biofloc technology (BFT) took advantages of different microbial processes to manage the nitrogenous waste and organic matters; autotrophic nitrification dominated for RAS and combination of processes for BFT. The differences in operation and management between these two rearing systems were clear. Aside from managing waste products, minimizing disease outbreak was another key concern for microbial management of the aquaculture rearing environment. Not only obligate pathogens that are the cause for concerns, but opportunistic pathogens that are typically part of the normal microbiota but can cause disease when the animals are stressed, are also important. The use of probiotics that's applied to the rearing environment have been common practices in shrimp aquaculture. While the evidence of successful probiotic uses had been observed in practical pond environment, its mechanism was still difficult to elucidate. Other strategies to manage the microbiome such as the K selection or microbially matured water had also shown some successes, especially in rearing of early development stage. By conditioning using a maturation unit or recirculation aquaculture system, the rearing water can become populated mostly by K strategist microbes that are characterized by their slow stable growth and more competitive at low substrate levels. Maintaining the dominance of K strategist can prevent the proliferation of r strategist and opportunistic pathogens from taking over the rearing environment. In actual practical settings, the maturing of the pond water before stocking the shrimp by some farmers may have benefited from both the development of matured nitrifying bacterial community as well as the K strategist. The evidence for the success of this strategy in actual shrimp farms at the production level remains to be seen.

Our understanding of the involvement of the microbiome in the rearing environment is still developing. With the advancement in molecular biology and various omics technology, these groups of microorganisms and their functions can now be investigated in better detail. Along with other important challenges facing aquaculture, understanding their roles during the production cycle and the effect of various practices on the microbiome could help in maintaining their desired functions in the ecosystem and providing a good rearing environment for the growth and health of the animal.

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Tilapia lake virus (TiLV) in tilapia

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The virus

Tilapia lake virus (TiLV) or *Tilapia tilapinevirus* is an RNA virus that affects global tilapia aquaculture (Surachetpong et al., 2020; Sunarto et al., 2022). Although the origin of TiLV is unknown, but it was first reported in Israel (Eyngor et al., 2014) and later found across more than four continents in 17 countries. In Thailand, TiLV was first identified in 2017, which is the cause of disease that the farmers often named "tilapia one-month mortality syndrome". Infection by TiLV often associates with high morbidity and mortality in Nile tilapia and red tilapia (Surachetpong et al., 2017). The epidemiological studies have shown that TiLV has spread in major water sources in Thailand and outbreaks continue after the fry has been transferred to natural waters. TiLV is pathogenic for all sizes of tilapia, not specific to small fish but the infection can occur in 10 days old fry after hatching, fry, juvenile, adult and brood stock, but high mortality of up to 100% is often found in the small fish, while lower mortality at 10% is possible in brood stock. Therefore, prevention of TiLV should begin in the hatcheries, where brood stock screening programs must be implemented as well as intensive biosecurity measures to prevent TiLV from entering the farms.

How to notify fish that are affected by TiLV and the response

- ✓ After fry or juvenile tilapia are released in cages or ponds within 2–6 weeks, the introduction of stress such as improper fish handling and alteration of water quality may trigger the outbreak of TiLV.
- ✓ The farmers start to observe moribund fish and the mortality rate increase above 2% –4% per day for at least 2 consecutive days.
- ✓ Fish show unusual swimming behaviors such as starting to swarm out and pile up along the edge of the pond, swimming at the water surface.
- ✓ Clinical signs and pathological changes include darkening skin (Nile tilapia) or Pale skin (red tilapia), skin erosion, skin congestion, exophthalmos, eye opacity, and abdominal swelling.
- ✓ TiLV is commonly found with other bacterial infections including *Aeromonas*, *Streptococcus*, and *Flavobacterium*
- ✓ A sample of sick fish (5–10 fish) should be sampled and submitted to a laboratory for further confirmation using histopathology, molecular techniques (PCR or qPCR) or virus isolation.

The transmission of TiLV in fish population

Fish are exposed to viruses released from moribund fish or in water. The virus enters fish through the mucosal surface including gills and intestine and spread systematically to other organs such as liver, spleen, kidney, heart, and brain. Notably, the virus can be detected in the reproductive organs such as gonads and eggs, suggesting TiLV can spread via horizontal and vertical transmission. Importantly, the main route of TiLV transmission is through the release of the virus in fish mucus and infecting the whole population (Liamnimitr et al., 2018). As such, proper water preparation, introduction of TiLV-free stock, and strict biosecurity should be applied to reduce the negative impact on the farms and prevent transboundary spread to other countries.

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DAA XII - 2025 INDIA

The Twelfth Symposium on Diseases in Asian Aquaculture will be held in India during November 2025. The Symposium will be organized by the Fish Health Section of the Asian Fisheries Society and Indian Council of Agricultural Research, New Delhi. This would provide an excellent platform for aquatic animal health experts including academicians, researchers and stakeholders to discuss and share their knowledge and experiences on emerging scenario regarding the aquatic animal health, and also the future direction of aquatic animal health research, especially with respect to Asia

3rd International Conference on Aquatic Animal Epidemiology to be held in New Delhi, India in November 2023

The Third International Conference in Aquatic Animal Epidemiology scheduled to be organized in November 2022 has been postponed and will be held in November 2023 in New Delhi by The International Society of Aquatic Animal Epidemiology (ISAAE) in collaboration with Indian Council of Agricultural Research, New Delhi and National Fisheries Development Board, Hyderabad, Department of Fisheries, Government of India. The Conference would provide an opportunity for dissemination of knowledge and developing network amongst researchers working in the area of aquatic animal epidemiology. The researchers working in the area of aquatic animal epidemiology are requested to plan for attending the Conference at New Delhi, India.

The editorial team expresses its sincere thanks to all the members who have contributed to the eNewsletter. The next issue of eNewsletter is being planned in January 2024. All the members are requested to share important news or other information that would be useful for the members of FHS.

eNewsletter Editorial Team