NETWORK OF AQUACULTURE CENTRES IN ASIA-PACIFIC

Thirteenth Meeting of the Asia Regional Advisory Group on Aquatic Animal Health

REPORT OF THE MEETING

Kim Do Royal Saigon Hotel, Ho Chi Minh City, Vietnam
22-23 November 2014
Prepared by the NACA Secretariat

Preparation of this document:

This report was prepared by the 13th Asia Regional Advisory Group on Aquatic Animal Health (AG) that met at Ki Royal Saigon Hotel, Ho Chi Minh City, Vietnam on 22nd to 23rd November, 2014.

The Advisory Group was established by the Governing Council of the Network of Aquaculture Centres in Asia-Pacific (NACA) to provide advice to NACA members in the Asia-Pacific region on aquatic animal health management, through the following activities: (a) evaluate disease trends and emerging threats in the region; (b) identify developments with global aquatic animal disease issues and standards of importance to the region; (c) review and evaluate the Quarterly Aquatic Animal Disease reporting programme and assess the list of diseases of regional concern; (d) provide guidance and leadership on regional strategies to improving management of aquatic animal health including those under the framework of the Asia Regional Technical Guidelines; (e) monitor and evaluate progress on Technical Guidelines implementation; (f) facilitate coordination and communication of progress on regional aquatic animal health programmes; (g) advise in identification and designation of regional aquatic animal health resources, as Regional Resource Experts (RRE), Regional Resource Centres (RRC) and Regional Reference Laboratories (RRL); and (h) identify issues of relevance to the region that require depth review and propose appropriate actions needed. Members of the Advisory Group include invited aquatic animal disease experts, World Animal Health Organization (OIE), Food and Agricultural Organization of the United Nations (FAO) and collaborating regional organizations.

Reference: NACA 2014. Thirteenth Meeting of the Asia Regional Advisory Group on Aquatic Animal Health: Report of the Meeting. Published by the Network of Aquaculture Centres in Asia-Pacific, Bangkok, Thailand.

ABBREVIATIONS AND ACRONYMS

AAH	Aquatic Animal Health
AAHSC	Aquatic Animal Health Standards Commission of the OIE
AAPQIS	Aquatic Animal Pathogen and Quarantine Information System (FAO)
AG	Advisory Group
AGM	Advisory Group Meeting
AHPND/AHPNS	Acute Hepatopancreatic Necrosis Disease/Acute Hepatopancreatic Necrosis Syndrome
ANAAHC	ASEAN Network of Aquatic Animal Health Centres
ANQAP	Australian National Quality Assurance Program
ASEM	Asian European Meeting
ASEAN	Association of South East Asian Nations
AVG	Abalone viral ganglioneuritis
AVM	Abalone viral mortality
BMP	Best management practices
BIOTEC	National Center for Genetic Engineering and Biotechnology (Thailand)
BOBLME	Bay of Bengal Large Marine Ecosystem
CA	Competent authority
CSIRO	Commonwealth Scientific and Industrial Research Organisation
COFI	Committee on Fisheries (FAO)
DA	Australian Government Department of Agriculture
DoF	Department of Fisheries (Thailand)
EU	European Union
EUS	Epizootic ulcerative syndrome
FAO	Food and Agricultural Organization of the United Nations
GAP	Good aquaculture practices
IAAHRI	Inland Aquatic Animal Health Research Institute (Thailand)
IHHN	Infectious hypodermal and haematopoietic necrosis
IMN	Infectious myonecrosis
IMNV	Infectious myonecrosis virus
KHV	Koi herpesvirus
LPT	Laboratory proficiency testing
LSNV	Laem Singh necrosis virus (in *P. monodon*)
MrNV	*Macrobrachium rosenbergii* nodavirus
MSGS	Monodon slow growth syndrome
NACA	Network of Aquaculture Centres in Asia-Pacific
NC	National Coordinator
NHP	Necrotising hepatopancreatitis
OIE	World Organisation for Animal Health
OsHV	Ostreid herpesvirus
PCR	Polymerase chain reaction
QAAD	Quarterly Aquatic Animal Disease
RT-PCR	Reverse transcriptase PCR
SAARC	South Asian Association for Regional Cooperation
SEAFDEC	Southeast Asian Fisheries Development Center
SEAFDEC-AQD	Southeast Asian Fisheries Development Center Aquaculture Department
SPF	Specific pathogen free
SVC	Spring viraemia of carp
SVCV	Spring viraemia of carp virus
TG	Technical Guidelines (Asia Regional Technical Guidelines on Health Management for the Responsible Movement of Live Aquatic Animals)

TOR	Terms of Reference
TS	Taura syndrome
TSV	Taura syndrome virus
VHS	Viral Haemorrhagic Saepticemia
WAHIS	World Animal Health Information System
WAHID	World Animal Health Information Database
WFC	WorldFish Center
WSD	White spot disease
WSSV	White spot syndrome virus
WTD	White tail disease
WTO	World Trade Organization
YHV	Yellowhead virus

The 13th Asia Regional Advisory Group on Aquatic Animal Health.

Back Row (From Left to Right)
Dr. Timothy Flegel (Centex Shrimp/Mahidol University, Thailand), Dr. Andy Shinn (FishVet Group), Dr. Ingo Ernst (DA, Australia), Dr. Siow Foong Chang (MSD Animal Health, Singapore), Dr. Jie Huang (OIE AAHSC, China)

Front Row (From Left to Right)
Dr. Eduardo Leaño (NACA), Dr. Hirofumi Kugita (OIE-RRAP, Japan), Dr. Hnin Thidar Myint (OIE-RRAP, Japan), Dr. Kjersti Gravningen (PHARMAQ, Norway), Dr. CV Mohan (WorldFish, Malaysia), Dr. Supranee Chinabut (Thailand), Dr. Siti Zarah Abdullah (Department of Fisheries, Malaysia), Dr. Temdoung Somsiri (IAAHRI, Thailand), Dr. Rolando Pakingking, Jr. (SEAFDEC AQD, Philippines)

Not in Photo: Dr. Rohana Subasinghe (FAO, Rome, Italy)

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OPENING SESSION

Dr. Eduardo Leaño welcomed all the participants on behalf of NACA Director General Dr. Cherdsak Virapat. Special mention was given to the new member/co-opted members of AG including Dr. Rolando Pakingking, Jr. (SEAFDEC AQD), Dr. Andy Shinn (FishVet Group), Dr. Hirofumi Kugita (OIE-Tokyo) and Dr. Siti Zarah Abdullah (DOF-Malaysia).

Dr. Ingo Ernst, outgoing Chairperson of AG, delivered the opening remarks, and reviewed the AG TOR prior to selection of new Chairperson and Vice-Chairperson. The group selected Dr. Kjersti Gravningen as the new Chairperson, and Dr. Rolando Pakingking, Jr. as the Vice-Chairperson.

Dr. Gravningen took over in presiding the AG meeting and the meeting agenda (Annex A) was adopted. The list of participants is presented in Annex B.

SESSION 1: PROGRESS SINCE AGM-12

1.1. PROGRESS REPORT FROM NACA'S REGIONAL AQUATIC ANIMAL HEALTH PROGRAMME

Dr. Eduardo Leaño presented the progress report of NACA's Regional Aquatic Animal Health Programme since the previous AGM 12. The Regional Laboratory Proficiency Testing Programme which was co-implemented by DA-Australia, ANQAP, CSIRO and NACA was completed in October 2014. The testing programme consisted of 4 rounds of testing for 10 important aquatic animal pathogens in the region. Overall, there was a general improvement in the performance of the participating laboratories in the detection of pathogens from the first to the final round.

Several activities in the region still focused on the new disease of cultured shrimp, AHPND. NACA and AG members had been involved in several national workshops and meetings (India, Iran and the Philippines), highlighting the importance of and current status of/updates on AHPND among shrimp-producing countries in the region. Disease status and lessons learnt was also presented during the Asia Pacific Fisheries Commission (APFIC) 5th Regional Consultative Forum which was organized by FAO in Hyderabad, India. The research group of Tim Flegel also made progress on the development of a more sensitive PCR primer (AP3) for the specific detection of AHPND bacteria, this is a follow-up of the first PCR primer that they released in December 2013 using AP1 and AP2. With the confirmation of the causative agent, change of name from AHPNS to AHPND, as well as more evidence on disease development, the disease card was revised and published online at NACA website.

The QAAD Report was continuously published with an average of 15 member governments submitting quarterly reports. NACA, in collaboration with IAAHRI, also undertook Officer Training on Fish Health Management in Kathmandu, Nepal upon the request of Nepal government. Dr. E. Leano (NACA) and V. Panyawachira (IAAHRI) conducted the training which covers lectures and laboratory practicals on fish anatomy and necropsy as well as parasitic, bacterial and fungal diseases of fish. NACA is also involved in USAID-MARKET project and is co-handling the aquatic animal health component in collaboration with DOF and ANAAHC. The project aims to develop an SOP for the movement of live aquatic animals in the ASEAN. NACA was also invited to participate in the 28th Conference of the OIE Regional Commission for Asia and the Far East and Oceania in November 2014, to present the key AAH activities in the region. The presentation highlighted the importance of AAH in the region and that it should also be given appropriate focus in all OIE meetings.

Other activities of the Regional AAH Programme are listed below:

- Special session at World Aquaculture Adelaide 2014 (WAA2014) on "Regional Cooperation for Improved Biosecurity" was organized by NACA with funding support from ACIAR. The session was co-chaired by Brett Herbert (DA Australia) and Ed Leaño (NACA) and the topics presented and discussed were: Biosecurity and regional cooperation (Brett Herbert); Regional cooperation for improved biosecurity and efficient aquatic animal health management in the Asia-Pacific (Ed Leaño); Factors affecting the emergence and spread of new infectious diseases (Peter Walker); Current progress in research on AHND in Thailand (Siripong Thitamadee); Future considerations for the domestication and breeding of penaeid shrimps (Greg Coman); and, Inbreeding and disease in tropical shrimp aquaculture: a reappraisal and a caution (Roger Doyle).
- Collaboration with Mekong River Commission (MRC) on the development of Code of Practice for Movement of Aquatic Organisms in the Lower Mekong Basin. A consultation workshop was held in November 2014 and the drafted Code was presented for comments of MRC member country representatives. The Code has been revised and circulated to MRC member countries for further feedbacks.

DISCUSSION

- At the OIE Regional Commission Conference, most participants are from veterinary services, which explain why there is more interest and activities on terrestrial animal health than aquatic animal health. This is also the reason why the aquatic focal point mechanism was established.
- The communication system in OIE is through the appointed OIE delegate who is often the CVO. In some countries the veterinary service is not responsible for aquatic animal health and there may not be good cooperation between the veterinary and aquatic animal health services. Thus in every country, it is important to strengthen the communication between aquatic focal points and OIE delegates. There are examples where strong progress has been made on this issue in some countries.
- Moreover, aquatic focal points should also have strong links with various veterinary organisations. They should be more connected with each other, and the region should be contributing more in the development of OIE standards.
- The strength of NACA in highlighting important aquatic animal activities in the region and some success stories of member countries is an important mechanism in convincing other member national governments to implement aquatic animal health programmes in their respective country (e.g. India on its current implementation of national aquatic animal disease surveillance programme).
- In the Philippines, the Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD) − Department of Science and Technology also recently allocated budget for an aquatic animal disease surveillance programme in the country, which was just implemented this year. One of the aims is to develop an efficient reporting system for important aquatic animal disease outbreaks in the country.
- The Laboratory Proficiency Testing Programme is a good initiative by the Australian Government and collaborating partners. With good results obtained from the four rounds of testing, other institutes are now encouraged to facilitate proficiency testing for other diagnostic protocols (e.g. on histopathology by CEFAS).
- Providing a proficiency testing program for molecular detection of pathogens requires significant investment of resources for quality assurance. Preferably, a laboratory accredited for the provision of PT should lead a PT program. Significant attention is required to ensure homogeneity and stability of samples, and for correct packaging and distribution of test panels and correct reporting of results. In some countries, PT is well established, especially for terrestrial diseases. Within Australia, proficiency testing is provided free of charge for aquatic animal disease diagnostic laboratories.

RECOMMENDATIONS

- AG recommended that it is important that aquatic focal points participate in the development of OIE standards, and should strongly promote standards that are relevant to the region;
- AG recommended that NACA should continue promoting successful aquatic animal health programmes in the region (*e.g.* disease surveillance programmes, improved disease diagnostics, *etc*.) to encourage other countries to improve capacities and implement better aquatic animal health management in their respective countries.

SESSION 2: OIE STANDARDS AND GLOBAL ISSUES

2.1. OUTCOMES OF RECOMMENDATIONS FROM OIE GENERAL SESSION AND THE AQUATIC ANIMAL HEALTH STANDARDS COMMISSION

Dr. Jie Huang reported on outcomes from the May 2014, 82nd General Session (GS) of the OIE with relevance to aquatic animal health and the Sept 2014 meeting of the Aquatic Animal Health Standards Commission of the OIE.

The GS adopted amended texts to the Aquatic Code as well as new chapters including: Infection with salmonid alphavirus; and, Criteria for determining susceptibility of aquatic animals to specific pathogenic agents. Adoption of the amended texts for Import risk analysis (Chapter 2.1.) and General obligations related to certification (Chapter 5.1.) were postponed. The 7th edition of the Aquatic Manual was published online and included the new chapter on salmonid alphavirus and three chapters where changes have been made:

2.2.2. Infectious hypodermal and haematopoietic necrosis
2.3.5. Infection with infectious salmon anaemia virus
2.4.9. Infection with ostreid herpesvirus 1 microvariants

Two OIE Reference Laboratories (RL) have requested for their removal from the list: Chinese Taipei for Spherical Baculovirus (*Penaeus monodon*-type baculovirus); and Australia for Infection with *Batrachochytrium dendrobatidis*. On the other hand, three OIE RLs were newly designated including: Chile for Infection with infectious salmon anaemia virus; Chinese Taipei for White spot disease; and, Norway for Infection with salmonid alphavirus. Replacement of experts for some OIE RLs were also made. Dr. Nick Moody to replace Dr. Alex Hyatt in OIE RL for Epizootic haematopoietic necrosis and Infection with ranavirus (Australia), Dr. Haakon Hassen to replace Dr. Tot Atle Mo in OIE RL for Infection with *Gyrodactylus salaris* (Norway), and Dr. Varinee Panyawachira to replace Dr. Somkiat Kanchanakhan in OIE RL for Infection with *Aphanomyces invadans* (Thailand).

Important OIE Conferences were scheduled and these are the Third Global Conference of the OIE Reference Centres in Seoul, Republic of Korea on 14-16 October 2014, and the OIE Global Conference on Aquatic Animal Health: 'Riding the wave to the future' at Ho Chi Minh City, Vietnam on 20-22 January 2015.

The AAC meeting in September 2014 touched upon several issues including amendments of texts in both the Aquatic Code and Aquatic Manual for comments of OIE delegates prior to adoption and revision. One important amendment to the Aquatic Manual is the listing of AHPND (Chapter 1.3). In light of the development of new diagnostic methods, the Commission reconsidered the disease for listing. The AAC developed an assessment in accordance with Article 1.2.2. and concluded that it now meets the relevant criteria for listing. The AAC also agreed that AHPND be proposed for listing. Recognising that it is essential to distinguish the causative agent of AHPND from other forms of the bacterium, the AAC recommended that an AHG be convened to develop a chapter on AHPND for inclusion in the Aquatic Manual. The AAC updated the Technical Disease Card for AHPND which is available on the OIE website: http://www.oie.int/fileadmin/Home/eng/Internationa_Standard_Setting/docs/pdf/Aquatic_Commission/AHPND_DEC_2013.pdf.

Other amendments proposed in the Aquatic Code include: Recommendations for surface disinfection of salmonid eggs (new Chapter 4.X); Control of hazards in aquatic animal feed (Chapter 4.7); General obligations related to certification (Chapter 5.1); Certification procedures (Chapter 5.2); Draft chapter 6.6 on 'Risk analysis for antimicrobial resistance arising from the use of antimicrobial agents in aquatic animals'; and, Amphibian disease-specific chapters (Chapters 8.1 and 8.2). Following adoption of a new Chapter 1.5. 'Criteria for listing species as susceptible to infection with a specific pathogen' at the 2014 GS, the AAC discussed the next steps to apply the criteria progressively to each OIE listed disease. An AHG should be convened to commence assessments for all OIE listed crustacean diseases starting with YHD as a pilot. The AAC recommended that a new AHG be convened to commence this work. For specific diseases in the Aquatic Manual, the AAC agreed to remove *Crassostrea gigas* from the list of susceptible species (to Infection with *Perkinsus olseni*) in the Aquatic Code (Chapter 11.6.) and the Aquatic Manual (Chapter 2.4.6). For Infection with *Xenohaliotis californiensis* (Chapter2.4.7), the AAC reviewed a MC submission requesting that this chapter be updated to include a diagnostic test that has been recently published. This proposal will be forwarded to the RL expert for consideration.

The AAC was also updated on proposals from the BSC regarding RCs. The BSC agreed that all OIE RL must be accredited to ISO 17025 or equivalent. This requirement would apply to all new applicants. Existing OIE RL that are not yet accredited would be given 3-years to achieve this standard. RL would be asked to upload a copy of their accreditation certificates in their annual report. For the OIE twinning projects, there are three on-going and approved projects in the region: USA/China for IHN; USA/Indonesia for crustacean diseases; and, Japan/Indonesia for KHV.

The AAC was informed of a proposal to prioritise diseases to guide vaccine development in aquatic and terrestrial animals with the goal of decreasing the use of antimicrobials in animals. The AAC requested to be kept informed of progress on this proposal and indicated their willingness to participate as required.

DISCUSSION

- On the proposed listing of AHPND, an important disease in the region and the Americas since its occurrence in Mexico, objection might arise on the basis that *Vibrio parahaemolyticus* is ubiquitous in the aquatic environment. There now appears to be strong justification for listing: diagnostic methods are available (e.g. AP3 primer from Tim Flegel's group); and the economic impact in the affected countries within the region is clear (China, Vietnam, Thailand and Malaysia).
- On OIE Reference laboratories, focus should be given on its quality systems, where most laboratories already complied but some still did not. One proposed requirement for OIE Reference Laboratories is that the laboratory is a recognized national reference laboratory.

- The criteria for susceptibility of species to listed diseases which was adapted last year will eventually be applied to crustacean diseases at first, then to other aquatic animal diseases. This is something that research institutes should be aware of, to follow the OIE criteria when testing for susceptible species.
- There are no zoonotic diseases listed in the Aquatic Animal Health Code; however, zoonotic disease is mentioned in the User's Guide as an issue.
- On the criteria in prioritizing what disease(s) should be considered for the development of vaccine, there is not yet any recommendation in the OIE Code for this issue. This is, however, highly important for disease prevention and control, and to greatly reduce the use of antibiotics in aquaculture. This initiative, which is at conceptual stage at the moment, is related to antimicrobial resistance in animal production (terrestrial and aquatic). At this time, the proposal is focussed on research and development, and OIE proposed to establish a working group to deal with this issue.
- One of the obstacles for vaccine development is the existing country regulations on vaccine registration. In most cases, developed vaccine should be approved by the proper authority for each country where vaccine will be used. Consistent international approaches to vaccine approval would likely facilitate availability of vaccines.

RECOMMENDATION

- AG recommended that an initiative from regional and international organisations (*e.g.* OIE, FAO, NACA) on how to harmonise country regulations on registration of vaccines should be considered. This will facilitate in simplifying regulations on vaccine registration which can then promote wider use of fish vaccines in the region.

2.2. UPDATES ON FAO INITIATIVES IN ASIA PACIFIC IN SUPPORT OF AQUATIC ANIMAL HEALTH

Dr. Rohana Subasinghe presented on-going AAH programmes of FAO in Asia-Pacific and African regions. FAO program on AAH is still very strong, since the first TCP held in Asia which created the AG. Currently, biosecurity program is also strong because of its importance at all levels of aquaculture production (farm, national, regional). Most of the efforts are in Africa at the moment. Biosecurity Africa is a current big project for strengthening biosecurity and capacity building in the African region. The rate of growth in Africa is faster than any other areas of the world (except Asia), and this trend really warrants support especially with the outbreaks of EUS in the Zambesi river system, and WSD in Mossambique which wiped out the shrimp industry. In Madagascar, same problem with WSD is happening.

Looking into the future, aquatic animal diseases are still one of the most important barriers for aquaculture growth. There is no mention of fish in the African animal health act, thus building capacity is highly needed starting from the policy to diagnostic, surveillance, people training and extension. FAO is working with African Bureau…for aquatic animal health management in the region. This focus on the African region doesn't mean that no activity is being underataken in the Asia-Pacific region. The strong capacity of the region to manage AAH can be used and extended to Africa where aquaculture is still in the developmental stage.

The One Health Programme, which FAO is working together with OIE and WHO, includes plant, animal and human health in ONE. Thus, besides country-based activities on AAH, it is high time to address things in a bigger picture and promote regional initiatives. The region has done lots of meetings, disease reporting and other activities on AAH, but if looking at individual country's status on AAH management, it will be a totally different picture (e.g. on how many countries in the region are implementing targeted surveillance programme).

DISCUSSION

- The rapid growth of aquaculture means it is increasing in importance to national economies and food security. This means threats to aquaculture are increasing in potential consequences. Panzootics continue to be a feature of aquaculture indicating significant weaknesses in quarantine and biosecurity. There has been significant investment in aquatic animal health capacity building in the Asia Pacific over recent decades by many organisations including FAO, NACA, OIE, the Australian Government and others. It may be timely to review the past 10-20 years of aquatic animal health management in the region To determine what has worked what hasn't and what regional programs may need to be pursued in the future. This could guide the development of a regional strategy for aquatic animal health.
- Fish as important source of protein is not all about protein content, but on producing protein efficiently with the least amount of resources available, and fish fits well with this criteria compared to livestocks.
- In doing this kind of work in the future, there is a need for political as well as industry commitments.

RECOMMENDATION

- AG recommended that important TCP reports should be widely disseminated to member countries.
- The AG agreed to further consider the proposal to review regional aquatic animal health management programs in the region. Dr Ernst agreed to develop a short concept note as a first step.

SESSION 3: REVIEW OF REGIONAL DISEASE STATUS

3.1. UPDATES ON CURRENT SHRIMP DISEASE THREATS IN ASIA WITH FOCUS ON EMS/AHPND

Prof. Timothy Flegel presented updates on top disease threats on cultured shrimps in the region. As with AGM 12 in 2013, cultivation of domesticated and genetically selected stocks of the American whiteleg shrimp *Penaeus* (*Litopenaeus*) *vannamei* remains the first choice in Asia with the black tiger shrimp *P. monodon* a far second. Importance of pathogens and levels of threat depend on the species of shrimp cultivated and on the geographical location of farms. For viral pathogens in Asia, white spot syndrome virus (WSSV) and yellow head virus type-1 (YHV-1) are still the most lethal for both species, although the latter has so far been confined to Thailand. However, a new, lethal variant (YHV-8) has been found in China. Also from China, another new virus called covert mortality nodavirus (CMNV) was recently reported [Zhang et al. 2014. A new nodavirus is associated with covert mortality disease of shrimp. J Gen Virol. in press]. We have found that it also occurs in at high prevalence (approximately 40%) in Thai shrimp farms and we have recently also received RT-PCR positive material from India. Its species range and impact on culture in the region have not yet been determined, but it is of urgent concern to do so.

For *P. vannamei* only, the next most important viral threat is infectious myonecrosis virus (IMNV) (fortunately still confined to Indonesia) while Taura syndrome virus (TSV) and infectious hypodermal and hematopoietic necrosis virus (IHHNV) are not serious threats to the tolerant shrimp stocks being cultivated. *P. vannamei* sometimes exhibits abdominal segment deformity disease (ASDD), associated with a retrovirus-like agent [Sakaew et al. 2013. Discovery and partial characterization of a non-LTR retrotransposon that may be associated with abdominal segment deformity disease (ASDD) in the whiteleg shrimp *Penaeus (Litopenaeus) vannamei*. BMC Veterinary Research. 9, 189].

For *P. monodon* only, the next most important viral pathogen is Laem Singh virus (LSNV) and an integrase-containing element (ICE) that are together associated with monodon slow growth syndrome (MSGS), but so far, only in Thailand [Panphut et al. 2011. A novel integrase-containing element may interact with Laem-Singh virus (LSNV) to cause slow growth in giant tiger shrimp. BMC Vet Res. 7, 18]. Less important are hepatopancreatic parvovirus (HPV) and monodon baculovirus (MBV), but only when captured *P. monodon* are used for postlarval production without implementation of proper preventative measures.

The most important non-viral disease threat for both species since 2009 has been called (unadvisedly) early mortality syndrome (EMS). It is characterized by massive sloughing of hepatopancreatic epithelial cells followed by death, and it is called acute hepatopancreatic necrosis disease (AHPND). The causative agent comprises unique isolates of Vibrio parahaemolyticus that carry an approximately 69 kbp plasmid that contains two toxin genes capable of acting together to kill shrimp. They pose no threat to human health. AHPND began in China around 2009 and spread to Vietnam in 2010, Malaysia in 2011, Thailand in 2012 and Mexico in 2013. Two interim PCR detection methods (AP1 and AP2) were introduced at the NACA website in December 2012 based on detection of the 69 kbp plasmid, and AP2 turned out to be the best with about 3% false positive results. Despite this weakness, the method was used successfully to reveal a high prevalence of AHPND bacteria in living broodstock feeds (e.g., polychaetes and bivalves), in broodstock and in post larvae used to stock rearing ponds. One of the 2 toxins (approximately 13 kDa) resembling the Pir binary insect toxins, located on the 69 kbp plasmid and found to act together to cause AHPND was used to develop a new PCR method (AP3). This was released at the NACA website in June 2014. It gave no false positive or false negative results with 104 bacterial isolates tested.

Possible preventative measures against pathogen entry with such feed materials would require treatment that would result in their death and it would include (in declining order of desirability) gamma irradiation (sterilization) of frozen material, pasteurization or freezing. The last of these methods (freezing) was the standard practice for polychaetes fed to shrimp broodstock, and it is still the practice in North and South America. However, the widespread habit of feeding live polychaetes has apparently arisen based on associated increases in nauplii production, at the complete sacrifice of all biosecurity concerns. In my opinion, it would be better to accept decreased nauplius yields in order to insure the

integrity of SPF broodstock. This is especially important for the risk of exposure to previously unknown pathogens. Another approach to solve the problem of disease transmission from living polychaetes has been to produce SPF animals in closed culture facilities.

Three other phenomena in the HP have become prominent together with AHPND since 2009. These include high prevalence of the microsporidian *Enterocytozoon hepatopenaei* in both broodstock and cultivated shrimp [Tangprasittipap et al. 2013. The microsporidian *Enterocytozoon hepatopenaei* is not the cause of white feces syndrome in whiteleg shrimp *P.vannamei*. BMC Veterinary Research. 9], of vermiform, aggregated transformed microvilli (ATM) (sometimes mistaken for gregarines) (Sriurairatana et al. 2014. White feces syndrome of shrimp arises from transformation, sloughing and aggregation of hepatopancreatic microvilli into vermiform bodies superficially resembling gregarines. PLos ONE. 9, e99170]. and of distorted hepatopancreatic tubules. It is possible that the latter two phenomena may result either from low levels of the toxins that cause AHPND or from separate causes. However, the rapid regional spread of AHPND and the simultaneous increase in prevalence of infections by the distinctly different, endemic pathogen *E. hepatopenaei*, suggests that the current situation in Asia may have resulted from an industry-wide decrease in rigor of biosecurity measures in shrimp hatcheries and rearing ponds. This could have arisen due to the dramatic reduction in disease outbreaks in cultivated shrimp since the widespread adoption of specific pathogen free (SPF) *P. vannamei* in Asia since 2001. Even with production based on use of SPF stocks, any decline in biosecurity measures would have left the industry vulnerable to the emergence of any new pathogen.

Although the cause of ATM is unknown and its impact on shrimp production has not been assessed, retarded growth in *P. vannamei* caused by endemic EHP is rapidly increasing in prevalence in China, Vietnam, Thailand and Malaysia. PCR methods are available for EHP detection [(Tangprasittipap et al. 2013 above) and a LAMP method (Suebsing et al. 2013. Loop-mediated isothermal amplification combined with colorimetric nanogold for detection of the microsporidian *Enterocytozoon hepatopenaei* in penaeid shrimp. J Appl Microbiol)], and EHP should be added to the list of required pathogens for exclusion from SPF stocks of both *P. monodon* and *P. vannamei*. An advisory on the threat from EHP and measures for control has been posted at the NACA website and an accompanying disease card is being prepared.

From 150 ponds in an ongoing Thai study of 200 ponds randomly selected before stocking, the prevalence of ponds affected by AHPND was in the range of 24% while prevalence for the microsporidian *Enterocytozoon hepatopenaei* (EHP) was 49% and that for vermiform, aggregated transformed microvilli (ATM) (sometimes mistaken for gregarines) was over 80%. The cause of the latter and its impact on production is still unknown, while EHP is associated with severe growth retardation rather than mortality. EHP is an endemic pathogen, generally not present in imported SPF stocks, so contamination occurs in Thailand. Its prevalence in other countries is not yet known.

For all the pathogens described above, the most effective control measures for reducing the risk of disease are to use post larvae derived from domesticated SPF shrimp stocks (with a pathogen exclusion list that includes all major viruses and parasites including *E. hepatopenaei*), cultivated in biosecure settings under management practices aimed at optimum (not maximum) production.

DISCUSSION

- Living polychaetes as shrimp broodstock feeds: found positive for the AHPND *V. parahaemolyticus* and was confirmed that it is the source of infection for outbreaks in Vietnam, Thailand and Malaysia. Indonesia never used living polychaetes imported from China as broodstock feeds (although they do use local polychatetes). This may be the reason for no AHPND outbreaks up to now. Howver, they should beware of EHP.
- In Thailand, the AHPND bacteria might be present earlier than the first outbreak of EMS, but nobody knew then that it was AHPND as the disease manifestation is similar to any *Vibrio* infection.
- There is no essential difference between the AP3 method and the techniques developed for detection of AHPND by Prof. Grace Lo's group and the Prof. Hirono's Japanese group. All focus on the detection of the ToxA gene but their methods also yield other bands other in addition to the one for ToxA. Prof Flegel's AP3 protocol only show a band specifically for the ToxA gene. The ToxA is a protein with similar function as other bacteria-producing toxins.
- On the use of tilapia polyculture with shrimp, it was found that once the green water is established, AHPND can be somehow prevented (as per Loc Tran's study). The same concept is true for biofloc systems. The balance in microbial population in the rearing environment is important in prevention of infection in shrimps.
- On SPF *P. vannamei*, it was reported that its use in shrimp culture has lowered the incidence of WSD from 30% to 1%.

RECOMMENDATIONS

- AG recommended that there is a need to validate methods and standardise procedures for the detection of bacteria responsible for AHPND.
- AG recommended that that a disease card be developed and posted at NACA website for: the new lethal variant of YHV (YHV-8), together with a specific detection method; and, CMNV, including the specific RT-PCR detection method, and that member countries work together to study the prevalence and impact of this virus.
- AG recommended that the AP3 method be used to identify sources of AHPND bacteria and that positive shrimp or other materials be excluded from shrimp production facilities.
- AG also recommended that the practice of feeding living marine animals to broodstock shrimp be strongly discouraged unless they have been proven free of AHPND bacteria and other pathogens.

3.2. UPDATES ON FISH DISEASES IN ASIA

Dr. Kjersti Gravningen presented current disease concerns for finfishes in the region. For bacterial diseases, more serotypes of *Streptococcus agalactiae* are emerging, and there seem to be differences between different regions. In order to get a better overview, serology should be included as a diagnostic tool for *S. agalactiae* in the region. In tilapia *Francisella* is also an emerging threat. On the marine side, *Tenacibaculum* are causing mortality in small fish for many species across the region, as well as *S. iniae*, mycobacteria and different vibrios.

For viral diseases, iridovirus are causing diseases in freshwater and marine species. VNN is also a major problem, mainly in small fish, but recently also observed among larger fishes such as juvenile/adult seabass and groupers.

DISCUSSION

- *Francisella* infection from tilapia stocks reared in Thailand in both hatcheries and grow-out. It is not easy to culture the bacteria *in vitro* as cell line is needed. This bacteria is also hiding in the macrophage of the host, thus treatment is difficult/not possible.
- *Aeromonas hydrophila* infection observed in marine fish cultured at 25-30 ppt salinity.
- In the Philippines, VNN in tilapia was observed in a private hatchery which reported mass mortality. The infection was also observed in the nursery.

3.3. UPDATES ON AMPHIBIAN AND MOLLUSCAN DISEASES IN THE ASIA-PACIFIC REGION

Dr. Andy Shinn reported current updates on amphibian and molluscan diseases in the region. The report of recent, notable molluscan and amphibian diseases listed by NACA and OIE and their occurrence throughout the wider Asia-Pacific (AP) region are summarised in Table 1. Although this table includes reports from reliable sources, this table also provides information given elsewhere that requires substantiating. Most notable is the first report of the amphibian chytrid fungus *Batrachochytrium dendrobatidis* (Bd) from five territories namely Hong Kong, Japan, Madagascar, Singapore and Taiwan bringing the total of infected territories to 13. The report of Bd from Taiwanese amphibians, however, resulted from a study of over 1,000 specimens held in a museum from collections dating back to the 1930s (Zhu et al., 2014). One important piece of information to emerge from the current summary is the report that crayfish are a vector in spreading the disease (Anon [3]); they can harbour infections for up to 12 weeks, with 90% of those exposed to fungus contaminated water becoming infected with a resultant 36% mortality. Ranavirus is also reported for the first time from Chinese Taipei and Hong Kong bringing the number of infected AP territories to six.

Table 1. A summary of recent molluscan and amphibian disease events throughout across the Asia-Pacific region; this includes both confirmed reports and non-official information.

Pathogen/Disease	Host	Country	Most recent report	References	Notes
Candidatus/Xenohaliotis Californiensis	*Haliotis discus discus*	Japan	2013	Kiryu et al., 2013	[1]
Infection with abalone herpesvirus	- *Haliotis diversicolor; H. aquatilisi* -	Australia China Myanmar	2007-2012 1999-2007; 2012(?) 2009	OIE Disease Information cards Huang et al., 1999 NACA QAAD (3Q 2008)	
Rickettsia-like organisms	*Tegillarca granosa*	China	2012	Zhu et al., 2012	[2]
Ostreid herpesvirus-1	*Crassostrea gigas*	Australia New Zealand	2013 2014	Paul-Pont et al., 2013; 2014 Keeling et al., 2014	[3] * [4] *
Bonamiaosis	-	Australia & New Zealand	2000-2005	OIE, 2000	
Bonamia exitiosa	*Saccostrea glomerata* -	Australia New Zealand	2004-2014 2000-2012	OIE, 2003a; Carnegie *et al.*, 2014 OIE, 2003a	[5] **
Bonamia ostreae	*Ostrea edulis*	China	2013	Feng et al., 2013	[6]
Haplosporidiosis	-	China	2013	Xie et al., 2013	[7]
Haplosporidium nelsoni	*Patinopecten yessoensis* -	China Japan	2012 2003-2006	Wang et al., 2012a OIE, 2003b	[8]
Mikrocytosis	-	Australia	2002-2005	OIE, 2001	***
Mikrocytos mackini	-	Australia	2006	OIE, 2005	*
Marteilia spp.	-	Australia RO Korea	2002-2005 2002	OIE, 2001	*
Marteilia-like organism	*Mytilus edulis*	China	2012	Wang et al., 2012b	[9]
Marteliloides	*Crassostrea ariakensis, C. gigas, Ruditapes philippinarum*	RO Korea	2013-2014	Limpanont et al., 2013	[10]
M. chungmuensis	-	Japan RO Korea	Known 2012	Limpanont et al., 2013	
Perkinsosis	-	Australia China Japan New Zealand	2002-2005 2013 2003 2000-2005	OIE, 2001 Xie et al., 2013 OIE, 2003b OIE, 2000	[11]
Perkinsus beihaiensis	*C. madrasensis*	India	2012	Sanil et al., 2012	[12]
P. marinus	-	French Polynesia RO Korea	2013 † 2013	OIE, 2012	[13] * *
P. olseni	- -	Australia China	1995 2006	NACA QAAD (4Q2005) OIE, 2006	[14]

	-	French Polynesia	2012-2013	OIE (Immediate notification)	[15] *
	Pinctada fucata	India	2010-2012	Sanil et al., 2010	
	-	Japan	2006-2012	OIE, 2006	
	-	New Zealand	2005-2014	OIE, 2014a	[16]
	-	RO Korea	2005-2010	NACA QAAD (2Q2005)	
	Meretrix lyrata	Vietnam	2011-2013	OIE, 2011	[17]
Batrachochytrium dendrobatidis	-	Australia	2007-2013	OIE Disease Information cards	*
		Cambodia	2010-2012	Neang, 2010	
		China	1930	Bai et al., 2010	[18]
		Hong Kong	2014	Kolby et al., 2014; Anon [1]	
		India	2013	Dahanukar et al., 2013	[19]
		Japan	2014	Anon [2]	[20]
		RO Korea	2009; 2013	Yang et al., 2009	[21]
		Madagascar	2014	Kolby, 2014	[22]
		Malaysia	2011	Savage et al., 2011	[23]
		New Zealand	2010-2012	OIE Disease Information	[24]
		Singapore	2013-2014	NACA QAAD, 2013-2014	[25]
		Taiwan	2014	Zhu et al., 2014	[26]
		Thailand	2012	Voeroes et al., 2012	
Ranavirus	-	Australia	2012	OIE Disease Information	[27]
	-	China	2008-2010	cards	[28]
	-	Taiwan	2014	OIE, 2014b	
	-	Hong Kong	2014	Kolby et al., 2014	
	Rana dybowskii	Japan	2010-2013	OIE, 2010	[29]
	-	Thailand	2012	OIE, 2012	

* See http://www.cefas.defra.gov.uk/idaad/location.aspx; ** While *Bonamia* species are present, the identity of the parasite is in question; *** *Mikrocytos roughleyi* is now considered to be *Bonamia roughleyi*; † Suspected but not confirmed; **[1]** First detection of CXC (an RLO) which causes withering syndrome in Japanese black abalone, *Haliotis discus discus*. Monthly mortality rates were between 3-10%. Cum. mort. 33% in one hatchery; **[2]** In 2012 a Rickettsia-like organism infection associated with mass mortalities (2005-09) of blood clams, *Tegillarca granosa*, in the Yueqing Bay in China. An area of 0.5 km^2 was affected with an av. mort rate of 30%. This is the fourth consecutive year with similar patterns of mortalities; **[3]** In 2010 the virus appears in the Botany Bay Estuary of NSW. In 2012 there is a mass mortality of commercial *C. gigas* in the Hawkesbury River Estuary (HRE) 50 km north of Botany Bay. In 2013 a new outbreak is reported in HRE (culture area covers 27 leases 15 M oysters < 9 mo and >2 M oysters over 12 mo). Mortality sudden (mortality within 3 d), cum. mort. 50+% (20-100%) in 1 yr <60mm oysters; cum. mort. 20+% in adults. Oyster to oyster transmission ruled out; **[4]** In 2010 the virus decimates farms in bays on the North Island; **[5]** A study concludes that BE is not responsible for winter mortality disease in Sydney rock oysters, *Saccostrea glomerata*; **[6]** Found in American exports of *Ostrea edulis* sent to China. One out of 104 oysters infected imported for consumption. Parasite found to survive 4 wks at 4°C *in vitro*; **[7]** *Haplosporidium* spp. was found in 8.6 % of the oysters collected from the Qindao, Shandong coastal area of China; **[8]** HN was identified in Japanese scallops, *Patinopecten yessoensis*, from Dalian along the northern coast of the Yellow Sea, China. Mass mortalities in 2 yr old stock in 2007 (70-90%) and 2008 (60-90%) was investigated. This is the first report of HN in *P. yessoensis* in China. Histology found a 6% infection; **[9]** A *Marteilia*-like parasite is found in 2.8% of the blue mussels, *Mytilus edulis*, collected from the Chinese coast. This is the first report of a *Marteilia*-like organism infecting *M. edulis* in China. No infection was found in green mussel, *Perna viridis*, samples; **[10]** *Marteilioides* infection in Suminoe oysters, *Crassostrea ariakensis* (first report; 99.9% similar to *M. chungmuensis*; no path. symptoms), Manila clams, *Ruditapes philippinarum* (0.4%; 98.2% similar to *M. chungmuensis*; no path. symptoms) and in Pacific oysters, *Crassostrea gigas* (lumpy ovaries, become infertile when infected; 99.9% similar to *M. chungmuensis* in Japan), on the south coast of Korea; **[11]** *Perkinsus* spp. was found in 8.3 % coastal oysters cultivated from shellfish farms of Beihai, Guangxi, China; **[12]** *Perkinsus beihaiensis* in *Crassostrea madrasensis*. 5-32% prev. across 5 sites. No mortalities or mortalities overlooked?; **[13]** *Perkinsus marinus* in 2013 suspected but not confirmed; **[14]** PO was implicated in the mass mortality of abalone (see Umeda and Yoshinaga, 2012; **[15]** Infection with *Perkinsus olseni*, French Polynesia results in immediate notification (Final report, 5/12/12); **[16]** OIE notification; **[17]** Disease outbreak in Lyrate Asiatic hard clams, *Meretrix lyrata*, in a 2.5 ha site in Nghi Thiet commune, Nghi Loc district in Nghe An Province; **[18]** Bd detected in 2010 in imported bullfrogs; **[19]** Found in 3 endemic and endangered species of frog; **[20]** Imported for trade; **[21]** First detected in 2009. In 2013 infection suspected but not confirmed; **[22]** Reported on native amphibians that are being exported; **[23]** Infection reported from four frog families from peninsular Malaysia; **[24]** Occurs in certain zones; **[25]** Between June 2013 and April 2014, 222 samples tested by qPCR. Bd DNA was found in 59 bullfrog samples imported for human consumption but not found in locally farmed bullfrogs; **[26]** First report of Bd in Taiwan; **[27]** RV enzootic; 2012 known to occur; **[28]** Known to occur in *Rana dybowskii* in Heilongjiang. In 2011, RV is reported in farmed giant salamanders; **[29]** Occurs in some zones.

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DISCUSSION

- AG members noted that some caution should be used in interpreting the information within the table because non-official information may not be complete or verified. Members queried the report of *Perkinsus marinus* in French Polynesia. The presence of the parasite was detected by PCR in 2013. No further follow-up or update thereafter.
- On the management of molluscan infection, the best way is to prevent the entry of pathogens. Globally, mollusc diseases have had detrimental effects on entire industries and resulted in complete cessation of farming of susceptible species in some areas.
- In China, OHSV-1 can infect molluscs though its association with macroalgae, thus people in the affected area tend to reduce the population of macroalgae to somehow prevent infection in scallops.

RECOMMENDATIONS

- The AG recommended that competent authorities carefully consider their measures to prevent the transboundary spread of mollusc diseases due to the often significant consequences of these diseases on mollusc production and the lack of effective measures to mitigate their impacts.
- The AG recommended that competent authorities follow OIE standards for mollusc diseases which provide measures to enable the sanitary safety of trade of molluscs and mollusc products.

SESSION 4: REPORTS ON AQUATIC ANIMAL HEALTH PROGRAMMES FROM PARTNER AGENCIES

4.1. AUSTRALIA'S NATIONAL AQUATIC ANIMAL HEALTH PROGRAMMES

Ingo Ernst provided an update on Australia's aquatic animal health programs. The most significant development since the previous advisory group meeting has been the development and publication of Australia's third National Strategic Plan for Aquatic Animal Health, AQUAPLAN 2014-2019. The new plan was developed on the basis of findings of a review of AQUAPLAN 2005-2010 and with close engagement with Australia's state and territory governments, aquatic animal industries and other stakeholders. The new plan has been prepared and endorsed by industry and governments, and has commenced. The new plan is intended to:

– address common national priorities across industry sectors
– target strategic issue that could have lasting benefit
– be focussed on defined achievable tasks.

The new plan includes five objectives:

1. Improving regional and enterprise-level biosecurity
2. Strengthening emergency disease preparedness and response capability
3. Enhancing surveillance and diagnostic services
4. Improving availability of appropriate veterinary medicines
5. Improving education, training and awareness.

Ingo provided the AG with examples of activities under each objective and the outcomes that they aim to achieve. Further information on AQUAPLAN 2015-2019 is available on the Department of Agriculture website at: www.agriculture.gov.au/aquaplan

Ingo also provided an update on the regional laboratory proficiency testing program for aquatic animal diseases that has been funded by the Australian Government Department of Agriculture. The program included 4 rounds of testing which are all now complete. The program was resource intensive, including: over 40 laboratories, 10 diseases, 6 samples per disease panel, 4 rounds, and extensive quality assurance including stability and homogeneity testing.

There was a strong commitment from participating laboratories resulting in a high submission rate of test results and many requests for participation.

Overall results indicate an improvement is diagnostic performance over the life of the program for all ten diseases. The program has proven to be an excellent model for a regional proficiency testing program.

DISCUSSION

- One AQUAPLAN activity aims to develop a smartphone application for Australia's existing national field guide for aquatic animal diseases. This will make the field guide more accessible and aims to improve awareness and reporting of significant diseases by target audiences. A previous version of the field guide was adapted as an Asia-Pacific field guide and made available on the NACA website. Once the app is developed, there may be an opportunity for it to be adapted as a regional field guide version, in collaboration with key regional organisation like NACA.
- AQUAPLAN 2014-2019 does not have a dedicated source of funding for implementation of its activities. However, because the priorities included in AQUAPLAN are agreed by all major stakeholders it is expected that activities will be funded by existing funding sources. In this way AQUAPLAN will attract funding from multiple sources—including in-kind resources.
- On the regional proficiency testing program, the 4-rounds of testing are now complete. For ongoing participation in PT for aquatic animal pathogens, some countries have requested participation in Australia's National PT program. This is possible for some important diseases (e.g. *Megalocytivirus*) where sufficient material is available but would be on a fee for service basis. Interested laboratories should contact ANQAP directly.
- Responsibilities for regulating veterinary chemical use in aquatic animals for human consumption are shared between the Australian Government and state/territory governments. The Australian Government is responsible for the registration of veterinary medicines (through the Australian Pesticides and Veterinary Medicines Authority) which approves uses based on efficacy and safety. The APVMA also approves product

labels. There are few products that are registered for use in food fish but some products can be used under minor use permits issued by the APVMA.

- State and territory authorities are responsible for control of use beyond the point of retail sale, including regulation and enforcement. In some cases the state/territory requirements may exceed the conditions of permits granted by the APVMA. For example in some instances regulatory approval may be required on each occasion of use, even if prescribed by a veterinarian and in accordance with a minor use permit conditions.
- For diagnostic methods, Australia and New Zealand share a system for developing diagnostic standards where no OIE standard exists, or where they are not sufficient for Australian conditions. A committee is responsible for overseeing this program which also has a program for "new test approvals".
- AG members queried the level of capability that farmers in Australia have to diagnose diseases. This varies among different sectors but many larger businesses will have staff that are trained in aspects of aquatic animal health management. For more common endemic diseases, farmers may have some basic diagnostic capabilities. However, any suspicion of exotic diseases must be reported to state / territory authorities who would investigate. If testing by a state authority establishes suspicion of an exotic disease those samples are then referred to Australia's national reference laboratory which will undertake confirmatory/exclusion testing.
- On the use of virtual slides (*e.g.* for histopathology), this is a very important and useful tool for diagnostics as well as teaching and training programmes.

RECOMMENDATION

- AG thanked DA Australia for the excellent presentation on the AAH activities and recognized its support to several important AAH activities in the region, as well as sharing the AQUAPLAN 2014-2019.

4.2. AQUATIC ANIMAL HEALTH ACTIVITIES OF THE FISH HEALTH SECTION, SEAFDEC/ AQD

Dr. Rolando Pakingking presented highlights of the Fish Health Section (FHS) activities from 2013-204. SEAFDEC AQD has implemented a total of 20 scientific studies, both in-house and externally funded, under the fish health component of the Thematic Program "Healthy and Wholesome Aquaculture" in 2014. These studies aim to (1) investigate the efficacy of probiotics and rationalize the need and application of diagnostics that will ensure biosecurity within culture systems and keep out exotic pathogens, especially trans-boundary pathogens (2 studies); (b) promote the wider use of conventional diagnostic as well as new methods especially for newly reported, emerging diseases (10 studies); and (c) find effective alternative safe drugs/chemicals (including natural products) to manage aquaculture diseases in lieu of harmful chemicals and drugs whose use has been discouraged or banned due to quality and safety issues (8 studies). In consonance with objective 1, studies that delve on the development of probiotics chiefly composed of indigenous bacteria recovered from fish and crustaceans (shrimps and crabs) and their rearing environments, and the isolation of bioactive compounds from Philippine seaweeds have been undertaken for the control and prevention of diseases afflicting these cultured organisms. While the data generated indicated some promising results in vitro, their application in vivo either through direct inoculation or indirectly via feed supplementation still warrant further investigations. Furthermore, detection of viral, bacterial, and parasitic pathogens implicated in emerging and re-emerging diseases of cultured fish and crustaceans were also conducted using conventional and molecular approaches to address objective 2. In conjunction with objective 3, the practicality of terrestrial plant extracts as antibacterial agent and anti-stimulant respectively for the treatment of bacterial diseases and upregulator of genes involved in innate immunity of fish and crustaceans was investigated. Activities that will be undertaken in 2015 include (a) examination of the effects of the isolated probiotic bacteria on the composition of microbial gut flora in shrimp; (b) selection of the most efficacious antimicrobial and probiont to be used in hatchery and grow-out trials; (c) compilation of the epidemiological information including genetic, phenotypic, ecological, spatial, and temporal characteristics of aquatic pathogens; (d) field testing of LFSB (lateral flow strip biosensors) strips developed for the detection of shrimp pathogens; (e) monitoring sanitary quality of cultured oysters and establishment of practical depuration procedures; (f) enhancement of vaccine efficacy for the prevention of viral nervous necrosis in high value marine fish; (g) application of adjuvants, carriers and RNAi technology to enhance the antiviral immune response of shrimp to WSSV; (h) establishment of protective measures against persistent and emerging parasitic diseases of tropical fish; (i) epidemiology of the Early Mortality Syndrome (EMS); and (j) assessment of training needs for capacity building of SEAFDEC member countries. In addition, from 1st to 3rd quarter of 2014, Fish Health Section's diagnostic cases include detection of shrimp viruses (WSSV: 75 positive/ 575 total number of specimens/cases examined (13%); IHHNV: 11/103 (11%); IMNV: 0/114; TSV: 0/108; and YHV: 0/61) and fish viruses (NNV: 20/42 (48%) and RSIV: 0/19).

DISCUSSION

- It has been observed that VNN is now affecting bigger-sized fish (even broodstock) and actually showing the clinical signs of the disease, thus broodstock vaccination is warranted.
- Disease diagnostic cases came from the institute (30%) and from other stakeholders (70%), this activity is a part of the regular disease monitoring programs of aquaculture farms/hatcheries.
- RNAi technology has a great potential for shrimp, but the only question is delivery.

RECOMMENDATIONS

- AG thanked SEAFDEC AQD Philippines for sharing the important AAH activities of its Fish Health Section.

4.3. ACTIVITIES OF IAAHRI ON AQUATIC ANIMAL HEALTH (2013-2014)

Dr. Temdoung Somsiri presented the on-going aquatic animal health programmes of Thailand. The DoF has a committee on implementation of The Animal Epidemic Act B.E. 2499 (1956) to provide authority IAAHRI to aquatic animal diseases concerning imported and exported aquatic animals. The activities also cover quarantine requirements and destruction of aquatic animal infected with diseases as listed under the national official measures. Procedures implemented for surveillance and monitoring of notifiable diseases (based on OIE-list) follow the OIE manual and importing countries requirements. Currently, Thailand has declared freedom on Epizootic haematopoietic necrosis; Infectious haematopoietic necrosis; Infection with Infectious salmon anaemia; Viral haemorrhagic septicaemia; Infection with Gyrodactylus salaris; Spring viraemia of carp; Infection with Aphanomyces invadans; Infectious myonecrosis; Crayfish plague and all OIE-listed molluscan diseases. IAAHRI summarizes all data for both active and passive surveillance and submits disease report to DoF, OIE and NACA.

The Molecular Biology and Virology laboratories of IAAHRI was participating in the Asian Regional Laboratory Proficiency Testing Programme for aquatic animal diseases that was funded by the Australian Government and implemented by project partners ANQAP, CSIRO AAHL and NACA. The Institute has passed the final round of testing for WSSV, IHHNV, YHV, TSV, IMNV, MrNV, RSIV, VNN, KHV and SVCV.

On the importation and exportation of live aquatic animals, approval of quarantine is now the responsibility of IAAHRI.Imported animals found to carry infectious pathogens will be eradicated without providing any compensation to the importers. IAAHRI issues health certificates for live aquatic animals intended for export. a total of 6,499 health certificates were issued during the budget year 2014.

In response to the current shrimp disease problem on AHPNS, the DoF has implemented several action plans. IAAHRI has participated on Importation of SPF broodstock aim to improvement genetic of marine shrimp in Thailand. These measures also led to the continuous decrease in AHPNS outbreaks in the country.

IAAHRI has carried out the training programme on new standard and DoF regulations:

- Good Practices for Aquatic Animal Disease Control in Aquaculture Establishment (Thai Agricultural Standard, TAS 7428-2012)
- Registration of aquaculture establishment for exportation of live aquatic animals for culture purpose B.E. 2557 (A.D. 2014).
- Procedures for requesting live aquatic animal health certificate for exportation B.E. 2557 (A.D. 2014).
- The target groups are farmer, exporter and officer. IAAHRI also provided on the job training for undergraduate students on aquatic animal disease diagnosis.

The First Meeting of Technical Working Group on Aquatic Animal Health Management under the ASEAN Public-Private Taskforce for Sustainable Fisheries and Aquaculture and ASEAN Workshop on Minimizing Risks Associated with Trans-boundary Aquatic Animal Diseases held in Pataya, Thailand during 13-14 August 2014. This activity arranged under cooperation among IAAHRI/ANAAHC/NACA/USAID-market aim to draft the standard operation procedures for responsible movement of live aquatic animal among ASEAN countries.

DISCUSSION

- AHPND challenge test on larger-sized shrimp (15 g) gave negative results, whilst smaller sized shrimp (3-5 g) are susceptible. It is recommended that someone needs to compare the susceptibility between shrimps from AHPND-affected zones and shrimps non-affected zones.

- Companies that produce shrimp broodstock are aware of this, but not sure if they are successful in keeping the system free from AHPND bacteria. There is really a need to fully validate the tests for AHPND, considering the significance of the disease to the industry. The validation process is described in the OIE Aquatic Manual.
- Living carriers is still the main concern on the spread of AHPND bacteria. At present, requests for AHPND isolates can be easily granted thus it can be transported from one country to another, and this might pose more problems in the future.
- Declaring freedom from disease depends on the disease, disease monitoring, active surveillance and biosecurity measures (including quarantine system) being implemented in the country. Performing active surveillance (following the OIE protocol) and having biosecurity measures in place and properly implemented, will significantly reduce the number of years for a country to declare freedom.
- Declaration of freedom at hatchery level in Thailand, regulations will be implemented by 2015. This regulation has undergone many steps including training, awareness programmes, capacity building for the farmers including biosecurity measures, record keeping, auditing, *etc*. prior to its implementation. As this is a government regulation, all shrimp hatcheries in the country must comply or they will face penalties.
- Capacity building for small-scale farmers on biosecurity implementation and record keeping was given more focus by the DOF, as big commercial hatcheries were already implementing biosecurity measures.

RECOMMENDATIONS

- AG thanked IAAHRI Thailand for sharing the important AAH activities of the institute.

4.4. AAH ACTIVITIES OF OIE REGIONAL REPRESENTATION IN ASIA AND THE PACIFIC

Dr. Hnin Thidar Myint presented updates on aquatic animal health activities by OIE Regional Representation in Asia and the Pacific. OIE RRAP, in collaboration with OIE Collaborating Centre for Diagnosis and Control of Animal Diseases and Related Veterinary Product Assessment in Asia, organized Regional Short-term trainings on Risk Assessment of Fish Vaccines in 2013 and 2014. Attendances were from Indonesia, Myanmar, Singapore, Thailand, and Vietnam in 2013, and Chinese Taipei, R.O. Korea, Malaysia, Mongolia and Philippines in 2014.

The third OIE Global Conference on Aquatic Animal Health: Riding waves for the Future will be convened in Ho Chi Minh City in January 2015, to raise awareness of aquatic animal health and to built a global framework for improving management, prevention and control of aquatic animal diseases. The Regional Seminar for OIE Focal Points for Aquatic Animals will be organised back-to-back with Global Conference. These activities will encourage OIE Focal Points in supporting the OIE Delegates' commitment on OIE activities for improving animal health and animal welfare. One of the supports of OIE RRAP to Regional Members is establishment of Delegates' Secure Site for the region via which OIE Delegates can share their comments to the reports of OIE Specialist Commissions in standard setting procedures.

According to the review on QAAD reports for 10-year period by Dr T. Waki, Collaborative Research Fellow for OIE RRAP, there are inconsistencies in the number of diseases reported in QAAD and in scientific papers, especially on molluscs diseases. The establishment of OIE-NACA Regional Core might be one of the solutions for quality improvement of QAAD reports. The system has been under discussion since 2008 but still far from launching because of technical problems. OIE RRAP expects, with the help of IT team in the OIE HQs, to launch this interface by next AG meeting. Until the regional core is ready, OIE RRAP will continue distribution of printed version of QAAD for Member countries.

Usage of antimicrobials in aquaculture can lead to the development of antimicrobial resistance. As OIE is planning to collect the data on antimicrobial usage in agricultural sector, NACA is requested to be a bridge between OIE Focal Points for Veterinary Products and aquatic experts to provide the country data on antimicrobial usage in veterinary sector to OIE under the authority of OIE Delegates.

DISCUSSION

- Regional strategy on AMR is available online at WHO website; it is important that this should be done as a region or as an industry so as to establish a solid conclusion. This is especially important since the animal production sectors (specifically aquaculture) are blamed for this AMR.
- OIE already have AMR Focal Points in each member country, but participation of aquatic animal health specialists are still limited in the discussion of AMR issues.

- AMR may become a trade issue, and member countries should be aware of this possibility. The aquaculture sector, as a user of antibiotics will be expected to contribute to the management of AMR. Guidance on monitoring antimicrobial use in aquaculture is available in the OIE Aquatic Code .
- Risk assessment studies would provide an indication of the relative risk of antimicrobial use in aquaculture leading to AMR that has consequences for human health, compared with uses in livestock and human health.
- The private sector in Thailand wants to ask OIE why they have to keep the records for disease free for 2 year. This is not only specific for shrimp diseases but applicable to all aquatic animal diseases, and there's no set principle on how those periods were established. This is something the commission recognised and have set up a committee to discuss this.

RECOMMENDATIONS

- AG congratulated OIE-RRAP for their important aquatic animal health activities in the region.
- AG recommended that NACA should contact key agencies (FAO, OIE) to undertake necessary regional activities to address the AMR issue (e.g. risk assessment studies).

SESSION 5: DISEASE REPORTING

5.1. QAAD REPORTING AND REVISION TO THE QAAD LIST

Dr. E. Leaño presented the status of QAAD Reporting in the region. A total of 64 reports have been published to date with an average of 15 countries reporting for each quarter. Two diseases were delisted from the list since January 2014 as per recommendation from the previous AGM 12: Akoya Oyster Disease and Milky Haemolymph Disease of Spiny Lobsters. China resumed reporting in the first quarter of 2014 after non-submission of reports for the last 2 quarters of 2013. Japan made the first report of Crayfish Plague (caused by *Aphanomyces astasci*) during the 2nd quarter of 2014. The pathogen was detected by PCR among imported Louisiana swamp crayfish (*Procambarus clarkii*). Japan also made significant improvement in reporting since the 2nd quarter of 2014: epidemiological comments of all the diseases reported are now included in their QAAD report. For the newly listed diseases in 2014, three countries (Malaysia, Thailand and Vietnam) have reported the presence of AHPND, while Australia reported the presence of Infection with Ostereid herpesvirus. Other diseases (not included in the list) reported are as follows:

- Infectious spleen and kidney necrosis virus (ISKNV) in marine and ornamental fish in Singapore;
- Hepatopancreatic parvovirus disease in Malaysia;
- Monodon baculovirus in Sri Lanka.

It was also recommended to the group that the publication of hard copy of the QAAD report be stopped starting January 2015 and only e-copies will be distributed online.

Dr. Jie Huang presented revisions in the OIE list of diseases which include name change for Yellowhead disease to Infection with yellow head virus, and delisting of Infection with ostereid herpesvirus – 1 μvar due to removal of Article 1.2.3 in the Aquatic Code. AHPND, on the other hand, is now proposed for listing by the OIE.

DISCUSSION

- A review is needed for QAAD Reporting system since its inception up to the present. The review should focus on what has been accomplished over the last 15 years since the implementation of the reporting system, how the country members' capacity is improved in disease diagnostics, how the reporting system played an important role in the formulation of appropriate disease prevention and control measures, sufficient expertise on aquatic animal health, and on its role as a warning system for new emerging diseases in the region;
- QAAD has been proven as an effective and essential tool for early warning mechanism for emerging diseases in the region and prevention of their spread (*e.g.* cases of KHV and AHPND);
- On the non-reporting of AHPND in China for this year, the early mortality observed among cultured shrimp can be attributed to other causative agents (*e.g.* Covert Mortality NodaVirus) and presence of other bacteria which is either directly or indirectly associated with the disease. There are current arguments in the country on the real cause of the mortalities observed in cultured shrimp.
- It was suggested that two diseases be included in the list: EHP (*Enterocytozoan hepatopenaei*) and CMNV (Covert Mortality Nodavirus) which are currently affecting cultured shrimp in China. Discussion focussed on how these two diseases fit the listing criteria of OIE. The AG agreed that an assessment of these diseases

against the listing criteria are needed before they could included in the QAAD list. However to raise awreness of these diseases the AG decided that Disease Advisories should be developed for these diseases. This will raise awareness and and may assist the gathering of data on the presence of these diseases from other countries.

- Monodon Slow Growth Syndrome (MSGS) was suggested to be renamed as Infection with Laem-Singh virus or be delisted from the list. Except for Sri Lanka reporting on the presence of Laem-Singh virus in shrimp, no other countries are reporting the presence of MSGS.
- Hard copy printing of QAAD Report is still needed and the group asked how much does NACA spend to publish the 4 issues of the report in one year. Ed Leano will follow-up on this matter.

RECOMMENDATIONS

- AG recommended to include some details in the QAAD form such as:
    - List of possible control measures that can be applied for reported diseases;
    - Description of levels of diagnosis
- AG recommended that a critical review on the monitoring, surveillance and reporting programme as well as on aquatic animal health management in the region for the past 20-25 years. FAO, NACA and AG members will be the lead in conducting/writing the review.
- AG recommended that NACA prepare the disease advisories for EHP and CMNV (emerging diseases in the region). Prof. Flegel and Dr Jie will provide details of the disease for inclusion in the advisories. A news article on EHP will be available at NACA website soon.
- AG recommended to review the status of MSGS for delisting and EHP and CMNV for listing in QAAD, and to present these in the next AGM.
- AG recommended that printed copy of the QAAD Report be continued until the Regional WAHIS becomes available, and suggested that other source of funds can be tapped if NACA can no longer support its publication.
- AG recommended, in accordance with OIE recommendations, to change the name of "Yellowhead Disease" to "Infection with Yellow head virus" and the deletion of "Infection with ostereid herpesvirus". The QAAD list of diseases for 2015 is presented in Annex C.

SESSION 6. SPECIAL PRESENTATIONS AND OTHER MATTERS

6.1. AQUATIC ANIMAL HEALTH PROGRAM AND MANAGEMENT STRATEGIES IN MALAYSIA

Dr. Siti Zarah Abdullah presented the status of aquatic animal health management in Malaysia. The intensification and diversification of culture systems in Malaysian aquaculture has led to may disease problems and the establishment of National Fish Health Research Center (NaFisH) way back in 1996. Its main role is to provide technical inputs and scientific data related to aquatic animal health aspects and diseases through R&D activities conducted. Aquatic animal health researches being undertaken in the Center include epizootiology, vaccine development, and alternative medicines. For epizootiological studies, research are focussed on important aquatic animal diseases including Streptococcosis in tilapia, Vibriosis in marine fishes, EMS/AHPND of shrimps, and channel catfish virus (CCV) of catfish. Development of vaccine for Streptococcosis of red tilapia is one of the main activities for vaccine development. The main objectives of the research study are to determine lab and field efficacy of the feed-based whole cell vaccine against streptococcosis, and to determine the duration of protection provided by a feed-based whole cell vaccine in field. The feed-based vaccine (Strep To Vax) and working manual has been successfully launched by the Department of Fisheries Malaysia. The Center also developed bioencapsulated live feed with bacterial vaccine in marine fish larvae. For alternative medicines, the use of plant extracts against bacterial diseases of cultured marine and freshwater fishes has been initiated to: determine the best plant extracts as effective natural antibiotic agent against bacterial diseases in both freshwater and marine cultured fish; determine the acceptability and optimal dose requirement of selected plant extracts; determine the effectiveness of plant extract as treatment and prevention of bacterial diseases in cultured marine and freshwater fish.

Future directions and activities of the Center include the following:

- Access to FUND (national or international): opportunity to improve and conduct R&D for continuous emerging and re-emerging diseases in the aquaculture sector;
- Recruitment of experienced personnel(AAH) to work in R&D and biosecurity matters related to AAH;

- Aggressive registration of farms: to monitor and record any disease outbreaks for effective control and containment. Currently, 448 farms are registered. Cooperation by stakeholders will benefit the industry in reducing economic loss through disease control and prevention;
- Fish Disease Act and Regulations: draft review by competent legal adviser who understands the industry benefits for effective and immediate approval. Implementation is better when stakeholders and farmers appreciate its significance to sustainability of the industry and its economic contribution-awareness campaign.

DISCUSSION

- Vaccine on streptococcal infection developed in the institute is a recombinant and formalin-killed supplemented with adjuvant. Field trial is done, and it still has to be registered in the Veterinary Services before it becomes available in the market. This is also still in the process of patenting.
- On AHPND situation in the country, most of the farmers either changed species to *P. monodon* or practice polyculture with tilapia, to somehow manage the disease. But still, AHPND is prevalent in the country. The laboratory still receives samples from farmers that are positive for AHPND.

6.2. LOCAL SUPPORT FOR THE IDENTIFICATION OF *GYRODACTYLUS* SPECIES INCLUDING *G. SALARIS*

Dr. Andy Shinn presented a short paper on the importance of *Gyrodactylus* infestation among cultured fish, with special reference to *G. salaris*. Summary to be inputted by Andy

Should assistance in the identification of *Gyrodactylus salaris* (Monogenea) or other species of the genus be required, notably specimens collected from salmonids, then please contact Andy Shinn (email: andy.shinn@fishvetgroup.com) who is based in the Bangkok branch of the Fish Vet Group. Assistance and advice in specimen preparation, the discrimination of species based on attachment hook morphology and in sequencing of worms is available.

DISCUSSION

- Since rainbow trout is now being cultured in some countries, this can become an entry point for *G. salaris* in the region

6.3. DIGITAL SCANNING OF GLASS HISTOLOGY SLIDES

Dr. Andy Shinn made a short demonstration and discussion on the benefits of digital slide scanning. Glass histology slides are typically scanned at a high resolution (i.e. x40 objective) which can then be viewed using associated, free slide viewing software. The operator can view their slide from a computer or mobile phone / device and zoom in and out on areas of interest as one might when operating a traditional compound microscope. The benefits of taking scanned slides are that they are portable. Digital on-line archives (e.g. Google Cloud Storage facility) as a repository of valuable material can be created and shared among colleagues. The standardized scanning conditions generates images of a high quality that can be used for publications, presentations etc. Facilities for the scanning of glass slides exist within the Fish Vet Group branch in Bangkok. For more information on this service, please contact Don Griffiths (email: don.griffiths@fishvetgroup.com).

6.4. OPEN DISCUSSION ON AEC (ASEAN ECONOMIC COMMUNITY) IMPLEMENTATION BY 2015

- Some Focal Points are concerned on the movement of live aquatic animals within the region when the AEC is finally implemented next year. They have requested that it should be a top subject for discussion in related meetings, and to give focus on this issue in the future.
- This situation will be aggravated by the differences in member countries' capabilities/capacity on aquatic animal health management.

RECOMMENDATIONS

- AG recommended that member countries should be encouraged to avail of the OIE PVS Tool, to improve their capacities for aquatic animal health management especially when the AEC is implemented in the region.
- AG also recommended that NACA, ASEAN and other regional organizations should try to incorporate or at least make it as a requirement for member countries to undertake PVS, as a part of their overall national aquatic animal health management strategies. As PVS is a well-structured assessment tool to evaluate animal health capacity of the country, the role of NACA or ASEAN can really play a very important role by serving as a platform to encourage member countries to undertake PVS.

6.5. OTHER MATTERS AND DATE OF NEXT MEETING

As what has been initiated in this AGM, i.e. inviting one NACA member country to join the meeting, AG recommended to invite either Indonesia or Vietnam in the next AGM.

The next AGM (AGM 14) will be held in Bangkok, Thailand in November 2015 (final dates to be decided).

ANNEX A: MEETING AGENDA

13TH MEETING OF ASIA REGIONAL ADVISORY GROUP
ON AQUATIC ANIMAL HEALTH (AGM 13)
22-23 NOVEMBER 2014
KIM DO ROYAL SAIGON HOTEL, HO CHI MINH CITY, VIETNAM

Day 1 (22 November, Saturday)

09:00 – 12:00

Opening Session

- Welcome address: **Dr. Eduardo Leaño**, Coordinator, Aquatic Animal Health Programme, NACA
- Opening Remarks: **Dr. Ingo Ernst**, AG Chairman, DA Australia
- Selection of new Chair and Vice-Chair

(AG Chairman, will take over)

Session 1. Progress Report

- Progress since AGM 12 **(Dr. Eduardo Leaño**, NACA)

DISCUSSIONS AND RECOMMENDATIONS

Session 2. OIE Standards and Global Issues

- Outcomes of recommendations from OIE General Session and the Aquatic Animal Health Standards Commission (**Dr. Jie Huang**, AAHSC, OIE)
- Updates on FAO initiatives in Asia-Pacific in support of aquatic animal health (**Dr. Rohana Subasinghe,** FAO)

DISCUSSIONS AND RECOMMENDATIONS

Lunch

13:30 – 17:00

Session 3. Review of Regional Disease Status

- AHPND updates and other emerging threats on crustaceans (**Dr. Tim Flegel**, Mahidol University)
- Updates and emerging threats on finfishes (**Dr. Kjersti Gravningen**, PHARMAQ)
- Updates on other diseases (molluscs and amphibians) (**Dr. Andy Shin,** FishVet Group)

DISCUSSIONS AND RECOMMENDATIONS

Session 4. Reports on Aquatic Animal Health Programmes from Partner Agencies

- DA Australia (**Dr. Ingo Ernst**, DA)

- Fish Health Section, SEAFDEC Aquaculture Department, Philippines (**Dr. Rolando Pakingking, Jr.**, SEAFDEC AQD)

DISCUSSIONS AND RECOMMENDATIONS

Group Photo (during coffee break)

Day 2 (23 November, Sunday)

09:00 – 12:00

Session 4 (Continued)

- Aquatic Animal Health Research Institute, Thailand (**Dr. Temduong Somsiri,** IAAHRI)
- Updates on OIE-NACA WAHIS Regional Core and AAH activities of OIE-Regional Representation for Asia and the Pacific (**Dr. Hnin Thidar Myint**, OIE Tokyo)

DISCUSSIONS AND RECOMMENDATIONS

Session 5. Aquatic Animal Health Management Activities in NACA Member Country: Malaysia

- Presentation by **Dr. Siti Zahrah Abdullah**, Department of Fisheries, Malaysia

DISCUSSIONS AND RECOMMENDATIONS

Lunch

14:00 – 17:00

Special Presentation on *Gyrodactylus salaris* (**Dr. Andy Shin**, FishVet Group)

Session 6. Disease Reporting

- QAAD Reporting: 2014 List and status of reporting (**Dr. Eduardo Leaño**, NACA)
- New OIE Disease List and revisions to the QAAD List for 2015 (**Dr. Jie Huang**, AAHSC, OIE)

DISCUSSIONS AND RECOMMENDATIONS

Session 7. Closing

- Other important matters (Status of TG Implementation)
- Presentation and Adoption of Report and Recommendations
- Date of next AGM

18:30

Official Dinner (hosted by NACA); current and past Chairpersons of AFS-FHS joined the group

Annex B: List of Participants

I. Advisory Group Members
World Organisation for Animal Health (OIE)
Dr. Jie Huang (AAHSC) Virologist – Senior Researcher Head, Maricultural Disease Control and Molecular Pathology Laboratory Yellow Sea Fisheries Research Institute Chinese Academy of Fishery Sciences 106 Nanjing Road, Qingdao, SD 266071, PR China aqudis@public.qd.sd.cn; huangjie@ysfri.ac.cn
Food and Agriculture Organization of the United Nations (FAO)-RAP
Dr. Rohana Subasinghe Chief Aquaculture Branch Fisheries and Aquaculture Management Division Fisheries and Aquaculture Department Food and Agriculture Organization of the UN Viale delle Terme di Caracalla 00153 Rome, ITALY Rohana.subasinghe@fao.org
OIE Regional Representation for Asia and the Pacific, Tokyo, Japan
Dr. Hnin Thidar Myint OIE Regional Representation for Asia and the Pacific Food Science Building 5F The University of Tokyo 1-1-1 Yayoi, Bunkyo-ku, Tokyo 113-8657, Japan hnin.thidar@oie.int
DA, Australia
Dr. Ingo Ernst Manager, Aquatic Animal Health Unit Office of the Chief Veterinary Officer Department of Agriculture, Fisheries and Forestry GPO Box 858 Canberra ACT 2601, Australia ingo.ernst@daff.gov.au
Thailand
Prof. Timothy Flegel Centex Shrimp, 4th Floor Chalermprakiat Building Faculty of Science, Mahidol University Rama 6 Road, Bangkok 10400, Thailand sctwf@mahidol.ac.th
Dr. Supranee Chinabut Bangkok, Thailand supraneecb@yahoo.com
Dr. Temduong Somsiri Director, Inland Aquatic Animal Health Institute Department of Fisheries, Kasetsart University Campus Ladyao, Jatujak, Bangkok 10900, Thailand tsi_f@yahoo.com
SEAFDEC AQD, Philippines
Dr. Rolando Pakingking, Jr. Head, Fish Health Section SEAFDEC Aquaculture Department Tigbauan, Iloilo, Philippines rpakingking@seafdec.org.ph

Private Sector
Dr. Kjersti Gravningen Director, PHARMAQ Asia PHARMAQ, Ltd. VN Ho Chi Minh City, Vietnam Kjersti.gravningen@pharmaq.no
II. Co-opted members
Dr. Hirofumi Kugita Regional Representative OIE Regional Representation for Asia and the Pacific Food Science Building 5F The University of Tokyo 1-1-1 Yayoi, Bunkyo-ku, Tokyo 113-8657, Japan rr.asiapacific@oie.int
Dr. Siow Foong Chang MSD Animal Health 1 Perahu Road Singapore 718847 siow.foong.chang@merck.com
Dr. Andy Shinn Fish Vet Group Asia Ltd. 99/386, Chaengwattana Building (Building C) Chaengwattana Road, Bangkok, Thailand andy.shinn@fishvetgroup.com
Dr. C.V. Mohan Senior Scientist WorldFish Jalan Batu Maung, Batu Maung Bayan Lepas, Penang 11960, Malaysia v.chadag@cgiar.org
III. Invited NACA member country
Dr. Siti Zarah Abdullah National Fish Health Research Centre Fisheries Research Institute 11960 Batu Maung, Penang, Malaysia siti.zahrah.abd@gmail.com
IV. NACA Secretariat
Dr. Eduardo M. Leaño (Technical Secretary of AG) Coordinator, Aquatic Animal Health Programme eduardo@enaca.org

Annex C: List of Diseases in the Asia-Pacific

Quarterly Aquatic Animal Disease Report
(Beginning January 2015)

1. DISEASES PREVALENT IN THE REGION	
1.1 FINFISH DISEASES	
OIE-listed diseases	**Non OIE-listed diseases**
1. Epizootic haematopoietic necrosis	1.Grouper iridoviral disease
2. Infectious haematopoietic necrosis	2.Viral encephalopathy and retinopathy
3. Spring viraemia of carp	3.Enteric septicaemia of catfish
4. Viral haemorrhagic septicaemia	
5. Infection with *Aphanomyces invadans* (EUS))	
6. Red seabream iridoviral disease	
7. Infection with koi herpesvirus	
1.2 MOLLUSC DISEASES	
OIE-listed diseases	**Non OIE-listed diseases**
1. Infection with *Bonamia exitiosa*	1. Infection with *Marteilioides chungmuensis*
2. Infection with *Perkinsus olseni*	2. Acute viral necrosis (in scallops)
3. Infection with abalone herpes-like virus	
4. Infection with *Xenohaliotis californiensis*	
1.3 CRUSTACEAN DISEASES	
OIE-listed diseases	**Non OIE-listed diseases**
1. Taura syndrome	1. Monodon slow growth syndrome
2. White spot disease	2. Acute hepatopancreatic necrosis disease (AHPND)
3. Infection with yellow head virus	
4. Infectious hypodermal and haematopoietic necrosis	
5. Infectious myonecrosis	
6. White tail disease (MrNV)	
7. Necrotising hepatopancreatitis	
1.4 AMPHIBIAN DISEASES	
OIE-listed diseases	**Non OIE-listed diseases**
1. Infection with Ranavirus	
2. Infection with *Bachtracochytrium dendrobatidis*	
2. DISEASES PRESUMED EXOTIC TO THE REGION	
2.1 Finfish	
OIE-listed diseases	**Non OIE-listed diseases**
1. Infection with HPR-deleted or HPR0 salmon anaemia virus	1. Channel catfish virus disease
2. Infection with salmon pancreas disease virus	
2. Infection with *Gyrodactylus salaris*	
2.2 Molluscs	
OIE-listed diseases	**Non OIE-listed diseases**
1. Infection with *Bonamia ostreae*	
2. Infection with *Marteilia refringens*	
3. Infection with *Perkinsus marinus*	
2.3 Crustaceans	
OIE-listed diseases	**Non OIE-listed diseases**
1. Crayfish plague (*Aphanomyces astaci*)	

ANNEX D: ASIA REGIONAL TECHNICAL GUIDELINES – STATUS OVERVIEW (ADOPTED FROM AGM 9 REPORT)

Element of technical guidelines	Progress / status	Gaps / opportunities
1. Disease reporting *An understanding of the basic aquatic animal health situation is a pre-requisite for prioritising activities, developing national policy and identifying pathogens of national importance.*	• Regional QAAD reporting system established – participation has increased • The QAAD list has incorporated emerging diseases that were later listed by the OIE • Many countries have established national lists for reporting purposes with appropriate supporting legislation	• Participation could improve further – some countries report irregularly • The proposed regional core utilising the OIE's WAHID will streamline reporting and may improve participation • The exact status of individual countries with regard to adoption of national lists and supporting legislation is not know
2. Disease diagnosis *Diagnosis requires various levels of data, starting with farm- or site-level observations and progressing in technical complexity to electron microscopy, immunological and nucleic acid assays and other biomolecular methods. This means all levels of expertise, including that of the farmer and extension officer working at the pond side, make essential contributions to rapid and accurate disease diagnosis.* *Effective diagnostic capability underpins a range of programs including early detection for emergency response and substantiating disease status through surveillance and reporting.*	• Diagnostic capabilities have improved in many countries • NACA disease cards have been developed and maintained for emerging diseases • The Asia regional diagnostic manual has been developed • An Asia regional diagnostic field guide has been developed • OIE reference laboratories • Regional reference laboratories – where no OIE reference laboratory exists • Regional Resource Experts are available to provide specialist advice • Ad hoc laboratory proficiency testing programs have been run	• OIE twinning programs are a means to assist laboratories to develop capabilities • The exact status of diagnostic capability in individual countries is not certain • There is limited or no access to ongoing laboratory proficiency testing programs • Some areas of specialist diagnostic expertise are lacking • Network approaches are a means draw on available diagnostic expertise
3. Health certification and Quarantine measures *The purpose of applying quarantine measures and health certification is to facilitate transboundary trade in aquatic animals and their products, while minimising the risk of spreading infectious diseases*	• Strong progress has been made, particularly for high risk importations (e.g. importation o broodstock and seed stock) • Training has been provided through regional initiatives (e.g. AADCP project) • Commercial implications for trade have driven improved certification practices	• The importance of supporting aquatic animal health attestations through sound aquatic animal health programs continues to be underestimated, with possible ramifications for trade • Some inappropriate or illegal activities continue and threaten to spread trans-boundary

	• Harmonisation with OIE model certificates has occurred	diseases
4. Disease zoning and compartmentalisation *Zoning (and compartmentalization) allows for part of a nation's territory to be identified as free of a particular disease, rather than having to demonstrate that the entire country is free. This is particularly helpful to facilitate trade in circumstances where eradication of a disease is not feasible.Zoning is also an effective tool to restrict the spread of important pathogens and aid in their eradication.*	• Is an emerging need to meet requirements of importing countries • To facilitate trade, some countries are working toward having compartments and zones recognised	• Where common health status can be identified restrictions on trade can be reduced • Training opportunities would be beneficial • Learn from the experience of terrestrial animal industries (e.g. poultry)
5. Disease surveillance and reporting *Necessary to produce meaningful reports on a country's disease status by providing evidence to substantiate claims of absence of a particular disease and thereby support import risk analysis, justify import health certification requirements, and enable export health certification*	• Regional Resource Experts are available to provide specialist advice • Training has been provided through a number of initiatives (e.g. AADCP project) • Many published resources are available, including those of the OIE (publications and the OIE centre for aquatic animal epidemiology) • Collation of surveillance information has improved through participation in international reporting	• Remains a reliance on passive surveillance. Active surveillance may be beneficial but cost is often a barrier. • Methodologies to undertake effective but low-cost active surveillance would be of assistance • Epidemiological expertise is often limited • There is a need to increase surveillance of wildlife to support health status
6. Contingency planning *Important to provide a rapid and planned response for containment of a disease outbreak—thereby limiting the impact, scale and costs of the outbreak*	• Important provides a rapid and planned response for containment of a disease outbreak Some countries have advanced contingency planning with appropriate supporting legislation • Some countries have tested contingency plans through simulation exercises • Resources are available (e.g. Australia's AQUAVETPLAN, FAO guidelines, OIE links to resources)	• The exact status of contingency planning in individual countries is not certain • Training in emergency management frameworks may be useful • Support for developing contingency plans might usefully be directed at particular disease threats e.g. IMN
7. Import risk analysis	• Numerous resources and case studies published	• There is a need to build awareness of the concepts

The movement of live aquatic animals involves a degree of disease risk to the importing country. Import risk analysis (IRA) is the process by which hazards associated with the movement of a particular commodity are identified and mitigative options are assessed. The results of these analyses are communicated to the authorities responsible for approving or rejecting the import.	• The approach has been applied, particularly for some circumstances e.g. import of live *P. vannamei* • However risk analysis is not always applied, or is not applied appropriately • Regional training has been provided (e.g. AADCP project) •	• Training can be abstract and disengaging - should aim at trainees learning on scenarios relevant to their circumstances • This is a high priority generic need that is suited to development of a central training program
8. National strategies *The implementation of these Technical Guidelines in an effective manner requires an appropriate national administrative and legal framework, as well as sufficient expertise, manpower and infrastructure.*	• Many countries have developed national strategies • Detailed assistance has been provided to some countries (e.g. AADCP project)	• The exact status of national strategies in individual countries is not certain • The OIE's PVS tool provides a means of assessing the progress of individual countries
9. Regional capacity building *Regional-level capacity building in support of the implementation of the Technical Guidelines*	• Regional level programs are a cost-effective means to support capacity building in the region • Organisational structures are in place to coordinate activities and communicate progress (e.g. NACA, AG) • Numerous projects have been implemented to support capacity building across a range of disciplines (e.g. those supported by/through FAO, OIE, SEAFDEC, AADCP etc.) • Many organisations have an ongoing interest in investing in aquatic animal health capacity building in the region	• While many projects have been implemented, they are sometimes ad hoc in nature and ongoing impact may not be measured • Better coordination might be achieved by better documentation of progress and remaining gaps • There may be strategic benefit in implementing major projects that address multiple capabilities