NETWORK OF AQUACULTURE CENTRES IN ASIA-PACIFIC

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

REPORT OF THE MEETING

KU Home, Kasetsart University, Bangkok, Thailand
23-25 November 2015
Prepared by the NACA Secretariat

Preparation of this document:

This report was prepared by the 14th Asia Regional Advisory Group on Aquatic Animal Health (AG) that met at KU Home, Kasetsart University Campus on 23rd to 25th November, 2015.

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 organisations.

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ABBREVIATIONS AND ACRONYMS

AADCP	ASEAN Australia Development Cooperation Program
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	Acute Hepatopancreatic Necrosis Disease
AMC	ASEAN Member Countries
AMR	Antimicrobial resistance
ANAAHC	ASEAN Network of Aquatic Animal Health Centres
ANQAP	Australian National Quality Assurance Program
AQSIQ	General Administration of Quality Supervision, Inspection and Quarantine of the P. R. China
ASDD	Abdominal Segment Deformity Disease
ASEAN	Association of South East Asian Nations
ASWGFi	ASEAN Sectoral Working Group on Fisheries
AVG	Abalone viral ganglioneuritis
AVM	Abalone viral mortality
BAPHIQ	Bureau of Animal and Plant Health Inspection and Quarantine, Taipei, Taiwan
BMP	Best management practices
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
GBS	Group B *Streptococcus*
GCHV	Grass carp haemorrhagic virus
GFHN	Goldfish haematopoietic necrosis
HPM-EHP	Hepatopancreatic microsporidiosis caused by *Enterocytozoon hepatopenaei* (EHP)
IAAHRI	Inland Aquatic Animal Health Research Institute (Thailand)
IHHN	Infectious hypodermal and haematopoietic necrosis
IHNV	Infectious haematopoietic necrosis virus
IMN	Infectious myonecrosis
IMNV	Infectious myonecrosis virus
ISKNV	Infectious spleen and kidney necrosis virus
KHV	Koi herpesvirus
LPT	Laboratory proficiency testing
LSNV	Laem Singh necrosis virus (in *P. monodon*)
LSV	Laem Singh virus
MOA	Ministry of Agriculture, PR China
MrNV	*Macrobrachium rosenbergii* nodavirus
MRC	Mekong River Commission
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
OIE-RRAP	OIE Regional Representation in Asia and the Pacific, Tokyo, Japan
OsHV-1	Ostreid herpesvirus-1
PCR	Polymerase chain reaction
PVS	Performance of Veterinary Services (OIE)
QAAD	Quarterly Aquatic Animal Disease
RT-PCR	Reverse transcriptase PCR
SEAFDEC	Southeast Asian Fisheries Development Center
SEAFDEC-AQD	Southeast Asian Fisheries Development Center Aquaculture Department
SOM-AMAF	Senior Officers Meeting-ASEAN Ministers of Agriculture and Forestry
SPF	Specific pathogen free
STDF	Standard and Trade Development Facility of WTO
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
TSV	Taura syndrome virus
VHS	Viral Haemorrhagic Septicaemia
WAHIS	World Animal Health Information System
WAHID	World Animal Health Information Database
WF	WorldFish
WSD	White spot disease
WSSV	White spot syndrome virus
WTD	White tail disease
WTO	World Trade Organization
YHV	Yellowhead virus

The 14th Asia Regional Advisory Group on Aquatic Animal Health.

Back Row (From Left to Right)

Dr. Andy Shinn (FishVet Group, Thailand), **Dr. Ingo Ernst** (OIE-AAHSC and DA, Australia), **Mr. Simon Wilkinson** (NACA), **Mr. Kah Hui How** (OIE-RRAP, Japan), **Dr. Siow Foong Chang** (MSD Animal Health, Singapore), **Dr. Huang-Lin Kao** (Observer, BAPHIQ, Chinese Taipei)

Front Row (From Left to Right)

Dr. Eduardo Leaño (NACA), **Dr. Hong Liu** (AQSIQ, P.R. China), **Dr. Rolando Pakingking, Jr.** (SEAFDEC AQD, Philippines), **Dr. Hirofumi Kugita** (OIE-RRAP, Japan), **Dr. Puttharat Baoprasertkul** (IAAHRI, Thailand), **Prof. Timothy Flegel** (Centex Shrimp, Thailand), **Dr. Kjersti Gravningen** (Aquafuture, Norway), **Mr. Weimin Miao** (FAO-RAP, Thailand), **Dr. Derun Yuan** (NACA)

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OPENING SESSION

The 14th Meeting of the Asia Regional Advisory Group on Aquatic Animal Health (AG) was convened in Bangkok, Thailand, from 23-25 November 2015 (List of participants: Annex 1; Meeting Agenda: Annex 2).

The meeting was opened by Dr. Eduardo Leaño, NACA, and the AG Chair, Dr. Kjersti Gravningen, Aquafuture, Norway. New members (Dr Puttharat Baoprasertkul from IAAHRI and Mr. Kah Hui How from OIE-RRAP) and observer (Dr. Huang-Lin Kao from Chinese Taipei) were also welcomed. Special thanks were accorded to the representative from Chinese Taipei for attending AGM14 as an Observer. Dr. Leaño also noted that NACA had invited Myanmar as the NACA member country representative (as agreed since AGM 12) but had not received an official nomination.

An opening address was presented by Dr. Derun Yuan on behalf of the Director General of NACA. Dr. Yuan highlighted the different work programmes of NACA and focused on the Asia Regional Aquatic Animal Health Programme, the flagship and longest running programme of NACA. He then welcomed and wished the group fruitful discussions during the meeting.

Dr. Gravningen (current Chairperson) took over in presiding the AG meeting.

SESSION 1: PROGRESS SINCE AGM-13

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 13 which was held in Ho Chi Minh City, Vietnam on 22-23 November 2014, back-to-back with the 9th Symposium on Diseases in Asian Aquaculture (DAA9). The Quarterly Aquatic Animal Disease (QAAD) Report was continuously published with an average of 14 member governments submitting quarterly reports. NACA was engaged in a USAID-Maximizing Agricultural Revenue through Knowledge, Enterprise, Development, and Trade (MARKET) project and handled the Aquatic Animal Health Management component in collaboration with ASEAN Network of Aquatic Animal Health Centres (ANAAHC) and Department of Fisheries Thailand (DoF). The project was completed in June 2015 and the main output of the AAH Management component was the development of Standard Operating Procedures for Responsible Movement of Live Aquatic Animals in the ASEAN. This document was successfully endorsed during the 2015 sessions of ASEAN Sectoral Working Group on Fisheries (ASWGFi) and Senior Official Meeting-ASEAN Ministers on Agriculture and Forestry (SOM-AMAF). NACA also completed the development of a Regional Code of Practice for Movement of Aquatic Organisms in the Lower Mekong Basin, a collaboration by NACA with the Mekong River Commission (MRC).

Through funding from the Standard and Trade Development Facility (STDF) of the World Trade Organization (WTO), NACA hosted a Regional Consultation Workshop for Harmonization of Aquaculture Certification among ASEAN nations. The consultation workshop was participated by representatives from ASEAN member countries and addressed issues related to certification and trade of aquatic animals and products within and from ASEAN. A writeshop was also held following the workshop and a proposal is now being developed entitled "Promoting Regional Integration for Seafood Market access in the ASEAN (PRISM-ASEAN). If funded, this project will facilitate implementation of a harmonised certification scheme for important aquaculture commodities in the ASEAN, using existing regional and national standards.

As recommended during the AGM 13, a disease card for EHP was prepared by NACA in collaboration with Prof. Tim Flegel and his team at Mahidol University. The disease card is now available for free download from the NACA website. NACA and AG members also attended the 3rd OIE Global Conference on Aquatic Animal Health and the Regional Seminar for OIE National Focal Points for Aquatic Animals, held back-to-back in Ho Chi Minh City, Vietnam on January 2015. Other important regional meetings attended by NACA and some AG members were:

- ASEAN Aquaculture Summit 2015, 2-4 June, Singapore
- OIE Regional Workshop on Safe International Trade in Aquatic Animals and Aquatic Animal Products, 22-24 July, Niigata, Japan
- 29th Conference of the OIE Regional Commission for Asia, the Far East and Oceania, 14-19 October, Ulaanbatar, Mongolia
- Workshop on Harmonization of Aquatic Animal Quarantine and Health Certification for Exportation and Importation in ASEAN Countries, 2-4 November 2015, Jakarta, Indonesia.

DISCUSSION

- NACA is currently preparing a project to harmonise aquaculture certification standards for trading of aquatic animals within and from the ASEAN region. The project will initially focus on shrimp, using the existing ASEAN Shrimp standard (ASEAN Shrimp GAP) as a case study.
- Presently, market recognition of third-party certification standards was quite limited and the proliferation of standards was causing confusion and a degree of frustration amongst producers. The development of certification standards would be best focused on aspects that would help address market access restrictions.
- Standards were not seen to have value unless they had a meaningful level of acceptance by the market, and they should not be developed in isolation. It is necessary to involve the major end users of aquaculture certification in the process, which increasingly looked to be major industry/trading groups rather than consumers *per se*.
- The initial motivation for developing the ASEAN Shrimp Standard (note: this preceded the current ASEAN project on harmonisation of certification) was to establish a standard developed by the region to facilitate trade within the region, rather than attempting to comply with external requirements. There are presently wide disparities among national regulations in AMCs. National implementation of the ASEAN Shrimp Standard would probably be free for producers.

RECOMMENDATION

- AG recommended that regional aquaculture certification schemes that will be developed and implemented should conform with relevant international standards including the Codex Alimentarius (for food safety), OIE standards (for aquatic animal health), and FAO Technical Guidelines on Aquaculture Certification (for aquaculture certification).

SESSION 2: OIE STANDARDS AND GLOBAL ISSUES

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

Dr. Ingo Ernst reported on outcomes of the 3rd OIE Global Conference on Aquatic Animal Health, the 83rd OIE General Session held in Paris in May 2015 and on the September 2015 meeting of the OIE Aquatic Animal Health Standards Commission.

3rd OIE Global Conference on Aquatic Animal Health. The conference was held in Ho Chi Minh City, Viet Nam on 20-22 January 2015. The conference had three principal themes: surveillance, zoning and compartmentalization, and capacity building.

There was strong interest from participants in the surveillance session. The presentations and panel discussions raised several points regarding strengthening recommendations on surveillance in the OIE Aquatic Code. In particular, the session highlighted the need to provide guidance on more flexible approaches to surveillance while addressing the challenges of conducting surveillance for aquatic animal diseases. The need to consider underlying epidemiological principles when specifying the required surveillance periods in the disease-specific chapters of the Aquatic Code was recognised.

The session on compartmentalisation highlighted the need to clarify the concept. The purpose of compartmentalisation in the Aquatic Code is to facilitate international trade and may be distinct from biosecurity measures not primarily designed to facilitate international trade. The need for separate guidance for zoning and compartmentalisation in the Aquatic Code was recognised. This revised guidance should support practical application of these concepts by the private sector and Competent Authorities and would require supporting guidance on biosecurity and disease control.

The conference emphasised the importance of the PVS pathway to support Member Countries to build capacity of their Veterinary and Aquatic Animal Health Services. Member Countries were invited to consider requesting an OIE PVS Tool: Aquatic evaluation of their Veterinary Service or Aquatic Animal Health Service with the objective of improving competencies and general compliance with OIE standards for aquatic animals. Many countries have expressed an interest in an OIE PVS Aquatic evaluation but few have made formal requests to date.

83rd OIE General Session. Dr Ernst provided a summary of items of aquatic animal health standards adopted at the 83rd OIE General Session, focusing on those considered of most interest to NACA member countries including:

- User's guide
- Glossary
  - New definitions for biosecurity, disinfection and disinfectant.
- Diseases listed by the OIE (Chapter 1.3.)
  - Acute hepatopancreatic necrosis disease listed by the OIE
- Import risk analysis (Chapter 2.1.)
- Recommendations for disinfection of salmonid eggs (new Chapter 4.X.)
  - Revised chapter moved from the Aquatic Manual to the Aquatic Code; supports articles in disease-specific chapters for some diseases that do not have vertical transmission.
- Control of hazards in aquatic animal feed (Chapter 4.7.)
  - Substantially revised chapter that focuses on transmission of infectious diseases of aquatic animals via feed
  - Chemical and physical hazards associated with feed and feed ingredients are not addressed
  - Simplified approach on safety of feed and feed ingredients (i.e. source freedom, absence in product, treatment to inactivate, use in non-susceptible populations)
- General obligations related to certification (Chapter 5.1.)
- Certification procedures (Chapter 5.2.)
- Risk analysis for antimicrobial resistance arising from the use of antimicrobial agents in aquatic animals (new Chapter 6.5.)
  - New chapter adapted from equivalent Terrestrial Code chapter
  - Addresses risks to human health and risks to aquatic animal health
  - Defines the hazard as a resistant microorganism or resistance determinant that emerges as a result of the use of a specific antimicrobial agent in aquatic animals
  - Standard risk assessment approaches including: entry, exposure and consequence assessment; risk estimation, management and communication.
- Infection with *Batrachochytrium dendrobatidis* (Chapter 8.1.)
  - Removal of article describing treatment of live animals as this is not considered an adequate risk mitigation measure.
- Infection with ranavirus (Chapter 8.2.)
- Articles X.X.7. and X.X.11. of disease-specific chapters
- Corrections in Articles 10.4.4. and 10.4.6. Annex 15
- Infection with Perkinsus olseni (Article 11.6.2.)
- Revised Aquatic Manual Chapters
  - Infectious hypodermal and haematopoietic necrosis (Chapter 2.2.2.)
  - Necrotising hepatopancreatitis (Chapter 2.2.4.)
  - Taura syndrome (Chapter 2.2.5.)
  - Yellow head disease (Chapter 2.2.8.)
  - Infection with *Perkinsus olseni* (Chapter 2.4.7.)

The report of the 83rd OIE General Session is available on the OIE website.

October 2015 meeting of the Aquatic Animal Health Standards Commission. At their October 2015 meeting, the Commission revised several texts and provided them to member countries for comment. Dr Ernst provided a summary of items considered to be of most interest to NACA member countries including:

- Glossary
  - New definitions for OIE guideline and OIE Standard; revised definition for vector
- Proposed revisions to Articles 1.5.2. and 4.2.3. as a consequence of the proposed definition of 'vector'
- Criteria for the inclusion of diseases in the OIE list (Chapter 1.2.)
  - The criteria were being revised to simplify them and to bring the criteria in the terrestrial and aquatic codes into closer alignment whilst also meeting the objective of listing.
  - The objective is to '*support Member Countries' efforts to prevent the transboundary spread of important diseases of aquatic animals through transparent and consistent reporting'*
- Diseases listed by the OIE (Chapter 1.3.)
  - Assessments for *Batracochytrium salamandrivorans* and *Marteilia cochillia* to be completed and considered at the February 2016 Commission meeting

- Commission agreed that VHSV should be the next pathogen to be considered for strain differentiation – will consider this in the context of its work plan priorities.

- Disinfection of aquaculture establishments and equipment (revised Chapter 4.3)
  - This new chapter will provide recommendations on planning and implementation of disinfection procedures to prevent the spread of pathogenic agents
- Proposed restructure of Section 4: Disease prevention and control
  - Substantial changes to this section are proposed including the addition of new chapters, and reorganisation and revision of existing chapters.
  - The commission developed a proposed restructure of Section 4 and invited Member Countries' comments on it.
- General obligations related to certification (Chapter 5.1.)
- Acute Hepatopancreatic Necrosis Disease (new Chapter 9.X.)
  - Draft new chapter circulated for comment
- Infection with yellow head virus (Chapter 9.2.)
  - Susceptible species revised based on application of susceptibility criteria
- Aquatic Manual:
  - Infection with yellow head virus (Chapter 2.2.8.)

The report of the October 2015 meeting, the Aquatic Animal Health Standards Commission is available on the OIE website.

DISCUSSION

- Antimicrobial resistance (AMR) may become an important trade issue in time as there are now standards included in the Aquatic Code. This is most likely after countries had established their own domestic surveillance and control programmes. AMR was likely to attract consumer/political attention.
- One of the main risks of AMR in human health is the use of antimicrobials in humans; however livestock industries (including aquaculture) are major users of antimicrobials, and must therefore contribute to management of risks. Obvious regulatory issues include ensuring that critically important antimicrobials for human health are not used in livestock industries.
- Risk assessments on the use of antimicrobials in aquatic animals that might pose risks to human health, would be useful. It is likely that the risk profile from aquatic animals was quite different from that of terrestrial animals, although there is the issue of horizontal transfer of AMR determinants among bacterial species, including human pathogens. Some farms that had a zero-use policy towards antimicrobials were farming within the same watershed as farms that had poor practices. It is important that regulation be targeted at achieving certain measurable outcomes – although this could be difficult.
- To date there had been limited (or no?) evidence of AMR emerging from the use of antimicrobials in aquaculture having an impact on human health. For example, an AMR bacteria present in an aquatic animal product or a resistance determinant would need to be transmitted to humans, impact on their health and be resistant to treatment by antimicrobials. It may be difficult to reliably test for resistance factor markers in aquatic animal products.
- A priority risk mitigation measure would be to ensure that antimicrobials important for aquaculture and human health did not become ineffective. There is a need for good science concerning these risk pathways.
- There is room for improvement in regulation of antimicrobial use in aquaculture within the region. In some examples/countries, farmers treat animals with products that did not indicate the active ingredient on the package; the farmers literally did not know what they were using.
- In the shrimp industry (and catfish in Vietnam) the processor contract with the farm was contingent on the animals passing antimicrobial residue testing; if the product fails to pass testing requirements the contract is void and price must be re-negotiated, since the product will be sold to domestic market instead.
- It is possible that trading partners may introduce surveillance and monitoring requirements for AMR in future (probably after they establish their own national programmes) but this had not yet happened. Responsible use of antibiotics in aquaculture and regulation and monitoring would be a good foundation to start with. With regards to development of a surveillance programme for AMR it would be natural to focus on bacteria that could be isolated from the animals in question (e.g. fish, shrimps).
- In the Section 4 of the Aquatic Code (Disease prevention and control), it may be useful to include guidance on preventative measures for aquatic animal diseases. The Code largely focuses on facilitating safe trade.

RECOMMENDATIONS

- AG recommended that the appropriate national authorities develop strategies for control and management of AMR in aquaculture (including proper labelling of commercial products used as feed and pond additives

with respect to antimicrobials), in line with WHO GAPs. Baseline studies on the use of antimicrobials and status of AMR should be undertaken when appropriate.

- Wherever possible, published standards for susceptibility testing should be used for AMR surveillance. It is acknowledged, however, that there are few standards for aquatic animal diseases and these should be formulated.
- AG recommended that measures to improve responsible use of antimicrobials should be a priority for member countries' national strategies for AMR in line with OIE standards.
- AG recommended that the usage of antimicrobials should be by animal groups (terrestrial livestock, aquaculture), and not by total usage in the country.

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

Mr. Weimin Miao, FAO Aquaculture Officer for Asia and the Pacific, made a presentation on FAO's work in the areas aquatic animal health at country, regional and global levels, which was prepared by Ms. Melba Reantaso, Aquaculture Officer, FAO FIRA and added a few additions of his own. The presentation introduced FAO's major work in the areas of aquatic animal health (AAH) in 2015, which include the FAO TCP projects implemented at country and inter-regional levels, FAO global AAH programme activities, other kinds of FAO support to the member countries in the areas of AAH.

In 2015, FAO implemented the following country and inter-regional TCP projects:

- TCP/INS/3402: Development of preventive aquatic animal health protection plan and enhancing emergency response capacities to shrimp disease outbreaks in Indonesia;
- TCP/MAL/3501 (facility): Strengthening Aquaculture Biosecurity Capacity of Malaysia's Department of Fisheries;
- TCP/INT/3501: Strengthening biosecurity governance and capacities for dealing with the serious shrimp infectious myonecrosis virus (IMNV) disease;
- TCP/INT/3502: Reducing and managing the risks of Acute Hepatopancreatic Necrosis Disease (AHPND) of cultured shrimp.

In 2015, FAO also carried out various activities under its global AAH programme, which included i) initiating "Socio-economic assessment of the impacts of aquatic diseases"; ii) initiating "Development of guidelines on the use and maintenance of SPF- and SPR-stocks in shrimp aquaculture"; iii) initiating the work on Antimicrobial Resistance (AMR); iv) support the member countries to conduct FAO self-assessment survey on performance and capacity on AAH and v) including aquatic diseases in FAO Quarterly Early Warning Bulletin for Food and Agriculture for the first time (Issue Nos. 15). FAO also provided other technical assistance and policy advice to FAO member governments in addressing AAH, which included: i) supported South African Development Community (SADC) in developing the Sub-regional biosecurity strategy in 2014 that is being approved by SADC Ministers; ii) supported Kingdom of Saudi Arabia in conducting Roundtable meeting on "Risks of EMS in shrimp aquaculture and prevention mechanisms"; iii) supported introductory training course on risk analysis for aquatic animal movement for RECOFI countries and Peru; and, iv) Supported an International Emergency Fish Disease Investigation Mission on a suspected Outbreak of Epizootic Ulcerative Syndrome (EUS) to the Democratic Republic of Congo (DRC).

In the biennium of 2015-2016, FAO will continue with its global AAH programme activities. Meanwhile, FAO will address the pending requested TCP support by Fiji and Federated States of Micronesia in addressing the issues related to AAH. FAO will continue the implementation of the two inter-regional TCP on AHPND and IMNV and the TCP facility for Malaysia. FAO will launch a new regional TCP on piloting aquaculture planning and management tools that is very likely to include tools addressing AAH. FAO will continue the introductory training course on risk analysis for aquatic animal movement for Malaysia, Fiji and other potential countries.

In the coming biennium, FAO will strengthen the cooperation with NACA in the areas of AAH, which will include but is not limited to: i) Development of guidelines on the use and maintenance of SPF- and SPR-stocks in shrimp aquaculture; ii) Organization of regional and inter-regional workshops for FAO regional and interregional TCP projects; iii) initiate socio-economic assessment of the impacts of aquatic diseases; and, iv) continue to provide support to NACA AG/AAH annual meetings.

DISCUSSION

- The TCP to pilot aquaculture tools will be implemented in three countries (Thailand, Philippines and Vietnam) – it may be worth considering inviting the Maldives to participate under their own funding, as they are

currently undertaking their first planning process and recently commissioned development of a mariculture plan.

- Implementation of the tools to other countries (including Maldives) can be done after the pilot, where adjustments can be made on the tools based on the initial results in three selected countries.
- Among the aquaculture tools to be tested, aquatic animal health and biosecurity will be among the top priorities.
- Guidelines on development of SPF and SPR broodstock lines would be very useful. At present it was likely that some of the SPF/SPR lines advertised are not really such, or may not have been developed systematically.
- On the self-evaluation tool on the country's aquatic animal health capacity, a set of assessment questionnaires has already been developed by FAO (since around 2012) and FAO is now encouraging countries to make use of this. Interested countries can contact FAO HQ.

RECOMMENDATION

- AG recommended that important TCP reports of FAO related to aquatic animal health can be linked to NACA website for wider dissemination. NACA will coordinate with FAO HQ in this regard.

SESSION 3: REVIEW OF REGIONAL DISEASE STATUS

3.1. CURRENT STATUS OF SHRIMP DISEASES IN ASIA

Prof. Timothy Flegel presented updates on top disease threats on cultured shrimps in the region. As with the report for AGM13, 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, and it is recommended that a disease card for this, together with a specific detection method be posted at the NACA website. 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. 95, 2700-2709]. 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. Again, it is recommended that a disease card, including the specific RT-PCR detection method be posted at the NACA website and that member countries work together to study the prevalence and impact of this virus.

For *P. vannamei* only, the next most important viral threat is still 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 but prevalence has dropped sharply since publication of an article describing its nature [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 characterised 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 a 69 kbp plasmid called pAP1 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, Mexico in 2013 and the Philippines in 2015. Details about this disease and the causative agent are now available as a draft chapter in the current OIE Manual of Diagnostic Tests for Aquatic Animals.

Diagnostic methods and a disease card are also available at the NACA website. It is recommended that PCR methods targeting the toxins be used to identify sources of AHPND bacteria and that positive shrimp or other materials be excluded from shrimp production facilities. It is 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.

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, pasteurisation 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. The widespread habit of feeding live polychaetes, however, 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 such as polychaetes in closed culture facilities.

Three other phenomena in the HP have become prominent together with AHPND since 2009. These include high prevalence 1) of hepatopancreatic microsporidiosis (HPM) caused by the microsporidian *Enterocytozoon hepatopenaei* (EHP) in both broodstock and cultivated shrimp [Tangprasittipap et al. 2013. The microsporidian *E. hepatopenaei* is not the cause of white feces syndrome in whiteleg shrimp *P. vannamei*. BMC Veterinary Research. 9]; 2) 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 3) of distorted hepatopancreatic tubules. It is possible that the latter two phenomena may result either from low levels of the AHPND toxins 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 EHP suggest 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 HPM is rapidly increasing in prevalence in China, Vietnam, Thailand, Malaysia and most recently India. 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 *E. 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 together with an accompanying disease card.

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 *E. 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 probably 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*), and to cultivate shrimp in biosecure settings under management practices aimed at optimum (not maximum) production. The information in this summary is essentially included in a recent review (Thitamadee, S., Prachumwat, A., Srisala, J., Sritunyalucksana, K., Flegel, T.W., Itsathitphaisarn, O., 2016. Review of current disease threats for cultivated penaeid shrimp in Asia. Aquaculture. 452, 69-87).

DISCUSSION

- Top viral threat is still WSD while the top bacterial threat is AHPND; top parasitic threat is HPM-EHP.

- HPM has been confirmed in China, Vietnam, Thailand, India (paper is to be published soon) and it is suspected to be endemic in the region. Since the previous AGM meeting, a disease card for HPM has been prepared and is now available at the NACA website.
- The practice of using polychaetes (as live feed) still continues, especially in shrimp broodstock as more nauplii can be obtained from those fed with live polychaetes. It would be better to check the polychaetes first by PCR and if they are positive for HPM (and/or AHPND bacteria), then they should not be used as feeds. At the very least, they should be frozen at -20°C for 48 hr before being used as feed for broodstock since this treatment would inactivate EHP and reduce the number of viable AHPND bacteria.
- Co-culture of tilapia with *P. vannamei*, or use of green water from tilapia ponds appeared to suppress *Vibrio* in some manner, possibly through some factor that is influencing the pond microbial flora (a publication is in preparation on this) or possibly by quorum sensing.

RECOMMENDATIONS

- AG recommended to add AHPND to the list of diseases for surveillance and monitoring in all AP countries, now that the disease is listed in OIE;
- Since HPM has been recommended to be added to the QAAD list, AG recommended that surveillance for this disease should be undertaken by all participating AP countries. Member countries should also add EHP to the list of agents for testing (by PCR) when importing live shrimp stocks and live feeds that are possibly infected or mechanical carriers of the pathogen (e.g. polychaetes, clams) and to check whether the parasite is viable by conducting co-habitation or feeding experiments.
- To prevent transmission of EHP and possibly other pathogens the AG recommended that living animals should at least be frozen (-20^{o}C for 48 h) before feeding to broodstock since this has been reported as effective in deactivating closely related microsporidians in fish and will also deactivate AHPND bacteria.
- AG recommended that people should only use agents which have proven to be effective in controlling microsporidians; prevention by PCR testing of broodstock should be the priority.
- AG recommended that Disease Cards for CMD and YHV-8 be prepared, to be led by Drs. Hong Liu and Jie Huang (China)

3.2. UPDATES ON FINFISH DISEASES IN ASIA

Dr. Siow-Foong Chang presented current disease concerns for finfishes in the region. Key viral diseases include VNN and iridoviral infection. Important bacterial diseases were streptococcosis, flexibacterioisis and motile aeromonas infection. Parasites such as *Benedenia* were also significant pathogens. The causative agent of scale drop disease was reported to be a virus in the Iridoviridae family. The zoonotic potential of Group B *Streptococcus* (GBS) in fish and threats from novel pathogens were shared.

DISCUSSION

- In general, VNN had been less of a problem in seabass as it only affects early stages, but this is not the case for grouper where the disease can be present up to the grow-out stage (chronic infection). Different control measures are needed for the two groups. Apart from disease agents, Singapore also reported a serious problem with harmful algal blooms causing massive fish kills.
- Group B *Streptococcus* (GBS) infections were reported in humans. The outbreak was traced to consumption of raw freshwater fish which were not processed or distributed under appropriate hygiene conditions. The use of freshwater fish in ready to eat raw fish dishes were banned in Singapore as a result of the outbreak. GBS is ubiquitous in the aquatic environment and is associated with fish and human disease. A farm-to-fork risk management approach should be used to minimise impact not just on production, but also public health.
- AG members shared that losses from *Streptococcus* were serious; Thailand lost about 7.5% of its production of tilapia; Bangladesh 26% and China had had major outbreaks. Losses across the region were probably very high. The cause of the spike in *Streptococcus* problems in recent years was not clear. *Streptococcus* control can be achieved through health management practices, such as stocking of vaccinated fish for pre-grow-out.
- The status of *Gyrodactylus salaris* in the region might be worth looking into, considering the current development and progress of cold-water aquaculture in the region.

RECOMMENDATIONS

- AG recommended that risk assessment (on pathogen spread) should be undertaken for countries contemplating the importation of warm- and cold-water species that will be used for cold-water aquaculture;

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. In addition, reptile diseases were also presented.

a) Molluscs

The Asian mollusc industry continues to grow at c. 3.94% p.a. (2000-2013) with 28 national states producing a total of 14,548,169 MT [5]. Top species in terms of production include cupped oysters (4.24 MT; 29.14%), Japanese carpet shells (3.86 MT; 26.52%), and, "scallops" (1.61 MT; 11.05%). Overall, production over the 2012-2013 period has grown by 4.1% with notable increases in "abalone" (21.17%), blood cockles (15.15%), green mussels (15.07%), swan mussels (13.35%) and "scallops" (13.26%), but at the same time there has been a marked 43.84% drop in the production of the Korean mussel (*Mytilus coruscus*) to 34,429 MT. Although Korean mussels are commonly affected by shell-boring polychaetes such as *Dipolydora giardia* and by the parasitic copepods *Modiolicola gracilicaudus* and *Mytilicola orientalis* which can cause mortalities or considerable damage with subsequent reductions in their market price, the precise reasons for this drop are unknown but it may be linked to the economics of production and the current market price of mussels.

A number of abalone mortality events have been reported in the past year including the mass mortality of Chinese scallops (*Chlamys farreri*) due to Acute Viral Necrosis Virus (AVNV) [14]. Summer mortalities of Chinese farmed stocks have been a regular occurrence since the mid-1990s, outbreaks can lead to the loss of >90% of stock within 5-8 d. A recent study, however, suggests that AVNV is a variant of Ostreid herpesvirus-1 (OsHV-1). Elsewhere, a low-rate but persistent mortality in Taiwanese cultured abalone resulted in 80% cumulative mortality. While withering syndrome, a fatal disease of abalone caused by *'Candidatus Xenohaliotis californiensis*' (CXC) - a *Rickettsiales*-like organism, was suspected, a histopathological study of samples found degeneration and necrosis of the foot muscle but no viral particles. Molecular sequencing suggested that the pathogen bore similarities to abalone shrivelling syndrome-associated virus of a Chinese isolate [2]. A study of the clinically chronic mortality cases found that approximately 30% of the specimens carried a bacteriophage-related chimeric marine virus. The aetiology of the mortalities, however, remains unknown. A rapid faecal PCR test for CXC is proposed [10].

Ostreid herpesvirus-1 is reported for the first time in adult Pacific oysters *Crassostrea gigas* reared in South Korea [9], however, infections are already known from *C. gigas* larvae reared in the country [6]. Infections of OsHV-1 are also reported in New Zealand [8] and in Australia [13] in 2014. In China, a study of mollusc aquaculture sites suggests that abnormal mortalities of the scallop (*Chlamys farreri*) and blood clams (*Scapharca broughtonii*) may be linked to viral infections caused by a type of Ostreid herpesvirus [1]. A parallel study investigating the summer mass mortalities of blood clams determined that mortalities were associated with a new variant OsHV1-SB [15].

In 2015, the OIE-listed haplosporidian protistan *Bonamia ostreae* was reported for the first time from New Zealand where sub-clinical infections were determined in flat oysters (*Ostrea chilensis*), being farmed at two semi-open sites that shared a single tidal excursion [11]. In 2015, there were further reports of *Perkinsus* infections in Australia. Two new publications provided details regarding the infection of *Perkinsus* sp. in mud ark cockles (*Anadara trapezia*) that occurred at six sites in Moreton Bay, Queensland in 2011, with prevalences ranging from 4 to 100% [3,4], whilst annual surveillance of wild flat oyster broodstock (*Ostrea angasi*) held in a hatchery in Westernport Bay, Victoria found that 1 of the 22 samples taken for analysis was positive for *Perkinsus olseni* [12]. Elsewhere, a new species of *Marteilia, M. granula*, was found in the epithelial cells of the stomach, intestine, and digestive diverticula of c. 8.9% of Manila clams (*Ruditapes philippinarum*) that were collected from Odawa Bay, Japan but without causing mass mortalities [7].

Finally, the mass mortality of blood cockles (*Anadara granosa*) in Malaysia that was profiled in the media was not due to a disease agent. A recent publication investigating the situation linked mortalities to low food availability [16]. Similar mortalities reported in Thailand in 2015 are under investigation.

b) Amphibians

The spread of chytrid fungus *Batrachochytrium dendrobatidis* (*Bd*) has been widely reported and has caused the extinction of >200 amphibians [19, 30]. Although few infections are reported from aquaculture, given the enormity and the impact of chytrid fungus on wild populations of amphibians, the literature is worth following and commenting on as conservation initiatives and management/control programmes may yield critical information that could minimize the impacts of infection in cultured populations. There are six new records of *Bd* from wild and cultured amphibians (*i.e.* from literature published in the last 12 months) and infections are now known from at least 20 Asian states. The new records include infections in: Indonesia 2008 (of *Hylarana* and *Limnodectes* spp.) [26]; Laos PDR 2011 (of *Leptolalax*, *Odorrana* and *Philautus* spp.) [32]; Philippines 2011 (of *Limnonectes*, *Occidozyga* and *Hylarana* spp.)

[32]; South Korea infections were suggested in 2009 and then confirmed in 2013 in fire bellied toads [17]; Sri Lanka 2011 (of *Fejervarya*, *Hylarana*, *Pseudophilautus*, *Polypedates* and *Lankanectes* spp.) [32]; and, Vietnam 2011 (of *Ophryophryne* and *Philautus* spp.) [32]. The analysis of museum archive collections of Chinese amphibians (80 species representing 1,007 specimens collected between 1933-2009) [33] and subsequently from Korea (244 specimens collected between 1911-2004) [20] found that 6% of the Chinese amphibians (*i.e.* 60 specimens, the earliest collected from 1933) and 3 of the Korean amphibians collected in 1911 tested positive for *Bd*.

Given the pathogenicity of Bd, there is interest in finding treatment regimes for its control and/or management. Immersion of Cascades frogs (*Rana cascadae*) in a 0.01% solution of itraconazole for 10 min each day over four consecutive days was reported to be effective against *Bd* infection [22]. The prevalence of infection of treated frogs that were released and then recaptured after 5 weeks was 13% versus 67% in the control group. Treatment did, however, appear to impact on their growth rate with treated frogs weighing 22% less and being c. 9% shorter than those in the control group. While there appear to be benefits to the use of such treatments, at the same time caution should be exercised until the susceptibility of treated frogs to other pathogens, *e.g. Ranavirus etc*, is known.

A second species, *Batrachochytrium salamandrivorans* (*Bs*), isolated from infected fire salamanders (*Salamandra salamandra*) [27], has had a devastating impact in the Netherlands where it has almost decimated Dutch populations [31]. A recent survey of Chinese amphibians, conducted out of concern regarding the potential impact of *Bs* on indigenous populations of amphibians, looked specifically for *Bs*, but fortunately found no evidence of infection [34].

Ranavirus (*Rv*) is now reported from at least 5 Asian states (Australia, China, Hong Kong, Japan and Thailand); an infection in Malaysia in 2013 was suspected but was not confirmed [18]. The anthropogenic factors facilitating the spread of ranaviruses were investigated in a UK-based study conducted by North *et al.* [28], who indicated that human population density; garden ponds and increasing pond depth; increasing fish and frog densities; the use of garden, fish care products, herbicides *etc*; increasing international trade in ornamental species; the use of salamanders/frogs as bait; were all important. The study suggested that *Rv* may have been introduced into certain countries with the importation of goldfish and bullfrogs, and that pesticides may cause immunosuppression predisposing populations to infection. The herbicide atrazine, for example, reduces leukocyte production and increases host susceptibility to *Rv* [21], while the insecticide chlorpyrifos increases *Rv* infection rates in tiger salamanders [24], and carbyl insecticide decreases host survival when in combination with *Rv* and predator cues [23].

c) Reptiles

The Asian production of Chinese soft shelled turtles (*Pelodiscus* [formerly *Trionynx*] *sinensis*), is rising at c. 10.77% p.a. and in 2013, five Asian states produced a total of 347,587 MT [5]. Infections of farmed stock in Zhejiang province, China in 2013 with *Bacillus thuringiensis* resulted in the mass mortality at several farms and severe economic losses [35].

Asia's production of crocodiles is also sizeable with Cambodia, China, Papua New Guinea, Thailand and Vietnam having established crocodile aquaculture industries - live animals are traded between Asian states for breeding, farming and for the food trade. In 2009, Cambodia had c. 1,000 farms producing 500,000 hatchlings [32]; Thailand produces c. 0.7-1 M crocodiles in >900 culture facilities nationwide [33,34]; Vietnam has c. 150 small operators in Dong Nai Province where c. 94,000 crocodiles are produced; a further c. 34,000 crocodiles are produced elsewhere in Vietnam [35-37]. Although crocodiles are frequently included in aquaculture, global production is not listed in aquaculture statistical databases, *e.g.* FAO FishStatJ *etc,* and little is known regarding the health of farmed populations in Asia. There are, however, a number of disease conditions that can result in significant mortalities, *e.g.* adenoviral hepatitis; crocodile pox (parapoxvirus) – which has been reported from Nile crocodiles and species in Australia; and, dermatophilosis (streptothrichosis) – which is reported from farmed Australian crocodiles and for which there is no known treatment.

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DISCUSSION

- It was recommended to the group that reptiles be included in the scope of the OIE Aquatics Commission because farming of turtles is more like aquaculture than livestock culture. The OIE was likely to include reptiles but they would probably be managed under the Terrestrial Animal Health Code.
- Ostreid herpes virus appears to be having a significant impact on different mollusc species; e.g. scallops in China and Pacific oysters in Australia, New Zealand and Korea. In Australia, OsHV-1 has resulted in cessation of commercial farming of Pacific oysters in the two affected estuaries. Other major oyster-producing regions are still free from the disease, and containment measures have worked to date. The industry is now looking at growing the native flat oyster (*O. angasi*) as an alternative species, although it is vulnerable to *Bonamia*.
- Chytrid fungus sampling by putting frog samples in filtered water makes sense, as it can effectively induce sporulation. Released spores can then be filtered and tested by PCR. This method, however, may be a bit costly especially the use of micro-filters to collect the zoospores. An alternative would be centrifugation.
- Ranaviruses (iridoviruses) – affect both fish and amphibians, but the viruses that affect fish are not necessarily the same as those that affect amphibians.

RECOMMENDATION

- AG recommended that, given the significance of reptile aquaculture production in Asia Pacific and some of the diseases affecting the overall production (e.g. in soft-shelled turtles), OIE delegates from the region should raise the issue of inclusion of reptiles under the Aquatic (or Terrestrial) Code during the next OIE GS.

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

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

Dr. Rolando Pakingking, Jr. presented highlights of the Fish Health Section (FHS) activities from 2014-2015. SEAFDEC AQD successfully implemented a total of 19 in-house and externally funded studies under the Thematic Program "Healthy and Wholesome Aquaculture" (Fish Health Component). These studies aimed to: (a) investigate the efficacy of probiotics and rationalise the need and application of diagnostics that will ensure biosecurity within culture systems and keep out exotic pathogens, especially trans-boundary pathogens; (b) promote the wider use of conventional diagnostic as well as new methods especially for newly reported, emerging diseases; (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; (d) enhance the stakeholders and fish health specialists' understanding and interpretation of molecular diagnostic techniques and to develop healthy broodstock through pathogen exclusion; and, (e) re-educate stakeholders and develop the capability of fish health specialists on fish disease diagnosis using gross clinical examination and bacteriology, mycology, parasitology and histopathology techniques.

To accomplish objective 1, studies involving the application and mode of action of probiotic *Bacillus* species in the larviculture of penaeid shrimps and crabs were carried out. Results showed that the indigenous poly-beta-hydroxybuterate (PHB) accumulating *Bacillus* sp. isolated from shrimp pond water improved the growth, survival (against *Vibrio campbellii* challenge), and robustness of *Penaeus monodon* postlarvae. Other indigenous probiont (*Bacillus subtilis* G10R11) isolated from the gastrointestinal tract of mudcrab possessed potent antimicrobial and quorum-sensing activity that protected mudcrab instar against *V. harveyi* infection in tank trials. Moreover, studies to address objective 2 were implemented including: quantitative and qualitative analyses of the bacterial microbiota of tilapia (*Oreochromis niloticus*) cultured in earthen ponds; establishment of sanitary quality of oysters (*Crassostrea iredalei*) and their culture environments; development of shrimp pathogen diagnostic tools using nested PCR and

lateral flow strip biosensors coupled with a mobile app and cloud-based information management; development and acceleration of rapid and effective fish and shrimp health management; and, establishment of a Philippine shrimp pathogen bio-bank and online biosurveillance information resource. Consonant to objective 3, novel strategies to reduce disease incidence in mudcrab hatchery and grow-out, application of adjuvants, carriers and RNAi technology to enhance the antiviral immune response of shrimp to WSSV, and enhancement of vaccine efficacy for the prevention of viral nervous necrosis in high value marine fish were likewise conducted. In addition, studies targeting the control of vertical transmission of virus from marine broodfish to eggs and larvae and establishment of protective measures against persistent and emerging parasitic diseases of tropical fish were also executed to accomplish objective 4. Finally, to address objective 5, an on-site training course with the goal of identifying current disease problems affecting economically important freshwater fish species, guiding fish health personnel in carrying out accurate diagnosis of the identified disease problem using standard methods, and assisting fish health personnel in the formulation of practical and economically sound disease prevention and control methods based on the information that will be generated will be conducted in Myanmar on 17-24 January 2016.

With the funding support from Japan-ASEAN Integrated Fund (JAIF), SEAFDEC AQD in collaboration with the Department of Agriculture's Bureau of Fisheries and Aquatic Resources will hold the ASEAN Regional Technical Consultation on EMS/AHPND and Other Trans-boundary Diseases for Improved Aquatic Animal Health Management in Southeast Asia on 22-24 February 2016 in Makati, Philippines. The main objective of this meeting is to bring together the representatives of ASEAN Member States and technical experts to take stock of the status of AHPND and other trans-boundary diseases, progress in R&D and identify researchable areas and other initiatives for regional cooperation. Specifically, the meeting aims to (a) assess the current status of AHPND and other emerging diseases in farmed shrimps in Southeast Asia; (b) review the status of trans-boundary disease issues in the region in any aquatic organism/product; (c) identify gaps, policy recommendations and priority areas for R&D collaboration to address these gaps; and (d) enhance cooperation among Member States, regional/international organizations and other relevant stakeholders on initiatives that support aquatic animal health. The proceedings of this meeting will be published. To efficiently disseminate the outputs of this meeting, an e-copy of the proceedings on the current status of AHPND and other emerging diseases in farmed shrimps in Southeast Asia, including the developments/advances in pathogenesis, diagnosis, epidemiology, surveillance, and control will also be uploaded onto the SEAFDEC and NACA websites. The outputs of the meeting are expected to result to important policy recommendations and collaborations for an improved aquatic animal health management in the region, particularly on farmed shrimps.

Additionally, from 4th quarter of 2014 up to 3rd quarter of 2015, Fish Health Section's diagnostic cases include detection of shrimp viruses (WSSV: 70 positive/ 615 total number of specimens/cases examined (11.4%); IHHNV: 79/398 (20.9%); IMNV: 0/48; TSV: 0/38; YHV: 0/19; MBV: 0/1; and AHPND: 3/125 (2.4%) and fish viruses (NNV: 2/46 (4.3%); RSIV: 0/8; and KHV: 0/1).

DISCUSSION

- Probiotics are a potential source of pathogens as well as beneficial species. Caution is required in their application.
- Probiotics may be applied either in the feed or directly to the water. Probiotics in feed are probably relatively safe (risk is very low) if appropriate quality controls are in place. However, probiotics "home brewed" at the pond side with dubious starter cultures in an uncontrolled manner are potentially more dangerous, as proliferation of pathogenic bacteria in the brew might also occur. Dumping such concoctions into a pond might result in disease development in the host.
- Commercial probiotics are poorly regulated and frequently do not contain the advertised organisms. Manufacturing/drying processes will kill most non-spore forming bacteria. There is also a chance of introducing AMR determinants from probiotics.
- In principle, the use of probiotics may be positive and provide associated benefits (e.g. reduced use of antimicrobials), but only if the probiotics contain the right organisms.
- Long-term storage of shrimp viruses is usually a problem (e.g. for IHHNV and TSV). Viral samples from both fish and shrimps can be stored in a bio-freezer (-80^{o}C) for long-term storage. Frozen aliquots, however, should be thawed rapidly (in running water) to obtain viable virus for laboratory use.
- If the concern is only for viral DNA, then ordinary freezing/storage will be sufficient.

RECOMMENDATIONS

- AG thanked SEAFDEC AQD Philippines for sharing the important AAH activities of its Fish Health Section.
- AG recommended that the Philippine's CA (BFAR) should look into the importation of probiotics from other countries, in coordination with research institutes like SEAFDEC AQD.

4.2. AUSTRALIA'S NATIONAL AQUATIC ANIMAL HEALTH PROGRAMMES

Dr. Ingo Ernst provided an update on Australia's aquatic animal health programs, including AQUAPLAN 2014-2019 Australia's National Strategic Plan for Aquatic Animal Health and the Asia Regional Proficiency Testing Program for Aquatic Animal Diagnostic Laboratories.

Dr Ernst provided a progress report on AQUAPLAN projects that were discussed at the 2014 NACA Advisory Group meeting. These included:

Activity 1.1. Develop sector-specific biosecurity plan templates and guidance documents

> Outcome: Access to best practice biosecurity planning and guidance tailored to aquaculture and fisheries (where applicable) sectors, leading to development of sector-specific biosecurity plans
>
> PROGRESS: A generic biosecurity plan template and guidance document has been prepared and "road tested" at several farms with an interest in biosecurity. The plan includes biosecurity principles, a risk assessment framework, and biosecurity plan template. The approach of the biosecurity plan is to identify pathways for transmission of pathogens to, within and from farms (e.g. aquatic animals, water, feed, equipment and people). A risk assessment approach is used to evaluate risks and determine appropriate treatments. Once these steps are completed a biosecurity plan can be developed by addressing biosecurity guidelines that cover several areas: record keeping, staff training, property management, transmission pathways, emergency procedures, monitoring and audit.

Activity 2.2. Develop a program of national and sector-specific emergency aquatic animal disease response exercises, including field and operational activities

> Outcome: A coordinated national program of emergency aquatic animal disease response exercises and outbreak evaluations to test and improve established systems, identify gaps and train personnel on a priority basis
>
> PROGRESS: A national working group has been convened to develop a program of emergency aquatic animal disease response exercises. The group first undertook a stock take of recent exercises and their outcomes to: determine needs, identify objectives for a national program of response exercises, and to propose priority activities. The group is also considering appropriate evaluation methodologies.

Activity 3.2. Make the Aquatic animal diseases significant to Australia identification field guide available as an application for mobile devices

> Outcome: Improved awareness and reporting of significant diseases by target audiences and improved quality of disease reports
>
> PROGRESS: Specifications for a mobile application have been drawn up and expressions of interest by commercial providers have been sought. The application is expected to be operational during 2016.

Activity 3.7. Improve the breadth of data in Neptune, particularly histopathology slide collections

> Outcome: Improved availability of aquatic animal health information and resources for research, teaching and diagnostic purposes
>
> PROGRESS: Limited progress. The system in transition to new host organisation. Operational and governance arrangements are being resolved.

Activity 4.1. Consider aquatic animal production issues to inform development of the national antimicrobial resistance strategy

> Outcome: A national antimicrobial resistance framework that addresses issues relevant to aquatic animal production.

PROGRESS: A National AMR strategy has been developed. An implementation plan is under development with a national forum held in Nov 2015. Possible activities for the aquaculture industry are under consideration.

Activity 5.2. Assess requirements for a national aquatic animal health curriculum that can be adapted for end-users ranging from vocational training to higher education

Outcome: Aquatic animal health curriculum end users, competency areas and supporting resource material needs are identified.

PROGRESS: A meeting to discuss a national curriculum has been held and included representatives from industry, education institutions and government. The meeting report is pending.

Dr. Ernst provided a progress report on the Asia Regional Proficiency testing Program for Aquatic Animal Diagnostic Laboratories. The program is now complete. It included 41 laboratories, 10 diseases, 6 samples per panel, and 4 rounds of testing. The program was resource intensive due to extensive quality assurance testing, including stability and homogeneity testing. Approximately 14,000 aliquots were required for 4 rounds of PT for 10 pathogens.

After four rounds of proficiency testing, 3,564 correct results (86% correct) were reported from a total of 4,144 possible correct results. Substantial improvements were made in the reporting of correct results for all 4 diseases. For one disease, IMN, this resulted in 100% correct results from all participating laboratories in the final round of testing. A final report for the program is available on the Australian Government Department of Agriculture and Water website. A link to the report is also available on the NACA website.

DISCUSSION

- Ring testing results show a strong improvement in diagnostic accuracy across rounds.
- The stability of samples under various storage and transit conditions was thoroughly examined. In almost all cases, samples remained suitable. For one sample (low positive) of one disease some occasional inconsistent results were found during stability testing. This sample was withdrawn from the program.

RECOMMENDATIONS

- AG thanked DA Australia for the excellent presentation on the AAH activities and recognised its support to several important AAH activities in the region.
- AG recommended that Australia continue laboratory proficiency testing for detection of pathogens (including exotic diseases) that are important in the region, and for other diagnostic methods (if possible) other than PCR.

4.3. ACTIVITIES OF IAAHRI ON AQUATIC ANIMAL HEALTH (2014-2015)

Dr. Puttharat Boprasertkul presented the on-going aquatic animal health programmes of Thailand. Two National Legislations, which provide authorities to DoF for aquatic animal disease control, have been recently revised: Fisheries Act B.E. 2558 (2015) and Animal Epidemic Act B.E. 2558 (2015). DoF set up the committee, through IAAHRI and CAAHRI, on implementation of Animal Epidemic Act concerning import and export aquatic animal disease control. The committee is responsible for national policies and DoF regulations for aquatic animal health. The regulations are designed to meet international aquatic animal health management standards that protect wild and farmed aquatic animals from serious diseases and maintain competitive international market access. IAAHRI is also a committee for quarantine approved premise. Imported animals which are found to carry infectious pathogens will be eradicated without providing any compensation to the importers.

IAAHRI conducts surveillance and monitoring programme on OIE-listed diseases in wild and cultured aquatic animals following the procedure from OIE manual and the requirement from importing countries. Presently, Thailand has declared freedom of the following diseases: 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. The OIE focal point from IAAHRI has regularly summarised and reported the surveillance data to DoF, OIE and NACA.

In order to ensure the quality of testing results on export live aquatic animals, the laboratories under IAAHRI follow the methods detailed within the OIE manual, and attend Proficiency Testing Programmes. The Molecular Biology laboratory at IAAHRI recently participated in PT, provided by The Australian National Quality Assurance Program (ANQAP) on Megalocytivirus due to the new regulation on exportation of ornamental finfish to Australia and the lab passed the test. IAAHRI issues Health Certificate for live aquatic animal shipment/export from Thailand. A total of 8,129 Live Aquatic Animal Health Certificates were issued during the budget year 2015.

IAAHRI is involved in several activities for human capacity building on aquatic animal health. It has conducted training programmes on new standard and DoF regulations relevant to farmers, exporters and fishery officers. IAAHRI also offered training course on aquatic animal diseases to international staff, and provided on the job training for undergraduate students on disease diagnosis. IAAHRI staff attended and presented the research related to aquatic animal health at the 9th Symposium on Diseases in Asian Aquaculture (DAA9) in Ho Chi Minh City, Vietnam during 24-28 November, 2015.

To accomplish the ASEAN Network of Aquatic Animal Health Centre (ANAAHC) activity on the Development of Standard Operating Procedure (SOP) for the Live Movement of Aquatic Animals in ASEAN, two Workshops were arranged by IAAHRI/ANAAHC/NACA /USAID-MARKET. The final draft of SOP was obtained early 2015, followed by the endorsement by ASWGFi and SOM-AMAF in June and September 2015, respectively. The SOP is now ready for further implementation in AMCs.

DISCUSSION

- Thailand conducts disease surveillance in wild populations of aquatic animals. So far, there are no critical findings obtained from the surveillance.
- Surveillance for aquaculture products and the environment are both active and passive. Surveillance information is available for public access, but presently only in the local dialect
- *Streptococcus* has been isolated mainly from cultured fish.
- Testing for AMR is conducted according to what bacteria can be isolated from samples, e.g. *Salmonella* from processed products and *Aeromonas hydrophila* from infected aquatic animal samples.
- Determining AMR cut-offs is based on standards set for the diffusion method of determining antibiotic resistance. It should be noted, however, that these standards were based on clinical isolates. The addition of salt in assay media for bacteria isolated from brackishwater and marine environments might have an effect on the activity of antibiotics used for the assay.
- The focus on AMR assessment should be on the antibiotics that are commonly used in aquaculture.

RECOMMENDATIONS

- AG thanked IAAHRI Thailand for sharing the important AAH activities of the institute.
- AG recommended that a small project for pilot implementation of ASEAN SOP in selected AMCs be formulated for possible funding support from donor agencies.

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

Dr. Hirofumi Kugita presented updates on aquatic animal health activities by OIE Regional Representation in Asia and the Pacific. As major OIE activities relevant to aquatic animal health, several events that took place in 2015 were reviewed including the 3rd OIE Global Conference on Aquatic Animal Health on 20-22 January 2015 and the Regional Seminar for OIE National Focal Points for Aquatic Animals on 22-23 January 2015, both held in Ho Chi Minh City, Vietnam, the Regional Workshop on Safe International Trade in Aquatic Animals and Aquatic Animal Products held on 22-24 July 2016, in Nagaoka, Japan, and the 29th Conference of the OIE Regional Commission for Asia, the Far East and Oceania on 14-18 September 2015, in Ulaanbaatar, Mongolia. The OIE Regional Work Plan Framework 2016-2020, newly adopted at the above mentioned 29th Conference of the OIE Regional Commission contains specific references to "Aquatic", recognising the particular importance of aquaculture in this region, as well as the OIE Delegates' Secured Access System for encouraging members to get more involved in the OIE International standard setting Process. Future plans for pertinent meetings, as well as the state of play of the OIE PVS Pathway including PVS Evaluation on Aquatic, were presented

Progress on the issue of antimicrobial resistance (AMR), including the adoption of the WHO Global Action Plan on AMR, which OIE is strongly committing to, as well as the OIE's ongoing work for the collection of data on antimicrobial use in food-producing animals with the aim of creating an OIE Global Database.

Considerations on the information systems for aquatic animal diseases were also presented, analysing and comparing the NACA-OIE Quarterly Aquatic Animal Disease (QAAD) Report and the OIE World Animal Health information System (WAHIS). He explained that both systems contain mostly comparable information, while additional data could be available only from WAHIS, like quantitative details or control measures. He pointed out the challenges these systems are facing that some members are submitting their data only to the either of them without being well aware of the difference of these systems. He finally made several proposals for exploring better and more efficient information system based on further coordination and collaboration between NACA and OIE.

DISCUSSION

- "One voice" from the Asia-Pacific is lacking for OIE aquatic animal health issues such as trade standards. It was noteworthy to hear for the first time during the May GS that a comment was made on behalf of the ASEAN, i.e. on the period of being free from the disease (aquaculture) before declaring freedom.
- Generally, less than 10 countries in AP make comments on the reports of the OIE Aquatics Commission. The new Secure Access system that was developed for OIE delegates will promote submission of comments from member countries which can be viewed by other delegates and used to formulate their own responses.
- On QAAD reporting, there is a need to harmonise reporting to NACA and OIE. It was also proposed to cease printing QAAD reports at the previous AG meeting but this was rejected by the AG.
- Printing costs are becoming prohibitive, NACA wishes to cease production of hard copies. A link to download the electronic version of the reports is already circulated to national coordinators, and they will receive this before the hard copy.
- NACA will investigate the possibility of moving to electronic data entry of national QAAD reports. This would facilitate export of records to the WAHIS system in future.
- On AMR surveillance, the OIE template for the collection of data on antimicrobial use in animals might create some issues when numbers are encoded into the surveillance form. Needs to account for the likelihood that some countries won't report, so the system may reflect those countries with more active reporting systems rather than actual global trends.
- Reporting on AMR: need to emphasize that at this stage, the purpose is not to provide an accurate picture of global usage, but rather to provide data for discussion and planning, raising awareness on how to develop national strategies on data collection, and to promote responsible use of antibiotics.
- There are likely to be some difficulties with regards to country abilities to collate accurate data on AMR. However, both the OIE Terrestrial and Aquatic Codes have guidelines on monitoring of antibiotic use.

RECOMMENDATIONS

- AG congratulated and thanked OIE-RRAP for their important aquatic animal health activities in the region.
- AG recommended that OIE National Focal Points on Aquatic Animal Health should better communicate and collaborate with their OIE Delegates as well as National Focal Points for other topics, particularly regarding comments on the OIE code and manuals, aquatic animal diseases reports to WAHIS and data collection on antimicrobial use in aquaculture.
- AG recommended that member countries should consider seeking an OIE PVS Aquatic evaluation.
- AG recommended that member countries be encouraged to review changes in OIE policies and standards in order for the region to have their scientific opinions heard during the OIE GS.
- AG recommended continued development of the regional online reporting system between NACA and OIE-RRAP, which will be used until the OIE-NACA WAHIS Regional Core becomes operational.

4.5. AAH ACTIVITIES OF CHINA

Dr. Hong Liu presented updates on aquatic animal health activities of China. Total aquatic production from P.R. China was 64 million MT in 2014, of which 47 million MT came from aquaculture representing 73.49% of total production. Mariculture accounted for 18 million MT (38.17% of total aquaculture production), while freshwater aquaculture was 29 million MT (61.83%). The Ministry of Agriculture (MOA) is the competent administrative authority and responsible for organising related activities on aquatic animal disease prevention and control. Fishery Bureau, Veterinary Bureau and National Fisheries Technology Extension Centre (NFTEC) under MOA are responsible for the implementation of specific activities. General Administration of Quality Supervision, Inspection and Quarantine (AQSIQ) is responsible for the inspection and quarantine of imported and exported aquatic animal and products.

NFTEC organises the surveillance, forecasting, prevention and control of aquatic animal diseases throughout China. A network including the fisheries agencies at the provincial, municipal level and national levels is underway. There are 3 OIE reference laboratories (SVC, WSS and IHHN), located in Shenzhen and Qingdao provinces. Three State key laboratories of aquatic animal health were established in Huanghai Fisheries Institute, Yangzi River Fisheries Institute and Pearl River Fisheries Institute. A reservoir of aquatic animal pathogens was established in Shanghai Ocean University, covering the collection and supply of virus, bacteria and cell lines. Laboratories in the branch of AQSIQ also actively took part in the national animal aquatic animal health activities and played an important role in the surveillance, zoning, proficiency test, reviewing OIE manual and code. Expert committee of disease prevention and control in aquaculture was established in 2012, which provided the expert direction and suggestions to the national aquatic animal health issues. Standardization group for disease prevention and control of aquatic animals under the State Aquaculture Standardisation Commission established in 2001, has organized and set 107 national standards and industrial standards. Official veterinary qualification was initiated and 2 training projects were organized in order to promote this work. Moreover, qualification of veterinary practitioner and village veterinary of aquatic animal health were also developed.

Disease survey has been carried out for 16 years and implemented in 30 provinces/ municipalities/autonomous regions. A total of 4200 stations were established with 8000 staff taking part in the disease surveillance and reporting, covering a total of 300,000 ha (3.6% aquaculture area of P. R. China). Economic loss for aquaculture in 2014 was CNY14 billion representing 1.78% of total aquaculture product value. National monthly reports of diseases in aquaculture were published.

National surveillance project on important diseases has been implemented since 2005. 23 provinces/municipalities/autonomous regions collected 2,099 samples tested in 17 laboratories in 2014. In 2015, 25 provinces/ municipalities/ autonomous regions collected 3921 samples and tested in 24 laboratories. National reference laboratories and chief experts were designated by MOA. They are responsible for analysing the surveillance data, writing the annual report for each disease, and for the assessing, investigating, confirming, providing prevention and control measures, and assisting the CA to deal with the outbreak of important diseases.

National surveillance project on imported and exported aquatic animals organised by AQSIQ has started since 2010. It covers all diseases listed in OIE code, and some important diseases such as VNN and GFHN. The project includes all exported and imported live aquatic animals based on some special ratio. It has been the main database for quarantine officials responsible for signing of health certificate for exported aquatic animals, and the evidence of compartment free from specific diseases.

Based on survey and surveillance projects, the national extension station organized 27 provinces/municipalities/autonomous regions to develop disease preparedness in aquaculture. The information is published in related newspapers, journals and websites.

Inspection of aquatic hatchery farms started from 2011 under the directions of MOA, for 10 diseases including spring viraemia of carp, grass carp haemorrhagic disease, infectious haematopoietic necrosis, white spot disease. Proficiency testing program for 6 diseases (SVCV, IHNV, KHV, GCHV, WSSV and IHHNV) was organized in 2014 and 2015, which was participated by 43 and 66 laboratories in 2014 and 2015, respectively. Proficiency rate was 76% (2014) and 92% (2015). Remote diagnostic platform has become a very important website and communication platform between the experts and the local farms. According to the actual situation of China, zoning and compartmentalization were also promoted in several provinces/municipalities and experience has been accumulated To promote the work in a wider scope. Surveillance project for antimicrobial resistance has been promoted in some provinces, where results were used towards responsible use of antibiotics in the field.

Chinese Aquatic Animal Health reports were published by Chinese Agriculture Press, reflecting the status of Chinese aquaculture in 2012, 2013 and 2014. OIE laboratory twinning was operated smoothly between OIE IHN reference laboratories in USA and the candidate laboratory in China. Both sides also cooperated in the study on molecular epidemiology of IHN and the virulence comparison.

DISCUSSION

- Local fisheries bureaus are responsible for local fish health issues. However, they have limited power in enforcing biosecurity measures and other regulations, especially in compartments declared free from particular diseases. AQSIQ has very strong controls on biosecurity of farms that wish to access export markets.

- Major hatcheries are state enterprises with very good biosecurity management.
- There is also a need in developing a process for auditing compartments for maintaining the status of disease freedom.

RECOMMENDATIONS

- AG congratulated and thanked Dr. Liu for presenting significant and important AAH activities in China and for possible regional collaborations in the future.
- AG recommended that aquatic animal health reports (e.g. annual AAH Report) from China be translated into English, as they would be very useful to NACA members. English versions of the report could be posted at NACA and other regional websites for wider dissemination of information.

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 Asia-Pacific region. A total of 68 reports have been published to date with an average of 14 countries reporting for each quarter. Infection with ostereid herpesvirus was deleted from the 2015 list of reportable diseases. For the newly listed AHPND, four countries in the region (China, Philippines, Thailand and Vietnam) have reported positive for the disease. Malaysia (which was also affected by the disease), however, did not report any AHPND outbreak from the 3rd quarter of 2014 to the 2nd quarter of 2015. A newly reported disease was Infectious Haematopoietic Necrosis (IHN) in *Oncorhyncus mykiss* (2-5 months old), which was reported by Iran from the first quarter of 2015 onwards. Other reported diseases include Infectious spleen and kidney necrosis virus (ISKNV) in marine and ornamental fish (Singapore), Heptopancreatic parvovirus disease (Malaysia), Monodon baculovirus (MBV) and Laem Singh Virus (LSV) (Sri Lanka), and parasitic infestations in freshwater fish (Myanmar). Australia (Dr. Brett Herbert), suggested that crayfish plague (*Aphanomyces astaci*) and *Bonamia ostreae* which were listed as diseases presumed exotic to the region should no longer be considered as such. Crayfish plague was reported from Taiwan (2013) and *Bonamia ostreae* in New Zealand (2015). It is therefore proposed that these two diseases be included under the OIE listed diseases for crustaceans and molluscs in the Asia-Pacific QAAD list. Lastly, the proposal to stop printing hard copies of the QAAD report was again presented for discussion.

Dr. Ingo Ernst presented revisions in the OIE list of diseases based on the recommendations made during the OIE General Session Meeting in May 2015. Only one disease was added to the list: AHPND under Diseases of Crustaceans.

DISCUSSION

- On crayfish plague reported in Taiwan, this was only one time report with high morbidity and mortality through passive surveillance, and all the affected animals were stamped out.
- The reported *Bonamia ostreae* in wild oysters in New Zealand was from “semi-open” farms.
- The proposal is to move Crayfish plague and Infection with *Bonamia ostreae* to the section on diseases occurring in the region (as they are on the OIE list).
- It should be noted that when an OIE-listed pathogen is found in a new host species, there is an obligation to report it (as these animals may be traded). However, this does not always happen at present.
- On printing the hard copy of QAAD, apart from the cost/limited print run, there is considerable overlap/duplication between the OIE and NACA systems. OIE-RRAP will further discuss with the HQ on the decision to merge QAAD reporting by OIE-RRAP and NACA into one.
- The last printed version will be Q3 2015. Instructions on how to access the electronic versions will be included in the last hard copy.
- On the issue of submission of reports to OIE-RRAP and NACA, the system will not be changed so as to avoid confusion to participating countries.

RECOMMENDATIONS

- AG recommended to transfer Crayfish plague and Infection with *Bonamia ostreae* (both OIE-listed) to reportable diseases in Asia-Pacific, from being listed under diseases presumed exotic to the region.
- AG recommended that NACA, in collaboration with OIE RRAP, should further encourage member countries to submit QAAD reports regularly and comprehensively, recognising that immediate notification as well as

regular reports to the OIE World Animal Health Information System (WAHIS) are the legal obligations for OIE member countries (different from QAAD report).

- AG recommended to transfer AHPND from non-OIE listed disease to OIE-listed disease for crustaceans in the Asia-Pacific QAAD list.

5.2. QAAD LISTING OF HEPATOPANCREATIC MICROSPORIDIOSIS (HPM) CAUSED BY *ENTEROCYTOZOON HEPATOPENAEI*

Dr. E. Leaño presented the case of HPM for inclusion in QAAD list of reportable diseases following the OIE Criteria for listing which include Consequences, Spread and Diagnosis. Based on the confirmed reports from China, Vietnam, Thailand and Indonesia (unconfirmed reports from India and Malaysia), HPM satisfied all the criteria for listing. Although mortality is not significant among shrimp affected by the disease, retarded growth was reported when copies above 10^3/ng total HP DNA is observed. The pathogen (*Enterocytozoon hepatopenaei*) is infectious and can be horizontally transmitted by feeding infected HP to healthy shrimps and by cohabitation. The disease can be properly diagnosed by level II (histopathology and *in situ* hybridisation) and level III (real time or nested PCR) diagnostics. It is, therefore, proposed that HPM-EHP be included in the Asia-Pacific QAAD list for 2016.

DISCUSSION

- The disease might already be widespread in many countries in the region. To encourage reporting and monitor the status of the disease, it is just appropriate to include it in the QAAD list of reportable diseases.

RECOMMENDATIONS

- AG recommended inclusion of HPM in the non-OIE listed diseases for crustaceans in the Asia-Pacific QAAD.

SESSION 6. OTHER MATTERS/CLOSING SESSION

6.1. ADOPTION OF REPORT AND DATE OF NEXT MEETING

Report of the meeting (Discussions and Recommendations) was presented and adopted.

As what has been initiated since AGM12, i.e. inviting one NACA member country to join the meeting, AG recommended to invite either India or Maldives in the next AGM (AGM15) which will be held in Bangkok, Thailand in November 2016 (final dates to be decided).

The meeting officially closed at 12:00 noon (25 November 2015).

ANNEX A: MEETING AGENDA

14TH MEETING OF ASIA REGIONAL ADVISORY GROUP ON AQUATIC ANIMAL HEALTH (AGM 14)

23-25 NOVEMBER 2015

KU HOME, KASETSART UNIVERSITY CAMPUS, BANGKOK, THAILAND

Day 1 (23 November, Monday)

09:00 – 12:00

Opening Session

- Welcome address: **Dr. Derun Yuan**, on behalf of Director General, NACA
- Opening Remarks: **Dr. Kjersti Gravningen**, AG Chairperson, Aquafuture, Norway

(AG Chairperson will take over)

Session 1. Progress Report

- Progress since AGM 13 **(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. Ingo Ernst**, AAHSC, OIE)
- Updates on FAO initiatives in Asia-Pacific in support of aquatic animal health (**Mr. Weimin Miao,** FAO)

DISCUSSIONS AND RECOMMENDATIONS

Lunch

13:30 – 17:00

Session 3. Review of Regional Disease Status

- Updates and emerging threats on crustaceans (**Dr. Tim Flegel**, Mahidol University)
- Updates and emerging threats on finfishes (**Dr. Siow Foong Chang**, MSD Animal Health)
- 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

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

DISCUSSIONS AND RECOMMENDATIONS
Group Photo (during coffee break)

18:30

Official Dinner (hosted by NACA);

Day 2 (24 November, Tuesday)

09:00 – 12:00

Session 4 (Continued)

- DA Australia (**Dr. Ingo Ernst**, DA-Austalia)
- Aquatic Animal Health Research Institute, Thailand (**Dr. Puttharat Baoprasertkul,** IAAHRI)
- Aquatic Animal Health activities of OIE-Regional Representation for Asia and the Pacific (**Dr. Hirofumi Kugita**, OIE Tokyo)
- Aquatic Animal Health Activities of China (**Dr. Liu Hong**, AQSIQ, PR China)

DISCUSSIONS AND RECOMMENDATIONS

Lunch

14:00 – 17:00

Session 5. Disease Reporting

- QAAD Reporting: 2014 List and status of reporting (**Dr. Eduardo Leaño**, NACA)
- QAAD listing of Hepatopancreatic microsporidiosis caused by *Enterocytozoon hepatopenaei* (EHP) (**Dr. Eduardo Leaño**, NACA)
- New OIE Disease List and revisions to the QAAD List for 2015 (**Dr. Ingo Ernst**, AAHSC, OIE)

DISCUSSIONS AND RECOMMENDATIONS

Day 3 (25 November, Wednesday)

09:00 – 12:00

Session 6. Closing

- Presentation and adoption of Discussions and Recommendations (**Dr. Eduardo Leaño**, NACA);
- Other Matters (NACA member country to be invited for AGM 15)
- Date and venue of next meeting

Lunch

13:00 -

Official visit to Fish Vet Group Diagnostic Laboratory in Bangkok (hosted by FVG; c/o Drs. Don Griffiths/Andy Shinn)

Annex B: List of Participants

I. Advisory Group Members
World Organisation for Animal Health (OIE) and DA-Australia
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III. Observer
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Dr. Derun Yuan Coordinator, Education and Training yuan@enaca.org
Mr. Simon Wilkinson Coordinator, Information and Communication Programme simon@enaca.org

Annex C: List of Diseases in the Asia-Pacific

Quarterly Aquatic Animal Disease Report
(Beginning January 2016)

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*	
5. Infection with *Bonamia ostreae*	
1.3 CRUSTACEAN DISEASES	
OIE-listed diseases	**Non OIE-listed diseases**
1. Taura syndrome	1. Monodon slow growth syndrome
2. White spot disease	2. Hepatopancreatic microsporidiosis (HPM) caused by *Enterocytozoon hepatopenaei* (EHP)
3. Infection with yellow head virus	
4. Infectious hypodermal and haematopoietic necrosis	
5. Infectious myonecrosis	
6. White tail disease (MrNV)	
7. Necrotising hepatopancreatitis	
8. Acute hepatopancreatic necrosis disease (AHPND)	
9. Crayfish plague (*Aphanomyces astaci*)	
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 *Marteilia refringens*	
2. Infection with *Perkinsus marinus*	

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 of 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