NETWORK OF AQUACULTURE CENTRES IN ASIA-PACIFIC

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

REPORT OF THE MEETING

Centara Grand Central Ladprao, Bangkok, Thailand
21-23 November 2016
Prepared by the NACA Secretariat

Preparation of this document:

This report was prepared by the 15th Asia Regional Advisory Group on Aquatic Animal Health (AG) that met at Centara Grand Central Ladprao Hotel on 21st to 23rd November, 2016.

The Advisory Group was established by the Governing Council of the Network of Aquaculture Centres in Asia-Pacific (NACA)in 2001 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, representatives of the World Animal Health Organisation (OIE) and the Food and Agricultural Organization of the United Nations (FAO), collaborating regional organisations such as SEAFDEC Aquaculture Department (SEAFDEC AQD) and OIE-Regional Representation in Asia and the Pacific (OIE-RRAP), and the private sector.

Reference: NACA 2016. Fifteenth Meeting of the Asia Regional Advisory Group on Aquatic Animal Health: Report of the Meeting. Published by the Network of Aquaculture Centres in Asia-Pacific, Bangkok, Thailand.

ABBREVIATIONS AND ACRONYMS

AAH	Aquatic Animal Health
AAHRDD	Aquatic Animal Health Research and Development Division of DoF Thailand
AAHSC	Aquatic Animal Health Standards Commission of the OIE
AG	Advisory Group
AGM	Advisory Group Meeting
AHPND	Acute Hepatopancreatic Necrosis Disease
AMC	ASEAN Member Countries
AMR	Antimicrobial resistance
AMU	Antimicrobial use/usage
ANAAHC	ASEAN Network of Aquatic Animal Health Centres
AQSIQ	General Administration of Quality Supervision, Inspection and Quarantine of the P. R. China
ASDD	Abdominal segment deformity syndrome
ASEAN	Association of South East Asian Nations
AVG	Abalone viral ganglioneuritis
AVM	Abalone viral mortality
BMP	Best management practices
CA	Competent authority
CAAHRI	Coastal Aquatic Animal Health Research Insitute
CMNV	Covert mortality nodavirus
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
FAO-RAP	FAO Regional Office for Asia and the Pacific
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
MBV	Monodon baculovirus
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
POMS	Pearl oyster mortality syndrome
RT-PCR	Reverse transcriptase PCR
SEAFDEC	Southeast Asian Fisheries Development Center
SEAFDEC-AQD	Southeast Asian Fisheries Development Center Aquaculture Department
SPF	Specific pathogen free
SPR	Specific pathogen resistant
SPT	Specific pathogen tolerant
STDF	Standard and Trade Development Facility of WTO
SVC	Spring viraemia of carp
SVCV	Spring viraemia of carp virus
TCP	Technical cooperation project
TG	Technical Guidelines (Asia Regional Technical Guidelines on Health Management for the Responsible Movement of Live Aquatic Animals)
TiLV	Tilapia lake virus
TSV	Taura syndrome virus
VCMD	Viral covert mortality disease
VHS	Viral Haemorrhagic Septicaemia
VP	*Vibrio parahaemolyticus*
WAHIS	World Animal Health Information System
WAHID	World Animal Health Information Database
WFS	White faeces syndrome
WHO	World Health Organization
WSD	White spot disease
WSSV	White spot syndrome virus
WTD	White tail disease
WTO	World Trade Organization
YHV	Yellowhead virus

The 15th Asia Regional Advisory Group on Aquatic Animal Health.

Back Row (From Left to Right)

Prof. Mohamed Shariff (AAHSC, OIE; Malaysia), **Dr. Andy Shinn** (FishVet Group, Thailand), **Dr. Hirofumi Kugita** (OIE-RRAP, Japan), **Prof. Timothy Flegel** (Centex Shrimp, Thailand), **Mr. Simon Wilkinson** (NACA), **Dr. Eduardo Leaño** (NACA), **Dr. Chien Tu** (Observer, AHRI, Chinese Taipei), **Dr. Kjersti Gravningen** (Aquafuture, Norway), **Dr. Derun Yuan** (NACA).

Front Row (From Left to Right)

Dr. Diana Chee (AVA, Singapore), **Dr. Thitiporn Laoprasert** (AAHRDD, Bangkok, Thailand), **Dr. Janejit K** (AAHRDD, Bangkok, Thailand), **Dr. Supranee Chinabut** (Thailand), **Dr. Melba Reantaso** (FAO, Rome, Italy), **Dr. Cherdsak Virapat (**(NACA), **Dr. Fania Dwi** (OIE-RRAP, Tokyo, Japan), **Dr. Hong Liu** (AQSIQ, P.R. China), **Dr. Rolando Pakingking, Jr.** (SEAFDEC AQD, Philippines), **Dr. Carolyn Benigno** (FAO RAP, Thailand)

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OPENING SESSION

The 15th meeting of the Asia Regional Advisory Group on Aquatic Animal Health was convened in Bangkok, Thailand, from 21-23 November 2015 (Annex 1: List of participants; Annex 2: Provisional agenda). The meeting was opened by Dr. Cherdak Virapat, Director General of NACA. Welcome remarks were given by Dr. Eduardo Leaño, Coordinator of the Aquatic Animal Health Programme of NACA.

Dr. Leaño thanked Dr. Kjersti Gravningen, Aquafuture, Norway, for Chairing the Advisory Group from 2014-2015. The AG selected Dr. Melba Reantaso, FAO, as the next Chair of the Advisory Group for the period 2016-2017, while Dr. Hong Liu as the Vice-chair.

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

SESSION 1: PROGRESS SINCE AGM-14

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 14. The Quarterly Aquatic Animal Disease (QAAD) Report was continuously published with some significant changes as endorsed during the AGM 14 (see Section 5.1 for details). The MRC project on the Development of Regional Code of Practice for Movement of Aquatic Organisms in the Lower Mekong Delta was completed in January 2016. The Draft Code was submitted and endorsed to MRC, and is also available at NACA website for free download (http://www.enaca.org/modules/library/publication.php?publication_id=1170). NACA was invited and participated in the 2nd Technical Working Meeting in Developing Strategic Plan of Action for ASEAN Cooperation on Fisheries (2016-2020) held on February 2016 at Nay Pyi Taw, Myanmar. The group identified NACA as one of the partner organizations for the implementation of regional activities on AAH, food safety and aquaculture certification.

On AHPND, NACA and partner organizations OIE and FAO provided updates on regional response, surveillance and monitoring and global initiatives, respectively, during the ASEAN Regional Technical Consultation on EMS/AHPND and Other Transboundary Diseases. The Consultation was co-organized by SEAFDEC AQD and BFAR, Philippines and was held on February 2016 at Manila, Philippines. Dr. Leaño was awarded by PCARRD-DOST, Philippines with a Balik Scientist Program (BSP), and was deployed to the Philippines for a 30-day mission from 17 April to 16 May 2016. He worked with Dr. Mary Beth Maningas of the University of Santo Tomas on her DOST-funded project "Pathobiology and Development of Molecular Detection Kit for EMS.AHPND-causing bacteria". NACA was also commissioned by FAO to organize inter-regional workshop on AHPND and expert working group meeting on SPF, SPR and SPT held in Bangkok, Thailand in April 2016. During the international workshop in June 2016, NACA and members of AG presented updates on AHPND in the region including AHPND research in Thailand (Prof. Flegel), Economic cost of diseases (Dr. Shinn), OIE activities on AHPND (Prof. Shariff), Reporting of AHPND in QAAD (Dr. Leaño), and AHPND in Southeast Asia (Dr. Pakingking). Kerala University of Fisheries and Ocean Studies (Kochi, India) invited Dr. Leaño as a plenary speaker during the International Conference on Science and Technology for National Development last November 2016. He presented NACA's regional response on AHPND and other emerging shrimp diseases.

Iran requested NACA expertise to undertake a workshop on WSD and shrimp health management. Dr. Leaño conducted the workshop in four shrimp-producing provinces in Iran: Gorgan, Bandar Abbas, Bushehr and Abadan in May 2016. Hosted by Beyza 21 Feed Mill Co., the workshop was attended by shrimp farmers, processors, government officers and officials from Veterinary Institute.

DISCUSSION

- The proposal submitted to STDF for consideration was not approved for funding, as the development of a certification scheme was deemed to be risky. However, STDF was willing to contribute funding if a co-sponsor could be found.

- A large Chinese project that will be implemented in ASEAN had met NACA to discuss involvement, however there had been no follow up to date. Dr. Liu offered to facilitate communications with the Ministry of Agriculture.
- The Chair asked for the status of recommendations made by AGM 14. Dr. Leaño indicated that they had subject to resource constraints. Some recommendations could not be implemented until a source of funding was found.
- The Chair requested that a list of recommendations be prepared by the Secretariat to aid follow up and contributions from all members.

RECOMMENDATION

- AG confirmed the relevance of the STDF proposal. STDF requires a partner to co-fund proposal as they consider it risky. Dr. Leaño was requested to write a one-page brief on the project that can be used to approach possible donors. Perhaps approach Thai Frozen Food Exporters Association. Timeline July 2017.

SESSION 2: OIE STANDARDS AND GLOBAL ISSUES

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

Prof. Mohamed Shariff reported on the outcomes of the 84th OIE General Session held in Paris in May 2016 and on the February and September 2016 meetings of the OIE Aquatic Animal Health Standards Commission.

84th OIE General Session. Prof. Shariff provided a summary of items of aquatic animal health standards (Aquatic Code and Aquatic Manual) adopted at the 84th OIE General Session, focusing on those considered of most interest to NACA member countries including:

AQUATIC CODE

- **Glossary**
  - New definition for 'vector', taking into consideration the definition of vector used in the Terrestrial Code.
  - Replace the word 'organism' with 'pathogenic agent'
  - In the definition for 'fallowing' the word 'carrier' replaced by 'vector' to align with the new proposed definition for vector.
- **Proposed revisions to Articles 1.4.3, 1.5.2, 2.1.4, 4.2.3 and 4.6.3.**
  - Amendments to Articles 1.5.2 and 4.2.3 to ensure that the use of 'vector' would be consistent with the proposed new definition of 'vector' throughout the Aquatic Code.
  - Term 'carrier' replaced by 'vector' in Articles 1.4.3, 2.1.4 and 4.6.3 given the new proposed definition for vector.
- **Notification of diseases and provision of epidemiological information (Chapter 1.1.)**
  - Standardisation of this chapter with the corresponding chapter in the Terrestrial Code.
- **General recommendations on disinfection (Chapter 4.3.)**
  - Improve readability of the text.
  - Comments on biosecurity will be addressed in a new chapter as proposed by the Commission for the restructuring of Section 4: Disease prevention and control of the Aquatic Code.
  - Amendments in Article 4.3.9, point 4; cage nets and other fibrous materials, Article 4.3.9, points 5 and 8; and Article 4.3.10 – Personal equipment.
- **General obligations related to certification (Chapter 5.1.)**
  - Delete point 2 of Article 5.1.4 as it was repeated in the text of point 3.
  - Re-introduce text at the new point 2 that addresses the need for the Competent Authority of an exporting country to inform the importing country of the result of an investigation that was initiated following the detection of disease associated with importation of aquatic commodities.

- Aligning texts in Article 5.1.4 with the corresponding text in the Terrestrial Code. With insertion of the words “suspected to be” before “associated”, to cater for situations where the link is not established with certainty.
- Retaining the wording “within a reasonable period after importation”, and to add “which shall not be longer than two incubation periods of that disease”. May need revision to improve clarity and proposed that the Aquatic Animals Commission review this article at its next meeting.

- **Infection with yellow head virus genotype 1 (Chapter 9.2.)**
  - Scope of Chapter 9.2 has not changed and includes only yellow head virus genotype 1 (YHV1).
  - Amend the title of Article 9.2.3 to align with the intended purpose of this article, i.e. the importation or transit of aquatic animals and aquatic animal products for any purpose regardless of the infection with YHV1 status of the exporting country, zone or compartment.
  - All disease-specific chapters in the Aquatic Code will adapt the change.
  - The words “aquatic animals” replaced by the words “commodities” in the last sentence of Article 9.2.8.

AQUATIC MANUAL

- Infection with yellow head virus genotype 1 (Chapter 2.2.8) Consistent with changes made in the Aquatic Code, the scope of Chapter 2.2.8 has not changed and includes only yellow head virus genotype 1 (YHV1)
- Red claw crayfish (*Cherax quadricarinatus*) be included in Section 2.2.2 (Species with incomplete evidence for susceptibility) of this chapter given that it met the relevant criteria in Chapter 1.5 for inclusion in this section of the Aquatic Manual chapter.
- “yellow head disease” instead of the abbreviation “YHD” in Section 2.1.1.

- **Reference Centres**

Acceptance of the following application for OIE Reference Centre status:

- OIE Reference Laboratory for infection with *Hepatobacter penaei* (necrotising hepatopancreatitis): Aquaculture Pathology Laboratory, School of Animal and Comparative Biomedical Sciences, University of Arizona, Tucson, United States of America. Designated Reference Expert: Dr Kathy Tang-Nelson.

Need to identify Reference Laboratories:

- Acute hepatopancreatic necrosis disease and Infection with *Batrachochytrium dendrobatidis*

Removal of Reference Laboratories:

- Following the retirement of the designated expert Dr Pen Heng Chang, removed Reference Laboratory for infection with abalone herpesvirus at the National Taiwan University in Taipei, Chinese Taipei.

February and September 2016 meetings of the Aquatic Animal Health Standards Commission. At the February and September 2016 meetings, the Aquatic Animals Commission revised several texts taking into account Member Country comments and recirculated them for further comments. For more information regarding these meetings, please refer to the official meeting reports available at:

http://www.oie.int/fileadmin/Home/eng/Internationa_Standard_Setting/docs/pdf/Aquatic_Commission/A_AAC_Feb_2016.pdf

http://www.oie.int/fileadmin/Home/eng/Internationa_Standard_Setting/docs/pdf/Aquatic_Commission/A_AAC_Sept_2016.pdf

Prof. Shariff provided a summary of items considered to be of most interest to NACA member countries including:

Glossary

- Zoning: Revised the definition taking into account the existing definition of compartment in the *Aquatic Code*, and amendments being proposed by the Code Commission for the term zone in the *Terrestrial Code*
- Aquatic animals: Revised the definition for aquatic animals to make it explicit that the definition only refers to live aquatic animals.

Criteria for the inclusion of diseases in the OIE list (Chapter 1.2.)

- Being revised to simplify them and bring the criteria in terrestrial and aquatic codes into closer alignment.

- The objective of listing is to '*prevent the transboundary spread of important diseases of aquatic animals through transparent, timely and consistent reporting*'.

Diseases listed by the OIE (Chapter 1.3.)

- Amendments to crustacean disease-specific chapters
    - All crustacean chapters aligned with proposed amendments to disease naming, i.e. infection with pathogen X'. Infection with pathogen agent X' is now the name of the disease, i.e. a proper noun.
- Infection with *Ranavirus*
    - Amend the listed name for 'infection with ranavirus' to 'infection with *Ranavirus* spp.' to more accurately reflect the scope of this disease which is any virus species of the Genus *Ranavirus*.
- *Batrachochytrium salamandrivorans* (Bsal)
    - Meets criteria of repeatable and robust diagnostic tests available in support of the proposed listing.
- Assessment for a novel orthomyxo-like virus, tilapia lake virus (TiLV)
    - Lack specific diagnostic methods for the disease. Meets the definition of an "emerging disease" and technical disease card will be developed.
- Hepatopancreatic microsporidiosis
    - Commission assessment of hepatopancreatic microsporidiosis caused by *Enterocytozoon hepatopanaei* concluded that the geographic distribution of the parasite is uncertain and does not meet the criteria for listing.

Disinfection of aquaculture establishments and equipment (Chapter 4.3)

- Made relevant amendments to improve clarity and readability.

Recommendations for surface disinfection of salmonid eggs (Chapter 4.4)

- Made relevant amendments to improve clarity and readability.

General obligations related to certification (Chapter 5.1)

- Amended point 2 of Article 5.1.4. to improve consistency with point 2 in Article 5.1.4 of the Terrestrial Code chapter.

Amendments to crustacean disease-specific chapters

The Aquatic Animals Commission reviewed the *ad hoc* Group on Susceptibility of crustacean species to infection with OIE listed diseases and proposed changes to the list of susceptible species in Article X.X.2 of the *Aquatic Code* for Infectious hypodermal and haematopoietic necrosis, Infectious myonecrosis, Necrotising hepatopancreatitis, Taura syndrome, White tail disease and Acute hepatopancreatic necrosis disease (the new draft chapter).

The application of the new criteria for listing species as susceptible to infection with a specific pathogen (described in Chapter 1.5.) resulted in an amended list of susceptible species in Article X.X.2. of these disease-specific chapters.

- Where relevant amendments to ensure alignment between all chapters with proposed amendments to disease naming, i.e. infection with pathogen X.' 'infection with pathogen agent X' is now the name of the disease, i.e. a proper noun.
- The Commission agreed to use recently launched FAO terminological database, 'FAOTERM' that includes a glossary of terminology (accessed at: http://www.fao.org/faoterm/en/).

New chapter Acute hepatopancreatic necrosis disease (Chapter 9.X.) including the Report of the *ad hoc* group on safety of products derived from aquatic animals (August 2016)

- Only *Vibrio parahaemolyticus* (Vp_{AHPND}) has been characterised and demonstrated as the pathogenic agent of AHPND, thus *Vibrio harveyi* and other bacterial isolates associated with AHPND should not be included as aetiological agents in Article 9.X.1.

Criteria for listing species as susceptible (Chapter 1.5)

- The Commission reviewed the criteria in Chapter 1.5. with the view to including a mechanism to list taxonomic groups of species as susceptible, when many species within a taxon have been determined to be susceptible and none has been found to be refractory to infection. The revised draft Article 1.5.9 was circulated to Member Country for comment.

Revised Article X.X.8

- Amendments were of an editorial nature to improve readability and consistency in syntax.

Review prawn taxonomy literature for *Penaeus*

- Commission agreed to use "old" *Penaeus* taxonomy (i.e. a single genus *Penaeus*, with 6 sub-genera).

OIE REFERENCE CENTRES

Reference Laboratory network GAP analysis

Commission identified the need to designate OIE Reference Laboratories for the following diseases:

- Acute hepatopancreatic necrosis disease
- Infectious haematopoietic necrosis
- Infection with *Aphanomyces invadans* (epizootic ulcerative syndrome)
- Infection with *Xenohaliotis californiensis*
- Infection with *Batrachochytrium dendrobatidis*

DISCUSSION

- The changes of crustacean disease definitions to "infection with" is simply to emphasise that measures of the Aquatic Code, including reporting obligations, apply irrespective of whether clinical disease is present. This is quite a significant change. The changes would be applied over a period of time, not all at once.
- Reference laboratories in Thailand had a meeting in Bangkok funded by the Newton Foundation. One of the recommendations of the meeting was to find a way to coordinate the reference laboratories in the region. The Newton Foundation has agreed to fund a further project along these lines.
- Thailand has established a National Animal Health Laboratory (under the supervision of CVO) at a national level, which has a direct link to OIE. It had been proposed for this organization to take in all the other disease laboratories in Thailand under its umbrella (network). The personnel responsible in the laboratory under the umbrella will become an adjunct staff of the Central Laboratory, and such laboratory will then be qualified to become an OIE Reference Laboratory for a particular disease.
- The obligations that came with being an OIE reference laboratory could prevent some laboratories (for example research laboratories) from applying, as they may not be able to meet the time frames due to their own core workload and priorities. The establishment of a national reference laboratory system would help solve this problem and also improve coordination.
- ASEAN platform to OIE: it may be worth considering ASEAN countries developing a joint proposal to support establishment of a similar network of national-level aquatic animal health laboratories, with assistance from NACA and possible funding from the Newton Foundation.
- China technical comments: AP region should try to set up a mechanism to organize the OIE member countries to discuss the comments together at least once a year. In the OIE general session, OIE member countries in AP region should have one voice. AP region should recommend experts in the region to OIE in taking part during the OIE ad hoc group work. AP region should also consider to set up a mechanism to organize the international proficiency tests and ring tests. An annual meeting of OIE reference centres and the state animal laboratories of OIE member countries in the region is necessary.

RECOMMENDATIONS

- AG recommended that the possibility of establishing a similar approach in other countries and forming an ASEAN-wide network be explored with the Newton Project and other potential funding sources.

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

Dr. Melba Reantaso made a presentation on FAO's work in the areas of aquatic animal health at country, regional and global levels. The general mechanism for providing technical assistance to FAO Member States was described briefly. This is through funds from the following: (i) Regular Programme (RP based on FAO's Strategic Programmes), (ii) the Technical Cooperation Programme (TCP) (under various categories, e.g. inter-regional, regional, sub-regional, national TCPs, TCP facility), (iii) emergency assistance (through emergency TCP and through the Crisis Management Center (CMC) that is part of the EMPRES (Emergency Prevention System), (iv) Donor-funded projects (multi-donor, single-donor), (v) Unilateral Trust Fund (UTF), and (vi) various types of partnerships and collaborative work.

Under the RP, current projects include: (a) Development of Guidelines on the Use of Specific Pathogen-Free (SPF), Specific Pathogen-Resistant (SPR) and Specific Pathogen-Tolerant (SPT) shrimp stocks; (b) a publication on "Responsible Management of Bacterial Pathogens/Diseases in Aquaculture"; and (c) a project on "Strengthening capacities, policies and national action plans on prudent and responsible use of antimicrobials in fisheries".

Recently concluded national TCPs include that for Indonesia (TCP/INS/3402: Development of preventive aquatic animal health protection plan and enhancing emergency response capacities to shrimp disease outbreaks in Indonesia) and Malaysia TCP/MAL/3501 (facility): Strengthening Aquaculture Biosecurity Capacity of Malaysia's Department of Fisheries). Ongoing TCP projects include the following: (i) Inter-regional TCP: 1.1 TCP/INT/3502 (Acute hepatopancreatic necrosis disease - AHPND): 11 countries in Asia (India, Iran, Philippines, Sri Lanka) LAC (ending in April 2017) ; 1.2 TCP/INT/3501 (Infectious myonecrosis virus IMNV): 6 countries in Asia (China, Indonesia and Thailand) (ending in November 2017); (ii) National TCP: TCP/MAL/3501: Strengthening Aquaculture Biosecurity Capacity of Malaysia's Department of Fisheries (ending in November 2016); (iii) TCP facility (TCP/PLW/3601/C1: Strengthening Biosecurity Capacity of Palau (start January 2017-December 2017; TCP facility for /Federated States of Micronesia: Development of a National Strategy on Aquatic Animal Health (under development January 2017-December 2017). Donor-funded projects include: (i) EU on Aquaculture Certification; (ii) USAID on Antimicrobial Resistance (c/o of FAORAP); and (iii) JICA for preparation Fiji National Aquatic Biosecurity and Aquatic Animal Health Strategy.

FAO provides technical assistance based on member governments' request. There has been an increased demand for technical support on aquatic animal health and biosecurity during the last decade – a clear indication of greater recognition by both public and private sectors on the importance of aquatic animal health and biosecurity as an essential element of sustainable aquaculture. FAO's technical assistance has a strong capacity building component as well as long-term policy-related aspects. In most projects a self-assessment which represents a gap analysis. This is done through the FAO survey questionnaires on capacities and performance on aquatic animal health. Another important role of FAO is to provide a neutral platform for representatives of the sectors of the government, producers and academics to meet and discuss ongoing and emerging aquatic animal health and biosecurity issues, build consensus and work together to find a common solution to these problems.

DISCUSSION

- Guidelines on the use of SPF, SPR and SPT were developed at an expert workshop in May 2016. The guidelines are in process of being finalized. They will provide technical definitions and guidelines on how to reach SPF status in shrimp stocks.
- On the publication of Responsible Management of Bacterial Diseases in Aquaculture, this is a pre-requisite to FAO's future work on AMR in aquaculture and will provide a reference to antimicrobial usage in aquaculture. A writeshop will be held in December, Italy.
- Project "Strengthening capacities, policies and national action plans on prudent and responsible use of antimicrobials in fisheries". The project will document antimicrobial use, provide modules on good aquaculture and biosecurity practices for selected species and prudent use of antimicrobials for farmers

developed and pilot tested. Two regional workshops and four national workshops will be conducted and aquaculture component of national action plans on AMR will be drafted. Extension materials and other publications will be developed for stakeholders. A fish product safety and quality component will focus on Bangladesh, Philippines, Thailand and Vietnam. Existing laboratories for antimicrobials detection will be upgraded and inspection systems revised to cover antimicrobials in sampling.

RECOMMENDATION

- AG recommended that FAO HQ-supported AMR project to work closely with the FAO RAP project in support of AMR activities in the region.
- AG noted that FAO's past support to aquatic animal health had been very beneficial and had had a large impact on aquaculture production, trade and livelihoods in the region. AG requested FAO to increase support to the region with regards to aquatic animal health activities.
- The AG suggested that Asian governments consider working together to raise the profile of biosecurity in ASEAN as a priority area to be highlighted at FAO COFI sub-committee meetings. [to be coordinated by NACA].

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 review for AGM14, levels of disease 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 still been confined to Thailand. There has not been any news of spread of a new, lethal variant (YHV-8) that was reported from China and covered in the AGM14 report, and it is still recommended that a disease card for this, together with a specific detection method be posted at the NACA website. A disease card for covert mortality nodavirus (CMNV), also from China [Zhang et al. 2014. J Gen Virol. 95, 2700-2709.] has been submitted to NACA but should be improved before publication. So far, negative impacts from CMNV have not been reported from other countries, although it has been detected by PCR in Thailand (Thitamadee *et al*. 2016. Aquaculture. 452, 69-87).

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. 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, this has been reported only from Thailand (Panphut *et al.* 2011. 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 current top bacterial threat for shrimp in Asia is still acute hepatopancreatic necrosis disease (AHPND) that is caused by isolates of *Vibrio parahaemolyticus* (VP) that carry an AHPND plasmid (pAP) that encodes two Pir-like toxins ($Pir^{vp}A$ and $Pir^{vp}B$) (VP_{AHPND}) that can cause massive sloughing of shrimp hepatopancreatic tubule epithelial cells (the pathognomonic lesion of AHPND). AHPND is now a listed crustacean disease of OIE. There is still some confusion caused by the persistent use of the term early mortality syndrome (EMS) as if equivalent to AHPND. This should be discouraged since early mortality in shrimp arises from several different causes, some of which are still unknown. In

addition, the description of AHPND should be modified to include description of isolates of other *Vibrio* species such as *V. harveyi* that carry pAP and produce $Pir^{vp}A$ and $Pir^{vp}B$ toxins and cause AHPND (Kondo *et al*. 2015. Genome Announc. 3, e00978-00915). The pAP plasmid has also been shown to be present in many serotypes of VP in Thailand (Chonsin *et al.* 2015. FEMS Microbiol Lett, fnv222; Kongrueng et al. 2015. J Fish Dis. 38, 957-966), indicating its ability to spread in the VP population and suggesting that spread to other species of *Vibrio* or other genera of gram negative bacteria should be investigated. Also included should be the description of isolates of VP that carry mutated pAP that do not produce $Pir^{vp}A$ and $Pir^{vp}B$ toxins but still cause 50% shrimp mortality (unpublished). These do not cause pathognomonic AHPND lesions, but instead collapsed HP tubule epithelia, a non-specific pathology that makes diagnosis by histopathology uncertain. The mechanism of shrimp death resulting from such mutant isolates should be further investigated, particularly with respect to additional toxins that may cause shrimp mortality on their own or potentiate the virulence of the $Pir^{vp}A$ and $Pir^{vp}B$ toxins (Sirikharin *et al*. 2015. PLoS ONE. 10, e0126987).

Production of farmed shrimp in Thailand has rebounded from a low of 180,000 metric tons in 2014 to a prediction of approximately 300,000 metric tons in 2016. This has been aided by knowledge of about AHPND, by use of PCR methods for VP_{AHPND} detection to eliminate contaminated broodstock and post larvae (PL) and by changes in pond management to reduce the overall quantity of organic matter in shrimp rearing pond water and sediments. In some cases, farmers use co-culture with *Tilapia* to reduce the risk of AHPND. An observational case–control epidemiological study of risk factors associated with EMS in Thailand has recently been published (Boonyawiwat *et al*. 2016. J Fish Dis. Online). Identified risk factors were use of chlorine treatment and reservoirs, presence of predator fish in water preparation, use of multiple shrimp species in one farm, increased PL stocking density and source of PL. Protective factors identified were delayed first day of feeding, polyculture with non-shrimp species and water ageing.

Another recent discovery has been the synergistic, potentiating effect of partner bacteria on the virulence of AHPND bacteria (unpublished). Two isolates from AHPND outbreak shrimp ponds have been identified, one from the genus *Roseateles* (Berkholderiales, Comamonadaceae) and the other from the genus *Shewanella* (Alteromonadales, Shewanellaceae). The presence or absence of such isolates in test shrimp may cause unexpected ehnancement of virulence for VP_{AHPND} isolates in bioassays. Further work is needed on the range of bacterial species that might act as VP_{AHPND} partners and on the mechanism by which they potentiate VP_{AHPND} virulence.

The other major emerging disease in Asia is hepatopancreatic microsporidiosis (HPM) caused by *Enterocytozoon hepatopenaei* (EHP). Although some progress on this disease has occurred since AGM14, it has been slower than desired and losses due to it continue to increase. We know that SPF stocks of both *P. monodon* and *P. vannamei* can be infected with EHP via live feeds in hatcheries and that the pathogen can then be passed on to their PL that can subsequently lead to losses as a result of retarded growth if they are stocked in rearing ponds. As a result, we recommend that any living feeds be at least treated at -20 Celcius for 48 h before use with broodstock (Leiro *et al*. 2012. Int J Food Microbiol. 156: 152-160). We also recommend that PL be screened for EHP before stocking and that they be rejected if positive. PCR tools and pond management protocols are available to reduce transmission and are listed at the NACA website. No effective therapeutic methods are currently known. To screen HP samples from PL and broodstock, PCR methods based on the SSU rRNA gene of EHP are suitable (1-step PCR (Tourtip *et al*. 2009. J Invertebr Pathol 102, 21-29; Tangprasittipap *et al.* 2013. BMC Vet Res. 9, 139; Suebsing *et al*. 2013. J Appl Microbiol. 114 1254-1263; Tang *et al.* 2015. J Invertebr Pathol. 130, 37–41; Liu *et al*. 2016. Progress in Fishery Sciences. 37, 119-126). However, to avoid cross reactions with other closely related microsporidians that do not infect *P. monodon* and *P. vannamei* but may be present in environmental carriers or environmental samples, we recommend instead a new, more specific, nested PCR method based on the spore-wall protein of EHP (Jaroenlak *et al.* 2016. www,enaca.org; Jaroenlak, *et al.* 2016. PloS one. 11, e0166320).

It has been shown the growth retardation due to HPM does not occur with infections at the level of 1000 copies per ng DNA or less as determined by real-time PCR using DNA extracted from shrimp HP tissue as the template (Liu *et al*. 2016. Prog Fish Sci. 37, 119-126). As copy numbers increase above this level the degree of retardation increases with EHP copy number and copy numbers above 10^7 per ng DNA may result in slow cumulative mortality. As a result of this information, levels of EHP infection in the HP are sometimes estimated based on the number of HP cells that produce

spores. However, our experience has shown that this procedure can be very misleading because specimens examined using *in situ* hybridization often show a very high proportion of infected cells that do not produce spores. In addition, the distribution of infected cells in the HP is very uneven, such that samples taken from different parts of the HP would give very different results with respect to severity of infection. Thus, we recommend that estimates of EHP severity be determined by homogenization of the whole HP followed by removal of a sub-sample for DNA extraction and qPCR targeting using either the SSU rRNA gene or the spore-wall protein gene.

Another issue related to HPM is that it is occasionally but not usually associated with white feces syndrome (WFS) (Ha *et al.* 2010. Agr Rural Devel Sci Tech 12, 45-50; Tang *et al*. 2016. J Invertebr Pathol 140: 1-7). A study of 196 shrimp ponds selected before stocking from 4 provinces in Thailand showed a prevalence of 61% for EHP as determined by PCR. However, no cases of WFS were reported over the duration of the study (unpublished). In addition, an earlier study found no correlation between EHP infection and WFS (Tangprasittipap et al. 2013. BMC Veterinary Research. 9, 139). The results suggest that some other factor must be involved (e.g., a bacterial pathogen?) in cases of WFS associated with EHP infections.

Many questions still remain answered about HPM and EHP. Are there life stages in other host species? These may be identified by PCR screening using the spore-wall protein method combined with microscopy and *in situ* hybridization. What are the modes of transmission in shrimp? These may be determined by feeding tests (Tangprasittipap *et al*. 2013. BMC Veterinary Research. 9, 139), co-habitation tests (Salachin *et al.* 2017. BMC Vet Res. In press; Tang *et al.* 2016. J Invertebr Pathol. 140, 1-7), or bath exposures using purified spores. Do other cell or spore types exist for internal reinfection and external transmission (Vávra, J., Lukeš, J., 2013. Adv Parasitol. 82, 253-319)? How can the spores be inactivated? This may be determined using viability assays and/or an infection model or by using the polar tube extrusion method with phloxine B. This can be carried out by preparing a squash mount of treated or untreated infected HP tissue or purified spores in a drop of 1.5% phloxine B in distilled water on a microscope slide followed by monitoring for polar tube (polar filament) extrusion. Inactivated spores will not extrude polar filaments. Is therapeutic treatment possible? This may be determined using tests with naturally infected shrimp or using one of the infection models described above. An urgent research need is the identification of infected carriers, since this should help in developing more effective biosecurity methods for shrimp hatcheries and ponds.

Another pathogen of recent interest is *Spiroplasma eriocheiris* origninally described as the cause of tremor disease in the Chinese mitten crab *Eriocheir sinensis* (Wang & Gu. 2002. Dis Aquat Org. 48:149-153; Wang *et al*. 2002. J Invertebr Pathol. 81: 202-204). It was later found in China to also infect the exotic crayfish *Procambarus clarkii*, the giant river prawn *Machrobrachium rosenbergii*, the oriental river prawn *Machrobrachium nipponensis* and the whiteleg shrimp *Penaeus vannamei* (Wang *et al*. 2011. Int J Syst Evol Microbiol. 61:703-708). Its wide host range and occurrence in both marine and freshwater crustaceans is alarming. The histological lesions in the HP of *P. clarkii* (Ding *et al*. 2013. Aquaculture. 380, 106-113; Ding *et al*. 2015. J Fish Dis. 38, 787-794) and in *M. rosenbergii* (unpublished) are distinctive and should be widely circulated to crustacean pathologists so they can be on guard against the spread of this pathogen. The published PCR detection methods (Wang *et al*. 2005. FEMS Microbiol Lett. 249: 131-137; Ding *et al*. 2007. Aquaculture. 265, 49-54) will also be helpful in screening specimens and confirming histological diagnoses.

There are also 3 other new crustacean pathogens that have been reported from China and should be put on the lookout list for shrimp pathologists even though they have been reported from other crustacean species. Their reports are all accompanied by detection methods using PCR techniques. These are 1) Macrobrachium rosenbergii Taihu virus (MrTV) (Pan *et al.* 2016. Int J Mol Sci. 17, 204) in the Family Dicistroviridae together with Taura syndrome virus; 2) a new Macrobrachium nipponense reovirus (MnRV) (Zhang *et al*. 2016. J Fish Dis. 39, 371-375); and 3) a new iridovirus of exotic redclaw crayfish (*Cherax quadricarinatus*) (CQIV) (Xu *et al*. 2016. Dis Aquat Org. 120, 17-26). The latter has been tested in laboratory challenges with the American *Procambarus clarkii* and with the whiteleg shrimp *Penaeus vannamei* in both of which it also causes high mortality. CQIV should be of particular concern for shrimp farmers since it has been shown to cause high mortality in *P. vannamei* in laboratory tests. Unfortunately, no information has been published regarding the histological lesions caused by CQIV, only that transmission electron microscopy (TEM) revealed iridovirus particles in the cytoplasm of cells in hematopoietic and gill tissue.

DISCUSSION

- The OIE definition of AHPND is sufficient but it only covers *Vibrio parahaemolyticus*;
- There are now evidences that other *Vibrio* species and possibly other genera can carry the toxin-producing plasmid originally found in AHPND *V. parahaemolyticus*. There is also evidence that other bacterial species become significantly more virulent in the presence of the toxin-producing *V. parahameolyticus*, indicating some sort of synergistic effect on infected shrimps.
- On VCMD, the disease card still lacks relevant information to show the clear effects of the virus to the affected tissues of shrimps. The published paper does not proceed to demonstrate a link between the pathogen and the lesions. Histological sections should be supported by clear in-situ hybridization, in order to establish that the virus is associated with the abnormalities observed in the affected tissues. Although the pathogen has been identified, the overall aetiology of the disease is not yet complete (e.g data on mortality, transmission studies) and probably doesn't meet OIE listing criteria at present.
- For emerging diseases, NACA usually releases disease advisories when an issue of concern arises as early warning system.

RECOMMENDATIONS

- AG recommended that the VCMD disease card be further improved prior to its publication; Dr. Leaño to coordinate with the Chinese team.
- AG recommended that NACA to prepare disease advisories on VCMD and other potentially important emerging diseases not only for shrimps but for other cultured species as well. These should include MrNV, MrTHV, *Cherax* iridovirus, Spiroplasma.

3.2. UPDATES ON FINFISH DISEASES IN ASIA

Dr. Diana Chee presented current disease concerns for finfishes in the region. There continue to be reports of traditional production diseases such as Viral nervous necrosis (VNN) and Red sea bream iridoviral disease (RSIVD) in 2016. Infections with Ranaviruses, which were fittingly described by Chinchar & Waltzek (2014) as being 'promiscuous pathogens of cold-blooded vertebrates', may exist in the background with the last report of Epizootic haematopoietic necrosis (EHN) from Australia (2012), and Grouper Iridoviral disease reported by Chinese Taipei (2016), and Singapore (2014). This may be under reported should no active surveillance exist for the virus.

Investigation of reports of lower production in tilapia fry or fingerlings is warranted for early detection and control of the spread of Tilapia lake iridovirus (TiLV). The virus has been reported in Latin-America. With our region's similar climate and live finfish movement for farming and food consumption, there is a high likelihood of the establishment of this novel virus in our region.

The Group B streptococcus (GBS) outbreak in Singapore showed that a common or known threat could behave in a novel manner. Although *Streptococcus agalactiae* is a known disease agent of freshwater fish such as tilapia, and the epidemiological link between human and fish Group B *Streptococcus* Serotype III Sequence Type 283 isolates has been postulated from as early as 2008[1,2]. The infection of humans via the consumption of raw fish caught the medical profession by surprise. Investigations showed that the contamination of the fish could have occurred along the food supply chain.

The GBS episode also highlights the important role of One Health. It was the existing One Health framework which allowed human health, veterinary and environmental health agencies in Singapore to communicate, investigate and

[1] Naraid Suanyuk, Fanrong Kong, Danny Ko, Gwendolyn L. Gilbert, Kidchakan Supamattaya. Occurrence of rare genotypes of *Streptococcus agalactiae* in cultured red tilapia *Oreochromis* sp. and Nile tilapia *O. niloticus* in Thailand—Relationship to human isolates? Aquaculture, 2008 Volume 284, Issue 1, Pages 35-40. http://www.sciencedirect.com/science/article/pii/S0044848608005139

[2] Christian MJ Delannoy, Margaret Crumlish, Michael C Fontaine, Jolinda Pollock, Geoff Foster, Mark P Dagleish, James F Turnbull, Ruth N Zadoks BMC Microbiol. 2013; 13: 41. Published online 2013 Feb 18. doi: 10.1186/1471-2180-13-41

establish that the pathogen was present in the raw fish. The resulting ban on the sale of the raw snakehead and Asian carp dish helped prevent further human infections, and deaths.

DISCUSSION

- Aquaculture needs to play a bigger role in One Health approach, this is in relation with the case of *Streptococcus* infection in humans due to consumption of raw freshwater fish (case in Singapore).
- Climate change and global warming, mass fish mortalities observed in some countries of the region might be the result of plankton bloom, especially at elevated temperature. In Vietnam as example, the effect of El Nino resulted in several outbreaks of diseases among aquacultured species due to increase in water temperature and salinity.
- On GIV in Chinese Taipei, it is mostly observed in grow out culture in ponds, with recorded mortalities of 30-60 %. Infected groupers are usually with co-infected with other pathogens like *Vibrio* spp.
- The Megalocytivirus infection in tilapia is similar to TILV.
- It was observed that after 2008, when tilapia aquaculture was fully developed, many diseases have been reported especially in the grow-out culture. The reason behind this should be explored and studied.
- The VNN infection in tilapia was reported way back in 2009 in the US. In the Philippines, there was also recorded occurrence of the disease in the hatchery.
- For summer mortality of tilapia in Egypt, the causative agent is not yet identified. But since the country is one of the top producers of tilapia, and considering its proximity to Israel which is presently affected by TILV, the risk is very high that the same pathogen is causing the mass mortality.
- Nile tilapia mortalities in Africa was also reported.

RECOMMENDATIONS

- AG recommended to raise awareness on the following diseases of freshwater animals: TILV, VNN, *Streptococcus*, megalocytivirus, carp edema virus.
- There is a need to understand the food supply chain for finfish and aquaculture species.
- AG recommended to closely watch emerging diseases and unexplained mortalities in finfishes, both cultured and from the wild.
- AG recommended that PCR should be used to detect *Streptococcus spp.* (including) *agalactiae* in susceptible finfish species.

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 2014, using data extracted from the FAO FishStatJ database and for which the last full statistics are available, the global production of molluscs stood at 16.16 million metric tons of which Asia produced 14.99 million tons (*i.e.* 92.73%). The long term annual growth of the industry (2000-2014) was *ca.* 3.78% for world production, while that for Asia was higher at 4.08% p.a. (3.96% for global production in 2014 compared to 3.94% for Asian production in the same year). Growth, however, has not been a smooth incremental rise but since 2000 has fluctuated up and down, including a -0.2% drop in global production in 2008 during a period when there were notable drops in the production of Pacific cupped oysters in China and Korea, sea snails and scallops in China, Japanese carpet shells in Italy, and Korean mussels. Currently, 35 of the 46 categories of mollusc that have been cultured on a commercial scale in Asia are in operation and provide production statistics for the FAO FishStatJ database. By comparison, 69 out of a total of 92 categories of mollusc are still cultured globally. When the long term trend (1950-2014) that maps the first appearance of new molluscan species for commercial production is examined, then an average 1.23 new species for aquaculture production are assessed each year.

In Asia, there are 20 mollusc producing states (see Table 1) which, not surprisingly, is dominated by China, followed by Japan, Republic of Korea, Thailand and Vietnam. From Table 1, however, the change in the relative rank position of blood cockles (*Anadara granosa*) and green mussels (*Perna viridis*) from the previous year asked the question of

whether: 1) the production economics of these species had changed and were becoming less favourable as a species to culture and so have declined naturally?; 2) had been impacted on by disease events?; or, 3) had merely been overtaken by the production of other species? In both Malaysia and Thailand, there have been reports regarding the mass mortality of blood cockles (Anon, 2014; Yurimoto *et al*., 2014; Pahri *et al*., 2016); losses in Surat Thani, Thailand in 2014, for example, were estimated at between US$ 11.2 and 14.0 million. The mortality events in Malaysia have been attributed to low food availability and to water pollution, while the underlying cause of the mortality within Samut Sakhon Province, Thailand is still under investigation and remains to be determined.

Looking at Thai mollusc production (all species) and the data provided by FAO FishStatJ and the Thai Department of Statistics, then the total number of operating mollusc farms has risen by 3.9% (incl. a 6% rise in the number of blood cockle farms, an 8.7% increase in the number of green mussel farms, but a 0.5% decrease in the number of oyster farms). The total area used for the culture of molluscs has increased by 5.2% (incl. 6.5% for blood cockles; 4.1% for green mussels; 6.1% for oysters), however, the average year-on-year change in production over the past five years has fallen by 7.0% p.a. (incl. -2.5% for blood cockles; -7.4% for green mussels; -1.3% for oysters). When Thai mollusc production as tons ha^{-1} over the past 5 years is considered, then blood cockle production has dropped by 50%, green mussels by *ca.* 66%, and oysters appear to fluctuate year to year (*ca.* ±7.5%). When the production of green mussels is considered elsewhere in Asia, then the output in Indonesia, Malaysia and the Philippines has also dropped markedly in recent years. Likewise, blood cockle production in Malaysia and South Korea has fallen. The basis for these changes in production and mortality events are largely unknown and require further investigation. Factors such as stocking densities, source and genetics of the spat (some of which is being brought in from Malaysia), siltation events *etc*, need to be investigated alongside mollusc health, water quality and environment assessments.

Table 2 provides a summary of significant molluscan and amphibian diseases throughout Asia. In the past year, Pacific Oyster Mortality Syndrome (POMS) which is an infection with ostreid herpesvirus-1 microvariant (OsHV-1 µvar) - a disease affecting pacific oysters, *Crassostrea gigas*, has continued to cause problems throughout Tasmania resulting in the death of millions of oysters and impacts to the supply of spat. POMS has been detected in six Tasmanian commercial growing regions and has now been confirmed in a population of wild oysters in the Derwent estuary. It is estimated that that POMS outbreak to date has resulted in losses exceeding $5.5 million and resulted in 40 jobs being lost.

In 2012 and 2013, mass mortalities of blood ark shell (*Scapharca* [*Anadara*] *broughtonii*), broodstock were reported in several hatcheries on the coast of northern China. qPCR and nested PCR using primers specific for ostreid herpesvirus 1 (OsHV-1) indicated significant higher prevalence of OsHV-1 DNA in cases associated with mass mortalities (p=0.0012 for qPCR, p<0.0001 for nPCR (Bai *et al*., 2016).

Other notable mortality events include the report of a mass mortality of oysters in Quảng Ninh province in Vietnam where 50-60% of the oysters have died in farms covering almost 200 hectares (Anon, 2016). Infections with *Perkinsus* and *Vibrio* bacterium were attributed as the cause. The young oysters, however, were not tested before being transferred.

Bonamia ostreae is reported in New Zealand for first time. The haplosporidian parasite *B. ostreae* has been largely restricted to the northern hemisphere including Europe, eastern and western North America. Histology of 149 adult oysters (*Ostrea chilensis*) from the Marlborough Sounds, New Zealand found *Bonamia* micro-cells, for the first time, in 119 (79.9%). *Bonamia* generic PCR and DNA sequencing produced 100% matches with *B. ostreae* but specific primers found 2.7% *B. exitiosa*, 40.3% *B. ostreae* and 53.7% with concurrent infections; an overall *Bonamia* prevalence of 96.6% (Lane *et al*., 2016). *Bonamia* parasites are also reported to have devastated native Australian Angasi oysters in Port Philip Bay (Best, 2016).

Batrachochytrium dendrobatidis (*Bd*) or chytrid fungus remains a pathogen of global significance that is decimating amphibian populations (Crawford *et al*., 2010). Recently, however, it has been shown that crayfish (*Procambarus* spp.) are hosts of this pathogen and can transmit *Bd* to amphibians. A survey of *Bd* in farmed and natural crayfish in

Louisiana, USA found a low prevalence and infection intensity in both farmed and native populations the prevalence of which varied seasonally (Brannelly *et al*., 2015). As crayfish are traded globally, there is concern that they may facilitate the spread of *Bd* infection to other commercially important stocks of crustacean. Infection of giant freshwater prawns, *Macrobrachium rosenbergii*, has already been demonstrated. A survey of 15 *M. rosenbergii* farms in South India between 2007-2011 indicated that *Bd* was responsible for major pandemics in culture ponds (Paulraj *et al.,* 2016). Certain studies suggest that *Bd* has been present for a long time in certain territories, *e.g.* in Brazil for at least 120-1,000 years, in Japan since 1902, South Korea since at least 1911, and in China since 1933. Elsewhere, *Bd* has been introduced and is now reported from across Asia (see Table 2). In China, *Bd* has recently been recorded from the south and central regions, but areas in the north remain poorly surveyed. In a study conducted by Zhu *et al.* (2016), *Bd* was not detected in wild amphibians from the provinces of north-eastern China (>700 individuals tested), but worryingly was found to be widely present (15.1%, 21 of 139) in amphibians traded in this region. This study raises the need for strict biosecurity measures at the national and regional level to reduce the possibility of further spread or inadvertent introduction of *Bd* into new territories. In addition to *Bd*, screening programmes for *Batrachochytrium salamandrivorans* (*Bs*), an emerging fungal pathogen of salamanders, are also in place. A recent study conducted by Ip *et al.* (2016) who examined eleven dead Chinese firebelly newts (*Cynops orientalis*) in a shipment from Hong Kong that had entered the US, fortunately did not find *Bs* but they were able to culture a virus from the internal organs of seven individuals and from two pools of tissues from a further four dead newts. The viral isolates indicated 100% identity (based on a glycoprotein gene) with spring viraemia of carp virus (SVCV) – an OIE listed pathogen. This finding suggests a novel route not previously recorded in amphibians.

DISCUSSION

- Some of the recent mortalities in blood cockles in Thailand had been caused by heavy rain and freshwater runoff. However, parasites had been observed in some samples although their possible role in mortalities was not known.
- Concern that chytrid fungus and Ranavirus seems to be able to affect other groups of animals such as crayfish and finfish. Possibility of the organism changing as it jumps to new hosts?
- In the Philippines, harvesting ban is the main factor in the reduction of mollusc harvests some years, as the government may ban harvesting for a period when there are blooms of red tides.
- Possible meeting on Ranavirus in 2019.

RECOMMENDATIONS

- AG recommended to raise awareness on Infection with *Batrachochytrium dendrobatidis*.
- AG recommended to try and improve coordination between wildlife authorities and health authorities for amphibians.
- AG recommended to investigate the impact of amphibian health issues on subsistence farmers in the region, eg. China, Thailand, Cambodia, Lao PDR, Vietnam, Indonesia and Myanmar.

Table 1. Asian mollusc production ranked by country and by the volume (tons) of each species produced by aquaculture. Data is drawn from FAO FishStatJ.

Country	tons	%	Mollusc product ranked	Tons	%	Mollusc product ranked	Tons	%
China PR	13,418,694	89.54	Cupped oysters	4,370,661	29.16	Slipper cupped oyster	22,355	0.15
Japan	376,820	2.514	Japanese carpet shell	3,974,351	26.52	Pen shells nei	17,618	0.12
Korea RO	359,292	2.398	Scallops nei	1,649,399	11.01	Flat and cupped oysters nei	11,403	0.08
Thailand K	209,567	1.398	Marine molluscs nei	1,134,412	7.57	Indian backwater oyster	4,700	0.03
Vietnam SR	198,881	1.327	Sea mussels nei	805,583	5.38	Australian mussel	3,237	0.02
New Zealand	99,034	0.661	Constricted tagelus	786,828	5.25	Inflated ark	2,921	0.02
Taiwan PC	99,015	0.661	Pacific cupped oysters	494,139	3.30	Freshwater mussel shells	1,979	0.01
Korea DPR	60,200	0.402	Blood cockles	461,446	3.08	Blacklip pearl oyster	1,970	0.01
Indonesia R	44,394	0.296	Sea snails	232,849	1.55	Clams etc	400	<0.01
Malaysia	42,649	0.285	Yesso scallops	193,456	1.29	Oriental cyclina	99	<0.01
Philippines R	41,117	0.274	Green mussels	159,474	1.06	Diphos sanguin	94	<0.01
Australia C	15,499	0.103	Abalones	125,533	0.84	Pearl oyster shells nei	38	<0.01
India R	14,200	0.095	Chinese mystery snail	110,393	0.74	Elongate giant clam	3	<0.01
Cambodia K	3,600	0.024	New Zealand mussel	97,438	0.65	Smooth giant clam	3	<0.01
French Polynesia OCFR	1,985	0.013	Swan mussel	92,459	0.62	Fluted giant clam	1	<0.01
Hong Kong SAR	641	0.004	Japanese hard clam	60,092	0.40	Bear paw clam	0.26	<0.01
Singapore R	469	0.003	Korean mussel	51,463	0.34			
New Caledonia	20	<0.001	Penguin wing oyster	44,394	0.30			
Palau R	7	<0.001	Asian clam	37,665	0.25			
Tonga	<1	<0.001	Freshwater molluscs nei	37,227	0.25			

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Table 2. The table summarises the last known report of each significant molluscan and amphibian disease in Asia. No data is recorded for the following Asian territories: Bhutan K.; Cook Islands; Fiji R.; Guam T., Indonesia R.; Kiribati R.; Korea PDR; Laos PDR; Marshall Islands R.; Micronesia FS; Nepal FDR; Northern Mariana Islands C.; Pakistan IR; Palau R.; Papua New Guinea IS; Philippines R.; Samoa IS; Samoa American T.; Solomon Islands; Sri Lanka DSR; Tuvalu; Vanuatu R.; Wallis and Futuna Islands T. Data is drawn from a variety of resources including NACA-OIE-FAO (2015-2016), the International Database on Aquatic Animal Diseases (Cefas, 2016), and white and grey literature.

Abbreviations: [a]From Tan *et al.* (2015) reporting that *Crassostrea gigas* imported from France and New Zealand into French Polynesia tested positive for OsHV-1; Abalone herpesvirus (**AH**); Acute viral necrosis – scallops (**AVNS**); *Batrachochytrium dendrobatidis* (**BD**); *Bonamia exitiosa* (BE); *Bonamia ostreae* (**BO**); Bonamiosis (**BON**); *Haplosporidium nelsoni* (**HN**); *Marteilia* (**MAR**); *Marteilioides* (**MART**); Marteilioides *chungmuensis* (**MC**); *Marteilia*-like organisms (**MLO**); *Mikrocytos mackini* (**MM**); Ostreid herpes virus-1 (**OHV1**); *Perkinsus marinus* (PM); *Perkinsus olseni* (**PO**); Rickettsia-like organisms (**RLO**); Ranavirus (**RV**); Xenohaliotis californiensis (**XC**).

	Mollusc disease								
	AH	**AVNS**	**BD**	**BE**	**BO**	**BON**	**HN**	**MAR**	**MART**
Australia C	2012		2013	2016					2005
Bangladesh PR			2013						
Cambodia K.			2012						
China PR	2012		2016		2013		2012		
French Polynesia OCFR									
Hong Kong SAR-PRC			2014						
India R			2013						
Japan			2016				2006		
Korea RO			2013				2006	2002	2014
Malaysia			2011						
Myanmar RU	2009								
New Zealand			2013	2016	2016	2005			
Singapore R			2016						
Taipei ROC	2012								
Taiwan ROC	2005								
Thailand K			2012						
Vietnam SR									

	MC	**MLO**	**MM**	**OHV1**	**PM**	**PO**	**RLO**	**RV**	**XC**
Australia C			2006	2016		2016		2012	
Bangladesh PR								2008	
China PR		2012		2013		2006	2012	2011	
French Polynesia OCFR				2015[a]	2013?	2013			
Hong Kong SAR-PRC								2014	
India R						2016			
Japan	2014					2012		2013	2015
Korea RO	2012			2015	2013	2010			
Malaysia								2013	
Myanmar RU									
New Zealand				2014		2015			
Singapore R									
Taipei ROC								2014	
Taiwan ROC									
Thailand K								2012	
Vietnam SR						2013			

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 2015-2016. Under the thematic program 'Healthy and Wholesome Aquaculture', the Fish Health Section (FHS) of the Aquaculture Department, Southeast Asian Fisheries Development Center (SEAFDEC AQD) implemented a total of 12 in-house and externally funded studies in 2016. These studies were conducted to: (1) investigate the efficacy of probiotics and rationalize the need and application of diagnostics that will ensure biosecurity within culture systems and keep out exotic pathogens, especially trans-boundary pathogens; (2) promote the wider use of conventional diagnostic as well as new methods especially for newly reported, emerging diseases; (3) 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; and, (4) 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 address objective 1, studies delving on the application and mode of action of probiotic *Bacillus* species in the larviculture of *Penaeus* spp., effects of poly-ß-hydroxybutyrate-accumulating Bacillus species on the water quality and thermal stress response of *Penaeus monodon* postlarvae during culture, establishment of sanitary quality of oysters (*Crassostrea iredalei*) and their culture environments, epidemiology of the acute hepatopancreatic necrosis disease (AHPND) in *P. monodon*, and use of commercial probiotics (PRO W, PRO 2) and disinfectant (PUR) to control AHPND and luminescent vibriosis in *P. vannamei* were conducted. Additionally, studies involving the establishment of a Philippine shrimp pathogen bio-bank and online biosurveillance information resource, development of shrimp pathogen diagnostic tools using nested PCR and lateral flow strip biosensors coupled with a mobile phone applciation and cloud-based information management, prevention and mitigation of diseases in cultured mudcrab, and development and acceleration of rapid and effective fish and shrimp health management were likewise carried out to realize objective 2. In consonance with objective 3, studies involving novel strategies to reduce disease incidence in mud crab hatchery and grow-out, application of adjuvants, carriers and RNAi technology to enhance the antiviral immune response of shrimp to WSSV, enhancement of vaccine efficacy for the prevention of viral nervous necrosis in high value marine fish, and establishment of protective measures against persistent and emerging parasitic diseases of tropical fish were likewise undertaken. Finally, to properly guide the Fish Health Laboratory (FHL) staff of the department of fisheries (DOF) on the accurate laboratory diagnosis of bacterial and parasitic diseases of freshwater fish species, an on-site training course on Health management of bacterial and parasitic diseases of freshwater fish species was conducted at the Aquatic Animal Health Disease Controlling Section, DOF, Tharketa, Yangon, Myanmar from 18 to 22 January 2016. Eleven fish health officers participated in the lectures and hands-on exercises. Lectures focused on the major bacterial and parasitic diseases currently affecting cultured freshwater fishes in Myanmar. In addition, hands-on exercises including fish necropsy, quantitative determination and identification of parasite load in the gills and skin of fish, respectively, were conducted. Together with the fish health staff of the DOF, parasitological examination of carps and tilapias reared in some floating net cages in Inle Lake was also done. Because bacterial infections among freshwater fish species cultured in earthen ponds and reservoir in Myanmar were particularly identified as a serious problem, fish health personnel of the DOF should be adept in carrying out correct diagnosis of diseased fish samples submitted to the DOF's FHL through adherence to correct bacteriological techniques including asepsis, biochemical characterization tests, *in vitro* drug sensitivity test, and infection bioassay among others. Thus to realize this goal, a follow up On-Site Training Course on Fish Health Management: Basic Bacteriological Techniques was also conducted from 7 to 11 November 2016 at the Aquatic Animal Health Disease Controlling Section of the DOF. A total of 20 participants, i.e. 15 and 5 from the DOF and academe (Yangon University), respectively, attended the training and workshop. Lectures focused on Principles of Sustainable Freshwater Fish Aquaculture and Disease Development in Aquaculture; Major Bacterial Diseases of Freshwater Fishes while hands-on exercises included bacterial isolation, purification and characterization, and infection bioassay. These aforetasted activities focusing on technology extension and demonstration aimed to address objective 4.

From the 1st to 4th quarter of 2016, AQD'S Fish Health Section's diagnostic cases include detection of shrimp viruses (WSSV: 67 positive/ 399 total number of specimens/cases examined (16.8%); IHHNV: 24/347 (6.9%); IMNV: 0/13; TSV: 0/13; YHV: 0/14; and AHPND: 101/189 (53.4%) and fish viruses (NNV: 1/30 (3.3%); and RSIV: 0/5.

During the 2012 and 2013 meetings of the SEAFDEC Program Committee, member country representatives conveyed concern regarding the outbreaks of EMS/AHPND and other transboundary diseases in the region and recognized the need for concerted regional effort to address this. In response, the SEAFDEC Council, during its meeting in April 2014, suggested that aquatic animal health management, particularly the control and prevention of transboundary aquatic animal diseases, be included in the formulation of future programs of SEAFDEC and its partners in the region. Acknowledging the pressing need for sustained regional efforts to address disease problems in farmed aquatic animals, particularly on shrimps, SEAFDEC AQD and the Department of Agriculture's Bureau of Fisheries and Aquatic Resources of the Philippines, with the financial support from the Japan-ASEAN Integration Fund, convened the Regional Technical Consultation on EMS/APHND and other Transboundary Diseases for Improved Aquatic Animal Health in Southeast Asia from 22 to 24 February 2016 in Makati City, Philippines. Over 60 delegates representing the technical experts, the ASEAN Member States and Japan, regional and international organizations and private sector attended the Consultation. The participants assessed the current status of EMS/AHPND and other emerging diseases in farmed shrimps in ASEAN Member States, identified gaps, priority areas for research and development collaboration and formulated regional policy recommendations which are outlined in Table 3. To efficiently disseminate the outputs of the ASEAN Regional Technical Consultation on EMS/AHPND and Other Transboundary Diseases for Improved Aquatic Animal Health in Southeast Asia, apart from the printed/hard copies, the proceedings of the meeting entitled "Addressing acute hepatopancreatic necrosis disease (AHPND) and other transboundary diseases for improved aquatic animal health in Southeast Asia. (2016). Pakingking, R. V., Jr., de Jesus-Ayson, E. G. T., & Acosta, B. O. (Eds.). Tigbauan, Iloilo, Philippines: Aquaculture Dept., Southeast Asian Fisheries Development Center. 109 p." has also been electronically published at the SEAFDEC AQD website (http://hdl.handle.net/10862/3096).

DISCUSSION

- Dealing with disease emergencies requires concerted efforts from countries and experts in the region. For KHV as example, when this emerging disease occurs, countries tend to contact FAO and NACA for assistance. This approach allows expert teams to be rapidly assembled in response to the emerging disease. However it requires strong collaborative arrangements to be in place, and for funding support to be available.
- Aquatic animal health initiatives are currently in decline in the region, it would be timely to try and reinvigorate collaborative arrangements. A meeting on among NACA, SEAFDEC and ANAAHC is planned which aims to develop a strategy on how to make ANAAHC active again and be recognized as important Aquatic Animal Health body in the ASEAN.
- OIE member countries have an obligation to report outbreaks of listed diseases within 24 hours once detected. Reporting is usually the responsibility of the Chief Veterinary Officer (OIE Delegate). However, the reporting from the aquatic animal sector is not working as well as the terrestrial livestock sector at present.
- In dealing with disease emergencies, early warning is really the first step in emergency preparedness, the second is early detection and third is early response. FAO has been doing some work on assessing the capacity of countries on emergency preparedness. A self-assessment scheme has been developed for countries to check their capability. Early warning, networking and knowledge of disease are critical for successful operation of the system.
- Some countries use the OIE guidelines to create trade barriers, for example taking very lengthy time to conduct risk analyses, or making decisions on market access that are not actually consistent with data from a risk analysis. Challenging such a decision can cost millions as the case must be passed to the World Trade Organisation.
- Some countries have the legislative obligations to require any individual that suspects or detects a notifiable disease to report it to the competent authority before any information is disseminated outside. This can cause delays or place constraints on the publication of such highly important findings.

Table 3. Regional policy recommendations formulated during the regional technical consultation on AHPND/EMS and other transboundary diseases

Issues/Gaps	Regional Policy Recommendations
Legislative and policy frameworks	• Develop National Strategy and Policy Frameworks • Member countries to harmonize legislation and regulations related to aquatic animal health management, particularly the legislation for transboundary movement of live aquatic animals
Strategy for prevention, control, and biosecurity	• Promote compliance with good aquaculture practices to maintain optimal environmental conditions during the culture period • Establish effective prevention system on EMS/AHPND and other diseases based on R&D results • Develop and implement the Guidelines on Health Management and Good Practices to prevent EMS/AHPND and other trans-boundary diseases • Strictly implement the reporting system to relevant authorities and/or Competent Authority at country, regional and international levels (Early warning system, Monitoring system, Information for the regular report, Annual report) • Develop emergency preparedness and contingency plans (should be the responsibility of Competent Authority) • Private and public sectors to ensure fund availability and consider this as joint endeavor
Rapid and reliable detection of EMS/AHPND	• Diagnostic methods: should follow the World Organization for Animal Health (OIE) guidelines • Develop tool kits • Ensure availability and capacity of laboratory services, either public or private
Research and development program at regional and national levels	• Use of live feeds for livestock (specifically polychaetes)– potential carriers of pathogen • Effects of inbreeding/genetic erosion on susceptibility to AHPND • Toxin plasmid transfer to other *Vibrio* species and possibly other bacterial pathogens • Vertical transmission, risk factors, mixed infection • Use of greenwater technology, probiotics, new disease prevention and control strategies
Cooperation among relevant stakeholders	• Strengthen cooperation arrangements among ASEAN Member States (AMS), international/regional organizations such as OIE, Food and Agriculture Organization of the United Nations (FAO), Network of Aquaculture Centres in Asia and Pacific (NACA), SEAFDEC and ASEAN Network of Aquatic Animal Health Centres (ANAAHC)
Capacity building program	• This should also include technology transfer from AMS to another AMS
Awareness building	• Enhance awareness of farmers and relevant stakeholders on R&D developments in transboundary diseases (especially on management and control)

- In some cases CVOs do not have experience with aquatic animals, or may not have an interest, seeing it as the responsibility for the fisheries sector.

RECOMMENDATIONS

- AG recommended bringing together terrestrial and livestock health authorities and CVO's in a common meeting to share experience on early warning, response and emergency management as a matter of urgency.
- AG recommended the follow up activities identified during the regional technical consultation on AHPND be used as a basis for developing proposals to be submitted to JAIF or other funding agencies in collaboration with ANAAHC.

4.2. ACTIVITIES OF AAHRDD ON AQUATIC ANIMAL HEALTH (2015-2016)

Dr. Thitiporn Laoprasert presented the on-going aquatic animal health programmes of Thailand under the newly established Aquatic Animal Health Research and Development Division (AAHRDD) of the Department of Fisheries (DOF). Recently, the DOF has announced a new National Act, Royal Ordinance Act B.E. 2558 (2015) in place of the Fisheries Act B.E. 2558 (2015). The Act is designed to protect and solve the country's problem on Illegal Unreported and Unregulated Fishing (IUU). This Act has also resulted in a significant re-organization of the DOF. Previously, the DOF had two main organizations involved in AAH management namely the IAAHRI (under the Inland Fisheries Research and Development Bureau) and the CAAHRI (under the Coastal Fisheries Research and Development Bureau). Since 1 October 2016 and in the course of the re-organization of the DOF, the IAAHRI was upgraded into a Division (Aquatic Animal Health Research and Development Division; AAHRDD) which is now directly under the Director General (DG), while CAAHRI became the Aquatic Animal Health Research Center under AAHRDD. The Division has the following responsibilities for both coastal and freshwater AAH management:

- approval of fish farm standards for the importation and exportation of live aquatic animals, which is conducted under the registration of aquaculture establishments for the exportation of live aquatic animals for culture purposes B.E. 2557 (A.D. 2014).
- undertake surveillance and monitoring programmes on OIE-listed diseases in wild and cultured populations of aquatic animals, following the procedure from OIE manual and the requirements from importing countries. So far, there are no critical findings obtained from the surveillance. Presently, Thailand has declared freedom for 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 AAHRDD regularly summarise and reports the surveillance data to DoF, OIE and NACA.
- competent authority of the country for issuance of health certificates for live aquatic animals. A total of 8,262 Live Aquatic Animal Health Certificates were issued during the budget year 2016.
- provide disease diagnostic services for fish farmers at either AAHRDD laboratories or on site clinics, and provide advises for health management, disease prevention, control and treatment for a more effective AAH management.

AAHRDD has carried out several activities for human capacity building on aquatic animal health, including training programs on new standard and DOF regulations relevant to farmers, exporters and fishery officers. AAHRDD also offered training courses on aquatic animal diseases to international staff, and provided on the job training/laboratory practice on disease diagnosis for undergraduate students from various local universities (eg. Kasetsart University, Chulalongkorn University, Maejo University, Silapakorn University). In 2016, AAHRDD has conducted 4 training programs for both government officers and fish farmers as follows:

<u>Government officers</u>

- Training on the Drug Act B.E. 2510(1967) and the Food Act B.E. 2522(1979)
- Training on the Registration of Aquaculture Establishment for Exportation of Live Aquatic Animals for Culture Purposes, B.E. 2557 (2014);
- Training on the Surveillance and Monitoring System for Antimicrobial Resistance.

<u>Fish farmers</u>

- Training on the Prudent Use of Drugs and Chemicals in Aquaculture

AAHRDD has carried out surveillance and monitoring system on AMR in aquaculture under the National Strategic Plan, in collaboration with the Ministry of Public Health and other officers under Ministry of Agriculture and Cooperatives. During this fiscal year, AAHRDD staffs also attended international meetings and study visits on aquatic animal health and ornamental fish trade:

- The 84th General Session World Organization for Animal Health (OIE) during 22-27 May 2016 held at Paris, France.
- The 7th Meeting of the Japan-Thailand Sub-Committee on Agriculture, Forestry and Fisheries during 20-25 June 2016 held at Tokyo, Japan. The meeting focussed on new import regulations of live aquatic animals (goldfish and shrimp) and cooperation project on Food Safety.
- The meeting and exchange view on new importation regulation of ornamental fish trade to China: Guangzhou and Beijing during 20-25 June 2016.

DISCUSSION

- ANAAHC in collaboration with DOF is trying to propose a pilot implementation of the ASEAN SOP on Responsible Movement of Live Aquatic Organisms in Thailand. A workshop (to be hosted by DOF) is planned to be held next year in Bangkok.
- There is a recurring problem in trying to get nominations for ANAAHC Focal Points, and with the frequent turnover of staff in some countries, this may affect the operation of ANAAHC in the region.
- On reactivation of the ANAAHC, the main constraint is the lack of any funding support that makes it difficult to operate.
- ANAAHC could be a suitable forum for reviewing the various ASEAN guidelines that have/are being developed.

RECOMMENDATIONS

- AG recommended to make a listing of all ASEAN guidelines related to aquatic animal health, and to determine the status of implementation in the region.
- The AG will provide guidance in mobilising resources for potential projects within ASEAN plus Australia, China, Japan, R.O. Korea and other interested partners.

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

The OIE activities relevant to aquatic animal health were presented jointly by Dr. Hirofumi Kugita, OIE Regional Representative for Asia and the Pacific, and Dr Fania Dwi, Regional Veterinary Officer. Dr Kugita reviewed the OIE Regional meetings taken place in 2016, including OIE National Focal Point Seminar for WAHIS, Veterinary Products and Veterinary Laboratories, as well as the Regional Steering Committee Meeting of GF-TADs, some of those meetings dealt with Aquatic Animal Health issues as well. Dr. Kugita introduced the aquatic related activities that RRAP has conducted, such as the Regional teleconference about the OIE Aquatic Commission Report and Regional Delegates' Secure Access System, through which OIE is encouraging member countries to be more involved in the International Standard Setting Process. Dr. Kugita also touched on several aquatic related meetings in the region which the RRAP attended. Dr. Kugita finally announced several relevant meetings scheduled in 2017, including the OIE National Focal Points Seminar for Aquatic Animal Diseases.

Dr. Dwi then reviewed the Quarterly Aquatic Animal Disease (QAAD) Report since last AG meeting in November 2015. Dr. Dwi noted that NACA and OIE RRAP have discontinued the printed version of QAAD Report and are now publishing the same QAAD Report on their respective website, under the collaborative work between them, since the last quarter of 2015. Dr. Dwi highlighted that the QAAD report submission from member countries are still low level, being received by more or less half of regional member countries, whereas the report to the OIE WAHIS is the obligation of the OIE member countries. Dr Dwi also mentioned that the OIE HQs is now working on the WAHIS Renovation, which would eventually make it possible to consolidate the QAAD Report and the OIE WAHIS and establish a more efficient, practical and user friendly reporting system. It will still take several years before such system become operational.

DISCUSSION

- On QAAD report submission, the problem sometimes is on the OIE delegates not submitting the reports prepared by the Aquatic Focal Points. As such, the possibility of seeking approval to have the QAAD reports recognized as 'official' even though that they come from a different channel.
- Use the upcoming OIE meeting of aquatic animal health focal points to try and revive interest in the reporting system and integration with QAAD.
- Consider converting the QAAD report to database entries that can support mapping and other applications.
- Many countries do not have good internal reporting systems. It is often not straightforward for an official to make a report, as they need to have access to the basis for making the report.
- OIE emphasized that all comments received from member countries are given due consideration, and encouraged countries to provide input.
- OIE noted that there were usually only a few interventions from the Asian region at its General Session, while other regions were much more vocal. It may be worth considering how Asian countries can coordinate amongst themselves to present a united position at the meeting. Perhaps ASEAN countries could take the lead on this.
- ASEAN already made the move of "one voice" during the 2105 OIE General Session (OIE GS) on the issue of long time frame of disease absence required to declare freedom from a particular aquatic animal disease. The initiative was the result of gathering ASEAN Aquatic Focal Points during the OIE meeting in HCMC, asked them to relay the message to their respective OIE Delegate, and appointed Thailand to present the issue during the OIE GS on behalf of ASEAN.

RECOMMENDATIONS

- AG recommended that NACA take a leading role in ensuring that aquatic focal points raise important issues with their CVO in advance of the OIE General Session.
- The AG recommends to pool the information on the OIE reference laboratories for aquatic diseases.
- The AG noted that the diagnostic capacity of the region was greatly underutilised and that governments in the region establish a mechanism to coordinate and connect these resources. A first step will be to establish a database of laboratories and their capabilities.
- The AG recommends that governments undertake gap analysis using existing mechanisms such as the FAO self-assessment questionnaire or OIE PVS tool to determine the required services that should be put in place to support this fast growing sector.
- AG recommended that a session on disease reporting during the OIE-organized Aquatic Focal Point meetings be included, and highlight the member countries' legal obligations to report presence or absence of reportable aquatic animal diseases to OIE.
- AG recommended to develop a mechanism for an Asian 'one voice' similar to what is being used by the EU and African group, to voice out concerns on AAH during the OIE GS.

4.4. AAH ACTIVITIES OF CHINA

Dr. Hong Liu presented updates on aquatic animal health activities of China. Total fisheries production for 2015 in China increased to 67 million tonnes, 3.7% more than that of 2014. Aquaculture production was 49 million tonnes, representing 73% of total production and an increase of 4% over that produced in 2014. Of this, 18 million tonnes (37% total aquaculture production) was from marine aquaculture while 32 million tonnes (i.e. 65%) was from freshwater aquaculture. Total aquaculture area was 8.46 million ha, with the marine culture area covering 2.3 million ha (27%) and that used for freshwater culture covering an area of 6.14 million ha (73%). Main culture modes are pond culture, net/cage culture, bottom culture and suspended culture.

Aquatic animal disease surveillance has been conducted for the past 17 years and has been implemented in 31 provinces/ municipalities/autonomous regions. Surveillance covers 4,122 sites, 8,000 personnel, 300,000 ha of farm area, and 74 species. Economic loss caused by diseases in 2015 was CNY 1.35 billion of which 52% was from

crustaceans, 32% from finfish and 11% from shellfish. A national surveillance project which focuses on 8 important diseases was implemented in 2015. Twenty-five (25) provinces/municipalities/autonomous regions collected a total of 4,200 samples tested across 24 laboratories. Detailed epidemiological analyses of the 8 diseases were published which became the basis for prevention, zoning and control of these diseases. A national surveillance project on imported and exported aquatic animals organized by AQSIQ, which was implemented in 2010, is still running. Covering all of the diseases listed in the OIE code, and some additional important and emerging diseases, the updated regulation of inspection and quarantine, supervision and management on imported aquatic animals was initiated on the September 1, 2016.

Some activities concerning the disease prevention and control on aquatic animal disease in China have continued. Guidelines relating to certain diseases in aquaculture, how to prevent and/or deal with certain diseases, have been published in a wide range of newspapers, journals and websites. The inspection of aquatic hatchery farms started in 2011 under the directions of the MOA and continues to run smoothly. Proficiency tests for 6 diseases, including SVCV, IHNV, cyprinid herpesvirus 3, GCHV, WSSV and IHHNV were organized in 2015 and are routinely conducted. Sixty-five (65) laboratories joined in these tests, with a satisfactory correct identification rate of 90%. Remote diagnostic platforms, such as the use of websites, have become very important communication platform between experts and local farmers. Zoning and compartmentalization have been promoted in several provinces/municipalities. A surveillance project on resistance to antibiotics used in aquaculture has been promoted in some provinces. The analysis from the surveillance project has been used in the promotion regarding the prudent use of antibiotics in the field.

The reports of Chinese aquatic animal health have been published by the Chinese Agriculture Press, reflecting the status of Chinese aquaculture in 2015. Some diseases have been continuously affecting the aquaculture industry in China, such as microsporidiosis, myxosporidiosis, grass carp haemorrhage, infection of cyprinid herpesvirus 3, infection of cyprinid herpesvirus 2, tilapia streptococcosis, enteric septicaemia of catfish, mandarin fish & snake-head & large-mouth bass viral diseases caused by ISKNV and rhabodovirus, viral nervous necrosis and lymphosystis. Crayfish and Chinese mitten crab suffered from white spot syndrome virus. This also includes the first report of a new pathogenic iridovirus from redclaw crayfish *Cherax quadricarinatus* from China.

DISCUSSION

- A new iridovirus has been found in red claw crayfish and *P. vannamei*, it is the first report for crustaceans.
- For some OIE diseases that were delisted like MBV, some countries still ask for information on them. However, such information cannot be used for trade restrictions.
- Whitespot was detected in some shellfish and some imported shrimp broodstock.
- ISAV was detected in an imported chilled salmon.
- The sanitary safety of aquatic animal products is assessed thoroughly based on available scientific evidence in accordance with Chapter 5.4 of the Aquatic Code. For those products that meet the criteria, they are listed as safe commodities in the relevant disease specific chapters of the Aquatic Code. All assessments are published on the OIE website at http://www.oie.int/en/international-standard-setting/specialists-commissions-groups/aquatic-animal-commission-reports/other-reports/.
- IHHN (and possibly TSV) should be considered for delisting, as they are no longer a threat to the region.

RECOMMENDATIONS

- AG recommended that China as the world's leading aquaculture producer continue providing information on scientific findings, especially on aquatic animal health, and to continue to actively support and take the lead in areas of specific competence in aquatic animal health.
- AG recommended that it is useful to establish and maintain a database of AAH experts, training courses implemented, and trained personnel, for ANAAHC use.

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. To date, a total of 72 QAAD Reports have been published. As per recommendations during the AGM 14, significant changes were made in the QAAD Reporting in Asia-Pacific. The first was on the printing of hard copy of QAAD Reports which was stopped commencing on the 4th quarter of 2015. QAAD reports are now published online and downloadable at both NACA and OIE-RRAP websites.

The second significant change was the merging of OIE-RRAP and NACA QAAD Reports in the Asia-pacific Region, which commenced from the first quarter of 2016. From the 22 participating governments under the NACA QAAD Reporting programme, the report now covers 33 member governments plus one none-OIE-member (French Polynesia). Despite the mergence, however, the number of countries submitting the quarterly reports declined. During the first quarter of 2016, only 18 reports were received representing 53% of the total number of countries participating in the programme. It was further reduced to 15 reports during the second quarter or 2016. It was brought out during the FAO Inter-regional Workshop on AHPND that there might be a reporting fatigue among many of the participating governments. Thus, a question on what can be further done or actions that should be taken to revive the interest of most, if not all, participating governments to submit disease reports regularly.

There were no changes to the OIE-list of diseases for 2017, thus no report was made in this regard.

DISCUSSION

- The NACA and OIE-RRAP QAAD Report has been merged, and the report still follow the old format. However, discussions were made between NACA and OIE-RRAP that in time, there will be changes in the actual format of the reports.
- The Level I, 2 and 3 diagnosis were originally added to indicate the level of certainty associated with a report, and are based on the methods used (e.g. level 1 basic observation, level 3 molecular methods). This is still practiced in the present reporting system.
- How to solve the issue of OIE delegates not submitting the QAAD report? Formerly the QAAD focal points would copy draft reports to NACA for information, although they were not yet endorsed by the CVO. If the report were also submitted to OIE, it could follow up with the country delegate to confirm that they endorse the report.
- Countries should be requested to arrange a smooth transition when focal points change.
- Why do countries not report? In some cases focal points may not realise the importance of the report. Awareness raising should be undertaken during the upcoming OIE meeting.
- It should be the responsibility of the focal points to reach out to and work together with the CVO.
- OIE emphasized that all comments received by countries are given due consideration, and encouraged countries to provide input.
- The system will not be changed so as to avoid confusion to participating countries.

RECOMMENDATIONS

- AG recommended to encourage more active reporting from countries.
- AG recommended that some issues pertaining to delays in QAAD report submission caused by CVOs is to be dealt on a case by case basis.
- AG further recommended to determine which countries are not regularly reporting or has stopped reporting and analyse the reasons as basis for taking some actions.
- AG recommended to delete Monodon slow-growth syndrome (MSG) from the QAAD list for 2017.
- AG recommended to add the following diseases under the non-OIE listed diseases and disease advisories should be accordingly prepared (by NACA):
    - VCMD
    - *Spiroplasma eriocheiris* infection

- Iridovirus in crayfish
- Carp edema virus disease

- AG recommended to revisit the design/architecture of the QAAD and progress to an online database storage system rather than paper reports.

SESSION 6. SPECIAL SESSION

6.1. ADDRESSING ANTIMICROBIAL USE (AMU) AND ANTIMICROBIAL RESISTANCE (AMR) IN ASIA'S LIVESTOCK , AQUACULTURE AND CROP PRODUCTION SYSTEMS

Dr. Carolyn Benigno presented the FAO's programme and Action Plan on AMR – supporting implementation of the FAO Resolution on AMR and the Global Action Plan in the food and agriculture sectors. Increasing global Antimicrobial Resistance (AMR) is a major threat to human and animal health. It endangers modern human and veterinary medicine and undermines the safety of our food and environment. Antimicrobials play a critical role in the treatment of diseases of farm animals (aquatic and terrestrial) and plants. Their use is essential to food security, to our well-being, and to animal welfare. However, the misuse of these drugs, associated with the emergence and spread of antimicrobial- resist- ant micro-organisms, places everyone at great risk.

FAO's Thirty-ninth Conference (in June, 2015) adopted Resolution 4/2015 on AMR which recognized that it poses an increasingly serious threat to public health and sustainable food production, and that an effective response should involve all sectors of government and society. To support the implementation of the said Resolution, the FAO Action Plan on AMR addresses four major Focus Areas:

- improve awareness on AMR and related threats;
- develop capacity for surveillance and monitoring of AMR and AMU (antimicrobial use) in food and agriculture;
- strengthen governance related to AMU and AMR in food and agriculture;
- promote good practices in food and agricultural systems and the prudent use of antimicrobials.

This Action Plan supports the WHO-led Global Action Plan on Antimicrobial Resistance highlighting the necessity of adopting a "One Health" approach, with the involvement of public health and veterinary authorities, the food and agriculture sectors, financial planners, environmental specialists, and consumers. In consideration of the complex and nuanced operating environment driving AMU and AMR in agriculture in Asia, a regional project funded by USAID through FAO (OSRO/RAS/502/USA Addressing Antimicrobial Usage in Asia's Livestock, Aquaculture and Crop Production Systems) uses a multi-track approach to promote responsible AMU stewardship.

The project aims to promote a more prudent use of antimicrobial in the livestock and aquaculture production industry as well as in the crop production sector in Asia leading to minimizing the likelihood of AMR development and spread. To achieve such objective, the project focuses on the following components: 1) Improvement of understanding and document of AMU and AMR in livestock and the aquaculture industry; 2) Enhancement of awareness amongst target groups of AMR impacts and AMU best practices; 3) Establishment of regional platform for promotion of AMU stewardship in Asia; and 4) Strengthening capacities in surveillance of AMR and antimicrobial residue in livestock and livestock products.

DISCUSSION

- The number of antibiotics permitted for use in aquaculture is very small and the permitted residues are near-zero for practical purposes, rendering their legitimate use very difficult. If farmers are not provided with legitimate options that they can use in a rational manner, the whole thing goes underground and becomes uncontrolled.
- On registration of chemicals for use in aquaculture – system is geared towards terrestrial agriculture where there is a relatively small number of species, the industry is very large and can afford/has the scale to gather large amounts of data requested. Aquaculture by contrast has a very large number of species and sub-sectors

are relatively small, so it is very difficult to gather the same level of data. This is one of the reasons why few drugs have regulatory approval for use in aquaculture. Do no harm should be a guiding principle.

- It was difficult to restrict access of aquaculture farmers to antibiotics as they could readily buy drugs that were legitimately available for terrestrial livestock.
- Another issue was that antimicrobials are being used in an untargeted or prophylactic manner by non-professionals.
- It is also difficult to obtain actual data on antimicrobial usage as many stakeholders were reluctant to provide it. It was necessary to build up a picture using data from multiple sources.
- On the goal at the end of the project, AMR cannot be stopped but can be mitigated. Baseline data on antimicrobial usage is definitely needed, and is presently lacking for livestocks, aquaculture and crops.
- On Thailand's experience, it is too risky to get the real information. Many countries will not provide the facts as it will affect the industry as a whole, and this may affect the main objective of the project. There will be so many grey areas which cannot be accessed by surveys and existing data collection mechanisms.
- End goal should be to have antimicrobials issued to aquaculture under prescription, and this should be strictly implemented in all aquaculture-producing countries in the region.
- Anti-microbial resistance is a high priority issue that threatens the industry, environment and human health. There is a need to raise awareness of veterinarians issuing prescriptions and behavior of farmers in using drugs without professional guidance. Addressing this issue is highly important and a big challenge.

RECOMMENDATIONS

- The AG considered salient issues on AMR, as listed below, which should be tabled for consideration during the planned first AMR workshop in 2017.
- AG recommended to explore several mechanisms for collecting data on AMR, including from internet, national data, first-hand information from farmers and other stakeholders.
- AG recommended that priority action be taken on this issue as this is important for aquaculture that may affect further development and sustainability of the sector, the environment and considering the high profile attention given by major international organizations like WHO, OIE, FAO and UN.
- AG recommended to support the development of National Actions Plan on AMR and assist in the aquatic/aquaculture component of the national plans under One Health approach.
- AG recommended to properly coordinate with the other two FAO-implemented projects which can assist in the process of data collection and assessment (of the current project).
- AG recommended to consider capacity building actions on: training of veterinarians, drug prescription, farmer education.
- AG recommended to explore other resource mobilisation mechanisms to support the required actions at regional and national levels.

SESSION 7. PROGRESS ON AGM14 ACTION PLAN

Dr. Reantaso spearheaded the discussion on the status of implementation of the action plan which was formulated during the previous AGM 14. The table below summarizes the actions taken and further recommendations of the 15th AG.

AGM 14 Recommendations	Actions taken (2016)	Recommendations AGM15
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)	• Proposal on harmonized certification scheme for shrimp aquaculture was finalized and submitted to STDF for possible funding. • Promoting Regional Integration for Seafood Market-Access in the ASEAN (PRISM-ASEAN)	• STDF requires a partner to co-fund proposal as they consider it risky. Ed to write a one-page brief on the project that can be used to approach possible donors. Perhaps approach Thai Frozen Food Exporters Association. Timeline July 2017.
AMU and AMR • 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. • Published standards for susceptibility testing should be used for AMR surveillance. • Measures to improve responsible use of antimicrobials should be a priority for member countries' national strategies for AMR in line with OIE standards. • Usage of antimicrobials should be by animal groups (terrestrial livestock, aquaculture), and not by total usage in the country	• Possible collaboration with FAO-RAP on AMU and AMR in aquaculture in selected countries in the region (LOA in preparation)	• Next AGM will have a technical session on AMR as an agenda item.
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	• FAO Second International Technical Workshop on Acute Hepatopancreatic Necrosis Disease (AHPND) – published at NACA website on 31 May 2016	
Add AHPND to the list of diseases for surveillance and monitoring in all AP countries, now that the disease is listed in OIE	• AHPND now listed under OIE diseases in QAAD 2016	• Consider development of cartoon-based extension materials, which can be easily adapted to other languages.
HPM-EHP • Has been recommended to be added to the QAAD list • 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°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	• Quarterly reporting for HPM-EHP commenced in January 2016 • Recommendations for the prevention of spread of HPM-EHP were included in the Disease Card • No information on chemotherapeutants that can be used for treatment/control of HPM-EHP	

which have proven to be effective in controlling microsporidians; prevention by PCR testing of broodstock should be the priority.		
Disease Cards for VCMD and YHV-8 be prepared, to be led by Drs. Hong Liu and Jie Huang (China)	• Disease card for VCMD has been prepared by the team of Jie Huang. First draft of the Disease Card has been finalized by NACA for approval and endorsement of 15th AG	• Further improve the disease card prior to publication and dissemination
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	• None	• FAO have developed an introductory training course on import risk analysis. However, these training courses are attached to TCPs. NACA could apply for a regional TCP on behalf of a number of regional countries.
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	• None	• The AG's action is to inform NACA member states of the decision of the OIE General Assembly to treat reptiles as terrestrial animals for purposes of the code.
Philippine's CA (BFAR) should look into the importation of probiotics from other countries, in coordination with research institutes like SEAFDEC AQD	• The issue on probiotic use, locally versus imported probiotics, and probiotic ban were tackled during the RTC on AHPND in SEA •	• Collect information on regulation of probiotics in the region.
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.	• No updated from Ingo	• NACA to follow up • OIE reference laboratory should be made use for proficiency testing
Small project for pilot implementation of ASEAN SOP in selected AMCs be formulated for possible funding support from donor agencies	• Undertaken a meeting with ANAAHC and Dr. Jesper Clausen on the possibility of obtaining sourcing funds from donor agency for pilot implementation of the ASEAN SOP; • DOF-Thailand expressed interest in the pilot implementation of the SOP and is planning to hold a consultation workshop in 2017	
OIE • 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. • Member countries should consider seeking an OIE PVS Aquatic evaluation • 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 • 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	• Member government responsibility • On the development on online regional reporting system, initial discussion were made, but no action has been implemented to date	
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	• No report has been translated yet??	• oriprobe.com/journals/p.html – English names of thousands of Chinese journals, e-access. Inform Google. Could we ask Google to include these in Google Scholar?

QAAD Reporting • 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 • NACA and OIE to 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), which are the legal obligations for OIE member countries (different from QAAD report) • transfer AHPND from non-OIE listed disease to OIE-listed disease for crustaceans in the Asia-Pacific QAAD list.	• Crayfish plague and Infection with *Bonamia ostrea* are now included in reportable diseases in the AP, starting in the first quarter of 2016; • Message to OIE aquatic Focal Points and NACA National Coordinators was sent reminding them to regularly submit QAAD reports to NACA and/or OIE-RRAP • AHPND was transferred under OIE-listed diseases commencing on the first quarter of 2016	

SESSION 8. OTHER MATTERS/CLOSING SESSION

8.1. ADOPTION OF REPORT AND DATE OF NEXT MEETING

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

The next AGM (AGM 16) will be held in Bali, Indonesia back-to-back with the 10th Symposium of Diseases in Asian Aquaculture. Proposed dates of the meeting will be on 26-27 August 2017 (hotel venue to be arranged).

The meeting officially closed at 12:30 PM (23 November 2016).

ANNEX A: MEETING AGENDA

15TH MEETING OF ASIA REGIONAL ADVISORY GROUP ON AQUATIC ANIMAL HEALTH (AGM 15)

21-23 NOVEMBER 2016

CENTARA GRAND AT CENTRAL LADPRAO, BANGKOK, THAILAND

AGENDA:

Day 1 (21 November, Monday)

09:00 – 12:00

Opening Session

- Welcome address: **Dr. Eduardo Leaño**, Coordinator, Aquatic Animal Health Programme, NACA
- Opening remarks: **Dr. Cherdsak Virapat**, Director General, NACA
- Self introduction
- Election of Chair and Vice Chair

(AG Chairman, will take over)

Session 1. Progress Reports

- Progress since AGM 14 **(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. Mohammed Shariff**, AAHSC, OIE)
- Updates on FAO initiatives in Asia-Pacific in support of aquatic animal health (**Dr. Melba Reantaso**, FAO)

DISCUSSIONS AND RECOMMENDATIONS

Group Photo
Lunch

13:30 – 17:00

Session 3. Special Discussion on Antimicrobial Use and Resistance in Aquaculture

- AMU and AMR Surveillance in Livestock and Aquaculture: Project Background (**Dr. Carolyn Benigno**, FAO-RAP, Thailand)

DISCUSSIONS AND RECOMMENDATIONS

Session 4. Review of Regional Disease Status

- Updates and emerging threats on finfishes (**Dr. Diana Chee**, Animal and Plant Health Center, Singapore)
- Updates and emerging threats on crustaceans (**Prof. Tim Flegel**, Centex Shrimp, Thailand)

DISCUSSIONS AND RECOMMENDATIONS

19:00

Welcome Dinner (hosted by NACA)

Day 2 (22 November, Tuesday)

09:00 – 12:00

Session 4 Continued. Review of Regional Disease Status

- Updates on other diseases (molluscs and amphibians) (**Dr. Andy Shinn**, Fish Vet Group, Thailand)
- Viral Covert Mortality Disease (VCMD): Disease card and Assessment for Listing (in QAAD Asia-Pacific) (**Dr. Eduardo Leaño**, NACA)

DISCUSSIONS AND RECOMMENDATIONS

Session 5. Reports on Aquatic Animal Health Programmes from Partner Agencies

- Fish Health Section, SEAFDEC Aquaculture Department, Philippines (**Dr. Rolando Pakingking, Jr.**, SEAFDEC AQD)
- Aquatic Animal Health Research Institute, Thailand (**Dr. Thitiporn Laoprasert,** IAAHRI)

DISCUSSIONS AND RECOMMENDATIONS

Lunch

14:00 – 17:00

Session 5 Continued. Reports on Aquatic Animal Health Programmes from Partner Agencies

- OIE-Regional Representation in Asia and the Pacific (**Dr. Hirofumi Kugita**, OIE-Tokyo)
- Aquatic animal health activities of China (**Dr. Liu Hong**, APIQTC)

DISCUSSIONS AND RECOMMENDATIONS

Session 6. Special Discussion: Biosecurity in Aquaculture

- Open discussion on status of Biosecurity in aquaculture in the AP region

Session 7. Disease Reporting

- QAAD Reporting: status and updates (**Dr. Eduardo Leaño**, NACA)
- New OIE Disease List and revisions to the QAAD List for 2017 (**Dr. Mohammed Shariff**, AAHSC, OIE)

DISCUSSIONS AND RECOMMENDATIONS

Day 3 (23 November, Wednesday)

09:00-12:00

Session 7. Closing

- Other important matters
- Presentation and Adoption of Report Discussion and Recommendations

Lunch

Afternoon

Free

Annex B: List of Participants

I. Advisory Group Members
World Organisation for Animal Health (OIE)
Prof. Mohammed Shariff Bin Mohamed Din (AAHSC) Faculty of Veterinary Medicine University Putra Malaysia 4300 Serdang, Selangor Malaysia pshariff@gmail.com
Food and Agriculture Organization of the United Nations (FAO)
Dr. Melba B. Reantaso Fishery Resources Officer Aquaculture Management and Conservation Service (FIMA) Department of Fisheries and Aquaculture Food and Agriculture Organization of the United Nations Rome, Italy Melba.Reantaso@fao.org
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IV. NACA Secretariat
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Dr. Cherdsak Virapat Director General cherdsak.virapat@enaca.org
Mr. Simon Wilkinson Coordinator, Information and Communication Programme simon@enaca.org
Dr. Derun Yuan Coordinator, Education and Training Programme yuan@enaca.org

Annex C: List of Diseases in the Asia-Pacific

Quarterly Aquatic Animal Disease Report
(Beginning January 2017)

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	4.Carp edema virus disease (CEVD)
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. Hepatopancreatic microsporidiosis (HPM) caused by *Enterocytozoon hepatopenaei* (EHP)
2. White spot disease	
3. Infection with yellow head virus	2. Viral covert mortality diseases (VCMD)
4. Infectious hypodermal and haematopoietic necrosis	3. *Spiroplasma eriocheiris* infection
5. Infectious myonecrosis	4. Iridovirus in crayfish
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: AG Action Plan (for 2017)

(Based on the list of recommendations from all sessions)

Issue(s)	Actions needed
1) Disease awareness	• NACA to raise awareness on the following diseases: o MrNV o MrTHV o Cherax iridovirus o Spiroplasma infection in shrimps o TILV o VNN o Streptococcosis in tilapia o Megalocytivirus o Carp edema virus o Infection with *Batrachochytrium dendrobatidis* • NACA to prepare disease advisories on VCMD and other important diseases as listed above. • VCMD Disease Card to be further improved prior to its publication; Dr. Leaño to coordinate with the Chinese team
2) QAAD Reporting	• Session on QAAD Reporting be included in OIE-organized meetings for Aquatic Focal Points; member countries' legal obligation to report the presence or absence of reportable aquatic animal diseases should be highlighted; • Encourage more active reporting from member countries; • Issues on delays in submission of QAAD Reports caused by CVO's is to be dealt with on a case by case basis; • Determine the countries that are not regularly reporting or has stopped reporting; analyse the reasons as basis for taking some actions; • Revisit the design/architecture of the QAAD and progress to an online database storage system rather than paper reports; • Delete Monodon slow-growth syndrome from the QAAD list; • Add the following under non-OIE listed diseases: o VCMD o *Spiroplasma eriocheiris* infection o Iridovirus in crayfish o Carp edema virus disease (CEVD)
3) Certification	• Relevance of STDF proposal on harmonized ASEAN certification scheme for shrimps; a one-page brief should be prepared and be used to approach possible donors which can co-fund the project with STDF • Make a listing of all ASEAN guidelines related to AAH, and determine the status of implementation in the region; • AG to provide guidance in resource mobilisation for potential projects within the ASEAN and in collaboration with key donor

	counties like Australia, China, Japan, R.O. Korea and other interested partners.
4) Diagnostics and Surveillance	• PCR is recommended method for the detection of *Streptococcus* spp. (including *agalactiae*) in susceptible species; • Under-utilization of diagnostic capacity of the region; governments should establish mechanism to coordinate and connect their resourced. First step is to establish a database of laboratories and their capabilities; • Possibility of establishing a Network of Reference Laboratories (similar to Newton Foundation-funded project in Thailand) in the region which can be directly connected to OIE; • Establish and maintain database of AAH experts, training courses implemented, and trained personnel (mainly for use of ANAAHC).
5) AMU and AMR	• FAO HQ-supported AMR project to work closely with FAO-RAP, in support of AMR activities in the region; • Explore several mechanisms for collecting data on AMR, including from internet, national data, first-hand information from farmers and other stakeholders; • Priority action be taken on this issue as this is important for aquaculture development and sustainability, as well as for the environment considering the high profile attention given by major international organizations like WHO, OIE, FAO and UN; • Support the development of national action plans on AMR under the One Health approach, and assist in the aquatic/aquaculture component of the plan; • Capacity building on: training of veterinarians; drug prescription; farmer education; • Mobilise resources to support the required actions at both regional and national levels.
6) Support on AAH management in the region	• FAO should increase support to the region on AAH activities; • China to continue to provide information on scientific findings on AAH and to continue to actively support and take the lead in areas of specific competence in AAH.
7) OIE matters	• NACA to take a leading role in ensuring that Aquatic Focal Points raise important issues with their CVO in advance of the OIE GS ; • Develop a mechanism for an Asian “one voice” similar to what is being used by EU and African group to voice out concerns on AAH during OIE GS; • Pool information on the OIE reference laboratories for aquatic animal diseases.
8) AAH management strategy and emergency preparedness	• Governments to undertake gap analysis using existing mechanisms such as FAO self-assessment questionnaires or OIE PVS tool to determine the required services that should be put into place in support to the fast growing aquaculture sector; • Bring together terrestrial and livestock health authorities and CVOs in a common meeting to share experiences on early

	warning, response and emergency management as a matter of urgency.
9) Biosecurity	• AMCs to work together in raising the profile of biosecurity in ASEAN as priority area to be highlighted at FAO COFI sub-committee meetings; NACA to coordinate.
10) Amphibian health	• Investigate the impact of amphibian health issues on subsistence farmers in the region, e.g. China, Thailand, Cambodia, Lao PDR, Viet Nam, Indonesia and Myanmar; • Try and improve coordination between wildlife authorities and health authorities for amphibians.
11) AGM14 issues a) AMR b) AHPND c) Risk Assessment on pathogen spread d) Inclusion of reptiles under terrestrial animals e) Probiotics f) Australia's program on laboratory proficiency testing	• Next AGM will have a technical session on AMR as an agenda item. • Consider development of cartoon-based extension materials, which can be easily adapted to other languages; • FAO have developed an introductory training course on import risk analysis. However, these training courses are attached to TCPs. NACA could apply for a regional TCP on behalf of a number of regional countries. • Inform NACA member states of the decision of the OIE General Assembly to treat reptiles as terrestrial animals for purposes of the code. • Collect information on regulation of probiotics in the region. • NACA to follow-up; OIE reference laboratories should be made use for proficiency testing.

ANNEX E: 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