



World Organisation
for Animal Health



Launch of the Regional Aquatic Animal Health Network for North Africa (RAAHN-NA)

25 – 27 April 2023 Tunis, Tunisia

Case Study



Network of Aquaculture Centres in Asia-Pacific (NACA): Health and Biosecurity Programme



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Network of Aquaculture Centres in Asia-Pacific

More than 30 years of Successful Networking



- **Intergovernmental organization**

- Established in 1990
- 19 Members (governments) across the Asia-Pacific region.

Australia, Bangladesh, Cambodia, China, Hong Kong SAR, India, Indonesia, IR Iran, DPR Korea, Lao PDR, Malaysia, Maldives, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Thailand, and Vietnam

- Associate Members:
Secretariat of the Pacific Community (SPC); Network of Aquaculture Centres in Central-Eastern Europe (NACEE)

Network of Aquaculture Centres in Asia-Pacific

More than 30 years of Successful Networking



Mission:

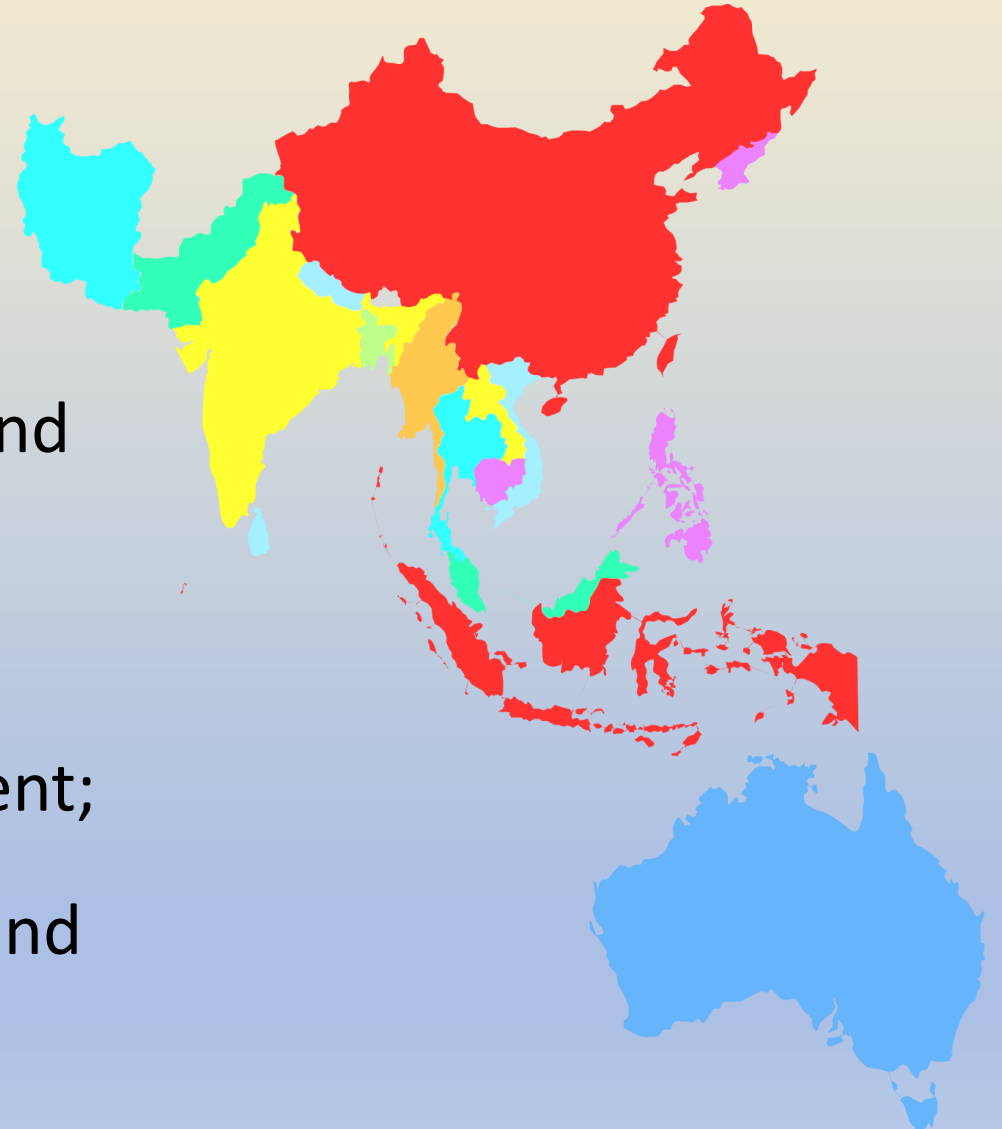
- Promote rural development through sustainable aquaculture and aquatic resource management.
- Seek to improve the livelihoods of rural people, reduce poverty and increase food security.

Network of Aquaculture Centres in Asia-Pacific

More than 30 years of Successful Networking

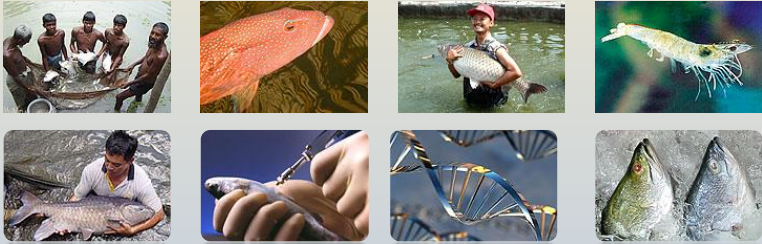
Objectives:

- To assist Members in their efforts to expand aquaculture development mainly for the purposes of:
 - ✓ increasing production;
 - ✓ improving rural income and employment;
 - ✓ diversifying farm production; and,
 - ✓ increasing foreign exchange earnings and savings.



Network of Aquaculture Centres in Asia-Pacific

More than 30 years of Successful Networking



Five Regional Lead Centres

- Freshwater Fisheries Research Centre, P.R. China
- Central Institute for Freshwater Aquaculture, India
- Aquaculture Department, SEAFDEC, Philippines
- Inland Fisheries Research & Development Bureau, Thailand
- Coldwater Fisheries Research Center, Iran



More than 30 participating centres throughout the region

- Collaborating in research
- Sharing information and resources
- Training and exchanging expertise

Network of Aquaculture Centres in Asia-Pacific

More than 30 years of Successful Networking



- Thematic Programmes
 - Productivity & Sustainability
 - **Health & Biosecurity**
 - Genetics & Biodiversity
 - Food Safety & Security
 - Emerging Regional & Global Issues

- Cross-cutting Programmes
 - Education & Training
 - Information & Networking
 - Strategy & Governance
 - One Community



Asia Regional Aquatic Animal Health and Biosecurity Programme

NACA pioneered the development of an **aquatic animal health network** for the Asia-Pacific region, drawing together governments and technical experts to share information/expertise on the detection, containment and management of diseases.

It is the longest running programme of NACA and is considered as a “flagship” programme.

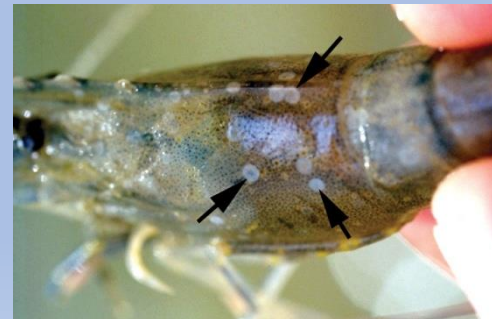
Established in 1998; it is now on its 25th year of implementation in the region.



Asia Regional Aquatic Animal Health and Biosecurity Programme

Purpose

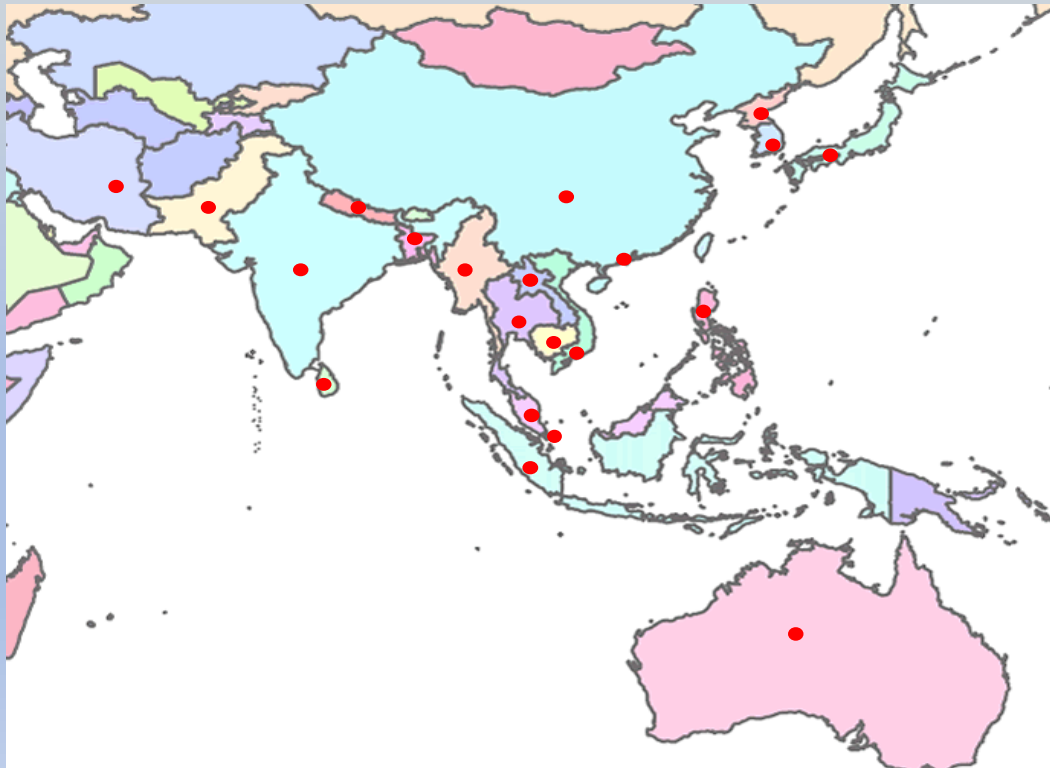
Improve regional cooperation/networking to reduce risks of aquatic animal diseases impacting the livelihoods of aquaculture farmers, national economies, trade, environment, and human health.





Asia Regional Aquatic Animal Health and Biosecurity Programme

Participated by 22 member governments from the Asia-Pacific region



- Australia
- Bangladesh
- Cambodia
- China
- Hong Kong SAR
- India
- Indonesia
- IR Iran
- Japan
- Lao PDR
- DPR Korea
- Rep. of Korea
- Malaysia
- Maldives
- Myanmar
- Nepal
- Pakistan
- Philippines
- Thailand
- Singapore
- Sri Lanka
- Vietnam



Asia Regional Aquatic Animal Health Programme

Works closely with international, regional and national organizations:



World Organisation
for Animal Health
Founded as OIE



Australian Government
Department of Agriculture,
Water and the Environment



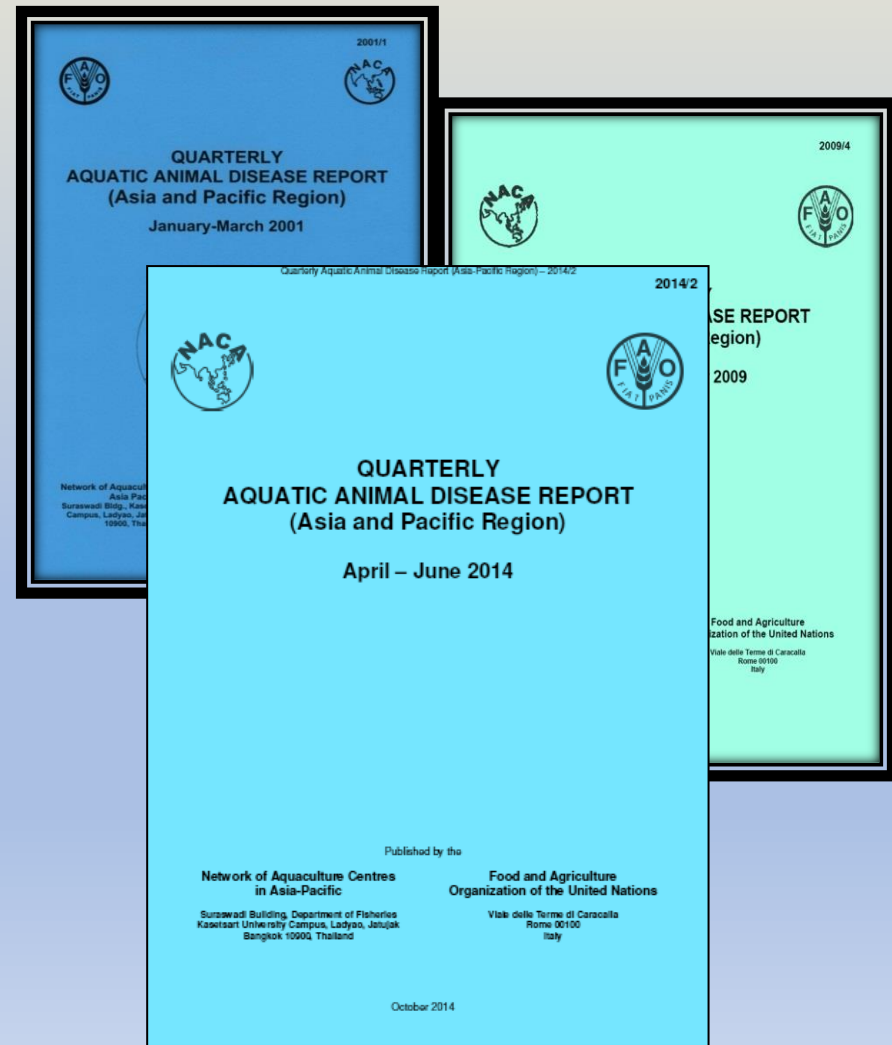
Key activities:

- Promoting regional cooperation and networking in aquatic animal health and welfare;
- Developing and implementing national strategies on aquatic animal health;
- Supporting regional disease surveillance, reporting, and response to disease emergencies;
- Strengthening aquatic animal health capacity and biosecurity in the region;
- Widespread promotion of better aquatic animal health management practices at farm level.

Regional Aquatic Animal Disease Reporting in the Asia-Pacific

formerly Quarterly Aquatic Animal Disease (QAAD) Reporting

- First published in 3rd quarter of 1998;
- Established in response to the need of developing a cohesive strategy for aquatic animal health management in the region;
- Collecting and collating of disease data;
- Provide insights on the presence or absence of important aquatic animal diseases in the region.



Regional Aquatic Animal Disease Reporting in the Asia-Pacific

formerly Quarterly Aquatic Animal Disease (QAAD) Reporting

- Total of 90 QAAD reports have been published up to 2020;
- e-copies (which commenced in the 4th quarter of 2015) are published and uploaded onto WOAHH-RRAP and NACA websites;
- From January 2021, a new AAD reporting was implemented;
- All Members are now invited to submit all the monthly data as soon as available to WOAHH RRAP and NACA with their WOAHH Delegate in copy, to ensure the timeliness of the disease information;



 NETWORK OF
AQUACULTURE CENTRES
IN ASIA-PACIFIC

NETWORK ▾ PUBLICATIONS ▾ THEMES ▾ 🔍

New Aquatic Animal Disease Reporting for Asia and the Pacific from January 2021

4 August 2021 | 439 views | Tags: Health

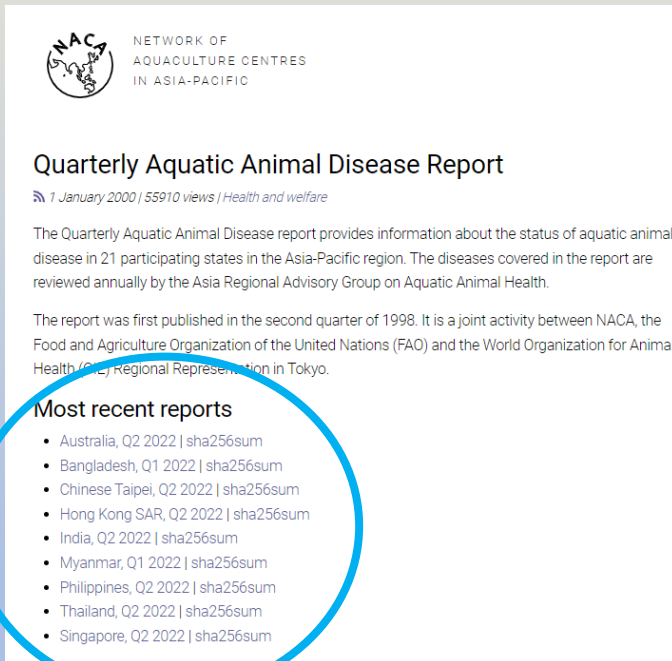
The new OIE World Animal Health Information System (OIE-WAHIS) was initially launched in 2020, with an aim to develop a modern and dynamic platform to ease the burden on Members to collect and report information on the global animal health situation to the OIE, as well as to make animal health information more easy-access and usable to the public.

In this regard, OIE and NACA also planned the establishment of a Regional Online reporting system

- The new AAD monthly reporting is a “rolling report” containing all the disease information from January of each year (in every report that is submitted).

Regional Aquatic Animal Disease Reporting in the Asia-Pacific

formerly Quarterly Aquatic Animal Disease (QAAD) Reporting



NACA NETWORK OF AQUACULTURE CENTRES IN ASIA-PACIFIC

Quarterly Aquatic Animal Disease Report

1 January 2000 | 55910 views | Health and welfare

The Quarterly Aquatic Animal Disease report provides information about the status of aquatic animal disease in 21 participating states in the Asia-Pacific region. The diseases covered in the report are reviewed annually by the Asia Regional Advisory Group on Aquatic Animal Health.

The report was first published in the second quarter of 1998. It is a joint activity between NACA, the Food and Agriculture Organization of the United Nations (FAO) and the World Organization for Animal Health (OIE) Regional Representation in Tokyo.

Most recent reports

- Australia, Q2 2022 | sha256sum
- Bangladesh, Q1 2022 | sha256sum
- Chinese Taipei, Q2 2022 | sha256sum
- Hong Kong SAR, Q2 2022 | sha256sum
- India, Q2 2022 | sha256sum
- Myanmar, Q1 2022 | sha256sum
- Philippines, Q2 2022 | sha256sum
- Thailand, Q2 2022 | sha256sum
- Singapore, Q2 2022 | sha256sum

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World Organisation for Animal Health
Founded as OIE

2022

- [Australia](#) (15 Sep 2022)
- [Bangladesh](#) (9 May 2022)
- [Chinese Taipei](#) (New: 2 Nov 2022)
- [India](#) (21 Sep 2022)
- [Myanmar](#) (27 May 2022)
- [Singapore](#) (New: 4 November 2022)
- [Thailand](#) (12 Oct 2022)

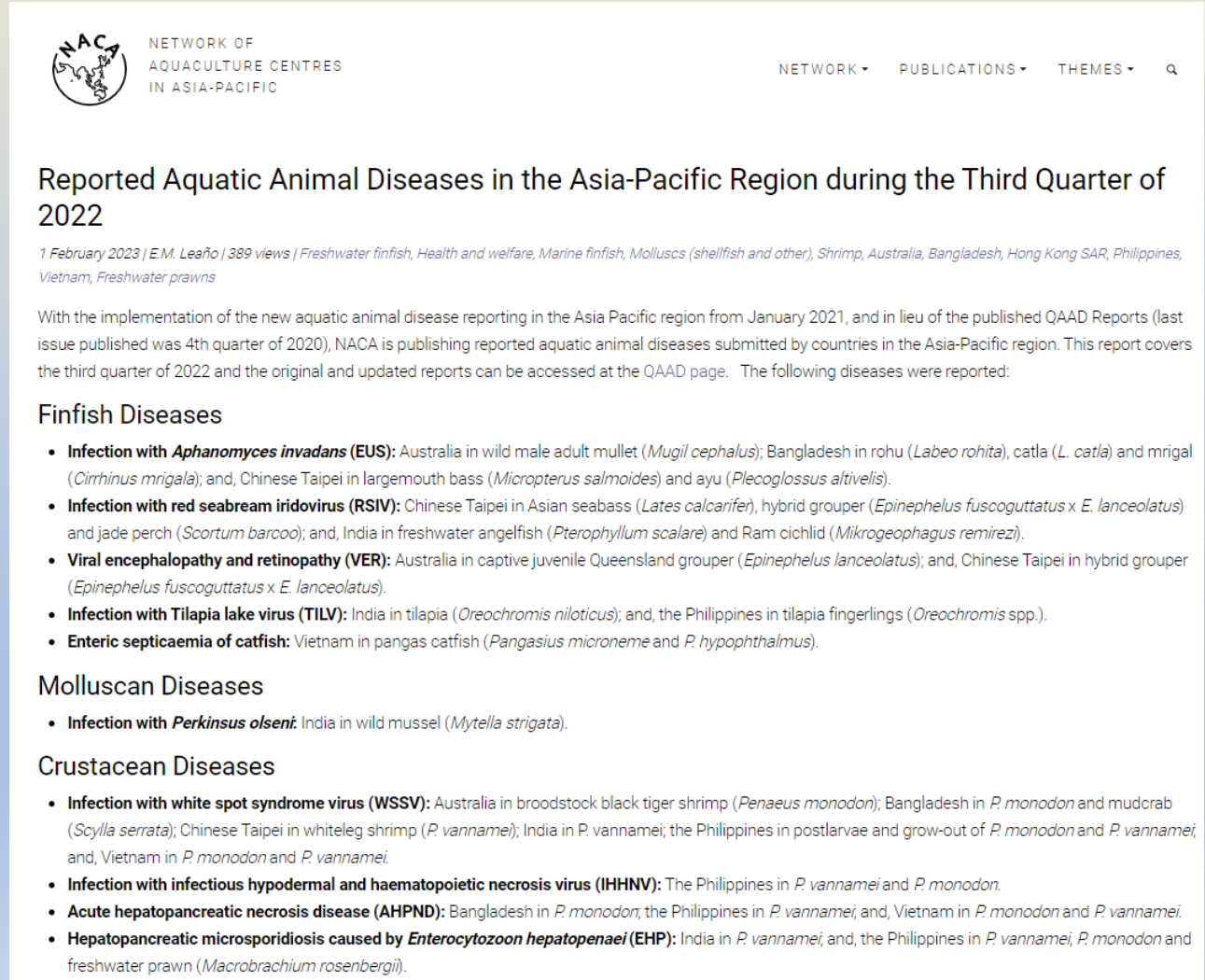
<https://rr-asia.woah.org/>

- Updated reports are published in dedicated pages at both NACA and WOAH-RRAP websites.

Regional Aquatic Animal Disease Reporting in the Asia-Pacific

formerly Quarterly Aquatic Animal Disease (QAAD) Reporting

- In lieu of the QAAD Reports, NACA publishes quarterly news article on AAD reporting, which include reported aquatic animal diseases (based on submitted reports).



The screenshot shows the NACA (Network of Aquaculture Centres in Asia-Pacific) website. The page title is "Reported Aquatic Animal Diseases in the Asia-Pacific Region during the Third Quarter of 2022". The article is dated 1 February 2023, by E.M. Leão, with 389 views. It covers various aquatic animal diseases reported in the region during the third quarter of 2022. The article is categorized under "Freshwater finfish, Health and welfare, Marine finfish, Molluscs (shellfish and other), Shrimp, Australia, Bangladesh, Hong Kong SAR, Philippines, Vietnam, Freshwater prawns".

Reported Aquatic Animal Diseases in the Asia-Pacific Region during the Third Quarter of 2022

1 February 2023 | E.M. Leão | 389 views | Freshwater finfish, Health and welfare, Marine finfish, Molluscs (shellfish and other), Shrimp, Australia, Bangladesh, Hong Kong SAR, Philippines, Vietnam, Freshwater prawns

With the implementation of the new aquatic animal disease reporting in the Asia Pacific region from January 2021, and in lieu of the published QAAD Reports (last issue published was 4th quarter of 2020), NACA is publishing reported aquatic animal diseases submitted by countries in the Asia-Pacific region. This report covers the third quarter of 2022 and the original and updated reports can be accessed at the QAAD page. The following diseases were reported:

Finfish Diseases

- **Infection with *Aphanomyces invadans* (EUS):** Australia in wild male adult mullet (*Mugil cephalus*); Bangladesh in rohu (*Labeo rohita*), catla (*L. catla*) and mrigal (*Cirrhinus mrigala*); and, Chinese Taipei in largemouth bass (*Micropterus salmoides*) and ayu (*Plecoglossus altivelis*).
- **Infection with red seabream iridovirus (RSIV):** Chinese Taipei in Asian seabass (*Lates calcarifer*), hybrid grouper (*Epinephelus fuscoguttatus* x *E. lanceolatus*) and jade perch (*Scortum barcoo*); and, India in freshwater angelfish (*Pterophyllum scalare*) and Ram cichlid (*Mikrogeophagus remirezi*).
- **Viral encephalopathy and retinopathy (VER):** Australia in captive juvenile Queensland grouper (*Epinephelus lanceolatus*); and, Chinese Taipei in hybrid grouper (*Epinephelus fuscoguttatus* x *E. lanceolatus*).
- **Infection with Tilapia lake virus (TILV):** India in tilapia (*Oreochromis niloticus*); and, the Philippines in tilapia fingerlings (*Oreochromis* spp.).
- **Enteric septicaemia of catfish:** Vietnam in pangas catfish (*Pangasius microneme* and *P. hypophthalmus*).

Molluscan Diseases

- **Infection with *Perkinsus olseni*:** India in wild mussel (*Mytella strigata*).

Crustacean Diseases

- **Infection with white spot syndrome virus (WSSV):** Australia in broodstock black tiger shrimp (*Penaeus monodon*); Bangladesh in *P. monodon* and mudcrab (*Scylla serrata*); Chinese Taipei in whiteleg shrimp (*P. vannamei*); India in *P. vannamei*; the Philippines in postlarvae and grow-out of *P. monodon* and *P. vannamei*; and, Vietnam in *P. monodon* and *P. vannamei*.
- **Infection with infectious hypodermal and haematopoietic necrosis virus (IHHNV):** The Philippines in *P. vannamei* and *P. monodon*.
- **Acute hepatopancreatic necrosis disease (AHPND):** Bangladesh in *P. monodon*; the Philippines in *P. vannamei*; and, Vietnam in *P. monodon* and *P. vannamei*.
- **Hepatopancreatic microsporidiosis caused by *Enterocytozoon hepatopenaei* (EHP):** India in *P. vannamei*; and, the Philippines in *P. vannamei*, *P. monodon* and freshwater prawn (*Macrobrachium rosenbergii*).

Regional Aquatic Animal Disease Reporting in the Asia-Pacific

formerly Quarterly Aquatic Animal Disease (QAAD) Reporting

Through its more than 20 years....

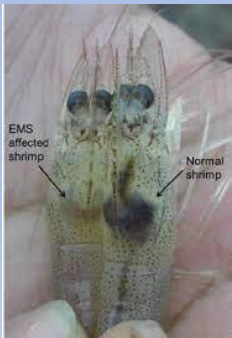
- Useful mechanism for recognizing emerging and important aquatic animal diseases in the region;
- Provides up-to-date information on important aquatic animal diseases;
- Serves as a guide to participating countries in revising their national list of reportable diseases
- Valuable source of information to support risk analysis;
- Paved way in the establishment of excellent regional networking in support of disease surveillance and reporting;

Regional Aquatic Animal Disease Reporting in the Asia-Pacific

formerly Quarterly Aquatic Animal Disease (QAAD) Reporting

Through its more than 20 years....

- Serves as early warning system for emerging diseases/pathogens in the Asia-Pacific Region



- Diseases initially listed in QAAD that have been listed in WOAHA
 - Koi herpesvirus disease (KHV) (listed in QAAD in 2005 ⇒ listed in WOAHA in 2007),
 - Infection with abalone herpesvirus (2005 ⇒ 2007),
 - White tail disease (MrNV and XSV) (2005 ⇒ 2008),
 - Necrotising hepatopancreatitis (NHP) (2005 ⇒ 2010),
 - Acute hepatopancreatic necrosis disease (AHPND) (2013 ⇒ 2015)
 - Infection with decapod iridescent virus 1 (DIV1) (2019 ⇒ 2021)
 - Infection with tilapia lake virus (TiLV) (2018 ⇒ 2022)

Asia Regional Advisory Group on Aquatic Animal Health (AG)

- Established by the Governing Council of NACA in 2001 to provide advice to NACA members on aquatic animal health management:
 - 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.

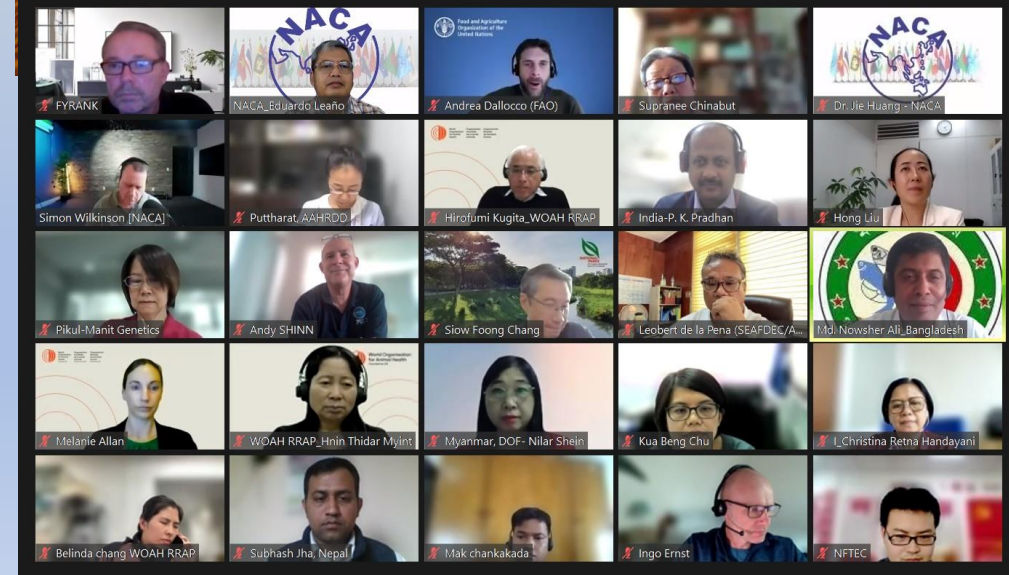
Asia Regional Advisory Group on Aquatic Animal Health (AG)

- Composed of invited aquatic animal disease experts, and representatives from World Organisation for Animal Health (WOAH), Food and Agriculture Organization of the United Nations (FAO), collaborating regional organizations, and the private sector.
- Meet annually to discuss important and current issues on aquatic animal health, revise disease list, and recommend necessary actions for better AAH management in the region.



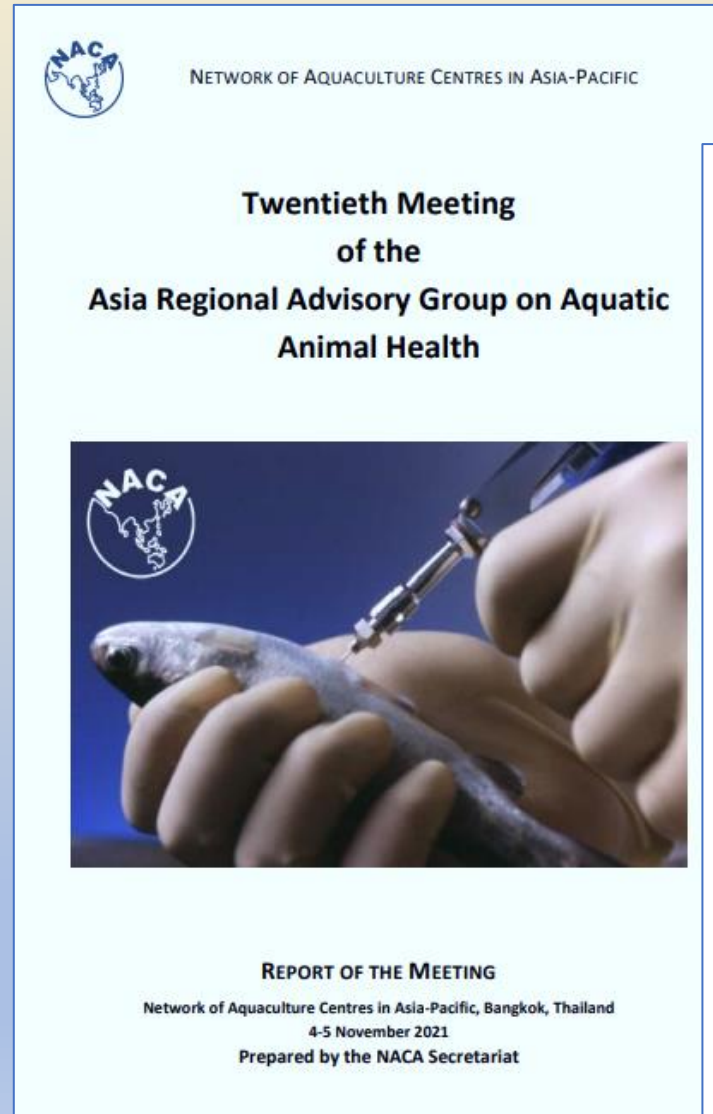
Asia Regional Advisory Group on Aquatic Animal Health (AG)

- **Noteworthy:** the **commitment** of members and co-opted members has sustained the AG for 21 years (and counting);
- The last meeting (AGM-21) was held virtually on 17-18 November 2022. Discussed in the meeting include:
 - Updates on the activities of the Asia Regional Aquatic Animal Health Programme of NACA;
 - Updates on WOAHA AAHSC
 - Updates of FAO's PMP/AB
 - Farm-level Aquaculture Biosecurity and Assessment Tool
 - Implementation of WOAHA's AAH Strategy
 - Updates on WOAHA's Regional Collaboration Framework on AAH
 - Disease prevention and control
 - Regional disease reporting



Asia Regional Advisory Group on Aquatic Animal Health (AG)

- Reports of the meeting are available for free download at NACA website www.enaca.org



Disease Advisories: Emerging aquatic animal diseases in the region



DISEASE ADVISORY

Asia Regional Aquatic Animal Health Programme

Early Mortality Syndrome (EMS)/Acute Hepatopancreatic Necrosis Syndrome (AHPNS): An emerging threat in the Asian shrimp industry

Eduardo M. Leão and C.V. Mohan
NACA, Bangkok, Thailand

The Asia-Pacific region, being the top producer of aquaculture products in the world, is continuously beset by emerging aquatic animal disease problems causing high mortalities and economic losses among small farmers as well as commercial producers. Over the last couple of decades, several diseases (e.g. luminous vibriosis, white spot syndrome, yellowhead disease, Taura syndrome) have caused significant devastation in the shrimp aquaculture of the region, causing the collapse of some industries (e.g. *Penaeus monodon*). Recently, a new/emerging disease known as early mortality syndrome (EMS) in shrimp (also termed acute hepatopancreatic necrosis syndrome or AHPNS) has been reported to cause significant losses among shrimp farmers in China (2009), Vietnam (2010) and Malaysia (2011). It was also reported to affect shrimp in the eastern Gulf of Thailand (Flegel, 2012).

The disease affects both *P. monodon* and *P. vannamei* and is characterized by mass mortalities (reaching up to 100% in some cases) during the first 20-30 days of culture (post-stocking in grow-out ponds). Clinical signs observed include slow growth, corkscrew swimming, loose shells, as well as pale coloration. Affected shrimp also consistently show an abnormal hepatopancreas (shrunken, small, swollen or discoloured). The primary pathogen (considering the disease is infectious) has not been identified, while the presence of some microbes including *Vibrio*, microsporidians and nematode has been observed in some samples. Lightner et al. (2012) described the pathological and etiological details of this disease. Histological examination showed that the effects of EMS in both *P. monodon* and *P. vannamei* appear to be limited to the hepatopancreas (HP) and show the following pathology:


- 1) Lack of mitotic activity in generative E cells of the HP;
- 2) Dysfunction of central hepatopancreatic B, F and R cells;
- 3) Prominent karyomegaly and massive sloughing of central HP tubule epithelial cells;
- 4) Terminal stages including massive intertubular hemocytic aggregation followed by secondary bacterial infections.

Similar histopathological results were obtained by Prachumwat et al. (2012) on Thai samples of *P. vannamei* collected from Chantaburi and Rayong provinces in late 2011 and early 2012 (Figure 1). The progressive dysfunction of the HP results from lesions that reflect degeneration and dysfunction of the tubule epithelial cells that progress from proximal to distal ends of HP tubules. This degenerative pathology of HP is highly suggestive of a toxic etiology, but anecdotal information suggests that disease spread patterns may be consistent with an infectious agent.

In China, the occurrence of EMS in 2009 was initially ignored by most farmers. But in 2011, outbreaks became more serious especially in farms with culture history of more than 5 years and those closer to the sea using very saline water of 20 (Panakorn, 2012). Shrimp farming in Hainan, Guangdong, Fujian and Guangxi suffered during the first half of 2011 with almost 80% losses

@Copyright NACA; May 2012

Early Mortality Syndrome/ Acute Hepatopancreatic Necrosis Syndrome (2012)



DISEASE ADVISORY

Asia Regional Aquatic Animal Health Programme

Tilapia Lake Virus (TiLV) – an Emerging Threat to Farmed Tilapia in the Asia-Pacific Region

Network of Aquaculture Centres in Asia-Pacific, Bangkok, Thailand


- **TiLV (an Orthomyxo-like RNA virus) is an emerging disease of cultured tilapia in the Asia-Pacific region;**
- **Originally observed and reported in Israel, Ecuador, Colombia and Egypt, TiLV is now confirmed in cultured tilapia in Thailand causing mass mortalities;**
- **At risk is here is the US\$7.5 billion global industry per annum, especially among the top tilapia-producing countries in the region including China, the Philippines, Thailand, Indonesia, Lao PDR and Bangladesh.**

Tilapias are highly important (and inexpensive) source of fish protein in the world and are one of the most popular species for aquaculture in several regions including the Asia-Pacific. The top 10 producing-countries include China, Egypt, Philippines, Thailand, Indonesia, Lao PDR, Costa Rica, Ecuador, Colombia and Honduras. Since 2009, tilapia aquaculture has been threatened by mass die-offs of farmed fish in Israel and Ecuador (Bacharach et al., 2016). The aetiological agent causing this mass die-offs has been described and identified as a novel Orthomyxo-like (RNA) virus named as Tilapia lake virus (TiLV) (Eyngor et al. 2014; 2016; Bacharach et al., 2016). This has been reported as a newly emerging virus that causes syncytial hepatitis of tilapia (SHT). As of 2016, countries affected by this emerging disease of tilapia include Israel, Ecuador, Colombia and Egypt (Eyngor et al., 2014; Ferguson et al., 2014; Bacharach et al., 2016; Tsofack et al., 2016; Del-Pozo et al., 2017; Fathi et al., 2017).

Recently, disease outbreaks among cultured tilapias have occurred in Thailand, wherein high cumulative mortalities (20-90%) were observed and recorded (Dong et al., 2017a). Thirty-two outbreaks were investigated during 2015-2016 involving large number of deaths of unknown cause among farmed tilapia (*Oreochromis niloticus*) and red hybrid tilapia (*Oreochromis* spp.) (Suratchatpong et al., 2017). Histopathology (of the liver showing similar signs to SHT), transmission electron microscopy, in-situ hybridization and high nucleotide sequence identity to TiLV from Israel (Dong et al. 2017b) confirmed that these outbreaks were caused by TiLV.

@Copyright NACA; May 2017

TiLV (2017)



DISEASE ADVISORY

Asia Regional Aquatic Animal Health Programme

Decapod Iridescent Virus 1 (DIV1): an emerging threat to the shrimp industry

Network of Aquaculture Centres in Asia-Pacific, Bangkok, Thailand

The shrimp industry has been beset by many devastating diseases in the last three decades, which has caused severe production and economic losses and even caused the collapse of the industry in some countries. These include viral (WSSV, TSV, YHV), bacterial (luminous vibriosis, AHPND), and parasitic (EHP) diseases. Recently, another emerging shrimp viral disease is threatening the shrimp industry in China, one of the top shrimp producers in the world. The virus, formally named as Decapod iridescent virus 1 or DIV1 by ICTV, was first detected as early as 2014 from *Cherax quadricarinatus* samples in Fujian Province, and temporarily named the new virus as *Cherax quadricarinatus* Iridovirus (CQIV) (Xu et al., 2016). In December 2014, Qiu et al. (2017) identified a new iridescent virus in farmed white leg shrimp *Penaeus vannamei* from Zhejiang Province and named it Shrimp hemocyte iridescent virus (SHIV) based on the infected tissues and susceptible species. The disease has occurred in farmed *P. vannamei* and giant freshwater prawn *Macrobrachium rosenbergii* in some provinces (Qiu et al., 2018c, 2019) and again in February this year, affecting about a quarter of the area under shrimp production in the south of Guangdong Province (He, 2020). The virus infects all stages of shrimps (PLs, juveniles, adults) and has been observed to affect the Pacific white shrimp, crayfish, and giant freshwater prawn.

Currently known susceptible species of DIV1 include *P. vannamei*, *M. rosenbergii*, *Exopalaemon carinicauda*, *M. nipponense*, *Procambarus clarkii*, and *C. quadricarinatus* (Xu et al., 2016; Qiu et al., 2017; Qiu et al., 2019a; Chen et al., 2019). Two species of crab, *Eriocheir sinensis* and *Pachygrapsus crassipes* could be infected with DIV1 in experimental challenge through intramuscular injection (Pan et al., 2017), but cannot yet be identified as susceptible species. DIV1 could also be detected in *P. chinensis*, *P. japonicus*, *M. superbum*, *Nereis succinea* or some cladocera by PCR method (Qiu et al., 2017; Qiu et al., 2018a; Qiu et al., 2019a; Qiu et al., 2019b). Infection with DIV1 has been reported in some provinces of P.R. China since 2014. China has extended the National Targeted Surveillance Program to cover DIV1 since 2017 and revealed that DIV1 has been detected in 9 of 15 provincial administrative regions (Qiu et al., 2018a; Qiu et al., 2019b; BoF et al., 2019). Positive cases have been reported in the wild populations of *P. monodon* caught in Indian Ocean (Srisala et al., 2020). The geographic distribution of DIV1 may be wider than currently known, since mortality may not have been investigated in other countries or regions (NACA, 2019).

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DIV 1 (2020)

Disease Cards: Important aquatic animal diseases in the region

Diseases of finfish
Viral diseases—**Epizootic haematopoietic necrosis**

Signs of disease
Important: animals with disease may show one or more of the signs below, but disease may still be present in the absence of any signs.

Disease signs at the farm level

- typically many (hundreds or thousands) of small fish less than 10 cm long found on downwind bank of water body
- large numbers of fish-eating birds (eg seagulls) at water surface.

Disease signs at the tank or pond level


- fish cease feeding
- juveniles (<25 mm) often swimming in disorientated fashion at surface
- adults may also be affected when the disease first arrives in an area.

Clinical signs of disease in an infected animal


- distended abdomen
- darkened skin colour
- petechial (pinpoint) haemorrhages at base of fins
- haemorrhaging of the gills.

Gross signs of disease in an infected animal

- swollen kidney and spleen.



Mass mortality of redfin perch. Note the small individuals affected and swollen stomach of fish at centre of the photograph
Source: Anonymous



Note the characteristic haemorrhagic gills of the redfin perch on the left
Source: Anonymous

Diseases of crustaceans
Viral diseases—**Infectious myonecrosis**

Signs of disease
Important: animals with disease may show one or more of the signs below, but disease may still be present in the absence of any signs.

Disease signs at the farm level

- large numbers of sick animals and significant mortalities in juvenile and subadult pond-reared stocks of *Penaeus vannamei*

Clinical signs of disease in an infected animal

- acute form of disease produces gross signs and elevated mortalities, but disease progresses to a chronic phase with persistent low-level mortalities
- focal to extensive white necrotic areas in



Diseases of finfish
Viral diseases—**Spring viraemia of carp**

Signs of disease
Important: animals with disease may show one or more of the signs below, but disease may still be present in the absence of any signs.

Disease signs at the farm level


- 100% mortality in juvenile and subadult pond-reared stocks of European carp

Disease signs at the tank or pond level

- fish cease feeding
- fish swimming in disorientated fashion at surface

Clinical signs of disease in an infected animal

- distended abdomen
- darkened skin colour
- petechial (pinpoint) haemorrhages in the fatty tissue
- exophthalmus (pop eye)
- oedema (dropsy)



Spring viraemia of carp in European carp. Note characteristic haemorrhagic skin, swollen stomach and exophthalmus ('pop eye')
Source: HJ Schlotfeldt

Available for free download at NACA website www.enaca.org

Response to Disease Emergencies: Regional consultations

- Asia Pacific Emergency Regional Consultation on Shrimp EMS/AHPNS (2012)
- Emergency Regional Consultation on Tilapia Lake Virus (TiLV) (2017)
- Online Consultation on Strategies for Hepatopancreatic Microsporidiosis caused by *Enterocytozoon hepatopenaei* (EHP) (2021)



Invited Experts:



Dr. Celia
Lavilla-Pitogo



Prof. Tim
Flegel



Dr. Andy
Shinn



Dr. Celia
Lavilla-Pitogo



Dr. Diva Cano

Capacity Building

Proficiency Testing Program for Aquatic Animal Disease Diagnostic Laboratories in Asia-Pacific



Australian Government
Department of Agriculture,
Water and the Environment



Other Activities

AMU/AMR



In collaboration with FAO

- AMR Risk to Aquaculture and Monitoring of AMR in Bacterial Pathogens in Aquaculture;
- Documentation and Characterization of Antimicrobial Use in the Aquaculture Sector;
- Development of Regional Guidelines on AMR and AMU in Aquaculture

In collaboration with WOA

- Consultation Meeting on Antimicrobial Resistance and Antimicrobial Use in Aquaculture
- *Ad hoc* Group on Technical References for AMR in Aquaculture

Aquaculture Biosecurity



In collaboration with FAO

- Technical Working Group on PMP/AB and Development of NACA Regional AAH Strategy for Aquatic Organism Health

In collaboration with WOA

- Collection and Evaluation of Existing Guidelines and Awareness Materials on Aquaculture Biosecurity for Small-scale Farms in the Asia-Pacific Region

Animal Welfare



**FISH WELFARE: WHAT WE NEED TO KNOW?
DRIVING HEALTH, QUALITY AND PROFIT
IN AQUACULTURE**



Video available at: <https://vimeo.com/channels/naca2023/page:1>

Network of Aquaculture Centres in Asia-Pacific

More than 30 years of Successful Networking



Our Strengths:

- Network of individuals, institutions and governments;
- Access to vast resources in the network;
- Network has extensive expertise in aquaculture;
 - Governance & policy, management, production technology, rural development, certification, global and regional standards, and BMPs
- Good Track Record in promotion of international Codes of Practice for Responsible Fisheries and Aquaculture



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NACA is **ONE**

Ownership of Members

Network of Resources

Expertise of Aquaculture



Thank you

For more information, visit us at www.enaca.org