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Suraswadi Building, Department of Fisheries
Kasetsart University Campus, Ladyao,
Jatujak, Bangkok 10900, Thailand

**The OIE Regional Representation
for Asia and The Pacific**

Food Science Building 5F, The University Of
Tokyo, 1-1-1 Yayoi, Bunkyo-Ku
Tokyo 113-8657, Japan

**Food and Agriculture
Organization of the United Nations**

Viale delle Terme di Caracalla
Rome 00100
Italy

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Foreword

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

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).

Signs of the Disease

Clinical signs of infected *P. vannamei* are not typical, including slightly reddish body, hepatopancreatic atrophy with colour fading, and empty stomach and guts. A unique gross sign of DIV1 can be observed in diseased *M. rosenbergii*, which exhibit a typical and whitish area under the carapace at the base of rostrum. Moribund individuals sink to the bottom in deep water

and dead individuals can be found every day, with a cumulative mortality up to 80% (Chen et al. 2019; Qiu et al. 2017; Qiu et al. 2019a). The half lethal time (LT50) of DIV1 per os challenge was 8.11 ± 0.81 d (Qiu et al., 2017) which is about double of that of WSSV.

Internally, the following can be observed in infected shrimps:

- Dark eosinophilic inclusions mixed with basophilic tiny staining and karyopyknosis in hematopoietic tissues, lymphoid organs, and hemocytes in gills, hepatopancreatic sinus and pereopods in histopathological sections stained by H&E.
- Typical icosahedral iridescent virions occur in the cytoplasm of the above-mentioned tissues observed with ultrathin sections under transmission electron microscope.

PCR Detection Methods

Nested PCR (Qiu et al., 2017)

Nested PCR is carried out in two separate steps using two pairs of primers targeting the ATPase gene of DIV1. In the first step, the PCR amplifies a 457 bp amplicon. In the second step, a 129 bp amplicon is amplified. To visualize the amplicons, the PCR product (5 μ L of each) was analyzed in a 1% agarose gel containing GeneFinder (Bio-V, China).

The first-step PCR:

- i) The 25 μ L of PCR reaction mixture contained 2.5 μ L of 10 \times Ex Taq Buffer (Mg²⁺ free), 2 mM MgCl₂, 0.2 mM dNTPs, 0.4 μ M primers (SHIV-F1: 5' GGG CGG GAG ATG GTG TTA GAT-3' and SHIV-R1: 5'-TCG TTT CGG TAC GAA GAT GTA-3'), 0.625 U TaKaRa Ex Taq DNA polymerase (TaKaRa, Dalian, Liaoning, China), and 1 μ L of template DNA.
- ii) The PCR was performed at 95°C for 3 min, followed by 35 cycles of 95°C for 30 s, 59°C for 30 s and 72°C for 30 s, ending at 72°C for 2 min.

The second step of the (nested) PCR:

- i) A PCR mixture the same as above but with 1 μ L of the 1st step PCR product as templates and different primers (SHIV-F2: 5'-CGG GAA ACG ATT CGT ATT GGG-3' and SHIV-R2: 5'-TTG CTT GAT CGG CAT CCT TGA-3').
- ii) The amplification was performed with the following cycling parameters: initial denaturation at 95°C for 3 min, followed by 35 cycles of 95°C for 30 s, 59°C for 30 s and 72°C for 20 s, with a final extension at 72°C for 2 min.

Real-time PCR

A new TaqMan assay (DIV1-MCP qPCR) was established using a pair of primers (142F/142R) targeting a amplicon of 142 bp in the DIV1 MCP gene. The sequences of primers are 142F: 5'-AAT CCA TGC AAG GTT CCT CAG G -3' and 142R: 5'- CAA TCA ACA TGT CGC GGT GAA C -3'. The sequence of TaqMan probe is 5'- CCA TAC GTG CTC GCT CGG CTT CGG -3' labeled with 6-FAM at the 5' end and TAMRA at the 3' end. (Qiu et al., 2020)

The earlier reported TaqMan assay (DIV1-ATPase qPCR) used a pair of primers (SHIV-F/SHIV-R) targeting a amplicon of 188 bp in the DIV1 ATPase gene. The sequences of primers are SHIV-F: 5'- AGG AGA GGG AAA TAA CGG GAA AAC-3', SHIV-R: 5'- CGT CAG

CAT TTG GTT CAT CCA TG-3'. The TaqMan Probe has the sequence: 5'- CTG CCC ATC TAA CAC CAT CTC CCG CCC-3'.

The DIV1-ATPase qPCR method is not recommended to be used as the second verification of the nested PCR method, as its amplicon has partial overlap with the target sequence of the nested PCR. (Qiu et al., 2018b). The amplification can be carried out following the protocol:

- i) Real-time PCR amplification was performed in a 20- μ L reaction system consisting of 10 μ L 2 \times Master Mix (FastStart Essential DNA Probes Master mix, Roche), 500 nM of each primer, 200 nM TaqMan probe and 1 μ L DNA template.
- ii) The PCR profile is one cycle of 95 °C for 10 min for initial denaturation, followed by 40 cycles of 95 °C for 10 seconds and 60 °C for 30s to 1 min.

The methods can detect 1.2 copies of target DNA. These two Real-time PCR methods can verified each other. The diagnostic sensitivity and diagnostic specificity are 97.2% and 98.7%, respectively, when the DIV1-MCP qPCR was compared with the DIV1-ATPase qPCR (Qiu et al, 2020).

Suggested Preventive Strategies

The establishment of biosecurity system for the industry is the principle of prevention and control of DIV1 (Huang et al., 2017). Surveillance program, broodstock/postlarvae quarantine, and health certification for the disease are urgently needed in major shrimp producing countries. For these purposes, regional or national capacity building for DIV1 testing and proficiency testing should be carried out as soon as possible. In addition, notification and reporting of any outbreak or viral detection should be promoted. There is no typical clinical sign for infected penaeid shrimps. Alternatively, giant freshwater prawn *M. rosenbergii* can be used as an indicator species for suspected cases, as a typical white hematopoietic tissue can be observed in the diseased prawns. Confirmatory diagnosis should rely on molecular detection methods. Unlike WSSV, DIV1 can easily cause lethal infection to the species of genus *Macrobrachium*. Thus, polyculture with different crustaceans (e.g. *P. vannamei* and *M. rosenbergii*) will bring high risk of DIV1 transmission and should not be recommended (Qiu et al., 2019). However, as diseased shrimp can be removed by predatory fish (Jang et al., 2007), polyculture of shrimp with a small number of fish is recommended for prevention of the disease. A high-density nursery of postlarva with a second testing before stoking to the grow-out pond can be considered as a quarantine approach to increase biosecurity (Clausen et al., 2016). Studies have shown that live polychaete used as feed for broodstock has been found positive for DIV1, and may pose risk of introducing the pathogen. Therefore, it is suggested that shrimp breeding and hatchery facilities should use an alternative feed or adopt some treatment approaches to decontaminate live feeds prior to use (Qiu et al., 2018c).

References:

- BoF, NFTEC, CSF (2019). Aquatic Animal Health in China (Issued by Bureau of Fisheries, Ministry of Agriculture and Rural Affairs, P. R. China, National Fisheries Technology Extension Center, China Society of Fisheries), 2019, China Agriculture Press, Beijing.
- Chen, X., Qiu, L., Wang, H.-L., Zou, P.-Z., Dong X., Li, F.-H., Huang J. (2019). Susceptibility of *Exopalaemon carinicauda* to the infection with Shrimp hemocyte iridescent virus (SHIV 20141215), a strain of Decapod iridescent virus 1 (DIV1). Viruses (under review), Preprints 2019, 2019020115. doi: 10.20944/preprints201902.0115.v1.11, 387. doi: 10.3390/v11040387.
- Clausen, J. H., Decamp, O., Kayankarnavee, S., Thaisilp, N. (2016). Adapting to a new reality: shrimp nurseries as the new normal. Aqua Culture Asia Pacific, 12(4):15-18.. <https://www.aquaasiapac.com/document-download.php?id=163>
- Huang, J., Dong, X., Zhang, Q.-L., Wan, X.-Y., Xie, G.-S., Yang, B., Wang, X.-H., Liang, Y., Xu, H., Li, C., Song, X.-L.. (2017). Epidemiology and biosecurity for shrimp farming industry. The 10th Symposium on Diseases in Asian Aquaculture, 28 Aug - 1 Sept, 2017, Bali,

Indonesia.

https://www.researchgate.net/publication/320254729_Epidemiology_and_biosecurity_for_shrimp_farming_industry

He, H. (2020). China's shrimp farmers 'terrified' as deadly virus threatens to destroy lucrative seafood industry. South China Morning Post, <https://www.scmp.com/economy/china-economy/article/3079484/chinas-shrimp-farmers-terrified-deadly-virus-threatens>

Jang, I.-K., Jun, J.-C., Jo, G.-J., Cho, Y.-R., Seo, H. -C., Kim, B.-L., Kim, J.-S. (2007). Polyculture of fleshy shrimp *Fenneropenaeus chinensis* and white shrimp *Litopenaeus vannamei* with river puffer *Takifugu obscurus* in shrimp ponds. J. Aquaculture (In Korean), 20(4): 278-288.

<http://www.koreascience.or.kr/article/JAKO200707341593391.page>

NACA (2019). Eighteenth 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.

Pan, C. K., Yuan, H. F., Wang, T. T., Yang, F., Chen, J. M. (2017). Study of *Cherax quadricarinatus* iridovirus in two crab. Journal of Applied Oceanography, 36(1): 82-86 (in Chinese).

Qiu, L., Chen, M. M., Wan, X.Y., Li, C., Zhang, Q.L., Wang, R.Y., Cheng, D.Y., Dong, X., Yang, B., Wang, X.H., Xiang, J.H., Huang, J. (2017). Characterization of a new member of Iridoviridae, Shrimp hemocyte iridescent virus (SHIV), found in white leg shrimp (*Litopenaeus vannamei*). Scientific Reports, 7(1):11834. doi: 10.1038/s41598-017-10738-8.

Qiu, L., Dong, X., Wan, X.Y., Huang, J. (2018a). Analysis of iridescent viral disease of shrimp (SHID) in 2017. In Analysis of Important Diseases of Aquatic Animals in China in 2017 (in Chinese). Fishery and Fishery Administration Bureau under the Ministry of Agriculture and Rural

Source: <https://enaca.org/?id=1098&title=decapod-iridescent-virus-1-an-emerging-threat-to-the-shrimp-industry>

Reports Received by the NACA and OIE-RRAP

(Officially prepared by OIE National Focal Points for Aquatic Animals/NACA National Coordinator, and submitted by OIE Delegate)

Country: AUSTRALIA*Period: January - March 2020

Item	Disease status ^{a/}			Level of diagnosis	Epidemiological comment numbers
	Month				
DISEASES PREVALENT IN THE REGION	January	February	March		
FINFISH DISEASES					
OIE-listed diseases					
1. Infection with epizootic haematopoietic necrosis virus	-(2012)	-(2012)	-(2012)		1
2. Infection with infectious haematopoietic necrosis virus	0000	0000	0000		
3. Infection with spring viremia of carp virus	0000	0000	0000		
4. Infection with viral haemorrhagic septicaemia virus	0000	0000	0000		
5. Infection with <i>Aphanomyces invadans</i> (EUS)	-(2017)	-(2017)	-(2017)		2
6. Infection with red sea bream iridovirus	0000	0000	0000		
7. Infection with koi herpesvirus	0000	0000	0000		
Non OIE-listed diseases					
8. Grouper iridoviral disease	0000	0000	0000		
9. Viral encephalopathy and retinopathy	-(2019)	+(2020)	+(2020)	III	3
10. Enteric septicaemia of catfish	-(2014)	-(2014)	-(2014)		4
11. Carp edema virus disease	***	***	***		
12. Tilapia lake virus (TiLV)	0000	0000	0000		
MOLLUSC DISEASES					
OIE-listed diseases					
1. Infection with <i>Bonamia exitiosa</i>	-(2019)	-(2019)	-(2019)		5
2. Infection with <i>Perkinsus olseni</i>	-(2019)	-(2019)	+?(2020)	III	6
3. Infection with abalone herpesvirus	-(2011)	-(2011)	-(2011)		7
4. Infection with <i>Xenohaliotis californiensis</i>	0000	0000	0000		
5. Infection with <i>Bonamia ostreae</i>	0000	0000	0000		
Non OIE-listed diseases					
6. Infection with <i>Marteilioides chungmuensis</i>	0000	0000	0000		
7. Acute viral necrosis (in scallops)	***	***	***		
CRUSTACEAN DISEASES					
OIE-listed diseases					
1. Infection with Taura syndrome virus	0000	0000	0000		
2. Infection with white spot syndrome virus	-(2018)	-(2018)	-(2018)		8
3. Infection with yellow head virus genotype 1	0000	0000	0000		
4. Infection with infectious hypodermal and haematopoietic necrosis virus	-(2019)	+(2020)	+(2020)	III	9
5. Infection with infectious myonecrosis virus	0000	0000	0000		
6. Infection with <i>Macrobrachium rosenbergii</i> nodavirus (White Tail disease)	-(2008)	-(2008)	-(2008)		10
7. Infection with <i>Hepatobacter penaei</i> (Necrotising hepatopancreatitis)	0000	0000	0000		
8. Acute hepatopancreatic necrosis disease (AHPND)	0000	0000	0000		
9. Infection with <i>Aphanomyces astaci</i> (Crayfish plague)	0000	0000	0000		
Non OIE-listed diseases					
10. Hepatopancreatic microsporidiosis caused by <i>Enterocytozoon hepatopenaei</i> (HPM-EHP)	0000	0000	0000		
11. Viral covert mortality disease (VCMD) of shrimps	***	***	***		

*Member of NACA's Asia Regional Aquatic Animal Health Programme

12. <i>Spiroplasma eriocheiris</i> infection	***	***	***		
13. Decapod iridescent virus 1 (DIV1)	0000	0000	0000		
AMPHIBIAN DISEASES					
OIE-listed diseases					
1. Infection with <i>Ranavirus</i> species	-(2008)	-(2008)	-(2008)		11
2. Infection with <i>Batrachochytrium dendrobatidis</i>	-(2019)	-(2019)	-(2019)		12
3. Infection with <i>Batrachochytrium salamandrivorans</i>	0000	0000	0000		
ANY OTHER DISEASES OF IMPORTANCE					
1. <i>Hepatopancreatitis</i> in prawns	-(2017)	-(2017)	-(2017)		13

**DISEASES PRESUMED EXOTIC TO THE REGION^b
LISTED BY THE OIE**

Finfish: Infection with HPR-deleted of HPR0 salmon anemia virus, Infection with salmon pancreas disease virus; Infection with *Gyrodactylus salaris*.

Molluscs: Infection with *Bonamia ostreae*; *Marteilia refringens*; *Perkinsus marinus*.

Crustaceans: Crayfish plague (*Aphanomyces astaci*).

NOT LISTED BY THE OIE

Finfish: Channel catfish virus disease

a/ Please use the following symbols:

+	Disease reported or known to be present	?()	Presence of the disease suspected but not confirmed in a zone
+?	Serological evidence and/or isolation of causative agent but no clinical diseases	***	No information available
?	Suspected by reporting officer but presence not confirmed	0000	Never reported
+()	Occurrence limited to certain zones	-	Not reported (but disease is known to occur)
+?()	Confirmed infection/infestation limited to one or more zones of the country, but no clinical disease	(year)	Year of last occurrence

b/ If there is suspicion or confirmation of any of these diseases, they must be reported immediately, because the region is considered free of these diseases

1. Epidemiological comments:

(Comments should include: 1) Origin of the disease or pathogen (history of the disease); 2) Species affected; 3) Disease characteristics (unusual clinical signs or lesions); 4) Pathogen (isolated/sero-typed); 5) Mortality rate (high/low; decreasing/increasing); 6) Death toll (economic loss, etc); 7) Size of infected areas or names of infected areas; 8) Preventive/control measures taken; 9) Samples sent to national or international laboratories for confirmation (indicate the names of laboratories); 10) Published paper (articles in journals/website, etc). and 11) Unknown diseases: describe details as much as possible.)

Comment No.	
1	Epizootic haematopoietic necrosis was not reported this period despite passive surveillance in Victoria (last reported 2012), the Australian Capital Territory (last reported 2011), New South Wales (last reported 2009) and South Australia (last reported 1992). Passive surveillance and never reported in the Northern Territory, Queensland, Tasmania and Western Australia.
2	Infection with <i>Aphanomyces invadans</i> (EUS) was not reported this period despite passive surveillance in New South Wales (last reported 2017), the Northern Territory (last reported 2017), Queensland (last reported 2014), Western Australia (last reported 2013), Victoria (last reported 2012) and South Australia (last reported 2008). Passive surveillance and never reported in Tasmania. No information available this period in the Australian Capital Territory.

<p>3</p>	<p>Viral encephalopathy and retinopathy (VER) 1. Reported in the Northern Territory in February and March 2020, passive surveillance; 2. Species affected – 45-day old Barramundi (<i>Lates calcarifer</i>) (February 2020); Juvenile and young mature individuals of various freshwater finfish species, including Chequered rainbowfish (<i>Melanotaenia splendida inornata</i>), Western rainbowfish (<i>Melanotaenia australis</i>), Siamese fighting fish (<i>Betta splendens</i>), Pennyfish (<i>Denaruisa australis</i>) and Delicate blue-eye (<i>Pseudomugil tenellus</i>) (March 2020); 3. Clinical signs – affected fish displayed typical neurological signs (February 2020); affected fish displaying typical neurological signs or dark skin discoloration (March 2020); 4. Pathogen – Betanodavirus; 5. Mortality rate – less than 1% (February 2020); Mortality rates were difficult to assess due to mixed age structures in each tank and green water situation, but cumulative mortalities were generally high in juvenile fish (March 2020); 6. Economic loss – nil (February 2020); High economic loss due to destocking (March 2020); 7. Geographic extent – Nursery area of a barramundi grow-out farm, full recirculation culture system consisted of several 5000L fibreglass tanks and an earthen pond (February 2020); Captive bred ornamental fish breeding facility, closed freshwater static system consisted of 50 individual 2500 to 5000L plastic or fibreglass tanks, single species in each tank (March 2020); 8. Containment measures – Quarantine of clinically affected fish (February 2020); Movement control, destocking and decontamination (March 2020); 9. Laboratory confirmation – Histopathology, Betanodavirus PCR test; 10. Publications – nil.</p> <p>Viral encephalopathy and retinopathy is known to occur in Queensland (last reported 2019), New South Wales (last reported 2018), Western Australia (last reported 2013), South Australia (last reported 2010) and Tasmania (last reported 2000). Passive surveillance and never reported in Victoria. No information available this period in the Australian Capital Territory.</p>
<p>4</p>	<p>Enteric septicaemia of catfish (<i>E. ictaluri</i>) was not reported this period despite passive surveillance and never reported in New South Wales, South Australia, Victoria and Western Australia. No information available this period in the Australian Capital Territory. It was reported from clinically normal fish from a single river in Queensland (last reported 2014), the only occurrence of <i>E. ictaluri</i> in wild fish populations in Australia. Active surveillance throughout Northern Australia has found no evidence of <i>E. ictaluri</i> in any other wild fish populations. <i>E. ictaluri</i> has been detected previously in association with imported ornamental fish including; the Northern Territory in a closed aquarium (last reported 2011), and in PC2 containment facilities in Tasmania (last reported 2001) and Queensland (last reported 2008).</p>
<p>5</p>	<p>Infection with <i>Bonamia exitiosa</i> was not reported this period despite passive surveillance in South Australia (last reported 2019), Western Australia (last reported 2017) and Victoria (last reported 2016). Passive surveillance and never reported in Queensland, New South Wales, Tasmania and Northern Territory. No information available for the Australian Capital Territory (no marine water responsibility).</p>

6	<p>Infection with <i>Perkinsus olseni</i> 1. Reported in Western Australia in March 2020, passive surveillance; 2. Species affected – 2015 year class sentinel Green lip abalone (<i>Haliotis laevigata</i>); 3. Clinical signs – Clinically healthy; 4. Pathogen – <i>Perkinsus olseni</i>; 5. Mortality rate – N/A; 6. Economic loss – N/A; 7. Geographic extent – sentinel abalone kept in farm outflow channels; 8. Containment measures – None; 9. Laboratory confirmation – <i>Perkinsus olseni</i> nested PCR (AAHL in-house). <i>Perkinsus olseni</i> was not observed in tissues by histopathology; 10. Publications – nil</p> <p>Infection with <i>Perkinsus olseni</i> is previously known to occur in South Australia (last reported 2019), Victoria (last reported 2015), and New South Wales (last reported 2005). Passive surveillance and not reported for this period for Queensland (last reported 2014). Passive surveillance and never reported in the Northern Territory and Tasmania. No information available for the Australian Capital Territory (no marine water responsibility).</p>
7	<p>Infection with abalone herpesvirus (abalone viral ganglioneuritis) was not reported this period despite active and passive surveillance in Tasmania (last reported 2011), New South Wales (last reported 2011 and eradicated following detection in contained commercial live-holding facilities) and Victoria (last reported 2010). Passive surveillance and never reported in the Northern Territory, Queensland, South Australia, Western Australia. No information available this period in the Australian Capital Territory (no marine water responsibility).</p>
8	<p>Infection with white spot syndrome virus (white spot disease) was not reported this period despite targeted surveillance in Queensland (last reported 2018). White spot disease has never been reported despite active and passive surveillance in New South Wales, South Australia, Western Australia and Northern Territory. Never reported in Victoria and Tasmania despite passive surveillance. No information available for the Australian Capital Territory (no marine water responsibility).</p>
9	<p>Infection with infectious hypodermal and haematopoietic necrosis virus 1. Reported in Queensland in February and March 2020, passive surveillance; 2. Species affected – Juvenile <i>Penaeus monodon</i> (February and March 2020); 3. Clinical signs – moribund prawns at pond edge (February 2020); 100 weak prawns at pond edge (March 2020); 4. Pathogen – IHNV; 5. Mortality rate – Unknown; 6. Economic loss – nil; 7. Geographic extent – one pond on one farm (February 2020); different pond on the same farm as February 2020 detection (March 2020); 8. Containment measures – N/A; 9. Laboratory confirmation – Histopathology and RT-PCR; 10. Publications – nil</p> <p>Infection with infectious hypodermal and haematopoietic necrosis virus was previously known to occur in Queensland (last reported 2019) and the Northern Territory (last reported 2003). Passive surveillance and never reported in New South Wales, South Australia, Victoria and Western Australia. No information available this period in the Australian Capital Territory (no marine water responsibility) and Tasmania (susceptible species not present).</p>

10	Infection with <i>Macrobrachium rosenbergii</i> nodavirus (White tail disease) was not reported this period despite passive surveillance in Queensland (last reported 2008). Passive surveillance and never reported in the Australian Capital Territory, New South Wales, the Northern Territory, South Australia, Victoria and Western Australia. No information available this period from Tasmania (susceptible species not present).
11	Infection with <i>Ranavirus</i> was not reported this period despite passive surveillance in the Northern Territory (last reported 2008, prior to official reporting for Ranavirus). Suspected but not confirmed through passive surveillance in Queensland. Passive surveillance and never reported in Tasmania and New South Wales. No information available this period in the Australian Capital Territory, South Australia, Victoria and Western Australia.
12	Infection with <i>Batrachochytrium dendrobatidis</i> was not reported this period despite passive surveillance in New South Wales (last reported 2019), Queensland (last reported 2018), Victoria (last reported 2016), Tasmania (last reported 2013) and Western Australia (last reported 2008). Passive surveillance and never reported in the Northern Territory. No information available this period in the Australian Capital Territory and South Australia.
13	Hepatopancreatitis in prawns was not reported this period despite passive surveillance in Queensland (last reported 2017). Passive surveillance and never reported in New South Wales. No information available in the Australian Capital Territory, Victoria, Northern Territory, South Australia, Western Australia and Tasmania.

2. New aquatic animal health regulations introduced within past six months (with effective date):

Nil

Country: **BANGLADESH***Period: **January - March 2020**

Item	Disease status ^{at}			Level of diagnosis	Epidemiological comment numbers
	Month				
DISEASES PREVALENT IN THE REGION	January	February	March		
FINFISH DISEASES					
OIE-listed diseases					
1. Infection with epizootic haematopoietic necrosis virus	0000	0000	0000		
2. Infection with infectious haematopoietic necrosis virus	0000	0000	0000		
3. Infection with spring viremia of carp virus	0000	0000	0000		
4. Infection with viral haemorrhagic septicaemia virus	0000	0000	0000		
5. Infection with <i>Aphanomyces invadans</i> (EUS)	-	-	-	I	
6. Infection with red sea bream iridovirus	0000	0000	0000		
7. Infection with koi herpesvirus	0000	0000	0000		
Non OIE-listed diseases					
8. Grouper iridoviral disease	0000	0000	0000		
9. Viral encephalopathy and retinopathy	0000	0000	0000		
10. Enteric septicaemia of catfish	0000	0000	0000		
11. Carp edema virus disease	0000	0000	0000		
12. Tilapia lake virus (TiLV)	0000	0000	0000		
MOLLUSC DISEASES					
OIE-listed diseases					
1. Infection with <i>Bonamia exitiosa</i>	0000	0000	0000		
2. Infection with <i>Perkinsus olseni</i>	0000	0000	0000		
3. Infection with abalone herpesvirus	0000	0000	0000		
4. Infection with <i>Xenohaliotis californiensis</i>	0000	0000	0000		
5. Infection with <i>Bonamia ostreae</i>	0000	0000	0000		
Non OIE-listed diseases					
6. Infection with <i>Marteilioides chungmuensis</i>	0000	0000	0000		
7. Acute viral necrosis (in scallops)	0000	0000	0000		
CRUSTACEAN DISEASES					
OIE-listed diseases					
1. Infection with Taura syndrome virus	0000	0000	0000		
2. Infection with white spot syndrome virus	0000	0000	0000		
3. Infection with yellow head virus genotype 1	0000	0000	0000		
4. Infection with infectious hypodermal and haematopoietic necrosis virus	0000	0000	0000		
5. Infection with infectious myonecrosis virus	0000	0000	0000		
6. Infection with <i>Macrobrachium rosenbergii</i> nodavirus (White Tail disease)	0000	0000	0000		
7. Infection with <i>Hepatobacter penaei</i> (Necrotising hepatopancreatitis)	0000	0000	0000		
8. Acute hepatopancreatic necrosis disease (AHPND)	0000	0000	0000		
9. Infection with <i>Aphanomyces astaci</i> (Crayfish plague)	0000	0000	0000		
Non OIE-listed diseases					
10. Hepatopancreatic microsporidiosis caused by <i>Enterocytozoon hepatopenaei</i> (HPM-EHP)	0000	0000	0000		

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11. Viral covert mortality disease (VCMD) of shrimps	0000	0000	0000		
12. <i>Spiroplasma eriocheiris</i> infection	0000	0000	0000		
13. Decapod iridescent virus 1 (DIV1)	0000	0000	0000		
AMPHIBIAN DISEASES					
OIE-listed diseases					
1. Infection with <i>Ranavirus</i> species	0000	0000	0000		
2. Infection with <i>Batrachochytrium dendrobatidis</i>	0000	0000	0000		
3. Infection with <i>Batrachochytrium salamandrivorans</i>	0000	0000	0000		
ANY OTHER DISEASES OF IMPORTANCE					
1. Infection with <i>Streptococcus</i> (Climbing perch and Tilapia)	-	+()	+()	III	1
2. Infection with <i>Aeromonas</i> (Climbing perch and Shing)	-	+()	+()	III	2
3. Infection with <i>Staphylococcus</i> (Tilapia)	-	+()	+()	II	3

**DISEASES PRESUMED EXOTIC TO THE REGION^b
LISTED BY THE OIE**

Finfish: Infection with HPR-deleted of HPR0 salmon anemia virus; Infection with salmon pancreas disease virus; Infection with *Gyrodactylus salaris*.

Molluscs: Infection with *Bonamia ostreae*; *Marteilia refringens*; *Perkinsus marinus*.

Crustaceans: Crayfish plague (*Aphanomyces astaci*).

NOT LISTED BY THE OIE

Finfish: Channel catfish virus disease

a/ Please use the following symbols:

+	Disease reported or known to be present	?()	Presence of the disease suspected but not confirmed in a zone
+?	Serological evidence and/or isolation of causative agent but no clinical diseases	***	No information available
?	Suspected by reporting officer but presence not confirmed	0000	Never reported
+()	Occurrence limited to certain zones	-	Not reported (but disease is known to occur)
+?()	Confirmed infection/infestation limited to one or more zones of the country, but no clinical disease	(year)	Year of last occurrence

b/ If there is suspicion or confirmation of any of these diseases, they must be reported immediately, because the region is considered free of these diseases

1. Epidemiological comments:

(Comments should include: 1) Origin of the disease or pathogen (history of the disease); 2) Species affected; 3) Disease characteristics (unusual clinical signs or lesions); 4) Pathogen (isolated/sero-typed); 5) Mortality rate (high/low; decreasing/increasing); 6) Death toll (economic loss, etc); 7) Size of infected areas or names of infected areas; 8) Preventive/control measures taken; 9) Samples sent to national or international laboratories for confirmation (indicate the names of laboratories); 10) Published paper (articles in journals/website, etc). and 11) Unknown diseases: describe details as much as possible.)

Comment No.	
1	<p>Infection with <i>Streptococcus</i></p> <p>1. Reported in Mymensingh and Chandpur;</p> <p>2. Species affected – Climbing perch (<i>Anabas testudinius</i>) and tilapia (<i>Oreochromis niloticus</i>)</p> <p>3. Clinical signs – loss of balance, unusual movement, opaque eye, enlargement and discoloration of liver, kidney, spleen and bile;</p> <p>4. Pathogen – <i>Streptococcus agalactiae</i>;</p> <p>5. Mortality rate – 30-40%;</p> <p>6. Economic loss –;</p> <p>7. Geographic extent – Mymensingh and Chandpur;</p> <p>8. Containment measures – use of disinfectants and antibiotics (tetracycline);</p> <p>9. Laboratory confirmation –;</p> <p>10. Publications – nil</p>

<p>2</p>	<p>Infection with <i>Aeromonas</i> 1. Reported in Mymensingh; 2. Species affected – Climbing perch (<i>Anabas testudinius</i>) and Shing catfish (<i>Heteropneustes fossilis</i>) 3. Clinical signs – loss of balance, unusual movement, opaque eye, red lesion on body; 4. Pathogen – <i>Aeromonas</i> spp.; 5. Mortality rate – 5%; 6. Economic loss –; 7. Geographic extent – Mymensingh; 8. Containment measures – use of disinfectants and antibiotics (tetracycline); 9. Laboratory confirmation –; 10. Publications – nil</p>
<p>3</p>	<p>Infection with <i>Staphylococcus</i> 1. Reported in Mymensingh; 2. Species affected – Tilapia (<i>Oreochromis niloticus</i>) ; 3. Clinical signs – loss of balance, unusual movement; 4. Pathogen – <i>Staphylococcus</i> sp.; 5. Mortality rate – 5%; 6. Economic loss –; 7. Geographic extent – Mymensingh; 8. Containment measures – use of disinfectants and antibiotics (tetracycline); 9. Laboratory confirmation –; 10. Publications – nil</p>

2. New aquatic animal health regulations introduced within past six months (with effective date):

Country: **CHINESE TAIPEI**

 Period: **January - March 2020**

Item	Disease status ^{at}			Level of diagnosis	Epidemiological comment numbers
	Month				
DISEASES PREVALENT IN THE REGION	January	February	March		
FINFISH DISEASES					
OIE-listed diseases					
1. Infection with epizootic haematopoietic necrosis virus	***	***	***		
2. Infection with infectious haematopoietic necrosis virus	***	***	***		
3. Infection with spring viremia of carp virus	***	***	***		
4. Infection with viral haemorrhagic septicaemia virus	***	***	***		
5. Infection with <i>Aphanomyces invadans</i> (EUS)	-	-	-		
6. Infection with red sea bream iridovirus	-	-	-		
7. Infection with koi herpesvirus	-	-	-		
Non OIE-listed diseases					
8. Grouper iridoviral disease	-	-	-		
9. Viral encephalopathy and retinopathy	+	-	+	AHRI	1
10. Enteric septicaemia of catfish	***	***	***		
11. Carp edema virus disease	-	-	-		
12. Tilapia lake virus (TiLV)	-	-	-		
MOLLUSC DISEASES					
OIE-listed diseases					
1. Infection with <i>Bonamia exitiosa</i>	***	***	***		
2. Infection with <i>Perkinsus olseni</i>	***	***	***		
3. Infection with abalone herpesvirus	-	-	-		
4. Infection with <i>Xenohaliotis californiensis</i>	***	***	***		
5. Infection with <i>Bonamia ostreae</i>	***	***	***		
Non OIE-listed diseases					
6. Infection with <i>Marteilioides chungmuensis</i>	***	***	***		
7. Acute viral necrosis (in scallops)	***	***	***		
CRUSTACEAN DISEASES					
OIE-listed diseases					
1. Infection with Taura syndrome virus	-	-	-		
2. Infection with white spot syndrome virus	-	-	-		
3. Infection with yellow head virus genotype 1	-	-	-		
4. Infection with infectious hypodermal and haematopoietic necrosis virus	-	-	-		
5. Infection with infectious myonecrosis virus	***	***	***		
6. Infection with <i>Macrobrachium rosenbergii</i> nodavirus (White Tail disease)	-	-	-		
7. Infection with <i>Hepatobacter penaei</i> (Necrotising hepatopancreatitis)	***	***	***		
8. Acute hepatopancreatic necrosis disease (AHPND)	-	-	-		
9. Infection with <i>Aphanomyces astaci</i> (Crayfish plague)	-	-	-		
Non OIE-listed diseases					
10. Hepatopancreatic microsporidiosis caused by <i>Enterocytozoon hepatopenaei</i> (HPM-EHP)	+	-	-	AHRI	2

11. Viral covert mortality disease (VCMD) of shrimps	***	***	***		
12. <i>Spiroplasma eriocheiris</i> infection	***	***	***		
13. Decapod iridescent virus 1 (DIV1)	***	***	***		
AMPHIBIAN DISEASES					
OIE-listed diseases					
1. Infection with <i>Ranavirus</i> species	-	-	-		
2. Infection with <i>Batrachochytrium dendrobatidis</i>	***	***	***		
3. Infection with <i>Batrachochytrium salamandrivorans</i>	***	***	***		
ANY OTHER DISEASES OF IMPORTANCE					
1.					
2.					

**DISEASES PRESUMED EXOTIC TO THE REGION^b
LISTED BY THE OIE**

Finfish: Infection with HPR-deleted of HPR0 salmon anemia virus; Infection with salmon pancreas disease virus; Infection with *Gyrodactylus salaris*.

Molluscs: Infection with *Bonamia ostreae*; *Marteilia refringens*; *Perkinsus marinus*.

Crustaceans: Crayfish plague (*Aphanomyces astaci*).

NOT LISTED BY THE OIE

Finfish: Channel catfish virus disease

a/ Please use the following symbols:

+	Disease reported or known to be present	?()	Presence of the disease suspected but not confirmed in a zone
+?	Serological evidence and/or isolation of causative agent but no clinical diseases	***	No information available
?	Suspected by reporting officer but presence not confirmed	0000	Never reported
+()	Occurrence limited to certain zones	-	Not reported (but disease is known to occur)
+?()	Confirmed infection/infestation limited to one or more zones of the country, but no clinical disease	(year)	Year of last occurrence

b/ If there is suspicion or confirmation of any of these diseases, they must be reported immediately, because the region is considered free of these diseases

1. Epidemiological comments:

(Comments should include: 1) Origin of the disease or pathogen (history of the disease); 2) Species affected; 3) Disease characteristics (unusual clinical signs or lesions); 4) Pathogen (isolated/sero-typed); 5) Mortality rate (high/low; decreasing/increasing); 6) Death toll (economic loss, etc); 7) Size of infected areas or names of infected areas; 8) Preventive/control measures taken; 9) Samples sent to national or international laboratories for confirmation (indicate the names of laboratories); 10) Published paper (articles in journals/website, etc). and 11) Unknown diseases: describe details as much as possible.)

Comment No.	
1	1. Pingtung county. 3 outbreak reports from 3 farms. 2. Date: (1), (2) Jan 3, (3) Mar 2. 3. Species: (1), (3) <i>Epinephelus fuscoguttatus</i> x <i>Epinephelus lanceolatus</i> , (2) <i>Lateolabrax japonicus</i> . 4. Mortality rate: low. 5. Total number of death: (1) 2000/20000, (2) 14000/400000, (3) 100/70000.
2	1. Pingtung county. 1 outbreak report from 1 farm. 2. Date: (1) Jan 4. 3. Species: (1) <i>Litopenaeus vannamei</i> . 4. Mortality rate: low. 5. Total number of death: (1) 6/100000.

2. New aquatic animal health regulations introduced within past six months (with effective date):

Country: **HONG KONG SAR, CHINA***Period: **January - March 2020**

Item	Disease status ^{al}			Level of diagnosis	Epidemiological comment numbers
	Month				
DISEASES PREVALENT IN THE REGION	January	February	March		
FINFISH DISEASES					
OIE-listed diseases					
1. Infection with epizootic haematopoietic necrosis virus	0000	0000	0000	II	
2. Infection with infectious haematopoietic necrosis virus	0000	0000	0000	III	
3. Infection with spring viremia of carp virus	0000	0000	0000	III	
4. Infection with viral haemorrhagic septicaemia virus	0000	0000	0000	III	
5. Infection with <i>Aphanomyces invadans</i> (EUS)	0000	0000	0000	III	
6. Infection with red sea bream iridovirus	-	-	-	III	
7. Infection with koi herpesvirus	-	-	-	III	
Non OIE-listed diseases					
8. Grouper iridoviral disease	-	-	-	III	
9. Viral encephalopathy and retinopathy	-	-	-	III	
10. Enteric septicaemia of catfish	0000	0000	0000	II	
11. Carp edema virus disease	***	***	***		
12. Tilapia lake virus (TiLV)	***	***	***		
MOLLUSC DISEASES					
OIE-listed diseases					
1. Infection with <i>Bonamia exitiosa</i>	0000	0000	0000	II	
2. Infection with <i>Perkinsus olseni</i>	0000	0000	0000	II	
3. Infection with abalone herpesvirus	0000	0000	0000	II	
4. Infection with <i>Xenohaliotis californiensis</i>	0000	0000	0000	II	
5. Infection with <i>Bonamia ostreae</i>	***	***	***		
Non OIE-listed diseases					
6. Infection with <i>Marteilioides chungmuensis</i>	0000	0000	0000	II	
7. Acute viral necrosis (in scallops)	0000	0000	0000	II	
CRUSTACEAN DISEASES					
OIE-listed diseases					
1. Infection with Taura syndrome virus	0000	0000	0000	III	
2. Infection with white spot syndrome virus	-	-	-	III	
3. Infection with yellow head virus genotype 1	0000	0000	0000	III	
4. Infection with infectious hypodermal and haematopoietic necrosis virus	0000	0000	0000	II	
5. Infection with infectious myonecrosis virus	0000	0000	0000	II	
6. Infection with <i>Macrobrachium rosenbergii</i> nodavirus (White Tail disease)	0000	0000	0000	II	
7. Infection with <i>Hepatobacter penaei</i> (Necrotising hepatopancreatitis)	***	***	***	II	
8. Acute hepatopancreatic necrosis disease (AHPND)	***	***	***	II	
9. Infection with <i>Aphanomyces astaci</i> (Crayfish plague)	0000	0000	0000	II	
Non OIE-listed diseases					
10. Hepatopancreatic microsporidiosis caused by <i>Enterocytozoon hepatopenaei</i> (HPM-EHP)	***	***	***		
11. Viral covert mortality disease (VCMD) of shrimps	***	***	***		

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12. <i>Spiroplasma eriocheiris</i> infection	***	***	***		
13. Decapod iridescent virus 1 (DIV1)	***	***	***		
AMPHIBIAN DISEASES					
OIE-listed diseases					
1. Infection with <i>Ranavirus</i> species	(1 Apr 2017)	(1 Apr 2017)	(1 Apr 2017)	III	
2. Infection with <i>Batrachochytrium dendrobatidis</i>	***	***	***	III	
3. Infection with <i>Batrachochytrium salamandrivorans</i>	***	***	***	III	
ANY OTHER DISEASES OF IMPORTANCE					
1.					
2.					

DISEASES PRESUMED EXOTIC TO THE REGION^b

LISTED BY THE OIE

Finfish: Infection with HPR-deleted of HPR0 salmon anemia virus; Infection with salmon pancreas disease virus; Infection with *Gyrodactylus salaris*.

Molluscs: Infection with *Bonamia ostreae*; *Marteilia refringens*; *Perkinsus marinus*.

Crustaceans: Crayfish plague (*Aphanomyces astaci*).

NOT LISTED BY THE OIE

Finfish: Channel catfish virus disease

a/ Please use the following symbols:

+	Disease reported or known to be present	?()	Presence of the disease suspected but not confirmed in a zone
+?	Serological evidence and/or isolation of causative agent but no clinical diseases	***	No information available
?	Suspected by reporting officer but presence not confirmed	0000	Never reported
+()	Occurrence limited to certain zones	-	Not reported (but disease is known to occur)
+?()	Confirmed infection/infestation limited to one or more zones of the country, but no clinical disease	(year)	Year of last occurrence

b/ If there is suspicion or confirmation of any of these diseases, they must be reported immediately, because the region is considered free of these diseases

1. Epidemiological comments:

(Comments should include: 1) Origin of the disease or pathogen (history of the disease); 2) Species affected; 3) Disease characteristics (unusual clinical signs or lesions); 4) Pathogen (isolated/sero-typed); 5) Mortality rate (high/low; decreasing/increasing); 6) Death toll (economic loss, etc); 7) Size of infected areas or names of infected areas; 8) Preventive/control measures taken; 9) Samples sent to national or international laboratories for confirmation (indicate the names of laboratories); 10) Published paper (articles in journals/website, etc). and 11) Unknown diseases: describe details as much as possible.)

Comment No.	
1	

2. New aquatic animal health regulations introduced within past six months (with effective date):

Country: **INDIA***

 Period: **January - March 2019**

Item	Disease status ^{a/}			Level of diagnosis	Epidemiological comment numbers
	Month				
DISEASES PREVALENT IN THE REGION	January	February	March		
FINFISH DISEASES					
OIE-listed diseases					
1. Infection with epizootic haematopoietic necrosis virus	0000	0000	0000		
2. Infection with infectious haematopoietic necrosis virus	0000	0000	0000		
3. Infection with spring viremia of carp virus	0000	0000	0000		
4. Infection with viral haemorrhagic septicaemia virus	0000	0000	0000		
5. Infection with <i>Aphanomyces invadans</i> (EUS)	+()	+()	+()	III	1
6. Infection with red sea bream iridovirus	(2018)	(2018)	(2018)		
7. Infection with koi herpesvirus	0000	0000	0000		
Non OIE-listed diseases					
8. Grouper iridoviral disease	0000	0000	0000		
9. Viral encephalopathy and retinopathy	-	-	+()	III	2
10. Enteric septicaemia of catfish	0000	0000	0000		
11. Carp edema virus disease	-	-	-		
12. Tilapia lake virus (TiLV)	-	+()	-	III	3
MOLLUSC DISEASES					
OIE-listed diseases					
1. Infection with <i>Bonamia exitiosa</i>	0000	0000	0000		
2. Infection with <i>Perkinsus olseni</i>	+()	-	-	III	4
3. Infection with abalone herpesvirus	0000	0000	0000		
4. Infection with <i>Xenohaliotis californiensis</i>	0000	0000	0000		
5. Infection with <i>Bonamia ostreae</i>	0000	0000	0000		
Non OIE-listed diseases					
6. Infection with <i>Marteilioides chungmuensis</i>	0000	0000	0000		
7. Acute viral necrosis (in scallops)	0000	0000	0000		
CRUSTACEAN DISEASES					
OIE-listed diseases					
1. Infection with Taura syndrome virus	0000	0000	0000		
2. Infection with white spot syndrome virus	+()	+()	+()	III	5
3. Infection with yellow head virus genotype 1	0000	0000	0000		
4. Infection with infectious hypodermal and haematopoietic necrosis virus	-	-	-		
5. Infection with infectious myonecrosis virus	(2019)	(2019)	(2019)		
6. Infection with <i>Macrobrachium rosenbergii</i> nodavirus (White Tail disease)	-	-	-		
7. Infection with <i>Hepatobacter penaei</i> (Necrotising hepatopancreatitis)	0000	0000	0000		
8. Acute hepatopancreatic necrosis disease (AHPND)	0000	0000	0000		
9. Infection with <i>Aphanomyces astaci</i> (Crayfish plague)	0000	0000	0000		
Non OIE-listed diseases					
10. Hepatopancreatic microsporidiosis caused by <i>Enterocytozoon hepatopenaei</i> (HPM-EHP)	+()	+()	+()	III	6

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11. Viral covert mortality disease (VCMD) of shrimps	0000	0000	0000		
12. <i>Spiroplasma eriocheiris</i> infection	0000	0000	0000		
13. Decapod iridescent virus 1 (DIV1)	0000	0000	0000		
AMPHIBIAN DISEASES					
OIE-listed diseases					
1. Infection with <i>Ranavirus</i> species	0000	0000	0000		
2. Infection with <i>Batrachochytrium dendrobatidis</i>	****	****	****		
3. Infection with <i>Batrachochytrium salamandrivorans</i>	0000	0000	0000		
ANY OTHER DISEASES OF IMPORTANCE					
1.					
2.					

**DISEASES PRESUMED EXOTIC TO THE REGION^b
LISTED BY THE OIE**

Finfish: Infection with HPR-deleted of HPR0 salmon anemia virus, Infection with salmon pancreas disease virus; Infection with *Gyrodactylus salaris*.

Molluscs: Infection with *Bonamia ostreae*; *Marteilia refringens*; *Perkinsus marinus*.

Crustaceans: Crayfish plague (*Aphanomyces astaci*).

NOT LISTED BY THE OIE

Finfish: Channel catfish virus disease

a/ Please use the following symbols:

+	Disease reported or known to be present	?()	Presence of the disease suspected but not confirmed in a zone
+?	Serological evidence and/or isolation of causative agent but no clinical diseases	***	No information available
?	Suspected by reporting officer but presence not confirmed	0000	Never reported
+()	Occurrence limited to certain zones	-	Not reported (but disease is known to occur)
+?()	Confirmed infection/infestation limited to one or more zones of the country, but no clinical disease	(year)	Year of last occurrence

b/ If there is suspicion or confirmation of any of these diseases, they must be reported immediately, because the region is considered free of these diseases

1. Epidemiological comments:

(Comments should include: 1) Origin of the disease or pathogen (history of the disease); 2) Species affected; 3) Disease characteristics (unusual clinical signs or lesions); 4) Pathogen (isolated/sero-typed); 5) Mortality rate (high/low; decreasing/increasing); 6) Death toll (economic loss, etc); 7) Size of infected areas or names of infected areas; 8) Preventive/control measures taken; 9) Samples sent to national or international laboratories for confirmation (indicate the names of laboratories); 10) Published paper (articles in journals/website, etc). and 11) Unknown diseases: describe details as much as possible.)

Comment No.	
1	<p>Infection with <i>Aphanomyces invadans</i> (EUS) was observed in <i>Cirrhinus mrigala</i>, <i>Puntius javanicus</i> and <i>Labeo bata</i> in very limited areas of Nagaon district in Assam, and <i>Labeo rohita</i> and <i>Hypophthalmichthys molitrix</i> in very limited areas of Lucknow and Barabanki districts of Uttar Pradesh.</p> <p>Preventive/Control measures taken: Treatment with lime followed by CIFAX was recommended.</p>
2	<p>Viral encephalopathy and retinopathy was reported in <i>Oreochromis niloticus</i> in very limited areas of Cuddalore district of Tamil Nadu.</p> <p>Preventive/Control measures taken: The farmer was advised to undertake pond disinfection with KMnO₄, stock the pond with PCR tested seed and follow biosecurity measures.</p>

3	<p>Tilapia lake virus (TiLV) disease was reported from <i>Oreochromis mossambicus</i> in Nagapattinam district of Tamil Nadu.</p> <p>Preventive/Control measures taken: Disinfection of pond water using bleaching powder after harvesting to be undertaken.</p>
4	<p>Infection with <i>Perkinsus olsenii</i> was detected in wild samples of <i>Perna viridis</i> and <i>Mytella strigata</i> from coast of Kerala.</p> <p>Preventive/Control measures taken: No control measures could be undertaken as the samples were from wild.</p>
5	<p>Infection with White spotsyndrome virus (WSSV) was reported in <i>Litopenaeus vannamei</i> from very limited areas of Thrissur and Alleppey districts of Kerala; Nagapattinam district of Tamil Nadu; Nellore, Prakasam, Srikakulam, Vizianagram and West Godavari districts of Andhra Pradesh; Uttar Kannada and Dakshina Kannada districts of Karnataka. The infection was also reported in <i>Scylla serrata</i>, <i>S olivacea</i> from very limited areas of Ernakulam district of Kerala, and <i>Penaeus monodon</i> from very limited areas of Ernakulam and Alleppey districts of Kerala.</p> <p>Preventive/Control measures taken: The farmers were advised emergency harvesting, drying of the ponds and disinfection before next stocking. Besides, the farmers were asked to implement strict biosecurity measures to prevent the spread of pathogen.</p>
6	<p>Hepatopancreatic microsporidiosis causedby <i>Enterocytozoon hepatopenaei</i> was reported in <i>Litopenaeus vannamei</i> from Nagapattinam, Ramnad, Pudukkottai, Cuddalore and Thiruvallur districts of Tamil Nadu; Guntur, Prakasam, Visakhapatnam, Srikakulam, East Godavari and West Godavari districts of Andhra Pradesh; Uttar Kannada Dakshina Kannada and Udipi districts of Karnataka; and Sindhudurg district of Maharashtra.</p> <p>Preventive/Control measures taken: The farmers were advised to dry the ponds and disinfect the farms with 6 ton of CaO per hectare after each harvest and stocking with EHP negative seed in the next crop.</p>

2. New aquatic animal health regulations introduced within past six months (with effective date):

Country: **NEW CALEDONIA**Period: **January - March 2020**

Item	Disease status ^{al}			Level of diagnosis	Epidemiological comment numbers
	Month				
DISEASES PREVALENT IN THE REGION	January	February	March		
FINFISH DISEASES					
OIE-listed diseases					
1. Infection with epizootic haematopoietic necrosis virus	***	***	***		
2. Infection with infectious haematopoietic necrosis virus	***	***	***		
3. Infection with spring viremia of carp virus	***	***	***		
4. Infection with viral haemorrhagic septicaemia virus	***	***	***		
5. Infection with <i>Aphanomyces invadans</i> (EUS)	***	***	***		
6. Infection with red sea bream iridovirus	***	***	***		
7. Infection with koi herpesvirus	***	***	***		
Non OIE-listed diseases					
8. Grouper iridoviral disease	***	***	***		
9. Viral encephalopathy and retinopathy	+	+	+		
10. Enteric septicaemia of catfish	***	***	***		
11. Carp edema virus disease	***	***	***		
12. Tilapia lake virus (TiLV)	***	***	***		
MOLLUSC DISEASES					
OIE-listed diseases					
1. Infection with <i>Bonamia exitiosa</i>	0000	0000	0000	II	
2. Infection with <i>Perkinsus olseni</i>	0000	0000	0000	II	
3. Infection with abalone herpesvirus	0000	0000	0000	II	
4. Infection with <i>Xenohaliotis californiensis</i>	0000	0000	0000	II	
5. Infection with <i>Bonamia ostreae</i>	0000	0000	0000	II	
Non OIE-listed diseases					
6. Infection with <i>Marteilioides chungmuensis</i>	0000	0000	0000	II	
7. Acute viral necrosis (in scallops)	***	***	***		
CRUSTACEAN DISEASES					
OIE-listed diseases					
1. Infection with Taura syndrome virus	0000	0000	0000	III	
2. Infection with white spot syndrome virus	0000	0000	0000	III	
3. Infection with yellow head virus genotype 1	0000	0000	0000	III	
4. Infection with infectious hypodermal and haematopoietic	2013	2013	2013	III	
5. Infection with infectious myonecrosis virus	0000	0000	0000	III	
6. Infection with <i>Macrobrachium rosenbergii</i> nodavirus (White Tail disease)	0000	0000	0000	III	
7. Infection with <i>Hepatobacter penaei</i> (Necrotising	0000	0000	0000	III	
8. Acute hepatopancreatic necrosis disease (AHPND)	0000	0000	0000	III	
9. Infection with <i>Aphanomyces astaci</i> (Crayfish plague)	0000	0000	0000	III	
Non OIE-listed diseases					
10. Hepatopancreatic microsporidiosis caused by <i>Enterocytozoon hepatopenaei</i> (HPM-EHP)	0000	0000	0000	III	
11. Viral covert mortality disease (VCMD) of shrimps	0000	0000	0000	III	

12. <i>Spiroplasma eriocheiris</i> infection	***	***	***		
13. Decapod iridescent virus 1 (DIV1)	***	***	***		
AMPHIBIAN DISEASES					
OIE-listed diseases					
1. Infection with <i>Ranavirus</i> species	***	***	***		
2. Infection with <i>Batrachochytrium dendrobatidis</i>	+?	+?	+?		
3. Infection with <i>Batrachochytrium salamandrivorans</i>	***	***	***		
ANY OTHER DISEASES OF IMPORTANCE					
1.					
2.					

DISEASES PRESUMED EXOTIC TO THE REGION^b

LISTED BY THE OIE

Finfish: Infection with HPR-deleted of HPR0 salmon anemia virus; Infection with salmon pancreas disease virus; Infection with *Gyrodactylus salaris*.

Molluscs: Infection with *Bonamia ostreae*; *Marteilia refringens*; *Perkinsus marinus*.

Crustaceans: Crayfish plague (*Aphanomyces astaci*).

NOT LISTED BY THE OIE

Finfish: Channel catfish virus disease

a/ Please use the following symbols:

+	Disease reported or known to be present	?()	Presence of the disease suspected but not confirmed in a zone
+?	Serological evidence and/or isolation of causative agent but no clinical diseases	***	No information available
?	Suspected by reporting officer but presence not confirmed	0000	Never reported
+()	Occurrence limited to certain zones	-	Not reported (but disease is known to occur)
+?()	Confirmed infection/infestation limited to one or more zones of the country, but no clinical disease	(year)	Year of last occurrence

b/ If there is suspicion or confirmation of any of these diseases, they must be reported immediately, because the region is considered free of these diseases

1. Epidemiological comments:

(Comments should include: 1) Origin of the disease or pathogen (history of the disease); 2) Species affected; 3) Disease characteristics (unusual clinical signs or lesions); 4) Pathogen (isolated/sero-typed); 5) Mortality rate (high/low; decreasing/increasing); 6) Death toll (economic loss, etc); 7) Size of infected areas or names of infected areas; 8) Preventive/control measures taken; 9) Samples sent to national or international laboratories for confirmation (indicate the names of laboratories); 10) Published paper (articles in journals/website, etc). and 11) Unknown diseases: describe details as much as possible.)

Comment No.	
1	
2	

2. New aquatic animal health regulations introduced within past six months (with effective date):

Country: **NEW ZEALAND**Period: **January - March 2020**

Item	Disease status ^{at}			Level of diagnosis	Epidemiological comment numbers
	Month				
DISEASES PREVALENT IN THE REGION	January	February	March		
FINFISH DISEASES					
OIE-listed diseases					
1. Infection with epizootic haematopoietic necrosis virus	0000	0000	0000	III	
2. Infection with infectious haematopoietic necrosis virus	0000	0000	0000	III	
3. Infection with spring viremia of carp virus	0000	0000	0000	III	
4. Infection with viral haemorrhagic septicaemia virus	0000	0000	0000	III	
5. Infection with <i>Aphanomyces invadans</i> (EUS)	0000	0000	0000	III	
6. Infection with red sea bream iridovirus	0000	0000	0000	III	
7. Infection with koi herpesvirus	0000	0000	0000	III	
Non OIE-listed diseases					
8. Grouper iridoviral disease	0000	0000	0000	III	
9. Viral encephalopathy and retinopathy	0000	0000	0000	III	
10. Enteric septicaemia of catfish	0000	0000	0000	III	
11. Carp edema virus disease	0000	0000	0000	III	
12. Tilapia lake virus (TiLV)	0000	0000	0000	III	
MOLLUSC DISEASES					
OIE-listed diseases					
1. Infection with <i>Bonamia exitiosa</i>	-(2019)	-(2019)	-(2019)	III	1
2. Infection with <i>Perkinsus olseni</i>	-(2019)	-(2019)	-(2019)	III	2
3. Infection with abalone herpesvirus	0000	0000	0000	III	
4. Infection with <i>Xenohaliotis californiensis</i>	0000	0000	0000	III	
5. Infection with <i>Bonamia ostreae</i>	-(2019)	-(2019)	-(2019)	III	3
Non OIE-listed diseases					
6. Infection with <i>Marteilioides chungmuensis</i>	0000	0000	0000	III	
7. Acute viral necrosis (in scallops)	0000	0000	0000	III	
CRUSTACEAN DISEASES					
OIE-listed diseases					
1. Infection with Taura syndrome virus	0000	0000	0000	III	
2. Infection with white spot syndrome virus	0000	0000	0000	III	
3. Infection with yellow head virus genotype 1	0000	0000	0000	III	
4. Infection with infectious hypodermal and haematopoietic	0000	0000	0000	III	
5. Infection with infectious myonecrosis virus	0000	0000	0000	III	
6. Infection with <i>Macrobrachium rosenbergii</i> nodavirus (White Tail disease)	0000	0000	0000	III	
7. Infection with <i>Hepatobacter penaei</i> (Necrotising	0000	0000	0000	III	
8. Acute hepatopancreatic necrosis disease (AHPND)	0000	0000	0000	III	
9. Infection with <i>Aphanomyces astaci</i> (Crayfish plague)	0000	0000	0000	III	
Non OIE-listed diseases					
10. Hepatopancreatic microsporidiosis caused by <i>Enterocytozoon hepatopenaei</i> (HPM-EHP)	0000	0000	0000	III	
11. Viral covert mortality disease (VCMD) of shrimps	0000	0000	0000	III	

12. <i>Spiroplasma eriocheiris</i> infection	0000	0000	0000	III	
13. Decapod iridescent virus 1 (DIV1)	0000	0000	0000	III	
AMPHIBIAN DISEASES					
OIE-listed diseases					
1. Infection with <i>Ranavirus</i> species	0000	0000	0000	III	
2. Infection with <i>Batrachochytrium dendrobatidis</i>	-(2019)	-(2019)	-(2019)	III	4
3. Infection with <i>Batrachochytrium salamandrivorans</i>	0000	0000	0000	III	
ANY OTHER DISEASES OF IMPORTANCE					
1.					
2.					

DISEASES PRESUMED EXOTIC TO THE REGION^b
LISTED BY THE OIE

Finfish: Infection with HPR-deleted of HPR0 salmon anemia virus; Infection with salmon pancreas disease virus; Infection with *Gyrodactylus salaris*.

Molluscs: Infection with *Bonamia ostreae*; *Marteilia refringens*; *Perkinsus marinus*.

Crustaceans: Crayfish plague (*Aphanomyces astaci*).

NOT LISTED BY THE OIE

Finfish: Channel catfish virus disease

a/ Please use the following symbols:

		?()	Presence of the disease suspected but not confirmed in a zone
+	Disease reported or known to be present		
+?	Serological evidence and/or isolation of causative agent but no clinical diseases	***	No information available
?	Suspected by reporting officer but presence not confirmed	0000	Never reported
+()	Occurrence limited to certain zones	-	Not reported (but disease is known to occur)
+?()	Confirmed infection/infestation limited to one or more zones of the country, but no clinical disease	(year)	Year of last occurrence

b/ If there is suspicion or confirmation of any of these diseases, they must be reported immediately, because the region is considered free of these diseases

1. Epidemiological comments:

(Comments should include: 1) Origin of the disease or pathogen (history of the disease); 2) Species affected; 3) Disease characteristics (unusual clinical signs or lesions); 4) Pathogen (isolated/sero-typed); 5) Mortality rate (high/low; decreasing/increasing); 6) Death toll (economic loss, etc); 7) Size of infected areas or names of infected areas; 8) Preventive/control measures taken; 9) Samples sent to national or international laboratories for confirmation (indicate the names of laboratories); 10) Published paper (articles in journals/website, etc). and 11) Unknown diseases: describe details as much as possible.)

Comment No.	
1	<i>Bonamia exitiosa</i> occurs in commercial oyster beds in Foveaux Strait, Southland where it is highly prevalent and associated with mortalities in mid to late summer. It occurs intermittently around the South Island and in Wellington Harbour (southern end of the North Island) and the North Island. Previous reports of detection in <i>Ostrea chilensis</i> have been from Hauraki Gulf (Auckland region), Tauranga (Bay of Plenty region), the Marlborough Sounds and Wellington Harbour. Annual monitoring of the presence of <i>B. exitiosa</i> infection is undertaken in the flat oyster (<i>O. chilensis</i>) population in the Foveaux Strait.

2	<p>Infection with <i>Perkinsus olseni</i> was first detected in New Zealand in 1999, in wild wedge shells (<i>Macomona liliana</i>). It was then found in wild populations of New Zealand cockles (<i>Austrovenus stutchburyi</i>), ark shells (<i>Barbatia novaezelandiae</i>) and pipi (<i>Paphies australis</i>) in 2000-2001. In July 2013, <i>P. olseni</i> was detected for the first time in farmed black foot pāua (<i>Haliotis iris</i>), an abalone species native to New Zealand. Further detections were made in wild <i>H. iris</i> populations in 2014. These mollusc species occur widely around the coast of New Zealand, but to date <i>P. olseni</i> has only been detected in these species from the Auckland region northwards. <i>Perkinsus olseni</i> was found for the first time on the South Island in New Zealand green lipped mussels (<i>Perna canaliculus</i>) in a land based aquaculture facility in September 2014, and then in wild New Zealand scallops (<i>Pecten novaezelandiae</i>) in November 2014. Both of these findings were in the Marlborough region, and were incidental and not associated with mortality events. In November 2017, passive surveillance detected <i>P. olseni</i> from New Zealand scallops in two sites within Kaipara harbour, Auckland region, and again was thought to be incidental and not associated with significant pathology in scallops. In August 2018, there was another incidental finding of <i>P. olseni</i> in farmed green lipped mussels (<i>Perna canaliculus</i>) in the Coromandel region (North Island), that was not associated with mortalities. In October 2019, <i>P. olseni</i> was detected in <i>P. canaliculus</i> in a land based aquaculture facility that were experiencing low level mortalities. It remains unknown if <i>P. olseni</i> was related to the mortalities in <i>P. canaliculus</i> in this case.</p>
3	<p>Infection with <i>Bonamia ostreae</i> was detected for the first time in New Zealand flat oysters (<i>Ostrea chilensis</i>) in January 2015. It was found in two regions in the northern part of the South Island: on one land-based aquaculture facility in the Nelson region, and on two marine farms in the Marlborough region. Since that time, movement controls have been in place to regulate the movement of susceptible shellfish from the northern regions of the South Island and active surveillance has been conducted for the purposes of early detection of spread. In 2016, <i>B. ostreae</i> was detected in both farmed and wild flat oysters within the Marlborough region (the same region as initially reported), and was associated with pathology and mortality in the farmed population. In May 2017 surveillance detected <i>B. ostreae</i> in marine flat oyster farms in Big Glory Bay, Stewart Island (situated in the Southland region, at the southern end of the South Island). No clinical signs or elevated mortality was observed in association with <i>B. ostreae</i> in farmed flat oysters in Big Glory Bay. Following this detection, movement controls to manage risk movements from Stewart Island were issued, and depopulation of all flat oyster farms within areas where <i>B. ostreae</i> had been detected commenced. Depopulation of farms in Big Glory Bay commenced on the 19 June 2017 and was completed September 2017. Depopulation of farms in Marlborough Sounds commenced on the 11 July and was completed in December 2017. In September 2019, surveillance detected <i>B. ostreae</i> in one wild flat oyster in Big Glory Bay, Stewart Island. No clinical signs were observed in association with this wild flat oyster.</p>
4	<p>The first isolation of <i>Batrachochytrium dendrobatidis</i> was made in 1999 in New Zealand. Since then the fungus has been detected both on the North and South Islands in both native and introduced frog species. In July 2019, <i>Batrachochytrium dendrobatidis</i> was detected in Southern brown tree frogs that had been wild caught in the Wellington region of New Zealand. Southern brown tree frogs are an introduced Australian species that have naturalised.</p>

2. New aquatic animal health regulations introduced within past six months (with effective date):

Country: **SINGAPORE***

 Period: **January - March 2019**

Item	Disease status ^{al}			Level of diagnosis	Epidemiological comment numbers
	Month				
DISEASES PREVALENT IN THE REGION	January	February	March		
FINFISH DISEASES					
OIE-listed diseases					
1. Infection with epizootic haematopoietic necrosis virus	0000	0000	0000		
2. Infection with infectious haematopoietic necrosis virus	0000	0000	0000		
3. Infection with spring viremia of carp virus	0000	0000	0000		
4. Infection with viral haemorrhagic septicaemia virus	0000	0000	0000		
5. Infection with <i>Aphanomyces invadans</i> (EUS)	0000	0000	0000		
6. Infection with red sea bream iridovirus	(2019)	(2019)	(2019)		
7. Infection with koi herpesvirus	(2019)	(2019)	(2019)		
Non OIE-listed diseases					
8. Grouper iridoviral disease	(2014)	(2014)	(2014)		
9. Viral encephalopathy and retinopathy	+	(2020)	(2020)	III	1
10. Enteric septicaemia of catfish	****	****	****		
11. Carp edema virus disease	****	****	****		
12. Tilapia lake virus (TiLV)	0000	0000	0000		
MOLLUSC DISEASES					
OIE-listed diseases					
1. Infection with <i>Bonamia exitiosa</i>	****	****	****		
2. Infection with <i>Perkinsus olseni</i>	****	****	****		
3. Infection with abalone herpesvirus	****	****	****		
4. Infection with <i>Xenohaliotis californiensis</i>	****	****	****		
5. Infection with <i>Bonamia ostreae</i>	****	****	****		
Non OIE-listed diseases					
6. Infection with <i>Marteilioides chungmuensis</i>	****	****	****		
7. Acute viral necrosis (in scallops)	****	****	****		
CRUSTACEAN DISEASES					
OIE-listed diseases					
1. Infection with Taura syndrome virus	0000	0000	0000		
2. Infection with white spot syndrome virus	(2018)	(2018)	(2018)		
3. Infection with yellow head virus genotype 1	0000	0000	0000		
4. Infection with infectious hypodermal and haematopoietic necrosis virus	0000	0000	0000		
5. Infection with infectious myonecrosis virus	0000	0000	0000		
6. Infection with <i>Macrobrachium rosenbergii</i> nodavirus (White Tail disease)	****	****	****		
7. Infection with <i>Hepatobacter penaei</i> (Necrotising hepatopancreatitis)	0000	0000	0000		
8. Acute hepatopancreatic necrosis disease (AHPND)	0000	0000	0000		
9. Infection with <i>Aphanomyces astaci</i> (Crayfish plague)	****	****	****		
Non OIE-listed diseases					
10. Hepatopancreatic microsporidiosis caused by <i>Enterocytozoon hepatopenaei</i> (HPM-EHP)	****	****	****		
11. Viral covert mortality disease (VCMD) of shrimps	****	****	****		

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12. <i>Spiroplasma eriocheiris</i> infection	***	***	***		
13. Decapod iridescent virus 1 (DIV1)	***	***	***		
AMPHIBIAN DISEASES					
OIE-listed diseases					
1. Infection with <i>Ranavirus</i> species	***	***	***		
2. Infection with <i>Batrachochytrium dendrobatidis</i>	(2018)	(2018)	(2018)		
3. Infection with <i>Batrachochytrium salamandrivorans</i>	(2018)	(2018)	(2018)		
ANY OTHER DISEASES OF IMPORTANCE					
1.					
2.					

DISEASES PRESUMED EXOTIC TO THE REGION^b

LISTED BY THE OIE

Finfish: Infection with HPR-deleted of HPR0 salmon anemia virus, Infection with salmon pancreas disease virus; Infection with *Gyrodactylus salaris*.

Molluscs: Infection with *Bonamia ostreae*; *Marteilia refringens*; *Perkinsus marinus*.

Crustaceans: Crayfish plague (*Aphanomyces astaci*).

NOT LISTED BY THE OIE

Finfish: Channel catfish virus disease

a/ Please use the following symbols:

+	Disease reported or known to be present	?()	Presence of the disease suspected but not confirmed in a zone
+?	Serological evidence and/or isolation of causative agent but no clinical diseases	***	No information available
?	Suspected by reporting officer but presence not confirmed	0000	Never reported
+()	Occurrence limited to certain zones	-	Not reported (but disease is known to occur)
+?()	Confirmed infection/infestation limited to one or more zones of the country, but no clinical disease	(year)	Year of last occurrence

b/ If there is suspicion or confirmation of any of these diseases, they must be reported immediately, because the region is considered free of these diseases

1. Epidemiological comments:

(Comments should include: 1) Origin of the disease or pathogen (history of the disease); 2) Species affected; 3) Disease characteristics (unusual clinical signs or lesions); 4) Pathogen (isolated/sero-typed); 5) Mortality rate (high/low; decreasing/increasing); 6) Death toll (economic loss, etc); 7) Size of infected areas or names of infected areas; 8) Preventive/control measures taken; 9) Samples sent to national or international laboratories for confirmation (indicate the names of laboratories); 10) Published paper (articles in journals/website, etc). and 11) Unknown diseases: describe details as much as possible.)

Comment No.	
1	Viral nervous necrosis virus (VNNV) was detected by PCR in a batch of diseased ~300-g pompano fish submitted by a commercial aquaculture facility. The fish health manager was promptly informed of the viral detection.

2. New aquatic animal health regulations introduced within past six months (with effective date):

Country: VIETNAM*

Period: January - March 2020

Item	Disease status ^{a/}			Level of diagnosis	Epidemiological comment numbers
	Month				
DISEASES PREVALENT IN THE REGION	January	February	March		
FINFISH DISEASES					
OIE-listed diseases					
1. Infection with epizootic haematopoietic necrosis virus	0000	0000	0000		
2. Infection with infectious haematopoietic necrosis virus	0000	0000	0000		
3. Infection with spring viremia of carp virus	0000	0000	0000		
4. Infection with viral haemorrhagic septicaemia virus	0000	0000	0000		
5. Infection with <i>Aphanomyces invadans</i> (EUS)	-	-	-		
6. Infection with red sea bream iridovirus	0000	0000	0000		
7. Infection with koi herpesvirus	0000	0000	0000		
Non OIE-listed diseases					
8. Grouper iridoviral disease	0000	0000	0000		
9. Viral encephalopathy and retinopathy	0000	0000	0000		
10. Enteric septicaemia of catfish	+()	+()	+()	I, III	1
11. Carp edema virus disease	0000	0000	0000		
12. Tilapia lake virus (TiLV)	0000	0000	0000		
MOLLUSC DISEASES					
OIE-listed diseases					
1. Infection with <i>Bonamia exitiosa</i>	0000	0000	0000		
2. Infection with <i>Perkinsus olseni</i>	(2013)	(2013)	(2013)		
3. Infection with abalone herpesvirus	0000	0000	0000		
4. Infection with <i>Xenohaliotis californiensis</i>	0000	0000	0000		
5. Infection with <i>Bonamia ostreae</i>	0000	0000	0000		
Non OIE-listed diseases					
6. Infection with <i>Marteilioides chungmuensis</i>	0000	0000	0000		
7. Acute viral necrosis (in scallops)	0000	0000	0000		
CRUSTACEAN DISEASES					
OIE-listed diseases					
1. Infection with Taura syndrome virus	0000	0000	0000		
2. Infection with white spot syndrome virus	+()	+()	+()	I, III	2
3. Infection with yellow head virus genotype 1**	0000	0000	0000		
4. Infection with infectious hypodermal and haematopoietic necrosis virus	0000	0000	0000		
5. Infection with infectious myonecrosis virus	0000	0000	0000		
6. Infection with <i>Macrobrachium rosenbergii</i> nodavirus (White Tail disease)	-	-	-		
7. Infection with <i>Hepatobacter penaei</i> (Necrotising hepatopancreatitis)	0000	0000	0000		
8. Acute hepatopancreatic necrosis disease (AHPND)	+()	+()	+()	I, III	3
9. Infection with <i>Aphanomyces astaci</i> (Crayfish plague)	0000	0000	0000		

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**Since 2015, “-“ was used for YHV in Vietnam (YHV was replaced by YHV1 from 2019). After recent verification of the YHV genotype detected since 2015, it was found that the YHV genotype was actually GAV. Therefore, the code for YHV1 is changed to “0000” starting from third quarter of 2019, which means that YHV1 is never reported in Vietnam.

Non OIE-listed diseases					
10. Hepatopancreatic microsporidiosis caused by <i>Enterocytozoon hepatopenaei</i> (HPM-EHP)	0000	0000	0000		
11. Viral covert mortality disease (VCMD) of shrimps	0000	0000	0000		
12. <i>Spiroplasma eriocheiris</i> infection	0000	0000	0000		
13. Decapod iridescent virus 1 (DIV1)	0000	0000	0000		
AMPHIBIAN DISEASES					
OIE-listed diseases					
1. Infection with <i>Ranavirus</i> species	0000	0000	0000		
2. Infection with <i>Batrachochytrium dendrobatidis</i>	0000	0000	0000		
3. Infection with <i>Batrachochytrium salamandrivorans</i>	0000	0000	0000		
ANY OTHER DISEASES OF IMPORTANCE					

**DISEASES PRESUMED EXOTIC TO THE REGION^b
LISTED BY THE OIE**

Finfish: Infection with HPR-deleted of HPR0 salmon anemia virus; Infection with salmon pancreas disease virus; Infection with *Gyrodactylus salaris*.

Molluscs: Infection with *Bonamia ostreae*; *Marteilia refringens*; *Perkinsus marinus*.

Crustaceans: Crayfish plague (*Aphanomyces astaci*).

NOT LISTED BY THE OIE

Finfish: Channel catfish virus disease

a/ Please use the following symbols:

+	Disease reported or known to be present	?()	Presence of the disease suspected but not confirmed in a zone
+?	Serological evidence and/or isolation of causative agent but no clinical diseases	***	No information available
?	Suspected by reporting officer but presence not confirmed	0000	Never reported
+()	Occurrence limited to certain zones	-	Not reported (but disease is known to occur)
+?()	Confirmed infection/infestation limited to one or more zones of the country, but no clinical disease	(year)	Year of last occurrence

b/ If there is suspicion or confirmation of any of these diseases, they must be reported immediately, because the region is considered free of these diseases

1. Epidemiological comments:

(Comments should include: 1) Origin of the disease or pathogen (history of the disease); 2) Species affected; 3) Disease characteristics (unusual clinical signs or lesions); 4) Pathogen (isolated/sero-typed); 5) Mortality rate (high/low; decreasing/increasing); 6) Death toll (economic loss, etc); 7) Size of infected areas or names of infected areas; 8) Preventive/control measures taken; 9) Samples sent to national or international laboratories for confirmation (indicate the names of laboratories); 10) Published paper (articles in journals/website, etc). and 11) Unknown diseases: describe details as much as possible.)

Comment No.	
1	Enteric Septicaemia of Catfish (<i>Edwardsiella ictaluri</i>) Infection found in some small scale catfish (<i>Pangasius micronema</i> , <i>P. hypophthalmus</i>) farms.

<p>2</p>	<p>Infection with white spot syndrome virus (White Spot Disease; WSD) Pathogen: White spot syndrome virus (WSSV) Species affected: <i>Penaeus monodon</i> and <i>Litopenaeus vannamei</i>; Name of affected area: reported and limited in some small scale farms with low biosecurity control. Shrimps were affected at 10-100 days after stocking; Mortality rate: average to high; Clinical signs: lethargic or moribund shrimps aggregated at pond surface and edges, slow to erratic swimming behavior, overall body color often reddish, minute to large (0.5-2.0 mm diameter) white inclusions embedded in the cuticle; Control measures: early harvest, strict isolation of infected ponds from movement, strengthened control of transportation, cleaning and disinfection of infected ponds and farming tools using Calcium hypochlorite (chlorine).</p>
<p>3</p>	<p>Acute Hepatopancreatic Necrosis Disease (AHPND) Pathogen: <i>Vibrio parahaemolyticus</i> with Phage A3 Species affected: <i>Penaeus monodon</i> and <i>Litopenaeus vannamei</i> (10-45 DOC) Name of affected area: reported and limited to some small-scale farms with low biosecurity control. Mortality rate: ; Clinical signs: shrimps become lethargic with soft, darkened shells, mottling of the carapace. Pathology is limited to hepatopancreas. Control measures: early harvest, strict isolation of infected ponds from movement and transport controls, cleaning and disinfection of infected ponds and farming tools using Calcium hypochlorite (chlorine).</p>

2. New aquatic animal health regulations introduced within past six months (with effective date): None

List of Diseases in the Asia-Pacific Quarterly Aquatic Animal Disease Report (Beginning 2020)

1. DISEASES PREVALENT IN THE REGION	
1.1 FINFISH DISEASES	
OIE-listed diseases	Non OIE-listed diseases
1. Infection with epizootic haematopoietic necrosis virus	1. Grouper iridoviral disease
2. Infection with infectious haematopoietic necrosis virus	2. Viral encephalopathy and retinopathy
3. Infection with spring viremia of carp virus	3. Enteric septicaemia of catfish
4. Infection with viral haemorrhagic septicaemia virus	4. Carp edema virus disease
5. Infection with <i>Aphanomyces invadans</i> (EUS)	5. Tilapia lake virus (TiLV)
6. Infection with red sea bream iridovirus	
7. Infection with koi herpesvirus	
1.2 MOLLUSC DISEASES	
OIE-listed diseases	Non OIE-listed diseases
1. Infection with <i>Bonamia exitiosa</i>	1. Infection with <i>Marteilioides chungmuensis</i>
2. Infection with <i>Perkinsus olseni</i>	2. Acute viral necrosis (in scallops)
3. Infection with abalone herpesvirus	
4. Infection with <i>Xenohalotis californiensis</i>	
5. Infection with <i>Bonamia ostreae</i>	
1.3 CRUSTACEAN DISEASES	
OIE-listed diseases	Non OIE-listed diseases
1. Infection with Taura syndrome virus	1. Hepatopancreatic microsporidiosis caused by <i>Enterocytozoon hepatopenaei</i> (HPM-EHP)
2. Infection with white spot syndrome virus	2. Viral covert mortality disease (VCMD) of shrimps
3. Infection with yellow head virus genotype 1	3. <i>Spiroplasma eriocheiris</i> infection
4. Infection with infectious hypodermal and haematopoietic necrosis	4. Decapod iridescent virus 1 (DIV1)
5. Infection with infectious myonecrosis virus	
6. Infection with <i>Macrobrachium rosenbergii</i> nodavirus (White Tail disease)	
7. Infection with <i>Hepatobacter penaei</i> (Necrotising hepatopancreatitis)	
8. Acute hepatopancreatic necrosis disease (AHPND)	
9. Infection with <i>Aphanomyces astaci</i> (Crayfish plague)	
1.4 AMPHIBIAN DISEASES	
OIE-listed diseases	Non OIE-listed diseases
1. Infection with <i>Ranavirus</i> species	
2. Infection with <i>Bachtrachytrium dendrobatidis</i>	
3. Infection with <i>Batrachocytrium salamandrivorans</i>	
2. DISEASES PRESUMED EXOTIC TO THE REGION	
2.1 Finfish	
OIE-listed diseases	Non OIE-listed diseases
1. Infection with HPRdeleted or HPR0 salmon anaemia virus	1. Channel catfish virus disease
2. Infection with salmon pancreas disease virus	
3. Infection with <i>Gyrodactylus salaris</i>	
2.2 Molluscs	
OIE-listed diseases	Non OIE-listed diseases
1. Infection with <i>Marteilia refringens</i>	
2. Infection with <i>Perkinsus marinus</i>	

Recent Aquatic Animal Health Related Publications

OIE Aquatic Animal Health Code, 22nd Edition, 2019. The OIE Aquatic Animal Health Code (the Aquatic Code) provides standards for the improvement of aquatic animal health worldwide. It also includes standards for the welfare of farmed fish and use of antimicrobial agents in aquatic animals. The sanitary measures in the Aquatic Code should be used by the Competent Authorities of importing and exporting countries for early detection, reporting and control of pathogenic agents in aquatic animals (amphibians, crustaceans, fish and molluscs) and to prevent their spread via international trade in aquatic animals and their products, while avoiding unjustified sanitary barriers to trade. The standards in the Aquatic Code have been formally adopted by the World Assembly of OIE Delegates, which constitutes the organisation's highest decision-making body. This 22nd edition incorporates modifications to the Aquatic Code agreed at the 87th General Session in May 2019. This edition includes the following updates: Glossary: revised definition for 'basic biosecurity conditions'; Chapter 1.5. 'Criteria for listing species as susceptible to infection with a specific pathogen'; Chapter 8.3. 'Infection with Ranavirus'; Chapter 9.1. 'Acute hepatopancreatic necrosis disease'; Articles 10.2.1. and 10.2.2. of Chapter 10.2. 'Infection with *Aphanomyces invadans*'; Article 10.5.2. of Chapter 10.5. 'Infection with salmonid alphavirus'; Articles 10.6.1., 10.6.2. and 10.6.8. of Chapter 10.6. 'Infection with infectious haematopoietic necrosis virus'; Article 10.7.2. of Chapter 10.7. 'Infection with koi herpesvirus'; Article 10.9.2. of Chapter 10.9. 'Infection with spring viraemia of carp virus'; Article X.X.8. of all disease-specific chapters (except for Article 10.3.8. of Chapter 10.3. 'Infection with *Gyrodactylus salaris*' due to the nature of the pathogenic agent) and Article 10.4.12. of Chapter 10.4. 'Infection with infectious salmon anaemia virus'. The Aquatic Animal Health Code is available for free download <http://www.oie.int/en/standard-setting/aquatic-code/access-online/>

OIE Manual of Diagnostic Tests for Aquatic Animals, 2019. The purpose of the Manual of Diagnostic Tests for Aquatic Animals (the Aquatic Manual) is to provide a standardised approach to the diagnosis of the diseases listed in the Aquatic Code, to facilitate health certification for trade in aquatic animals and aquatic animal products. Although there are many publications on the diagnosis and control of aquatic animal diseases, the Aquatic Manual is a key reference document describing the methods relevant to the OIE-listed diseases and other important diseases for use by aquatic animal health laboratories around the world. Adoption of the specified methods will help to increase efficiency of laboratories and to promote improvements in aquatic animal health world-wide. The manual is available for free download at <http://www.oie.int/en/standard-setting/aquatic-manual/access-online/>

NACA (2020). **Infection with Decapod Iridescent Virus 1 (DIV1): Disease Card.** Network of Aquaculture Centres in Asia-Pacific, <https://enaca.org/?id=1104&title=infection-with-decapod-iridescent-virus-1-%28div1%29-disease-card>

NACA (2020). **Disease Advisory-Decapod iridescent virus 1 (DIV1): An emerging threat to the shrimp industry.** Network of Aquaculture Centres in Asia-Pacific, <https://enaca.org/?id=1098&title=decapod-iridescent-virus-1-an-emerging-threat-to-the-shrimp-industry>

Sanguanrut, P., Thaiue, D., Thawonsuwan, J., Flegel, T. W., Sritunyalucksana, K. (2020). **Urgent announcement on usefulness of the lymphoid organ (LO) as an additional prime target for diagnosis of decapod iridescent virus 1 (DIV1) in diseased *P. vannamei*.** NACA Newsletter, ISSN 0115-8503, 2020, XXXV: 2. <https://enaca.org/?id=1092>.

Srisala, J., Sanguanrut, Thaiue, P. D., Laiphrom, S., Siritwattano, J., Khudet, J., Powtongsook, S., Flegel, T. W., Sritunyalucksana, K. (2020). **Urgent warning: Positive PCR detection results for infectious myonecrosis virus (IMNV) and decapod iridescent virus 1 (DIV1) in captured *Penaeus monodon* from the Indian Ocean.** NACA Newsletter, ISSN 0115-8503, 2020, XXXV: 2. <https://enaca.org/?id=1093>

Qiu, L., Chen, X., Guo, X.-M., Gao, W., Zhao, R.-H., Zhang, Q.-L., Yang, B., Huang, J. (2020). **A TaqMan probe based real-time PCR for the detection of Decapod iridescent virus 1.** Journal of Invertebrate Pathology, 2020, 107367. doi:10.1016/j.jip.2020.107367.

Harkell, L. (2020). **Chinese scientists confirm new virus causes shrimp ‘glass post-larvae’**. Undercurrent News, <https://www.undercurrentnews.com/2020/05/08/chinese-scientists-confirm-new-virus-causes-shrimp-glass-post-larvae>.

Reverter, M., Sarter, S., Caruso, D., et al. (2020). **Aquaculture at the crossroads of global warming and antimicrobial resistance**. Nature Communications, 11:1870 | <https://doi.org/10.1038/s41467-020-15735-6>.

Bondad-Reantaso, M.G., MacKinnon, B, Hao, B., Huang, J., et al. (2020). **Viewpoint: SARS-CoV-2 (the cause of COVID-19 in humans) is not known to infect aquatic food animals nor contaminate their products**. Asian Fisheries Science, 33:74-78.

Dong, H.T., Senapin, S., Gangnonngiw, W., Nguyen, V.V., Rodkhum, C., Debnath, P.P., Delamare-Deboutteville, J. and Mohan, C.V. (2020). **Experimental infection reveals transmission of tilapia lake virus (TiLV) from tilapia broodstock to their reproductive organs and fertilized eggs**. Aquaculture, 515: doi.10.1016.2019.734541

Nurliyana, M., Lukman, B., Ina-Salwany, M.Y., Zamri-Saad, M., Annas, S., Dong, H.T., Rodkhum, C. and Amal, M.N.A. (2020). **First evidence of scale drop disease virus in farmed Asian seabass (*Lates calcarifer*) in Malaysia**. Aquaculture, <https://doi.org/10.1016/j.aquaculture.2020.735600>.

NACA (2019). **Report of the Eighteenth Meeting of the Asia Regional Advisory Group on Aquatic Animal Health. Network of Aquaculture Centres in Asia-Pacific**, <https://enaca.org/?id=1094&title=report-of-the-18th-regional-advisory-group-on-aquatic-animal-health>.

Ernst, I. and Peeler, E.J. (Editors) (2019). **The Role of Aquatic Animal Health in Food Security**. Rev. Sci. Tech. Off. Int. Epiz., Volume 38, 651 pp.

Niederle, M.V., Bosch, J., Ale, C.E., Nader-Macías, M.E., Aristimuño Ficooseco, C., Toledo, L.F., Valenzuela-Sanchez, A., Soto-Azat, C., and Pasteris, S.E. (2019). **Skin-associated lactic acid bacteria from North American bullfrogs as potential control agents of *Batrachochytrium dendrobatidis***. PLoS ONE, 14 (9), e0223020.

Ye, L.T., Wu, L., Wang, J.Y., Li, Q.Z., Guan, J.L. & Luo, B. (2019). **First report of black-heart disease in Kumamoto oyster *Crassostrea sikamea* spat caused by *Polydora lingshuiensis* in China**. Diseases of Aquatic Organisms, 133, 247-252.

Qiu, L., Chen, X., Zhao, R.-H., Li, C., Gao, W., Zhang Q.-L., Huang J. (2019). **Description of a natural infection with Decapod iridescent virus 1 in farmed giant freshwater prawn, *Macrobrachium rosenbergii***. Viruses, 2019, 11(4): 354. doi: 10.3390/v11040354.

Dong, H.T., Senapin, S., Jeamkunakorn, C, Nguyen, V.V., Nguyen, N.T., Rodkhum, C., Khunrae, P., and Rattanaojpong, T. (2019). **Natural occurrence of edwardsiellosis caused by *Edwardsiella ictaluri* in farmed hybrid red tilapia (*Oreochromis* sp.) in Southeast Asia**. Aquaculture, 499:17-23.

Jaemwimol, P., Sirakanchana, K., Tattiyapong, P., Mongkolsuk, S. and Surachetpong, W., 2019. **Virucidal effects of common disinfectants against tilapia lake virus**. Journal of Fish Diseases, DOI: 10.1111/jfd.13060.

OIE, 2018. ***Batrachochytrium Salamandrivorans***. World Organization for Animal Health, Paris, France. http://www.oie.int/fileadmin/Home/eng/International_Standard_Setting/docs/pdf/Aquatic_Commission/A_BSAL_Disease_card.pdf

NACA, NFTEC, China-ASEAN CJRPMAT and SYS, 2018. **Emergency Regional Consultation for Prevention and Management of Tilapia Lake Virus (TiLV) in the Asia-Pacific**. EM leano and Y Liang (Editors). Network of Aquaculture Centres in Asia-Pacific, Bangkok, Thailand. 67 pp.

Qiu L, Chen M M, Wan X Y, et al., 2018. **Detection and quantification of Shrimp hemocyte iridescent virus by TaqMan probe based real-time PCR**. J Inverteb Pathol, 154.

- Huang, J., 2018. **Emerging disease: Shrimp haemocyte iridescent virus (SHIV)**. Global Aquaculture Advocate.
- Jansen, MD, Dong, HT and Mohan CV, 2018. **Tilapia lake virus: a threat to the global tilapia industry? Reviews in Aquaculture**, doi: 10.1111/raq.12254.
- Watts, JEM, Schreirer, HJ, Lanska, L. and Hale, M.S., 2017. **The rising tide of antimicrobial resistance in aquaculture: sources, sinks and solutions**. Marine Drugs, 15(6): 158.
- NACA, 2017. **Disease Advisory: Tilapia Lake Virus – an Emerging Threat to Farmed Tilapia in the Asia-Pacific Region**. Network of Aquaculture Centres in Asia-Pacific, Bangkok, Thailand.
- Jansen, M.D. and Mohan, C.V., 2017. **Tilapia Lake Virus (TiLV): Literature Review**. Penang, Malaysia: CGIAR Research Program on Fish Agri-Food Systems. Working Paper: FISH-2017-04.
- OIE, 2017. **Tilapia Lake Virus (TiLV) – a Novel Orthomyxo-like Virus**. World Organization for Animal Health, Paris, France.
- FAO, 2017. **Outbreaks of Tilapia lake virus (TiLV) Threaten the Livelihoods and Food Security of Millions of People Dependent on Tilapia Farming**. GIEWS Special Alert No: 338 – Global Food and Agriculture Organization of the United Nations, Rome, Italy.
- Surachetpong, W., Janetanakit, T., Nonthabenjawan, N., Tattiyapong, P., Sirikanchana, K. and Amonsin, A., 2017. **Outbreaks of tilapia lake virus infection, Thailand, 2015-2016**. Emerging Infectious Diseases, <https://dx.doi.org/10.3201/eid2306.161278>
- Dong HT, Siriroob, S., Meemetta, W., Santimanawong, W., Gangnonngiw, W., Pirarat, N., Khunrae, P., Rattanarojpong, T., Vanichviriyakit, R. and Senapin, S., 2017a. **Emergence of tilapia lake virus in Thailand and an alternative semi-nested RT-PCR for detection**. Aquaculture, doi: 10.1016/j.aquaculture.2017.04.019
- Dong HT, Siriroob, S., Meemetta, W., Santimanawong, W., Gangnonngiw, W., Pirarat, N., Khunrae, P., Rattanarojpong, T., Vanichviriyakit, R. and Senapin, S., 2017b. **A warning and an improved PCR detection method for tilapia lake virus (TiLV) disease in Thai tilapia farms**. http://www.enaca.org/modules/news/article.php?article_id=2077&title=tilapia-lake-virus-in-thailand-improved-pcr-detection-method
- Kramer, L., 2017. **Sizing up TiLV and its potential impact on tilapia production**. Global Aquaculture Advocate, May 2017.
- Li F, Xu L, Yang F., 2017. **Genomic characterization of a novel iridovirus from redclaw crayfish *Cherax quadricarinatus*: evidence for a new genus within the family Iridoviridae**. J Gen Virol, 98(10).
- Qiu L, Chen M M, Wan X Y, et al., 2017. **Characterization of a new member of Iridoviridae, Shrimp hemocyte iridescent virus (SHIV), found in white leg shrimp (*Litopenaeus vannamei*)**. Sci Rep, 7(1):11834.
- Qiu L, Chen M M, Wang R Y, et al., 2017. **Complete genome sequence of shrimp hemocyte iridescent virus (SHIV) isolated from white leg shrimp, *Litopenaeus vannamei***. Arch Virol, 130(9):1-5.
- Xu L, Wang T, Li F, et al., 2016. **Isolation and preliminary characterization of a new pathogenic iridovirus from redclaw crayfish *Cherax quadricarinatus***. Dis Aquat Org, 120(1):17.
- Pakingking, R.V. Jr., de Jesus-Ayson, E.G.T. and Acosta, B.O. (Eds.), 2016. **Addressing Acute Hepatopancreatic Necrosis Disease (AHPND) and Other Transboundary Diseases for Improved Aquatic Animal Health in Southeast Asia**. SEAFDEC AQD, Tigbauan, Iloilo, Philippines. 109 pp.

Lio-Po, G.D. and E.M. Leaño, 2016. **Chapter 13: Important diseases of penaeid shrimps.** In: IC Liao, NH Chao and EM Leaño (editors), *Progress of Shrimp and Prawn Aquaculture in the World*. National Taiwan Ocean University, Keelung, Taiwan, The Fisheries Society of Taiwan, Keelung, Taiwan, Asian Fisheries Society, Selangor, Malaysia and World Aquaculture Society, Louisiana, USA. p. 269-315.

Liu, Z., Zhang, Q.-L., Wan, X.-Y., Huang, J., 2016. **Development of real-time PCR assay for detection of microsporidian *Enterocytozoon hepatopenaei* and detection in shrimp samples under different growth rates.** *Progress in Fishery Sciences*. In press (in Chinese. Abstract in English).

Dabu, I.M., Lim, J.J., Arabit, P.M.T., Orense, S.J.A.B., Tabardillo Jr., J.A., Corre, V.L. and Maningas, M.B.B., 2015. **The first record of acute hepatopancreatic necrosis disease in the Philippines.** *Aquacul. Res.* doi: 10.1111/are.12923

de la Peña, L.D., N.A.R. Cabillon, D.D. Catedral, E.C. Amar, R.C. Usero, W.D. Monotilla, A.T. Calpe, D.D.G. Fernandez and C.P. Saloma, 2015. **Acute hepatopancreatic necrosis disease (AHPND) outbreaks in *Penaeus vannamei* and *P. monodon* cultured in the Philippines.** *Diseases of Aquatic Organisms*, 116:251-254.

Kondo, H., Van, P.T., Dang, L.T. and Hirono, I., 2015. **Draft genome sequence of non-*Vibrio parahaemolyticus* acute hepatopancreatic necrosis disease strain KC13.17.5, isolated from diseased shrimp in Vietnam.** *Genome Announc* 3(5):e00978-15. doi:10.1128/genomeA.00978-15.

Liu, L., Xiao, J., Xia, X., Pan, Y., Yan, S. and Wang, Y., 2015. **Draft genome sequence of *Vibrio owensii* strain SH-14, which causes shrimp acute hepatopancreatic necrosis disease.** *Genome Announc* 3(6):e01395-15. doi:10.1128/genomeA.01395-15.

Soto-Rodriguez, S.A., Gomez-Gil, B., Lozano-Olvera, R., Betancourt-Lozano, M. and Morales-Covarrubias, M.S., 2015. **Field and experimental evidence of *Vibrio parahaemolyticus* as the causative agent of acute hepatopancreatic necrosis disease of cultured shrimp (*Litopenaeus vannamei*) in Northwestern Mexico.** *Applied and Environmental Microbiology*, 81: 1-11.

Han, J.E., Tang, K.F.J., Tran, L.H. and Lightner, D.V., 2015. **Photorhabdus insect-related (Pir) toxin-like genes in a plasmid of *Vibrio parahaemolyticus*, the causative agent of acute hepatopancreatic necrosis disease (AHPND) of shrimp.** *Dis. Aquat. Org.*, 113:33-40

Sirikharin, R., Taengchaiyaphum, S., Sanguanrut, P., Chi, T.D., Mavichak, R., Proespraiwong, P., et al., 2015. **Characterization and PCR Detection Of Binary, Pir-Like Toxins from *Vibrio parahaemolyticus* Isolates that Cause Acute Hepatopancreatic Necrosis Disease (AHPND) in Shrimp.** *PLoS ONE* 10(5): e0126987. doi:10.1371/journal.pone.0126987

Zhang, Q., Liu, Q., Liu, S., Yang, H., Liu, S., Zhu, L., Yang, B., Jin, J., Ding, L., Wang, X., Liang, Y., Wang, Q. and Huang, J., 2014. **A new nodavirus associated with covert mortality disease of shrimp.** *J. Gen. Virol.*, 95:2700-2709.

Tran, L.H., Fitzsimmons, K., Lightner, D.V., 2014. **AHPND/EMS: From the academic science perspective to the production point of view.** *Aquaculture Asia-Pacific*, March/April 2014: 14-18.

Tran, L.H., Fitzsimmons, K., Lightner, D.V., 2014. **Tilapia could enhance water conditions, help control EMS in shrimp ponds.** *Global Aquaculture Advocate*, Jan/Feb 2014: 26-28

Mohan, C.V. and Leaño, E., 2014. **Shrimp early mortality syndrome (EMS)/Acute hepatopancreatic necrosis syndrome (AHPNS): an emerging aquatic animal disease in the Asia Pacific.** In: *Aquaculture New Possibilities and Concerns* (VRP Sinha and P Jayashankar, editors). p. 133-140.

List of NACA National Coordinators (*) and OIE National Focal Points for Aquatic Animals (**)

Country	Name and Address
Australia	<p>Dr. Ingo Ernst* Aquatic Animal Health Unit Office of the Chief Veterinary Officer Department of Agriculture, Fisheries and Forestry GPO Box 858, Canberra ACT 2601, Fax: +61-2-6272 3150; Phone: +61-2-6272 4328 Email: ingo.ernst@agriculture.gov.au</p> <p>Dr. Yuko Hood** Principal Science Officer, Aquatic Pest and Health Policy Department of Agriculture and Water Resources GPO Box 858, 7 London Circuit Canberra, ACT 2601 Phone: +61 2 6272 3024 E-mail: yuko.hood@agriculture.gov.au</p>
Bangladesh	<p>Dr. M. G. Hussain* Director General, Bangladesh Fisheries Research Institute (BFRI) Mymensingh 2201, Bangladesh Fax: +880-91-66559, Tel: +880-91-65874 E-mail: hussain.bfri@gmail.com; dg@fri.gov.bd; dqbfri@gmail.com</p> <p>Mr. Ali Nowsher** Assistant Director Aquaculture Section Department of fisheries Matshya Bhaban, Ramna Dhaka 1000 Phone: +880 295 605 17 E-mail: mnali28bcs@yahoo.com</p>
Bhutan	<p>Mr Drukpola Nill** Officiating Program Director National Research and Development Centre for Aquaculture Department of Livestock P.O. Box No.242 Ministry of Agriculture and Forests Gelephu, Sarpang Phone: +975 6 251190 E-mail: drukplola@moaf.gov.bt</p> <p>Mr Singye Tshering** Program director National Research Centre for Riverine and Lake Fisheries Department of Livestock Nyachu, Haa Phone: +975 8 375323 E-mail: singye2009@gmail.com</p>

<p>Brunei</p>	<p>Dr Wanidawati Tamat** Senior Fisheries Officer Department of Fisheries Ministry of Primary Resources and Tourism Jalan Peranginan Pantai Serasa Kampong Serasa, BT 1728 Phone: +673 2770 068 E-mail: wanidawati.tamat@fisheries.gov.bn</p>
<p>Cambodia</p>	<p>Mr. Chheng Phen* Acting Director Inland Fisheries Research and Development Institute (IFReDI) Fisheries Administration, # 186, Norodom Blvd., PO Box 582, Phnom Penh, Cambodia Phone: +855 23 221485 E-mail: chhengp@yahoo.com</p> <p>Mr Chan Dara Khan** Officer Department of Aquaculture Development, Fisheries Administration 186 Preah Norodom Blvd Sangkat Tonle Bassac, Khan Chamcar Mon Phnom Penh capital, P.O. Box 582 Phone: +855 1623 9454 E-mail: chandara_khan@yahoo.com</p>
<p>P.R. China</p>	<p>Qing Li** Division of Inspection and disease prevention National Fishery Technical Extension Center Building 18, Maizidian Street Chaoyang District Center Beijing 100125 Phone: +86 138 119 564 67 E-mail: qingli2@qq.com</p>
<p>Chinese Taipei</p>	<p>Dr Chih-Hong Song** Specialist Bureau of Animal and Plant Health Inspection and Quarantine Council of Agriculture, Executive Yuan 9F, No 100, Sec.2, Heping W. Rd. Zhongzheng Dist. Taipei City Tel: 886-2-2343 1415 E-mail: chsung@mail.baphig.gov.tw</p>
<p>Fiji</p>	<p>Dr Bhaheerathan Kanagasapapathy** Biosecurity Authority of Fiji Level 3, Provident Plaza 1, Ellery Street, Suva Phone: +679 3312512 E-mail: kanagasapapathy@baf.com.fj</p>
<p>Hong Kong China</p>	<p>Ms Joanne On-on Lee* Fisheries Officer (Aquaculture Environment) Agriculture, Fisheries and Conservation Department 8/F, Cheung Sha Wan Government Offices 303 Cheung Sha Wan Road Fax: +852 21520383; Tel: +852 21506808 E-mail: joanne_oo_lee@afcd.gov.hk</p>

<p>India</p>	<p>Mr. Intisar Anees Siddiqui* Fisheries Research & Investigation Officer Department of Animal Husbandry, Dairying and Fisheries Ministry of Agriculture, Krishi Bhawan, New Delhi 110114 Phone: +91-11-23389419/23097013 Fax: +91-11-23070370/23384030 E-mail: intisarsiddiqui@yahoo.co.in</p> <p>Dr Jujjavarapu Balaji** Joint Secretary (Fisheries) Ministry of Agriculture & Farmers Welfare Department of Animal Husbandry, Dairying and Fisheries Room No. 221 A, Krishi Bhawan New Delhi 110001 Phone: +91 011 2338 1994 E-mail: jsfy@nic.in</p>
<p>Indonesia</p>	<p>Dr Christina Retna Handayani** Head of Sub Directorate of Pest and Fish Disease Coutermeasure Directorate of Aquaculture Regional Development and Fish Health Ministry of Marine Affairs and Fisheries Ministryof Marine Affairs and Fisheries Building, Mina Bahari 4,6h Fl Jl. Medan Merdeka fim. No.16, RT.7/RW.1, Gambir, Centrallakarta, DKI Jakarta 1011 Phone: +62 213 521 977 E-mail: handayani_retna@yahoo.com</p>
<p>Iran</p>	<p>Dr. Kazem Abdi Khazineh Jadid* Director General, Aquatic Animal Health Department Iran Veterinary Organization Ministry of Jihad-E-Agriculture Seyed Jamaledin Asad-Abadi St., Vali-Asr Ave. P.O.Box 14155-6349, Tehran, Iran Tel: +98-21-88966877; Fax: +98-21-88957252 E-mail: kazemabdy@yahoo.com</p> <p>Dr Amrollah Ghajari** Director General of Aquatic Animal Health Department Iran Veterinary Organisation Seyed Jamaledin Asan Abadi Street, Vali Asr Av., Tehran, Phone: +98 21 888 99868 E-mail: amrellah.ghajari@ivo.ir</p>
<p>Japan</p>	<p>Dr Kei Yuasa** Deputy Director Fish and Fishery Products Safety Office, Animal Products Safety Division, Food Safety and Consumer Affairs Bureau, Ministry of Agriculture, Forestry and Fisheries 1-2-2 Kasumigaseki Chiyoda-ku Tokyo 100-8975 Phone: +81 3 3502 8098 E-mail: suisan_boueki@maff.go.jp</p>

<p>DPR Korea</p>	<p>Mr. Chong Yong Ho* Director of Fish Farming Technical Department, Bureau of Freshwater Culture Sochangdong Central District, P.O.Box. 95 , Pyongyong, Fax: +850-2-814416; Tel: 3816001, 3816121</p> <p>Dr. Yun Ki Man** Veterinary Expert Veterinary and Anti-Epizootic Department Ministry of Agriculture Jungsong-Dong, Sungri Street Central District, Pyongyang Phone: +850-21-811-138-182-78 E-mail: MOAECDD@silibank.com</p>
<p>Republic of Korea</p>	<p>Dr. Myoung Ae Park* Director, Pathology Division National Fisheries Research and Development Institute 152-1, Haeanro, Gijang-up Gijang-gun, Busan 619-705 Tel: +82-51-7202470 E-mail: mapark@nfrdi.go.kr</p> <p>Ms Hee Young Jang** Aquatic animal quarantine officer Ministry of Oceans and Fisheries, National Fishery Products Quality Management Service 337, Haeyang-ro, Yeongdo-gu, Busan Phone: +82 51 400 5722 E-mail: cnheon@korea.kr</p>
<p>Lao PDR</p>	<p>Dr. Bounthong Saphakdy* Director of Fisheries Division Department of Livestock and Fisheries DLF P.O. Box 811, Lao PDR E-mail: saphakdy@yahoo.com</p> <p>Mr. Akhane Phomsouvanh** Deputy Director Division of Fisheries Department of Livestock and Fisheries P.O. Box 6644, Vientiane 01000 Phone: +856-2121-7869 E-mail: akhane@live.com</p>
<p>Malaysia</p>	<p>Dr. Kua Beng Chu*/** Director National Fish Health Reserach Division 11960 Batu Maung Penang Palau Pinang Phone: +604 626 3922 E-mail: kbengchu@yahoo.com</p>

<p>Maldives</p>	<p>Dr. Shafiya Naeem** Senior Research Officer Maldives Marine Research Institute Ministry of Fisheries, Marine Resources and Agriculture H. White Wave, Moonlight Higon Male' - 20096 Phone: +960-332-2242 Fax: +960-332-6558 E-mail: snaeem@mrc.gov.mv; shafiyanaeem@gmail.com</p>
<p>Micronesia, Fed. States of</p>	<p>Mr Valentin Martin** Deputy Assistant Secretary Marine Resources Unit Department of Resources & Development P.O Box PS-12 Palikir, Phonpei, FM96941 Phone: +691-320-2620/5133/2646 Fax: +691-320-5854 E-mail: fsmmrd@mail.fm</p>
<p>Mongolia</p>	<p>Dr Enkhtuya Tserendorj** Veterinary Drug Residue specialist & researcher. Head of Food Hygiene & Residue testing Department State Central Veterinary Diagnostic Laboratory State Central Veterinary Laboratory Ministry of Food Agriculture and Light Industry Zaisan P.O.Box 53-03 Ulaanbaatar 210153 Phone: +976 997 38864 E-mail: enkhtuya@scvl.gov.mn</p>
<p>Myanmar</p>	<p>Mr. U Saw Lah Pah Wah* Department of Fisheries, Ministry of Livestock and Fisheries Sin Minn Road, Alone Township, Yangon, Myanmar Fax: +95 01 228-253; Tel: +95 01 283-304/705-547 E-mail: dof@mptmail.net.mm</p> <p>Dr Kyaw Naing Oo** Director, Research and Development Division Livestock Breeding and Veterinary Department Ministry of Agriculture, Livestock, Fisheries and Rural Development Office No (36), Yarzathingaha Road, Ottara Thiri Township PO Box: 15011 Nay Pyi Taw Phone: +95 9 250 066212 E-Mail: kyaw87vet@gmail.com</p> <p>Dr Sein Lwin** Livestock Breeding & Veterinary dept. Ministry of Livestock, Fisheries and Rural Development Office No (36), Yarzathingaha Road, Ottara Thiri Township PO Box: 15011 Nay Pyi Taw Phone: +95 9 534 3208 E-Mail: kolwinlay@gmail.com</p>

<p>Nepal</p>	<p>Mr Ram Prasad Panta* Senior Fisheries Development Officer Central Fisheries Laboratory Central Fisheries Building Balaju, Machhapokhari, Kathmandu Tel: 977-1-4385854 Fax: 977-1-4350833 E-mail: rppanta13@gmail.com</p> <p>Ms Laudari Sumitra** Senior Fisheries Development Officer Central fisheries promotion and conservation center Central fisheries building Balaju, Kathmandu Phone: +977 984 1421 115 E-mail: sumitra_laudari@hotmail.com</p>
<p>New Caledonia</p>	<p>Dr. Stéphanie Sourget** Chief, Quarantine and Animal Health Section Veterinary, Phytosanitary and Food Inspection Service Directorate of Veterinary Affairs, Food and Rural 2, rue Félix Russeil - port autonome BP M2, 98845 Noumea Phone: +687-41-01-84 Fax: 687-41-65-82 E-mail: stephanie.sourget@gouv.nc; davar.sivap@gouv.nc</p>
<p>New Zealand</p>	<p>Ms Giulia Raponi** Senior Adviser / Surveillance and Incursion Investigator Aquatic Animal Health PO Box 40742, Wallaceville 5140 Phone: +64 4 894 5621 E-mail: Giulia.raponi@mpi.govt.nz</p>
<p>Pakistan</p>	<p>Mr. Anser Mahmood Chatta* Deputy Fisheries Development Commissioner Livestock Division, Ministry of Food, Agriculture and Livestock 10th Floor, Shaheed-e-Millat Secretariat (Livestock Wing) I Islamabad, Pakistan Fax: +9251 9212630; Tel: +9251 9208267, ansermchatta@yahoo.com</p> <p>Mr Mian Muhammad Shafiq** Conservative Wildlife 5th Floor, LG&RD Complex G-5/2, Ministry of Climate Change Government of Pakistan Phone : +92 51 9245586 E-mail: mmsshafiq@yahoo.com</p>
<p>Papua New Guinea</p>	<p>Mr. Wani Jacob Aruma** Advisor Aquaculture and Inland Fisheries Unit National Fisheries Authority P.O.Box 2016 Port Moresby, National Capital District Tel: 675-3090-444 Fax: 675-320-2061 E-mail: jwani@fisheries.gov.pg; jacobaruma.wani@gmail.com</p>

Philippines	<p>Dr. Joselito R. Somga*/** Aquaculturist II, Fish Health Section, Bureau of Fisheries and Aquatic Resources Department of Agriculture 860 Arcadia Building, Quezon Avenue, Quezon City 1101 Fax: +63 2 3725055/4109987; Tel: +63 2 3723878 loc206 or 4109988 to 89 E-mail: jsomga@bfar.da.gov.ph</p>
Singapore	<p>Mr. Hanif Loo Jang Jing* Programme Executive (Aquaculture) Aquaculture Branch Food Supply & Technology Department Agri-Food & Veterinary Authority of Singapore 5 Maxwell Road, #01-00, Tower Block, MND Complex, Singapore 069110 Fax: +65 63257677; Tel: +65 63257636; Email: loo_jang_jing@ava.gov.sg</p> <p>Dr. Diana Chee*/** Deputy Director Industry and Professional Development Professional & Scientific Services Animal & Veterinary Services National Parks Board Animal and Animal Plant Health 6 Perahu Road Singapore 718827 E-mail: diana_chee@nparks.gov.sg</p>
Sri Lanka	<p>Dr. Kawasala Hawage Dulip Tharanga Kawasala** Veterinary Surgeon Veterinary Research Institute Department of Animal Production and Health Gannoruwa, Peradeniya Phone: +94 7134 71072 E-mail: dtkved@yahoo.com</p>
Thailand	<p>Dr. Jaree Polchana*/** Fishery biologist Inland Aquatic Animal Health Research Institute Department of Fisheries Kaset Klang, Chatuchak Bangkok 10900 Fax: +66 2 5613993; Tel: +66 2 5794122, 5796977 E-mail: jpolchana@gmail.com</p>
Timor Leste	<p>Dr. Felisiano Da Conceição** National Directorate and Veterinary Services Ministry of Agriculture and Fisheries Rua de Presidente Nicolau Lobato No.5 Comoro, Dili Tel: +670-331-0518 Mobile: 670-772-68-637 E-mail: maularavets@yahoo.com; alvabetha@gmail.com</p>

Vanuatu	Dr Ian Peebles** Acting Principal Veterinary Officer Biosecurity Vanuatu Ministry of Agriculture, Livestock, Forestry, Fisheries and Biosecurity PM 9086, Port Vila Phone: +678 235 19 E-mail: ipeebles@vanuatu.gov.vu
Vietnam	Dr. Nguyen Ngoc Tien*/** Head Aquatic Animal Health Division Department of Animal Health (DAH) 15/78 Giai Phong Street, Dong Da Hanoi, Vietnam Fax: +84 4 38685961; Phone: +84 4 38693605 E-mail: tien.epi.dah@gmail.com

**Instructions on how to fill in the
QUARTERLY AQUATIC ANIMAL DISEASE REPORT**

(Revised during the Provisional Meeting of the AG¹, Bangkok, Thailand, November 7-9, 2001)

Symbols used in the report are similar to those used by FAO, OIE and WHO for the *Animal Health Yearbook*. Please read these instructions carefully before you fill in the forms.

Under the heading 'Country', please enter your country.

Under the heading 'Period', please enter the reporting quarter (months) and year, e.g. January to March 2002.

Under the heading "Month", please enter months of a quarter in question, e.g. January, February, March.

In "Level of Diagnosis", please enter the Level of Diagnosis used, e.g., I, II, or III. See Section C below.

In "Epidemiological Comment Numbers", please enter the serial numbers, and write your corresponding epidemiological comments on page 2. See Section D below for guidance on the subjects to be covered under Epidemiological Comments.

If an unknown disease of serious nature appears, please fill in the last line of the form, with additional information on "Level of Diagnosis" and "Epidemiological Comment Numbers" as above.

Please do not fail to enter "****" or "-" as appropriate against each disease, which is essential to incorporate your information on the *Quarterly Aquatic Animal Disease Report (Asia and Pacific Region.)*

If you have new aquatic animal health regulations introduced within the past six months, please describe them under Section 2 on page 2.

Please use the following symbols to fill in the forms.

A. Symbols used for negative occurrence are as follows:

*** This symbol means that no information on a disease in question is available due to reasons such as lack of surveillance systems or expertise.

- This symbol is used when a disease is not reported during a reporting period. However the disease is known to be present in the country (date of last outbreak is not always known).

0000 This symbol is used when disease surveillance is in place and a disease has never been reported.

(year) Year of last occurrence (a disease has been absent since then).

B. Symbols used for positive occurrence are shown below.

+ This symbol means that the disease in question is reported or known to be present.

+? This symbol is used when the presence of a disease is suspected but there is no recognised occurrence of clinical signs of the disease in the country. Serological evidence and isolation of the causal agent may indicate the presence of the disease, but no confirmed report is available. **It is important that the species of animals to which it applies is indicated in the "Comments" on page 2 of the form if you use this symbol.**

+() These symbols mean that a disease is present in a very limited zone or zones as exceptional cases. It may also include the occurrence of a disease in a quarantine area.

? This symbol is used only when a disease is suspected by the reporting officer, but the presence of the disease has not been confirmed.

+?() These symbols mean that confirmed infection/infestation is limited to one of more zones of the country, but no clinical disease.

?() These symbols mean the presence of the disease suspected but not confirmed in a zone.

¹ Regional Advisory Group on Aquatic Animal Health (AG)

C. Levels of Diagnosis

LEVEL	SITE	ACTIVITY
I	Field	Observation of animal and the environment Clinical examination
II	Laboratory	Parasitology Bacteriology Mycology Histopathology
III	Laboratory	Virology Electron microscopy Molecular biology Immunology

D. Subjects to be covered in the Epidemiological Comments

1. Origin of the disease or pathogen (history of the disease);
2. Mortality rate (high/low or decreasing/increasing);
3. Size of infected areas or names of infected areas;
4. Death toll (economic loss, etc.);
5. Preventive/control measures taken;
6. Disease characteristics (unusual clinical signs or lesions);
7. Pathogen (isolated/sero-typed);
8. Unknown diseases (describe details as much as possible);
9. Samples sent to national or international laboratories for confirmation (indicate the names of laboratories); and
10. Published paper (articles in journals)/web site, etc.

IMPORTANT

Please send the **original report** or the best photocopy thereof to the OIE and/or NACA **by fax and registered airmail**. Faxed reports are needed to check whether or not the reports are all right. The deadline for submission of the reports is **two and a half months (75 days)** after the end of the quarterly period.

If you require further explanation, please write to the OIE (Tokyo), NACA (Bangkok) or FAO (Rome) at the following addresses, respectively:

OIE Regional Representation for Asia and the Pacific

Food Science Building 5F
The University of Tokyo
1-1-1 Yayoi, Bunkyo-ku
Tokyo, 113-8657, Japan
Tel. +81 3 5805 1931; Fax +81 3 5805 1934
E-Mail: rr.asiapacific@oie.int

NACA

P. O. Box 1040, Kasetsart Post Office, Bangkok 10903, Thailand
Tel: 66-2-561-1728/9 (ext. 117); Fax: 66-2-561-1727
Dr. E.M. Leaña
E-mail: eduardo@enaca.org

FAO

Fishery Resources Division, Fisheries Department
FAO of the United Nations
Viale delle Terme di Caracalla, 00100 Rome
Tel. +39 06 570 56473; Fax + 39 06 570 530 20
E-mail: Rohana.Subasinghe@fao.org

Notes

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Website: <http://www.enaca.org>

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