Report of the WOAH *ad hoc* Group on susceptibility of crustacean species to infection with WOAH listed diseases

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1. Introduction

This report covers the work of the WOAH *ad hoc* Group on Susceptibility of crustacean species to infection with WOAH listed diseases (the *ad hoc* Group) who met virtually on 7 to 9 November 2023.

An *ad hoc* Group on Susceptibility of crustacean species to infection with WOAH listed diseases previously completed assessments for infection with white spot syndrome virus (WSSV) in June 2016. The group completed another assessment at this time as there is new scientific evidence on the susceptibility of crustaceans to infection with WSSV to be reviewed. Findings from the assessments completed in both 2016 and 2023 are included in this report.

The list of participants and the Terms of Reference from the 2023 assessment are presented in Annex 1 and Annex 2, respectively. The list of participants from the 2016 assessment is presented in Annex 3.

2. Methodology

The *ad hoc* Group applied criteria, as outlined in Chapter 1.5. Criteria for listing species as susceptible to infection with a specific pathogen, of the WOAH *Aquatic Animal Health Code* (the *Aquatic Code*), to potential host species in order to determine susceptibility to infection with WSSV.

A three-stage approach, as described in Article 1.5.3, was used to assess the susceptibility of a species to infection with WSSV and was based on:

> Stage 1. criteria to determine whether the route of transmission is consistent with natural pathways for the infection (as described in Article 1.5.4.);
>
> Stage 2. criteria to determine whether the pathogenic agent has been adequately identified (as described in Article 1.5.5.);
>
> Stage 3. criteria to determine whether the evidence indicates that presence of the pathogenic agent constitutes an infection (as described in Article 1.5.6.):
>
> A. The pathogenic agent is multiplying in the host, or developing stages of the pathogenic agent are present in or on the host;
> B. Viable pathogenic agent is isolated from the proposed susceptible species, or infectivity is demonstrated by way of transmission to naïve individuals;
> C. Clinical or pathological changes are associated with the infection;
> D. The specific location of the pathogen corresponds with the expected target tissues.

Details of the three-stage approach applied by the *ad hoc* Group for infection with WSSV, including any additional considerations are described below:

2.1. Stage 1: Criteria to determine whether the route of transmission is consistent with natural pathways for the infection:

Table 1 describes the route of transmission for infection with WSSV used by the *ad hoc* Group when applying Stage 1 to assess susceptibility to infection with WSSV, as well as some considerations.

Table 1: Route of transmission for infection with WSSV

Route of transmission	Considerations
Natural exposure included situations where infection had occurred without experimental intervention (e.g. infection in wild or farmed populations) OR Non-invasive experimental procedures such as cohabitation with infected hosts or infection by immersion or *per os.*	Experimental infection via invasive routes (i.e. injection) was not considered a natural route of transmission and therefore such studies were not evaluated.

2.2. Stage 2: Criteria to determine whether the pathogenic agent has been adequately identified:

Table 2 describes the pathogen identification methods for infection with WSSV used by the *ad hoc* Group when applying Stage 2 to assess susceptibility to infection with WSSV, as well as some considerations.

Table 2: Pathogen identification for infection with WSSV

Pathogen Identification (WSSV)	Considerations
Specific TaqMan real-time PCR (e.g. Moody *et al.*, 2022) OR PCR or nested PCR followed by sequence analysis (e.g. Lo *et al.*, 1996)[1] OR *In-situ* hybridisation using a WSSV-specific probe (e.g. Nunan & Lightner, 1997) OR LAMP method using WSSV-specific primers (e.g. Kono *et al.*, 2004)	Because of the specificity of the TaqMan real-time PCR, sequence analysis was not considered necessary for pathogen confirmation. If a WOAH approved commercial kit was used to identify the pathogen which uses PCR, sequencing was not required.

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[1] PCR using two or more sets of primers were considered sufficient for pathogen identification in lieu of sequence analysis.

2.3. Stage 3: Criteria to determine whether the evidence indicates that presence of the pathogenic agent constitutes an infection:

Table 3 describes the evidence of infection used by the *ad hoc* Group when applying Stage 3 to assess susceptibility to infection with WSSV.

Table 3: Evidence of infection with WSSV

Evidence of infection			
A: Replication	**B: Viability / Infectivity**	**C: Pathology / Clinical signs[2]**	**D: Location**
Presence of characteristic inclusion bodies and positive labelling of inclusion bodies by ISH or IFAT OR Presence of virions in inclusion bodies by TEM OR Demonstration of high copy number by a specific TaqMan PCR (e.g. Moody *et al*., 2022) OR Demonstration of increasing copy number over time with qPCR with confirmatory PCR/sequencing specific for infectious virus OR Serial passage from individual to SPF individual of the same species.	Single passage bioassay to a SPF (target pathogen) of any susceptible host species and confirmation of pathogen identification.	Inclusions (eosinophilic to basophilic) within nuclei of cells in target organs and tissues. Host nuclei hypertrophic with marginated chromatin with/without the presence of clinical signs (e.g. white spots on cuticle, moribund, lethargic).	Cells of tissues and organs of ectodermal and mesodermal origin. Target tissues and organs include cuticular epithelium (gills, pleopods, appendages), connective tissues, haematopoietic tissue, haemocytes, antennal gland and lymphoid organ[3].

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[2] Pathology/Clinical signs may be non-specific, variable and include some or all of the characteristics listed.

[3] Lymphoid organ is not present in most non-penaeid host taxa. For non-crustacean host taxa, other organs and tissues may show evidence of infection with WSSV.

3. Scoring and assessments

Table 4 describes the different scores and outcomes of the assessments undertaken by the *ad hoc* Group.

Table 4: Scores

Score	Outcome
1	Species assessed as susceptible (as described in Article 1.5.7.). These species were proposed for inclusion in Article 9.9.2. of Chapter 9.9., Infection with WSSV, of the *Aquatic Code* and Section 2.2.1. of Chapter 2.2.8., Infection with WSSV, of the *Aquatic Manual*.
2	Species assessed as having incomplete evidence for susceptibility (as described in Article 1.5.8.) were proposed for inclusion in Section 2.2.2., Species with incomplete evidence for susceptibility of Chapter 2.2.8., Infection with WSSV, of the *Aquatic Manual*.
3	Species assessed as not meeting the criteria or for which there was unresolved or conflicting information. These species were not proposed for inclusion in either the *Aquatic Code* or the *Aquatic Manual*. The exceptions were species where pathogen-specific positive PCR results have been reported but an active infection has not been demonstrated. These species were proposed for inclusion in the second paragraph in Section 2.2.2. Species with incomplete evidence for susceptibility of Chapter 2.2.8. Infection with WSSV, of the *Aquatic Manual*.
4	Species assessed as non-susceptible.
NS	Species not scored due to insufficient or irrelevant information.

Table 5 summarises all of the assessments for host susceptibility to infection with WSSV undertaken by the *ad hoc* Group together with the outcomes and relevant references. For Stage 3, as described in Chapter 1.5. of the *Aquatic Code*, evidence to support criterion A alone was sufficient to determine infection. In the absence of evidence to meet criterion A, satisfying at least two of criteria B, C or D were required to determine evidence of infection.

Assessment Table Key:

N:	Natural infection	YES:	Demonstrates criterion is met	ND:	Not determined
E:	Experimental (non-invasive)	NO:	Criterion is not met	NS:	Not scored
EI:	Experimental invasive	I:	Inconclusive	N/A:	Not applicable

Table 5: Assessments for infection with WSSV

Family	Scientific name	Common name	Stage 1: Route of infection	Stage 2: Pathogen Identification	Stage 3: Evidence of Infection				Outcome	Year Assessed	References
					A	B	C	D			
Score 1											
Astacidae	*Austropotamobius pallipes*	white-clawed crayfish	E and EI	PCR and sequencing	YES	YES	YES	YES	1	2016	Bateman *et al.*, 2012b

Family	Scientific name	Common name	Stage 1: Route of infection	Stage 2: Pathogen Identification	Stage 3: Evidence of Infection				Outcome	Year Assessed	References
					A	B	C	D			
	Pacifastacus leniusculus	signal crayfish	E	PCR and sequencing	YES	YES	YES	YES	1	2016	Bateman *et al.*, 2012b
	Pontastacus leptodactylus	Danube crayfish	E	ISH, TEM, and dot blot	YES	NO	YES	YES	1	2016	Corbel *et al.,* 2001
Calanidae	*Calanus pacificus californicus*	no common name	E	qPCR of VP28 transcripts	YES	NO	NO	NO	1	2016	Mendoza-Cano *et al.*, 2014
Cambaridae	*Faxonius limosus*	spinycheek crayfish	E and EI	TEM, dot blot	YES	NO	YES	YES	1	2016	Corbel *et al.*, 2001
	Procambarus clarkii	red swamp crawfish	N and E and EI	PCR, ISH, dot blot	YES	NO/ YES	YES	YES	1	2016	Baumgartner *et al.*, 2009; Chang *et al.,* 1998a; Du *et al.*, 2008; Huang *et al.,* 2001; Wang *et al.,* 1998a; Xue *et al.,* 2012; Xu *et al.*, 2007
	Procambarus zonangulus	no common name	N	PCR and sequencing	YES	NO	YES	YES	1	2016	Baumgartner *et al.*, 2009
Cancridae	*Cancer pagurus*	edible crab	E and EI	ISH, TEM, dot blot	YES	YES	YES	YES	1	2016	Bateman *et al.,* 2012b; Corbel *et al.,* 2001
Nephropidae	*Homarus gammarus*	European lobster	E and EI	PCR and sequencing	YES	YES	YES	YES	1	2016	Bateman *et al.,* 2012a; Bateman *et al.,* 2012b
	Nephrops norvegicus	Norway lobster	E and EI	PCR and sequencing	YES	YES	YES	YES	1	2016	Bateman *et al.*, 2012b
Paguridae	*Pagurus benedicti*	no common name	N and EI	PCR, TEM	YES	NO	NO	NO	1	2016	Chang *et al.*, 2012
Palaemonidae	*Palaemon carinicauda*	ridgetail prawn	N and E	qPCR, dot blot, ISH	YES	YES	NO/YES	YES	1	2016	Dun *et al.,* 2015; Xu *et al.,* 2007
	Palaemon orientis	no common name	E	PCR, ISH	YES	NO	YES	YES	1	2016	Chang *et al.*, 1998b; Wang *et al.*, 1998a
	Palaemon ritteri	barred grass shrimp	E	PCR and sequencing	YES	NO	YES	NO	1	2016	Sánchez-Paz *et al.*, 2015

Family	Scientific name	Common name	Stage 1: Route of infection	Stage 2: Pathogen Identification	Stage 3: Evidence of Infection				Outcome	Year Assessed	References
					A	B	C	D			
Palinuridae	*Panulirus penicillatus*	pronghorn spiny lobster	E	PCR, ISH	YES	NO	YES	YES	1	2016	Chang *et al.,* 1998a; Chang *et al.,* 1998b; Wang *et al.,* 1998a
	Panulirus versicolor	painted spiny lobster	E	PCR, ISH	YES	NO	YES	YES	1	2016	Chang *et al.,* 1998a; Chang *et al.,* 1998b
Parastacidae	*Cherax quadricarinatus*	red claw crayfish	E and EI	PCR, qPCR, IHC	YES	YES	YES	YES	1	2016	Gao *et al*., 2014; Soowannayan *et al*., 2011
Penaeidae	*Metapenaeus ensis*	greasyback shrimp	N and E	PCR, ISH, dot blot	YES	NO	YES	YES	1	2016	Chang *et al*., 1998a; Chang *et al*., 1998b; Wang *et al*., 1998a; Wang *et al*., 1998b; Xu *et al*., 2007
	Penaeus chinensis	fleshy prawn	N and EI	qPCR, TEM, dot blot, ISH	YES	YES	YES	YES	1	2016	Gao *et al*., 2011; Huang *et al*., 2001; Jang *et al*., 2009; Zhan *et al*., 1998; Xu *et al*., 2007
	Penaeus indicus	Indian white prawn	N	PCR and sequencing	YES	NO	YES	YES	1	2016	Toms *et al*., 2015; Rajan *et al*., 2000; Rajendran *et al*., 1999; Hameed *et al*., 2000; Tang *et al*., 2012
	Penaeus japonicus	Kuruma prawn	N and E	PCR	YES	YES	YES	YES	1	2016	Chou *et al*., 1998; Feng *et al*., 2014; Lo *et al*., 1996b; Wang *et al*., 1998b; You *et al*., 2010; Zhan *et al*., 1998; Zhang *et al*., 2008

Family	Scientific name	Common name	Stage 1: Route of infection	Stage 2: Pathogen Identification	Stage 3: Evidence of Infection				Outcome	Year Assessed	References
					A	B	C	D			
	Penaeus monodon	giant tiger prawn	N	PCR, ISH, TEM, dot blot	YES	YES	YES	YES	1	2016	Toms *et al*., 2015; Lo *et al*., 1996b; Rajendran *et al*., 1999; Hameed *et al*., 2000; Wang *et al*., 1998a; Wang *et al*., 1998b; Zhan *et al*., 1998; Xu *et al*., 2007
	Penaeus paulensis	Sao Paulo shrimp	N	PCR and sequencing	YES	NO	YES	YES	1	2016	Souto Cavalli *et al*., 2011
	Penaeus stylirostris	blue shrimp	N	PCR (5 sets of primers)	YES	ND	ND	YES	1	2023	Galaviz-Silva *et al*., 2004
			E	Inoculum not characterised - typical histopathology only	YES	YES	YES	YES	2	2016	Lightner *et al*., 1998
	Penaeus vannamei	whiteleg shrimp	N and E	PCR, ISH, histology, dot blot	YES	YES	YES	YES	1	2016	Cuéllar-Anjel *et al*., 2012; Lightner *et al*., 1998; Lo *et al*., 1999; Wang *et al*., 1998b; Xu *et al*., 2007
	Trachysalambria curvirostris	southern rough shrimp	E	PCR, ISH	YES	NO	YES	YES	1	2016	Chang *et al*., 1998b; Wang *et al*., 1998a
Polybiidae	*Liocarcinus depurator*	blue-leg swimcrab	E	TEM, ISH, dot blot	YES	NO	YES	YES	1	2016	Corbel *et al*., 2001
	Necora puber	velvet swimcrab	E	PCR, TEM, ISH, dot blot	YES	NO	YES	YES	1	2016	Corbel *et al*., 2001
Portunidae	*Charybdis (Charybdis) granulata*	no common name	E	PCR, ISH	YES	NO	YES	YES	1	2016	Chang *et al*., 1998b; Wang *et al*., 1998a

Family	Scientific name	Common name	Stage 1: Route of infection	Stage 2: Pathogen Identification	Stage 3: Evidence of Infection				Outcome	Year Assessed	References
					A	B	C	D			
	Portunus sanguinolentus	threespot swimming crab	N and E and EI	PCR, ISH	YES	NO	YES	YES	1	2016	Chang *et al.*, 1998a; Chang *et al.*, 1998b; Kou *et al.*, 1998; Lo *et al.*, 1996a; Lo *et al.*, 1996b; Hameed *et al.*, 2003; Wang *et al.*, 1998b
	Scylla serrata	Indo-Pacific swamp crab	N and E	PCR, ISH	YES	YES	YES	YES	1	2016	Chen *et al.*, 2000; Toms *et al.*, 2015; Kanchanaphum *et al.*, 1998; Liu *et al.*, 2011a; Liu *et al.*, 2011b; Lo *et al.*, 1996a; Lo *et al.*, 1996b; Rajendran *et al.*, 1999; Overstreet *et al.*, 2009; Supamattaya *et al.*, 1998
Varunidae	*Eriocheir sinensis*	Chinese mitten crab	N and E and EI	PCR and sequencing	YES	YES	YES	YES	1	2016	Bateman *et al.*, 2012b; Ding *et al.*, 2015
Score 2											
Carcinidae	*Carcinus maenas*	green crab	E and EI	PCR	YES	YES	YES	YES	2	2016	Bateman *et al.*, 2012b; Corbel *et al.*, 2001
Ergasilidae	*Ergasilus manicatus*	no common name	E	qPCR	YES	NO	NO	NO	2	2016	Overstreet *et al.*, 2009
Gecarcinucidae	*Spiralothelphusa hydrodroma*	no common name	E and EI	PCR	YES	YES	YES	YES	2	2016	Sundar Raj *et al.*, 2012; Sahul Hameed *et al.*, 2001
	Vela pulvinata	no common name	E and EI	PCR	YES	NO	YES	YES	2	2016	Sahul Hameed *et al.*, 2001
Grapsidae	*Metopograpsus sp.*	N/A	E	EM in *P. vannamei* (no PCR)	YES	YES	YES	YES	2	2016	Rajendran *et al.*, 1999

Family	Scientific name	Common name	Stage 1: Route of infection	Stage 2: Pathogen Identification	Stage 3: Evidence of Infection				Outcome	Year Assessed	References
					A	B	C	D			
Macrophthalmidae	*Macrophthalmus (Mareotis) japonicus*	no common name	N	Dot blot, ISH	YES	NO	YES	YES	2	2016	Xu *et al.*, 2007
Ocypodidae	*Leptuca pugilator*	Atlantic sand fiddler	E and EI	PCR, ISH	YES	YES	YES	YES	2	2016	Kanchanaphum *et al.*, 1998
Palaemonidae	*Macrobrachium idella*	slender river prawn	E	Histopathology and western blot	YES	YES	YES	YES	2	2016	Rajendran *et al.*, 1999; Sahul Hameed *et al.*, 2000
	Macrobrachium lamarrei	Kuncho river prawn	E	Histopathology and western blot	YES	YES	YES	YES	2	2016	Sahul Hameed *et al.*, 2000
	Macrobrachium nipponense	Oriental river prawn	E	PCR	YES	NO	YES	YES	2	2016	Yun *et al.*, 2014
	Macrobrachium rosenbergii	giant river prawn	E and I	Various methods used	YES	YES	YES	YES	2	2016	Corteel *et al.*, 2012; Gudkovs *et al.*, 2014; Shahadat Hossain *et al.*, 2001a; Lo *et al.*, 1996a; Rajendran *et al.*, 1999; Sahul Hameed *et al.*, 2000
	Palaemon adspersus	Baltic prawn	E and EI	PCR, TEM, ISH, dot blot	YES	YES	YES	YES	2	2016	Corbel *et al.*, 2001
Palinuridae	*Panulirus homarus*	scalloped spiny lobster	EI	EM in *P. vannamei* – no PCR or sequencing	YES	YES	YES	YES	2	2016	Rajendran *et al.*, 1999
	Panulirus polyphagus	Mud spiny lobster	E	EM in *P. vannamei* – no PCR or sequencing	YES	YES	YES	YES	2	2016	Rajendran *et al.*, 1999
Penaeidae	*Metapenaeus dobsoni*	kadal shrimp	N and E	PCR	YES	YES	YES	YES	2	2016	Shahadat Hossain *et al.*, 2001a; Rajendran *et al.*, 1999
	Metapenaeus monoceros	speckled shrimp	N and E	PCR	YES	YES	YES	YES	2	2016	Joseph *et al.*, 2015; Rajendran *et al.*, 1999; Yan *et al.*, 2004

Family	Scientific name	Common name	Stage 1: Route of infection	Stage 2: Pathogen Identification	Stage 3: Evidence of Infection				Outcome	Year Assessed	References
					A	B	C	D			
	Penaeus aztecus	northern brown shrimp	E	Inoculum not characterised - typical histopathology only	YES	NO	YES	YES	2	2016	Lightner *et al*., 1998
			N	PCR (3 sets of primers)	ND	YES	ND	ND	3	2023	Chapman *et al*., 2004
	Penaeus duorarum	northern pink shrimp	E	Inoculum not characterised - typical histopathology only	YES	NO	YES	YES	2	2016	Lightner *et al*., 1998
			N	Negative (PCR – 3 sets of primers) [4]	ND	ND	ND	ND	NS	2023	Chapman *et al*., 2004.
			E	NO - histology only	YES	YES	YES	YES	NS	2023	Qiong-Wang *et al*., 1999
	Penaeus merguiensis	banana prawn	N and E	PCR, TEM/IFA	YES	YES	YES	YES	2	2016	Flegel *et al*., 2013; Wang *et al*., 2002
			N	Nested PCR and sequencing	ND	ND	ND	YES	2	2023	Saravanan *et al*., 2017
	Penaeus setiferus	northern white shrimp	N	PCR (3 sets of primers)	YES [5]	YES	ND	ND	2	2023	Chapman *et al*., 2004
			E	Inoculum not characterised - typical histopathology only	YES	YES	YES	YES	2	2016	Lightner *et al*., 1998
			N	TaqMan RT-PCR	ND	ND	ND	YES	3	2023	Muhammad *et al*., 2020
Portunidae	*Callinectes sapidus*	blue crab	E and EI	TaqMan RT-PCR	YES	ND	ND	ND	1[6]	2023	Blaylock *et al*., 2019
			N	TaqMan RT-PCR	ND	YES	ND	ND	3	2023	Powell *et al*., 2015

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[4] The number of animals screened in the study was low and were found to be negative through screening with 3 sets of primers.

[5] Only one animal out of 586 animals tested showed evidence of WSSV replication (positive for stage 3A).

[6] The *ad hoc* Group did not consider the single paper ranked with a score of '1' strong enough on its own for an overall score of '1' for this host species.

Family	Scientific name	Common name	Stage 1: Route of infection	Stage 2: Pathogen Identification	Stage 3: Evidence of Infection				Outcome	Year Assessed	References
					A	B	C	D			
	Charybdis (Charybdis) feriata	crucifix crab	N and E	PCR, ISH	YES	NO	YES	YES	2	2016	Shahadat Hossain *et al*., 2001a; Kou *et al*., 1998; Lo *et al*., 1996a; Wang *et al*., 1998a
	Portunus pelagicus	blue swimming crab	N and E and EI	PCR	YES	NO	YES	YES	2	2016	Kou *et al*., 1998; Supamattaya *et al*., 1998
	Portunus trituberculatus	gazami crab	N	qPCR	NO	NO	NO	NO	2	2016	Meng *et al*., 2009
	Scylla tranquebarica	purple mud crab	N and E	Nested PCR	YES	YES	YES	YES	2	2023	Gopalakrishnan *et al*., 2011
			N and E and EI	PCR (natural only)	YES	YES	YES	YES	2	2016	Joseph *et al*., 2015; Rajendran *et al*., 1999
Scyllaridae	*Scyllarus arctus*	lesser slipper lobster	E and EI	TEM, dot blot	YES	NO	YES	NO	2	2016	Corbel *et al*., 2001
Sergestidae	*Acetes sp.*	N/A	E and EI	PCR	YES	NO	YES	YES	2	2016	Supamattaya *et al*., 1998
Sesarmidae	*Sesarma sp.*	N/A	E and EI	PCR	YES	YES	YES	YES	2	2016	Kanchanaphum *et al*., 1998; Rajendran *et al*., 1999
Varunidae	*Helice tientsinensis*	no common name	N	dot blot, ISH	YES	NO	YES	YES	2	2016	Xu *et al*., 2007
Score 3											
Alpheidae	*Alpheus brevicristatus*	teppo snapping shrimp	ND	Nested PCR	NO	NO	NO	NO	3	2023	Takahashi *et al.,* 2003
			EI	Nested PCR, dot blot and ISH	YES	YES	YES	YES	NS	2023	Takahashi *et al.,* 2003; Xu *et al*., 2007
	Alpheus digitalis	forceps snapping shrimp	N	LAMP, PCR and sequencing	ND	ND	ND	ND	3	2023	Xu *et al*., 2021

Family	Scientific name	Common name	Stage 1: Route of infection	Stage 2: Pathogen Identification	Stage 3: Evidence of Infection				Outcome	Year Assessed	References
					A	B	C	D			
	Alpheus japonicus	Japanese snapping shrimp	N	LAMP, PCR and sequencing	ND	ND	ND	ND	3	2023	Xu *et al.*, 2021
	Alpheus lobidens	brownbar snapping shrimp	ND	Nested PCR	NO	NO	NO	NO	3	2016	Takahashi *et al., 2003*
Artemiidae	*Artemia salina*	brine shrimp	ND	Nested PCR	NO	NO	NO	NO	3	2016	Otta *et al.*, 1999
	Artemia sp.	N/A	N and E	Dot blot, ISH	NO	NO	NO	NO	3	2016	Xu *et al.*, 2007
			E	Nested PCR	ND	ND	ND	ND	3	2023	Zhang *et al.,* 2010
	Nikora sp.	N/A	E	PCR	NO	NO	NO	NO	3	2016	Zhang *et al.*, 2008
Astacidae	*Astacus astacus*	noble crayfish	E and EI	Nested PCR	NO	NO	NO	NO	3	2016	Jiravanichpaisal *et al.*, 2004
Balanidae	*Belanus sp.*	N/A	N and E and EI	PCR and sequencing; dot blot, ISH	NO/YES	NO/YES	NO/YES	NO/YES	3	2016	Ramirez-Douriet *et al.,* 2005; Xu *et al.,* 2007
Calappidae	*Calappa philargius*	spectacled box crab	E and EI	PCR	ND	ND	I[7]	YES	3	2023	Sahul Hameed *et al.,* 2003
Cambaridae	*Faxonius punctimanus*	spothand crayfish	N	PCR, probe	NO	NO	NO	NO	3	2016	Lo *et al.,* 1999
Crangonidae	*Crangon affinis*	Japanese sand shrimp	E	PCR, monoclonal antibody	NO	NO	YES	NO	3	2016	Gong *et al.,* 2010
			N	LAMP, PCR and sequencing	ND	ND	ND	ND	3	2023	Xu *et al.*, 2021
Cyclopidae	*Apocyclops royi*	no common name	E	PCR and sequencing	YES	NO	NO	NO	3	2016	Chang *et al.*, 2011
Diogenidae	*Diogenes nitidimanus*	no common name	EI	PCR	NO	NO	NO	NO	3	2016	Chang *et al.*, 2012
Dorippidae	*Paradorippe granulata*	granulated mask crab	E and EI	PCR	ND	ND	I[7]	YES	3	2023	Sahul Hameed *et al.*, 2003

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[7] The results in this study referred to all challenged crabs and did not differentiate between E and EI animals.

Family	Scientific name	Common name	Stage 1: Route of infection	Stage 2: Pathogen Identification	Stage 3: Evidence of Infection				Outcome	Year Assessed	References
					A	B	C	D			
Epialtidae	*Doclea muricata*	no common name	E and EI	PCR	ND	ND	I[7]	YES	3	2023	Sahul Hameed *et al.*, 2003
Euphausiidae	*Euphausia pacifica*	Isada krill	N	LAMP, PCR and sequencing	ND	ND	ND	ND	3	2023	Xu *et al.*, 2021
Galenidae	*Halimede ochtodes*	no common name	E and EI	PCR	ND	ND	I[7]	YES	3	2023	Sahul Hameed *et al.*, 2003
Grapsidae	*Grapsus albolineatus*	mottled crab	E and EI	PCR	ND	ND	I[7]	YES	3	2023	Sahul Hameed *et al.*, 2003
	Metopograpsus messor	no common name	N	PCR	NO	NO	NO	NO	3	2016	Shahadat Hossain *et al.,* 2001a
Hippolytidae	*Latreutes anoplonyx*	medusa shrimp	N	LAMP, PCR and sequencing	ND	ND	ND	ND	3	2023	Xu *et al.*, 2021
	Latreutes planirostris	flatnose shrimp	N	LAMP, PCR and sequencing	ND	ND	ND	ND	3	2023	Xu *et al.*, 2021
Leucosiidae	*Philyra syndactyla*	no common name	E and EI	PCR	ND	ND	I[7]	YES	3	2023	Sahul Hameed *et al.,* 2003
Lithodidae	*Lithodes maja*	stone king crab	E and EI	PCR	ND	ND	I[7]	YES	3	2023	Sahul Hameed *et al.*, 2003
Macrophthalmide	*Macrophthalmus (Macrophthalmus) sulcatus*	no common name	N	PCR	NO	NO	NO	NO	3	2016	Shahadat Hossain *et al.*, 2001a
Matutidae	*Ashtoret miersii*	no common name	E and EI	PCR	ND	ND	I[7]	YES	3	2023	Sahul Hameed *et al.*, 2003
	Matuta planipes	flower moon crab	N	PCR	NO	NO	NO	NO	3	2016	Otta *et al.*, 1999
Menippidae	*Menippe rumphii*	maroon stone crab	E and EI	PCR	ND	ND	I[7]	YES	3	2023	Sahul Hameed *et al.*,2003
Ocypodidae	*Gelasimus vocans*	orange fiddler crab	N	PCR	NO	NO	NO	NO	3	2016	Shahadat Hossain *et al.*, 2001a
	Leptuca panacea	gulf sand fiddler	N and EI	TaqMan RT-PCR	ND	ND	ND	YES	3	2023	Muhammed *et al.,* 2020
	Leptuca spinicarpa	spined fiddler	N	TaqMan RT-PCR	ND	ND	ND	YES	3	2023	Muhammed *et al.,* 2020

Family	Scientific name	Common name	Stage 1: Route of infection	Stage 2: Pathogen Identification	Stage 3: Evidence of Infection				Outcome	Year Assessed	References
					A	B	C	D			
	Minuca longisignalis	gulf marsh fiddler	N	TaqMan RT-PCR	ND	ND	ND	YES	3	2023	Muhammed *et al.*, 2020
	Minuca minax	redjointed fiddler	N	TaqMan RT-PCR	ND	ND	ND	YES	3	2023	Muhammed *et al.*, 2020
	Minuca rapax	mudflat fiddler	N	TaqMan RT-PCR	ND	ND	ND	YES	3	2023	Muhammed *et al.*, 2020
Paguridae	*Pagurus angustus*	no common name	EI	PCR	NO	NO	NO	NO	3	2016	Chang *et al.*, 2012
Palaemonidae	*Palaemon gravieri*	Chinese ditch prawn	N	LAMP, PCR and sequencing	ND	ND	ND	ND	3	2023	Xu *et al.*, 2021
	Palaemon macrodactylus	migrant prawn	N	PCR, qPCR	NO	NO	NO	NO	3	2016	Martorelli *et al.*, 2010
	Palaemon pandaliformis	potitinga prawn	N	LAMP	ND	ND	ND	NO[8]	3	2023	Bandeira *et al.*, 2018
	Palaemon pugio	daggerblade grass shrimp	N and EI	qPCR	NO	NO	YES	NO	3	2016	Muhammed and Lotz, 2015
			N and EI	TaqMan RT-PCR	ND	ND	ND	YES	3	2023	Muhammed *et al.*, 2020
	Palaemon sp.	N/A	N	PCR	NO	NO	NO	NO	3	2016	Lo *et al.*, 1996a
Parthenopidae	*Parthenope prensor*	no common name	E and EI	PCR	ND	ND	I[7]	YES	3	2023	Sahul Hameed *et al.*, 2003
Pasiphaeidae	*Leptochela gracilis*	lesser glass shrimp	N	LAMP, PCR and sequencing	ND	ND	ND	ND	3	2023	Xu *et al.*, 2021
Penaeidae	*Artemesia longinaris*	Argentine stiletto shrimp	N	PCR/qPCR	NO	NO	NO	NO	3	2016	Martorelli *et al.*, 2010
	Metapenaeus affinis	jinga shrimp	N	PCR	NO	NO	NO	NO	3	2016	Gholamhoseini *et al.*, 2013
	Metapenaeus brevicornis	yellow shrimp	N	PCR	NO	NO	NO	NO	3	2016	Shahadat Hossain *et al.*, 2001b

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[8] Gill tissue was used to for identify the pathogen which could be a detection on the surface of the animal rather than within the tissue.

Family	Scientific name	Common name	Stage 1: Route of infection	Stage 2: Pathogen Identification	Stage 3: Evidence of Infection				Outcome	Year Assessed	References
					A	B	C	D			
	Parapenaeopsis stylifera	kiddi shrimp	N	PCR, gene probes	NO	NO	NO	NO	3	2016	Gholamhoseini *et al*., 2013; Shahadat Hossain *et al*., 2001a
	Penaeus californiensis	yellowleg shrimp	N	PCR and sequencing	NO	NO	NO	NO	3	2016	Macías-Rodríguez *et al*., 2014
	Penaeus penicillatus	redtail prawn	N and E	PCR	NO	NO	NO	NO	3	2016	Chou *et al*., 1998; Lo *et al*., 1996a; Wang *et al*., 1998a
	Penaeus semisulcatus	green tiger prawn	N and E	PCR	NO	NO	NO	NO	3	2016	Lo *et al*., 1996a; Rajendran *et al*., 1999; Wang *et al*., 1998a
Portunidae	*Callinectes arcuatus*	cuata swimcrab	N	PCR (5 sets of primers)	ND	ND	ND	ND	3	2023	Galaviz-Silva *et al*., 2004
			N	PCR and sequencing	NO	NO	NO	NO	3	2016	Macías-Rodríguez *et al*., 2014
	Charybdis (Charybdis) annulata	banded-legged swimming crab	E and EI	PCR	ND	ND	I[7]	YES	3	2023	Sahul Hameed *et al*., 2003
	Charybdis (Charybdis) japonica	Japanese swimming crab	N	PCR	NO	NO	NO	NO	3	2016	Takahashi *et al*., 2003
	Charybdis (Charybdis) lucifer	no common name	E and EI	PCR	ND	ND	I[7]	YES	3	2023	Sahul Hameed *et al*., 2003
	Charybdis (Charybdis) natator	ridged swimming crab	N and E	PCR	NO	NO	NO	NO	3	2016	Kou *et al*., 1998
			E and EI	PCR	ND	ND	I[7]	YES	3	2023	Sahul Hameed *et al*., 2003
	Podophthalmus vigil	periscope crab	E and EI	PCR	ND	ND	I[7]	YES	3	2023	Sahul Hameed *et al*., 2003
	Portunus sanguinolentus	threespot swimming crab	E and EI	PCR	ND	ND	I[7]	YES	3	2023	Sahul Hameed *et al*., 2002

Family	Scientific name	Common name	Stage 1: Route of infection	Stage 2: Pathogen Identification	Stage 3: Evidence of Infection				Outcome	Year Assessed	References
					A	B	C	D			
	Portunus trituberculatus	gazami crab	N and E and EI	qPCR, TEM, histopathology	YES	NO	YES	YES	3	2016	Muhammad and Lotz, 2015
	Thalamita danae	no common name	E and EI	PCR	ND	ND	I[7]	YES	3	2023	Sahul Hameed *et al.*, 2003
Sergestidae	*Acetes chinensis*	northern mauxia shrimp	N	LAMP, PCR and sequencing	ND	ND	ND	ND	3	2023	Xu *et al.*, 2021
Sesarmidae	*Armases cinereum*	squareback marsh crab	N	qPCR only	ND	ND	ND	YES	3	2023	Muhammad *et al.*, 2020
	Circulium rotundatum	no common name	N	PCR	NO	NO	NO	NO	3	2016	Otta *et al.*, 1999
Solenoceridae	*Solenocera crassicornis*	coastal mud shrimp	N	PCR	NO	NO	NO	NO	3	2016	Shahadat Hossain *et al.*, 2001a
Squillidae	*Squilla mantis*	spottail mantis squillid	N	PCR	NO	NO	NO	NO	3	2016	Shahadat Hossain *et al.*, 2001a
Upogebiidae	*Austinogebia edulis*	no common name	N	PCR	ND	ND	ND	YES	3	2023	Zhu *et al.*, 2019
Varunidae	*Chhapgarus intermedius*	no common name	N	PCR	NO	NO	NO	NO	3	2016	Shahadat Hossain *et al.*, 2001a; Shahadat Hossain *et al.*, 2001b
	Cyrtograpsus angulatus	no common name	N	PCR, qPCR	NO	NO	NO	NO	3	2016	Martorelli *et al.*, 2010
	Helice tridens	no common name	N	PCR	NO	NO	NO	NO	3	2016	Kou *et al.*, 1998
	Neohelice granulata	no common name	N	PCR and sequencing	NO	NO	NO	NO	3	2016	Cavalli *et al.*, 2013; Marques *et al.*, 2011
Xanthidae	*Atergatis integerrimus*	red egg crab	E and EI	PCR	ND	ND	I[7]	YES	3	2023	Sahul Hameed *et al.*, 2003
	Demania splendida	no common name	E and EI	PCR	ND	ND	I[7]	YES	3	2023	Sahul Hameed *et al.*, 2003
	Liagore rubronaculata	no common name	E and EI	PCR	ND	ND	I[7]	YES	3	2023	Sahul Hameed *et al.*, 2003

Family	Scientific name	Common name	Stage 1: Route of infection	Stage 2: Pathogen Identification	Stage 3: Evidence of Infection				Outcome	Year Assessed	References
					A	B	C	D			
Not scored (NS)											
Artemiidae	*Artemia franciscana*	no common name	E	NO – PCR	ND	ND	ND	ND	NS	2023	Sahul Hameed *et al.,* 2002
Calappidae	*Calappa lophos*	common box crab	N and EI	NO – PCR	NO	NO	NO	NO	NS	2023	Wang *et al*., 1998a
Callianassidae	*Neotrypaea harmandi*	no common name	EI	Dot blot, ISH	YES	YES	YES	YES	NS	2016	Xu *et al.*, 2007
Lysmatidae	*Lysmata vittata*	Indian lined shrimp	N	Negative with LAMP, PCR and sequencing	ND	ND	ND	ND	NS	2023	Xu *et al.*, 2021
Nephropidae	*Homarus americanus*	American lobster	EI	TaqMan RT-PCR	N/A	N/A	N/A	N/A	NS	2023	Clark *et al*., 2013
Palinuridae	*Panulirus argus*	Caribbean spiny lobster	E and EI	TaqMan RT-PCR	I[9]	ND	I[9]	I[9]	NS	2023	Ross *et al.,* 2019
	Panulirus longpipes	longlegged spiny lobster	N and EI	NO – PCR	NO	NO	NO	NO	NS	2023	Wang *et al.,* 1998a
	Panulirus ornatus	ornate spiny lobster	EI	NO – PCR	YES	YES	YES	YES	NS	2023	Rajendran *et al.,* 1999; Wang *et al.,* 1998a
Panopeidae	*Panopeus obesus*	saltmarsh mud crab	N	TaqMan RT-PCR	ND	ND	ND	YES	NS	2023	Muhammed *et al.,* 2020
Penaeidae	*Metapenaeus joyneri*	shiba shrimp	N	Negative with LAMP, PCR and sequencing	ND	ND	ND	ND	NS	2023	Xu *et al*., 2021
	Penaeus brasiliensis	redspotted shrimp	N	I[10]	NO	NO	YES	YES	NS	2023	Cavalli *et al*., 2011
	Penaeus schmitti	southern white shrimp	EI	ISH	YES	ND	YES	YES	NS	2023	Unzueta-Bustamante *et al*., 2004
Parastacidae	*Cherax destructor*	yabby crayfish	E and EI	NO – histology, dot blot	YES	NO	YES	YES	NS	2023	Edgerton *et al*., 2004

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[9] The authors of the study did not differentiate between the two experimental groups and only one out of seven animals with waterborne exposure was low positive using qPCR (499 copies in 0.25 mg of haemolymph).

[10] This study did not indicate if the results for the PCR and sequence analysis was for this host species.

Family	Scientific name	Common name	Stage 1: Route of infection	Stage 2: Pathogen Identification	Stage 3: Evidence of Infection				Outcome	Year Assessed	References
					A	B	C	D			
Portunidae	*Scylla olivacea*	orange mud crab	EI	qPCR	YES	NO	YES	YES	NS	2023	Somboonna *et al.*, 2010
	Scylla paramamosain	green mud crab	EI	TaqMan real-time PCR	YES	ND	ND	YES	NS	2023	Gong *et al.*, 2022
			EI	TaqMan real-time PCR	ND	ND	ND	YES	NS	2023	Kong *et al.*, 2020
Sesarmidae	*Sesarma reticulatum*	purple marsh crab	N	TaqMan real-time PCR	ND	ND	ND	YES	NS	2023	Muhammad *et al.*, 2020
Sicyoniidae	*Sicyonia lancifer*	knight rock shrimp	N	Negative with LAMP, PCR and sequencing	ND	ND	ND	ND	NS	2023	Xu *et al.*, 2021
Squillidae	*Oratosquilla oratoria*	Japanese squillid mantis shrimp	N	Negative with LAMP, PCR and sequencing	ND	ND	ND	ND	NS	2023	Xu *et al.*, 2021
Thoridae	*Eualus sinensis*	iso shrimp	N	Negative with LAMP, PCR and sequencing	ND	ND	ND	ND	NS	2023	Xu *et al.*, 2021
Upogebiidea	*Upogebia major*	Japanese mud shrimp	N	Negative with LAMP, PCR and sequencing	ND	ND	ND	ND	NS	2023	Xu *et al.*, 2021
Varunidae	*Hemigrapsus sanguineus*	Asian shore crab	EI	dot blot, ISH	YES	YES	YES	YES	NS	2023	Xu *et al.*, 2007

Table 6: Assessments for infection with WSSV for non-crustaceans

Family	Scientific name	Common name	Stage 1: Route of infection	Stage 2: Pathogen Identification	Stage 3: Evidence of Infection				Outcome	Year Assessed	References
					A	B	C	D			
Ampullariidae	*Pomacea linnaei*	no common name	N	LAMP	ND	ND	ND	ND	NS	2023	Bandeira *et al.,* 2018
Brachionidae	*Brachionus plicatillis*	no common name	E	PCR	ND	ND	ND	ND	3	2023	Corre *et al*., 2012
	Brachionus urceolaris	no common name	N	PCR	NO	NO	NO	NO	3	2016	Yan *et al.,* 2004
Eunicidae	*Marphysa gravelyi*	no common name	N and E	PCR	ND	I[11]	ND	ND	3	2023	Vijayan *et al*., 2005
Nereididae	*Dendroneresis sp.*	N/A	N	PCR and sequencing	YES	NO	YES	NO	1	2016	Esrina *et al.,* 2012; Esrina *et al*., 2013; Haryadi *et al.,* 2015
Ostreidae	*Magallana* [Syn. *Crassostrea*] *gigas*	Pacific oyster	N	PCR and sequencing	ND	ND	ND	ND	3	2023	Vazquez-Bouchard *et al*., 2010
Thiaridae	*Melanoides tuberculata*	red-rim melania	N	LAMP	ND	ND	ND	ND	3	2023	Bandeira *et al*., 2018
Veneridae	*Meretrix lusoria*	Japanese hard clam	E	PCR	YES	YES	ND	ND	2	2023	Chang *et al*., 2011

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[11] In this study, *P. monodon* were fed WSSV infected polycheate worms and the identification of the pathogen was performed using PCR and no sequencing thus the *ad hoc* Group concluded that the detected virus could be from the original material.

4. Results

The *ad hoc* Group agreed that the 32 species meet the criteria for listing as susceptible to infection with WSSV in accordance with Chapter 1.5 of the *Aquatic Code*. These are proposed to be listed in Article 9.9.2 of Chapter 9.9. Infection with WSSV. These species are shown in the table below:

Family	Scientific name	Common name
Astacidae	*Austropotamobius pallipes*	white-clawed crayfish
	Pacifastacus leniusculus	signal crayfish
	Pontastacus leptodactylus	Danube crayfish
Calanidae	*Calanus pacificus californicus*	N/A
Cambaridae	*Faxonius limosus*	spinycheek crayfish
	Procambarus clarkii	red swamp crawfish
	Procambarus zonangulus	N/A
Cancridae	*Cancer pagurus*	edible crab
Nephropidae	*Homarus gammarus*	European lobster
	Nephrops norvegicus	Norway lobster
Paguridae	*Pagurus benedicti*	N/A
Palaemonidae	*Palaemon carinicauda*	ridgetail prawn
	Palaemon orientis	N/A
	Palaemon ritteri	barred grass shrimp
Palinuridae	*Panulirus penicillatus*	pronghorn spiny lobster
	Panulirus versicolor	painted spiny lobster
Parastacidae	*Cherax quadricarinatus*	red claw crayfish
Penaeidae	*Metapenaeus ensis*	greasyback shrimp
	Penaeus chinensi	fleshy prawn
	Penaeus indicus	Indian white prawn
	Penaeus japonicus	Kuruma prawn
	Penaeus monodon	giant tiger prawn
	Penaeus paulensis	Sao Paulo shrimp
	Penaeus stylirostris	blue shrimp
	Penaeus vannamei	whiteleg shrimp
	Trachysalambria curvirostris	southern rough shrimp
Polybiidae	*Liocarcinus depurator*	blue-leg swimcrab
	Necora puber	velvet swimcrab
Portunidae	*Charybdis (Charybdis) granulata*	N/A
	Portunus sanguinolentus	threespot swimming crab
	Scylla serrata	Indo-Pacific swamp crab
Varunidae	*Eriocheir sinensis*	Chinese mitten crab

The *ad hoc* Group agreed that *Dendroneresis sp.* (polychaete worms) also met the criteria for listing as susceptible to infection with WSSV in accordance with Chapter 1.5 of the *Aquatic Code*.

Twenty-nine were assessed as having incomplete evidence of susceptibility and were proposed to be included in Section 2.2.2 of Chapter 2.2.8. of the *Aquatic Manual*. These species are shown in the table below:

Family	Scientific name	Common name
Carcinidae	*Carcinus maenas*	green crab
Ergasilidae	*Ergasilus manicatus*	N/A
Gecarcinucidae	*Spiralothelphusa hydrodroma*	N/A
	Vela pulvinata	N/A
Grapsidae	*Metopograpsus sp.*	N/A
Macrophthalmidae	*Macrophthalmus (Mareotis) japonicus*	N/A
Ocypodidae	*Leptuca pugilator*	Atlantic sand fiddler
Palaemonidae	*Macrobrachium idella*	slender river prawn
	Macrobrachium lamarrei	Kuncho river prawn
	Macrobrachium nipponense	Oriental river prawn
	Macrobrachium rosenbergii	giant river prawn
	Palaemon adspersus	Baltic prawn
Palinuridae	*Panulirus homarus*	scalloped spiny lobster
	Panulirus polyphagus	Mud spiny lobster
Penaeidae	*Metapenaeus dobsoni*	kadal shrimp
	Metapenaeus monoceros	speckled shrimp
	Penaeus aztecus	northern brown shrimp
	Penaeus duorarum	northern pink shrimp
	Penaeus merguiensis	banana prawn
	Penaeus setiferus	northern white shrimp
Portunidae	*Callinectes sapidus*	blue crab
	Charybdis (Charybdis) feriata	crucifix crab
	Portunus pelagicus	blue swimming crab
	Portunus trituberculatus	gazami crab
	Scylla tranquebarica	purple mud crab
Scyllaridae	*Scyllarus arctus*	lesser slipper lobster
Sergestidae	*Acetes sp.*	N/A
Sesarmidae	*Sesarma sp.*	N/A
Varunidae	*Helice tientsinensis*	N/A

Pathogen-specific positive PCR results have been reported in the seventy-one species listed. These species were proposed to be included in the second paragraph of Section 2.2.2. of Chapter 2.2.8., Infection with WSSV of the *Aquatic Manual.* These species are shown in the table below:

Family	Scientific name	Common name
Alpheidae	*Alpheus brevicristatus*	teppo snapping shrimp
	Alpheus digitalis	forceps snapping shrimp
	Alpheus japonicus	Japanese snapping shrimp
	Alpheus lobidens	brownbar snapping shrimp
Artemiidae	*Artemia salina*	brine shrimp

Family	Scientific name	Common name
	Artemia sp.	N/A
	Nikora sp.	N/A
Astacidae	*Astacus astacus*	noble crayfish
Balanidae	*Belanus sp.*	N/A
Calappidae	*Calappa philargius*	spectacled box crab
Cambaridae	*Faxonius punctimanus*	spothand crayfish
Crangonidae	*Crangon affinis*	Japanese sand shrimp
Cyclopidae	*Apocyclops royi*	N/A
Diogenidae	*Diogenes nitidimanus*	N/A
Dorippidae	*Paradorippe granulata*	granulated mask crab
Epialtidae	*Doclea muricata*	N/A
Euphausiidae	*Euphausia pacifica*	Isada krill
Galenidae	*Halimede ochtodes*	N/A
Grapsidae	*Grapsus albolineatus*	N/A
	Metopograpsus messor	N/A
Hippolytidae	*Latreutes anoplonyx*	medusa shrimp
	Latreutes planirostris	flatnose shrimp
Leucosiidae	*Philyra syndactyla*	N/A
Lithodidae	*Lithodes maja*	stone king crab
Macrophthalmide	*Macrophthalmus (Macrophthalmus) sulcatus*	N/A
Matutidae	*Ashtoret miersii*	N/A
	Matuta planipes	flower moon crab
Menippidae	*Menippe rumphii*	maroon stone crab
Ocypodidae	*Gelasimus vocans*	orange fiddler crab
	Leptuca panacea	gulf sand fiddler
	Leptuca spinicarpa	spined fiddler
	Minuca longisignalis	gulf marsh fiddler
	Minuca minax	redjointed fiddler
	Minuca rapax	mudflat fiddler
Paguridae	*Pagurus angustus*	N/A
Palaemonidae	*Palaemon gravieri*	Chinese ditch prawn
	Palaemon macrodactylus	migrant prawn
	Palaemon pandaliformis	potitinga prawn
	Palaemon pugio	daggerblade grass shrimp
	Palaemon sp.	N/A
Parthenopidae	*Parthenope prensor*	N/A
Pasiphaeidae	*Leptochela gracilis*	lesser glass shrimp
Penaeidae	*Artemesia longinaris*	Argentine stiletto shrimp
	Metapenaeus affinis	jinga shrimp
	Metapenaeus brevicornis	yellow shrimp

Family	Scientific name	Common name
	Parapenaeopsis stylifera	kiddi shrimp
	Penaeus californiensis	yellowleg shrimp
	Penaeus penicillatus	redtail prawn
	Penaeus semisulcatus	green tiger prawn
Portunidae	*Callinectes arcuatus*	cuata swimcrab
	Charybdis (Charybdis) annulata	banded-legged swimming crab
	Charybdis (Charybdis) japonica	Japanese swimming crab
	Charybdis (Charybdis) lucifer	N/A
	Charybdis (Charybdis) natator	ridged swimming crab
	Podophthalmus vigil	periscope crab
	Portunus sanguinolentus	threespot swimming crab
	Portunus trituberculatus	gazami crab
	Thalamita danae	N/A
Sergestidae	*Acetes chinensis*	northern mauxia shrimp
Sesarmidae	*Armases cinereum*	squareback marsh crab
	Circulium rotundatum	N/A
Solenoceridae	*Solenocera crassicornis*	coastal mud shrimp
Squillidae	*Squilla mantis*	spottail mantis squillid
Upogebiidae	*Austinogebia edulis*	N/A
Varunidae	*Chhapgarus intermedius*	N/A
	Cyrtograpsus angulatus	N/A
	Helice tridens	N/A
	Neohelice granulata	N/A
Xanthidae	*Atergatis integerrimus*	red egg crab
	Demania splendida	N/A
	Liagore rubronaculata	N/A

During review when a paper referenced another that discussed non-crustacean animals and their susceptibility to WSSV those papers were reviewed and the assessment of the non-crustacean animals was included in Table 6. The scores provided for the non-crustacean species were based on criteria which had been specifically set for crustaceans. As such, these scores are not necessarily representative of the true susceptibility of these species to WSSV. These scores are provided for reference, as some of these species may be used as feed for crustaceans.

5. Naming convention for susceptible species

The scientific names of the host species are in accordance with the World Register of Marine Species (WoRMS) https://www.marinespecies.org/index.php.

The common names of host species are in accordance with FAOTERM (http://www.fao.org/faoterm/collection/faoterm/en/). Where a common name was not found in FAOTERM, the naming was done in accordance with https://www.sealifebase.ca.

6. Comments on the *ad hoc* Group's rationale and decision-making

'Inconclusive' was used to distinguish situations where more information was provided than would have been assessed as 'Not-determined' but the *ad hoc* Group could not conclude that the criterion was met. Each time inconclusive was used within the assessment table, the *ad hoc* Group provided additional information in a footnote. The *ad hoc* Group treated 'Inconclusive' as 'Not-determined' when making their final assessment.

The *ad hoc* Group agreed that while the ideal situation was two papers with a score of '1', a single robust study scoring '1' was also enough to conclude susceptibility of a species in the absence of conflicting evidence. Additional studies were still reviewed to check for any supporting or conflicting evidence. When additional papers were identified but the *ad hoc* Group did not feel that they were necessary to assess comprehensively because the species had already been determined as susceptible by other studies, these references were only noted in the list of references (Section 7).

The *ad hoc* Group did not review papers that had previously been reviewed in 2016 unless these papers were referenced in a more recently published paper and there was considered a rationale to assess the paper again. If a paper was reviewed in both 2016 and 2023, the year of assessment reflected the most recent assessment and was recorded as 2023.

7. Article 1.5.9 Listing of Susceptible species at a taxonomic ranking of Genus or higher

The *ad hoc* Group considered Article 1.5.9., Listing of susceptible species at a taxonomic ranking of Genus or higher, and determined that it is applicable for the susceptible species for WSSV identified.

8. References

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…/Annexes

Annex 1. List of Participants from 2023 assessment

MEETING OF THE WOAH *AD HOC* GROUP ON SUSCEPTIBILITY OF CRUSTACEAN SPECIES TO WOAH LISTED DISEASES

14, 21 and 23 March 2023 (virtual)

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List of Participants

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Annex 2. Terms of Reference from 2023 assessment

MEETING OF THE WOAH *AD HOC* GROUP ON SUSCEPTIBILITY OF CRUSTACEAN SPECIES TO WOAH LISTED DISEASES

Virtual Meeting, November 2023

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Terms of reference

Background

Chapter 1.5. Criteria for listing species as susceptible to infection with a specific pathogenic agent of the Aquatic Code, provides criteria for determining which host species are listed as susceptible in Article X.X.2. of each disease-specific chapter in the *Aquatic Code*.

Assessments for all of the WOAH listed diseases are being undertaken progressively by *ad hoc* Groups. Once completed, the revised list of susceptible species in the relevant Article X.X.2. of the *Aquatic Code* is circulated for Member comment and then presented for adoption.

Species, where there is some evidence of susceptibility but insufficient evidence to demonstrate susceptibility are included in the relevant disease-specific chapter in the *Aquatic Manual*.

The *ad hoc* Group on Susceptibility of crustacean species to infection with WOAH listed diseases completed assessments for infection with white spot syndrome virus (WSSV) in June 2016; however there is new scientific evidence that needs to be assessed.

Purpose

The *ad hoc* Group on Susceptibility of crustacean species to infection with WOAH listed diseases will undertake reassessments for infection with WSSV in crustaceans using new scientific evidence since the June 2016 assessments.

Terms of Reference

1) Review relevant literature documenting susceptibility of species for infection with WSSV and apply the criteria, as outlined in Chapter 1.5. Criteria for listing species as susceptible to infection with a specific pathogen, to potential host species.

2) Determine susceptible species for infection with WSSV based on Article 1.5.7.

3) Determine species with incomplete evidence for susceptibility for infection with WSSV based on Article 1.5.8.

Expected outputs of the *ad hoc* Group

1) Propose a list of susceptible species for inclusion in the Article 9.9.2. of Chapter 9.9., Infection with WSSV, in the *Aquatic Code.*

2) Propose a list of species with incomplete evidence for susceptibility for inclusion in Section 2.2.2 and Section 2.2.2. of Chapter 2.2.8. Infection with WSSV of the *Aquatic Manual*.

3) A report for consideration by the Aquatic Animals Commission at its February 2024 meeting.

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Annex 3. List of Participants from 2016 assessment

MEETING OF THE WOAH *AD HOC* GROUP ON SUSCEPTIBILITY OF CRUSTACEAN SPECIES TO WOAH LISTED DISEASES

Paris, 1-3 June 2016

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List of Participants

***** Note that the titles and affiliations of the participants represent information from the time of the assessment in 2016 and may not reflect current information in 2023.

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