

AQUATIC ANIMAL HEALTH STANDARDS COMMISSION

SEPTEMBER 2010 REPORT

USA COMMENTS

CHAPTER 9.6.

WHITE SPOT DISEASE

General Comment:

While the United States recognizes that Article 9.6.2., which recommends that this chapter apply to all decapod (order Decapoda) crustaceans from marine, brackish and freshwater sources, was not open for comment, we wish to provide the following scientific information to the AAHC for their consideration at their next meeting.

Background:

In its September 2009 report, the OIE's Aquatic Animal Health Commission (AAHC) responded to Member Country concerns over discrepancies in species listed as susceptible between the Aquatic Animal Health Code (herein the *Code*) and the Manual for Diagnostic Test for Aquatic Animals (herein the *Manual*) by proposing that specific criteria be used as guidance when evaluating if a species is susceptible to a disease. The AAHC indicated that susceptibility should be assessed with consideration of the following:

Criterion 1. Identification of the causative agent - Identification of the causative agent in accordance with methods described in the Aquatic Manual, is a prerequisite.

AND

Criterion 2. Natural pathways - Evidence should be classified as natural occurrence (NO), non-invasive experimental procedure (NIEP), and invasive experimental procedure (IEP). Natural occurrence, data from non-invasive experimental procedures and data from invasive experimental procedures that mimic the natural route of infection (for example, scarification of skin for transmission of EUS) should be considered as evidence of susceptibility.

AND

Criterion 3. Infection - A combination of these criteria should be used to assess infection of a host species:

- i. presence of an infectious or a viable organism, in or on, the live aquatic animal;

- ii. evidence of multiplication or other development of the organism;
- iii. clinical-pathological changes associated with the infection;
- iv. specific location of the pathogen.¹

Review of White Spot Disease (WSD)

Currently the *Code* and *Manual* require that all crustaceans in the Order Decapoda, regardless if from marine, brackish and freshwater sources be considered susceptible to White Spot Disease (WSD) and subject to zoosanitary requirements to ensure safe trade. The broad application of this requirement to all decapod species is not reflective of the AAHC's suggested approach to listing species as susceptible. The Order Decapoda is comprised of approximately 20,000 species of crustaceans. Evidence does not exist to support the listing of this number of species. There is, however, a large body of evidence to support listing specific species as susceptible. The United States has evaluated this body of available scientific evidence using the criteria proposed by the Commission and is requesting changes to the list of susceptible species for WSD in the Aquatic *Code* and *Manual* based on this analysis.

Analysis and Results

Table 1 includes a list of all crustacean species affected by WSSV that the United States proposes for listing in the *Code* and *Manual*. Table 2 provides corroborating evidence for each susceptible aquatic animal in Table 1. Papers cited in Table 2 were considered to provide the best supporting evidence that the species met the guidance criteria; however this does not represent all scientific evidence available. The numeric listing of the susceptible species in Table 1 corresponds to the supporting scientific evidence located in Table 2.

Guidance criteria for determination of susceptibility were used to evaluate each paper. Criteria 1 and 3 were considered as fulfilled for each paper listed in Table 2. Table 2 indicates the type of evidence provided in the publication with respect to criterion 2 where NO = Natural Occurrence, IEP = Invasive Experimental Procedure and NIEP = Non invasive Experimental procedure.

Based on this review, the United States feels that not all species listed are supported by clear evidence that they meet the criteria for susceptibility. Use of invasive experimental procedures (e.g. injection) and limited diagnostic testing (e.g PCR alone) do not provide sufficient corroborating evidence to support a species listing. Species listed in Table 1 in black font include those where there is clear evidence. Those in red are species the United States asserts do not have sufficient evidence to meet the Commission's guidance criteria. **As there is some evidence to support the probability of infection with the species listed in red, the United States is proposing that all species listed in Table 1 be included as susceptible until further evidence is provided to meet the guidance criteria and elucidate whether the species are susceptible**

¹ The type of scientific data supporting the criteria will depend on the causative agent under consideration. Examples of the occurrence of causative agents in non susceptible species may include PCR positive test results for a causative agent in a atypical species, e.g. KHV in skin of sturgeon; or in filter feeders, e.g. WSSV in rotifers, Artemia, or bivalves; or ISA virus in mussels. The outcomes of this assessment could be definite, possible and unlikely. The decision to list a species as susceptible will be based on a finding that the evidence is definite.¹

and should remain listed, or are not susceptible and should be removed. This is in keeping with the direction included in the AAHC 2010 report on the *Code*.

The United States also proposes that in addition to the criteria provided, guidance should be provided to Member Countries on additional factors that impact the determination of when and the type of zoosanitary measures that should be applied. These additional measures include:

1. Presence of other susceptible animals in the receiving waters
2. Biological factors that would affect the probability of pathogen survival and replication – examples include water temperature and salinity. If the water temperatures of the receiving waters are insufficient to support replication and thus survival of the virus, then the likelihood of disease occurrence if released is low.
3. Age and or lifestage of the aquatic animals

Table 1. List of Susceptible Species²

	Latin Name	Common English
1	<i>Acetes spp.</i>	Planktonic shrimp
2	<i>Alpheus brevicristatus</i>	Teppo Snapping shrimp
3	<i>Alpheus lobidens</i>	Brownbar Snapping Shrimp
4	<i>Aristeus spp.</i>	Gamba Shrimps
5	<i>Artemia spp.</i>	Artemia
6	<i>Astacus astacus</i>	Noble Crayfish
7	<i>Astacus leptodactylus</i>	Galician Crayfish
8	<i>Atergatis integerrimus</i>	Red Egg Crab
9	<i>Calappa lophos</i>	Common Box Crab
10	<i>Calappa philarigus</i>	Spectacled Box Crab
11	<i>Callianassa spp.</i>	Burrowing Mud Sbrimps
12	<i>Callinectes sapidus</i>	Blue Crab
13	<i>Cancer pagurus</i>	Edible Crab
14	<i>Carcinus maenas</i>	Green Crab
15	<i>Charybdis annulata</i>	Banded-legged Swimming Crab
16	<i>Charybdis cruciata</i>	Crucifix Crab
17	<i>Charybdis feriatius</i>	Flowery Crab
18	<i>Charybdis granulata</i>	Portunid Crab
19	<i>Charybdis hoplites</i>	None
20	<i>Charybdis japonica</i>	Japanese Swimming Crab
21	<i>Charybdis lucifera</i>	Box Crab
22	<i>Charybdis natator</i>	Ridged Swimming Crab
23	<i>Cherax destructor</i>	Yabby
24	<i>Cherax quadricarinatus</i>	Red Claw Crayfish
25	<i>Crangon crangon</i>	Common Shrimp
26	<i>Demania splendida</i>	None
27	<i>Doclea hybrida</i>	None
28	<i>Exopalaemon orientis</i>	Oriental Prawn
29	<i>Exopalaemon styliferus</i>	Roshma Prawn
30	<i>Farfantepenaeus aztecus</i>	Northern Brown Shrimp
31	<i>Farfantepenaeus duorarum</i>	Southern Pink Shrimp
32	<i>Fenneropenaeus chinensis</i>	Fleshy Prawn
33	<i>Fenneropenaeus indicus</i>	Indian White Prawn
34	<i>Fenneropenaeus merguensis</i>	Banana Prawn
35	<i>Fenneropenaeus penicillatus</i>	Redtail Prawn
36	<i>Gelasimus marionis nitidus</i>	Indian Fiddler Crab
37	<i>Grapsus albolineatus</i>	Mottled Lightfoot Crab
38	<i>Halimede ochtodes</i>	None
39	<i>Helice tridens</i>	Mud Burrowing Crab
40	<i>Hemigrapsus sanguineus</i>	Japanese Shore Crab
41	<i>Heterocarpus spp.</i>	Deep-sea Shrimps
42	<i>Homarus gammarus</i>	European Lobster
43	<i>Liagore rubromaculata</i>	None
44	<i>Liocarcinus depurator</i>	None
45	<i>Liocarcinus puber</i>	Velvet swimming crab
46	<i>Lithodes maja</i>	Norwegian King Crab
47	<i>Litopenaeus setiferus</i>	Northern White Shrimp
48	<i>Litopenaeus vannamei</i>	Whiteleg Shrimp
49	<i>Lysmata wurdemanni</i>	Peppermint Shrimp
50	<i>Macrobrachium idella</i>	Sunset Shrimp

² Common names are available in French upon request.

51	<i>Macrobrachium lamarrei</i>	Kuncho River Prawn
52	<i>Macrobrachium rosenbergii</i>	Giant River Prawn
53	<i>Macrobrachium spp.</i>	River Prawns
54	<i>Macrophthalmus sulcatus</i>	Ocypodid
55	<i>Marsupenaeus japonicus</i>	Kuruma Prawn
56	<i>Matuta miersi</i>	None
57	<i>Matuta planipes</i>	Flower Moon Crab
58	<i>Menippe rumphii</i>	Maroon Stone Crab
59	<i>Metapenaeus brevicornis</i>	Yellow Shrimp
60	<i>Metapenaeus dobsoni</i>	Kadal Shrimp
61	<i>Metapenaeus elegans</i>	Fine Shrimp
62	<i>Metapenaeus ensis</i>	Greasyback Shrimp
63	<i>Metapenaeus lysianassa</i>	Bird Shrimp
64	<i>Metapenaeus monoceros</i>	Speckled Shrimp
65	<i>Metapograpsus messor</i>	Mangrove Rock Crab
66	<i>Metapograpsus spp.</i>	Shore Crabs
67	<i>Ocypode stimpsoni</i>	Ghost Crab
68	<i>Orconectes limosus</i>	Spinycheek Crayfish
69	<i>Orconectes punctimanus</i>	Pothand Crayfish
70	<i>Pacifastacus leniusculus</i>	Signal Crayfish
71	<i>Palaemon adspersus</i>	Baltic prawn
72	<i>Panulirus homarus</i>	Scalloped Spiny Lobster
73	<i>Panulirus longipes</i>	Long-legged Spiny Lobster
74	<i>Panulirus ornatus</i>	Ornate Spiny Lobster
75	<i>Panulirus penicillatus</i>	Pronghorn Spiny Lobster
76	<i>Panulirus polyphagus</i>	Mud Spiny Lobster
77	<i>Panulirus versicolor</i>	Painted Spiny Lobster
78	<i>Paradorippe granulata</i>	Dorripid crab
79	<i>Parapenaeopsis stylifera</i>	Kiddi Shrimp
80	<i>Paratelphusa hydrodomous</i>	None
81	<i>Paratelphusa pulvinata</i>	None
82	<i>Parthenope prensor</i>	Elbow Crab
83	<i>Penaeus monodon</i>	Giant Tiger Prawn
84	<i>Penaeus semisulcatus</i>	Green Tiger
85	<i>Petrolisthes japonicus</i>	Porcelain Crab
86	<i>Phylira syndactyla</i>	None
87	<i>Podophthalmus vigil</i>	Sentinel Crab
88	<i>Portunus pelagicus</i>	Flower Crab
89	<i>Portunus sanguinolentus</i>	Three Spot Swimming Crab
90	<i>Portunus trituberculatus</i>	Horse Crab
91	<i>Procambarus clarkii</i>	Red Swamp Crayfish
92	<i>Pseudograpsus intermedius</i>	Mosaic Crab
93	<i>Scylla serrata</i>	Giant Mud Crab
94	<i>Scylla tranquebarica</i>	Purple Mud Crab
95	<i>Scyllarus arctus</i>	Small European Locust Lobster
96	<i>Sesarma oceanica</i>	None
97	<i>Sesarma spp.</i>	Mangrove Crabs
98	<i>Solenocera crassicornis</i>	Coastal Mud
99	<i>Squilla mantis</i>	Spottail Mantis Shrimp
100	<i>Squilla spp.</i>	Mantis Shrimps
101	<i>Thalamita danae</i>	Swimming Crab
102	<i>Trachysalambria curvirostris</i>	Southern Rough Shrimp
103	<i>Uca pugilator</i>	Atlantic Sand Fiddler
104	<i>Upogebia major</i>	Mud Shrimp

Table 2 References – for Corresponding species in Table 1.

	YEAR	AUTHORS	JOURNAL	VOL	PGS	TITLE	
1	2008	Pradeep B. , M. Shekar, N. Gudkovs, I. Karunasagar, I. Karunasagar	Diseases of Aquatic Organisms	78	189-198	Genotyping of White Spot Syndrome Virus Prevalent in Shrimp Farms of India	IEP
	1998	Supamattaya, K., Hoffmann, R.W., Boonyaratpalin, S. & Kanchanaphum, P.	Dis. Aquat. Org.	32	79-85	Experimental transmission of white spot syndrome virus (WSSV) from black tiger shrimp <i>Penaeus monodon</i> to the sand crab <i>Portunus pelagicus</i> , mud crab <i>Scylla serrata</i> and krill <i>Acetes</i> sp.	IEP and NIEP
2	1998	Maeda M., Itami T., Furumoto A., Hennig O., Imamura T., Kondo M., Hirono I., Takashi A. & Takahashi Y.	Fish Pathol.	33	373-380	Detection of penaeid rod-shaped DNA virus (PRDV) in wild-caught shrimp and other crustaceans. .	NO, IEP, NIEP Wild species tested with PCR only - no clinical signs.
3	1998	Maeda M., Itami T., Furumoto A., Hennig O., Imamura T., Kondo M., Hirono I., Takashi A. & Takahashi Y.	Fish Pathol.	33	373-380	Detection of penaeid rod-shaped DNA virus (PRDV) in wild-caught shrimp and other crustaceans. .	NO, IEP, NIEP Wild species tested with PCR only - no clinical signs.
4	2002	Chakraborty A. , S.K. Otta, B. Joseph, S. Kumar, M.S. Hossain, I. Karunasagar, M.N. Venugopal, I. Karunasagar	Current Science	82	1392-1397	Prevalence of White Spot Syndrome Virus in Wild Crustaceans along the Coast of India	NO Only PCR testing Samples from Markets and Landing Centres – No clinical signs noted
5	2006	Waikhom G. , K.R. John, M.R. George, M.J.P. Jeyaseelan	Aquaculture	261	54-63	Differential Host Passaging Alters Pathogenicity and Induces Genomic Variation in White Spot Syndrome Virus	NIEP Only PCR testing No mortalities
	2003	Li Q., Zhang J., Chen Y. & Yang F.	Dis. Aquat. Org.	57	261-264	White spot syndrome virus (WSSV) infectivity for <i>Artemia</i> at different developmental stages.	NIEP Only PCR testing
	2003	Vaseeharan B., Jayakumar R. & Ramasamy P.	Lett. Appl. Microbiol.	37	443-447	PCR-based detection of white spot syndrome virus in cultured and captured crustaceans in India.	NO Only PCR testing– No clinical signs noted

	2002	Chang Y.S., Lo C.F., Peng S.E., Liu K.F., Wang C.H. & Kou G.H.	Dis. Aquat. Org.	49	1-10	White spot syndrome virus (WSSV) PCR-positive <i>Artemia</i> cysts yield PCR-negative nauplii that fail to transmit WSSV when fed to shrimp postlarvae.	NO PCR testing only of cysts – negative results
	2002	Hameed, A.S. Sahul, B.L.M. Murthi, M. Rasheed, S. Satish, K. Yoganandhan, V. Murugan, K. Jayaraman	Aquaculture	204	1-10	An investigation of <i>Artemia</i> as a possible vector for white spot syndrome virus (WSSV) transmission to <i>Panaeus indicus</i> .	NIEP (PCR + Histo - > study indicates <i>Artemia</i> NOT a reservoir for WSSV)
6	2004	Jiravanichpaisal P. , K. Söderhäll, I. Söderhäll	Fish and Shellfish Immunology	17	265-275	Effect of water temperature on the immune response and infectivity pattern of white spot syndrome virus (wssv) in freshwater crayfish.	IEP
7	2001	Corbel V., Zuprizal, Z Shi, C. Huang, Sumartono, J-M. Arcier, J-R. Bonami	Journal of Fish Diseases	24	377-382	Experimental Infection of European Crustaceans with White Spot Syndrome Virus (WSSV)	IEP, NIEP (Both done for this species)
8	2003	Hameed, A.S. Sahul , Balasubramanian, G., Syed Musthaq, S. & Yoganandhan, K.	Dis. Aquat. Org.	57	157-161	Experimental infection of twenty species of Indian marine crabs with white spot syndrome virus (WSSV).	IEP, NIEP No clinical signs of infection or mortality but tested PCR positive
9	2002	Chakraborty A. , S.K. Otta, B. Joseph, S. Kumar, M.S. Hossain, I. Karunasagar, M.N. Venugopal, I. Karunasagar	Current Science	82	1392-1397	Prevalence of White Spot Syndrome Virus in Wild Crustaceans along the Coast of India	NO Only PCR testing No clinical signs noted
	1998	Wang Y-C. , C-F. Lo, P-S. Chang, G-H. Kou	Aquaculture	164	221-231	Experimental Infection of White Spot Baculovirus in Some Cultured and Wild Decapods in Taiwan.	NO, NIEP PCR Testing only but wild animals used in experiments
10	2003	Hameed, A.S. Sahul , Balasubramanian, G., Syed Musthaq, S. & Yoganandhan, K.	Dis. Aquat. Org.	57	157-161	Experimental infection of twenty species of Indian marine crabs with white spot syndrome virus (WSSV).	IEP, NIEP Vague clinical signs of infection noted, mortalities noted and histology summarized (no data given) and tested PCR pos.

	1998	Kou G.H., Peng S.E., Chiu Y.L. & Lo C.F.	In: Advances in Shrimp Biotechnology, Flegel T.W., ed. National Center for Genetic Engineering and Biotechnology, Bangkok, Thailand		267-271	Tissue distribution of white spot syndrome virus (WSSV) in shrimp and crabs.	NO PCR testing only No clinical signs noted
	1998	Lo C.F. & Kou G.H.	Fish Pathol.	33	365–371	Virus-associated white spot syndrome of shrimp in Taiwan: a review.	Review Article
11	1996	Lo, C.F., Ho, C.H., Peng, S.E., Chen, C.H., Hsu, H.E., Chiu, Y.L., Chang, C.F., Liu, K.F., Su, M.S., Wang, C.H. & Kou, G.H.	Dis. Aquat. Org.	27	215-225	White spot syndrome baculovirus (WSBV) detected in cultured and captured shrimp, crabs and other arthropods.	NO This species is not present in this article but has been incorrectly cited in other articles for this species
12	2005	Dorf B.A. , C. Hons, P. Varner	Journal of Aquatic Animal Health	17	373-379	A Three-Year Survey of Penaeid Shrimp and Callinectid Crabs from Texas Coastal Waters for Signs of Disease Caused by White Spot Syndrome Virus or Taura Syndrome Virus	NO
	2001	Chang Y-S. , S-E. Peng, H-C. Wang, H-C. Hsu, C-H. Ho, C-H. Wang, S-Y. Wang, C-F. Lo, G-H. Kou	Marine Biotechnology	3	163-171	Sequencing and Amplified Restriction Fragment Length Polymorphism Analysis of Ribonucleotide Reductase Large Subunit Gene of the White Spot Syndrome Virus in Blue Crab (<i>Callinectes sapidus</i>) from American Coastal Waters	NO
13	2001	Corbel V., Zuprizal, Z Shi, C. Huang, Sumartono, J-M. Arcier, J-R. Bonami	Journal of Fish Diseases	24	377-382	Experimental Infection of European Crustaceans with White Spot Syndrome Virus (WSSV)	IEP, NIEP (Both done for this species)
14	2001	Corbel V. , Zuprizal, Z Shi, C. Huang, Sumartono, J-M. Arcier, J-R. Bonami	Journal of Fish Diseases	24	377-382	Experimental Infection of European Crustaceans with White Spot Syndrome Virus (WSSV)	IEP, NIEP IEP only was done for this species

15	2001	Hossain M. S. , A. Chakraborty, B. Joseph, S.K. Otta, I. Karunasagar, I. Karunasagar	Aquaculture	198	1-11	Detection of New Hosts for White Spot Syndrome Virus of Shrimp Using Nested Polymerase Chain Reaction	NO PCR only No clinical signs noted
	2003	Hameed, A.S. Sahul , Balasubramanian, G., Syed Musthaq, S. & Yoganandhan, K.	Dis. Aquat. Org.	57	157-161	Experimental infection of twenty species of Indian marine crabs with white spot syndrome virus (WSSV).	IEP, NIEP
16	2002	Chakraborty A. , S.K. Otta, B. Joseph, S. Kumar, M.S. Hossain, I. Karunasagar, M.N. Venugopal, I. Karunasagar	Current Science	82	1392-1397	Prevalence of White Spot Syndrome Virus in Wild Crustaceans along the Coast of India	NO PCR only No clinical signs noted
	2001	Hossain M. S. , A. Chakraborty, B. Joseph, S.K. Otta, I. Karunasagar, I. Karunasagar	Aquaculture	198	1-11	Detection of New Hosts for White Spot Syndrome Virus of Shrimp Using Nested Polymerase Chain Reaction	NO PCR only No clinical signs noted
17	2002	Chakraborty A. , S.K. Otta, B. Joseph, S. Kumar, M.S. Hossain, I. Karunasagar, M.N. Venugopal, I. Karunasagar	Current Science	82	1392-1397	Prevalence of White Spot Syndrome Virus in Wild Crustaceans along the Coast of India	NO PCR only No clinical signs noted
	1998	Wang Y-C. , C-F. Lo, P-S. Chang, G-H. Kou	Aquaculture	164	221-231	Experimental Infection of White Spot Baculovirus in Some Cultured and Wild Decapods in Taiwan.	NO, NIEP PCR Testing only but wild animals used in experiments Neg->pos NO
18	1998	Chang P-S. , H-C. Chen, Y-C. Wang	Aquaculture	164	233-242	Detection of White Spot Syndrome Associated Baculovirus in Experimentally Infected Wild Shrimp, Crab and Lobsters by <i>in situ</i> Hybridization	NO, NIEP PCR Testing only but wild animals used in experiments
	1998	Wang Y-C. , C-F. Lo, P-S. Chang, G-H. Kou	Aquaculture	164	221-231	Experimental Infection of White Spot Baculovirus in Some Cultured and Wild Decapods in Taiwan.	NO, NIEP PCR Testing only but wild animals used in experiments
19	2002	Chakraborty A. , S.K. Otta, B. Joseph, S. Kumar, M.S. Hossain, I. Karunasagar, M.N. Venugopal, I. Karunasagar	Current Science	82	1392-1397	Prevalence of White Spot Syndrome Virus in Wild Crustaceans along the Coast of India	NO PCR only No clinical signs noted
20	2003	Takahashi et al.	(Asian Aquaculture Magazine?)	(Nov Dec)	25-27	(Detection and prevention of WSSV infection in cultured shrimp)?	Paper not in Reference Section of EFSA

21	2002	Chakraborty A. , S.K. Otta, B. Joseph, S. Kumar, M.S. Hossain, I. Karunasagar, M.N. Venugopal, I. Karunasagar	Current Science	82	1392-1397	Prevalence of White Spot Syndrome Virus in Wild Crustaceans along the Coast of India	NO PCR only No clinical signs noted
22	2003	Hameed, A.S. Sahul , Balasubramanian, G., Syed Musthaq, S. & Yoganandhan, K.	Dis. Aquat. Org.	57	157-161	Experimental infection of twenty species of Indian marine crabs with white spot syndrome virus (WSSV).	IEP, NIEP No clinical signs of infection or mortality but tested PCR positive
	1998	Kou G.H., Peng S.E., Chiu Y.L. & Lo C.F.	In: Advances in Shrimp Biotechnology, Flegel T.W., ed. National Center for Genetic Engineering and Biotechnology, Bangkok, Thailand		267-271	Tissue distribution of white spot syndrome virus (WSSV) in shrimp and crabs.	NO PCR testing only
23	2004	Edgerton B.F.	Diseases of Aquatic Organisms	59	187-193	Susceptibility of the Australain Freshwater Crayfish <i>Cherax destructor albidus</i> to White Spot Syndrome Virus (WSSV)	NIEP, IEP
24	2006	Liu, Y., J. Wu, J. Song, J. Sirvaraman, C.L. Hew	J. Virol.	80	10419-10427	Identification of a Novel Nonstructural Protein, VP9, from White Spot Syndrome Virus: Its Structure Reveals a Ferredoxin Fold with Specific Metal Binding Sites.	IEP
	2004	Claydon K., Cullen B. & Owens L.	Dis. Aquat. Org	62	265–268	OIE white spot syndrome virus PCR gives false-positive results in <i>Cherax quadricarinatus</i>	Samples came from histological positive samples of this species - PCR testing only
	2000	Shi, Z., C. Huang, J. Zhang, D. Chen, J.R. Bonami	J. Fish Dis.	23	285-288	Short Communication: White spot syndrome virus (WSSV) experimental infection of the freshwater crayfish, <i>Cherax quadricarinatus</i> .	IEP
25	?	Alday, V.				Personal	?

26	2003	Hameed, A.S. Sahul , Balasubramanian, G., Syed Musthaq, S. & Yoganandhan, K.	Dis. Aquat. Org.	57	157- 161	Communication Experimental infection of twenty species of Indian marine crabs with white spot syndrome virus (WSSV).	NIEP, IEP No clinical signs of infection or mortality but tested PCR positive
27	2003	Hameed, A.S. Sahul , Balasubramanian, G., Syed Musthaq, S. & Yoganandhan, K.	Dis. Aquat. Org.	57	157- 161	Experimental infection of twenty species of Indian marine crabs with white spot syndrome virus (WSSV).	IEP, NIEP Vague gross signs, Mortalities for both methods of infection and tested PCR positive
28	1998	Chang P-S. , H-C. Chen, Y-C. Wang	Aquaculture	164	233- 242	Detection of White Spot Syndrome Associated Baculovirus in Experimentally Infected Wild Shrimp, Crab and Lobsters by <i>in situ</i> Hybridization	NIEP
	1998	Wang Y-C. , C-F. Lo, P-S. Chang, G-H. Kou	Aquaculture	164	221- 231	Experimental Infection of White Spot Baculovirus in Some Cultured and Wild Decapods in Taiwan.	NO, NIEP PCR Testing only but wild animals used in experiments Neg->pos
29	2001	Hossain Md Shahadat , S.K. Otta, Indrani Karunasagar & Iddyia Karunasagar	Fish Pathol.	36	93-95	Detection of white spot syndrome virus (WSSV) in wild captured shrimp and in non-cultured crustaceans from shrimp ponds in Bangladesh by polymerase chain reaction.	NO PCR only testing Samples are wild captured animals some near ponds, some not – no clinical signs noted
30	1998	Lightner, D.V., K.W. Hasson, B.L. White, R.M. Redman	Journal of Aquatic Animal Health	10	271- 281	Experimental Infection of Western Hemisphere Penaeid Shrimp with Asian White Spot Syndrome Virus and Asian Yellow Head Virus	NIEP
31	1998	Lightner, D.V., K.W. Hasson, B.L. White, R.M. Redman	Journal of Aquatic Animal Health	10	271- 281	Experimental Infection of Western Hemisphere Penaeid Shrimp with Asian White Spot Syndrome Virus and Asian Yellow Head Virus	NIEP
32	2006	Zhang J-S. , S-L. Dong, X-L. Tian, Y-W. Dong, X-Y. Liu, D- C. Yan	Aquaculture	261	1181- 1185	Studies on the Rotifer (<i>Brachionus urceus</i> Linnaeus, 1758) as a Vector in White Spot Syndrome Virus (WSSV)	NIEP

33	2001	Hossain M. S. , A. Chakraborty, B. Joseph, S.K. Otta, I. Karunasagar, I. Karunasagar	Aquaculture	198	1-11	Transmission Detection of New Hosts for White Spot Syndrome Virus of Shrimp Using Nested Polymerase Chain Reaction	NO PCR only No clinical signs noted
	2000	Sahul Hameed A.S., Xavier Charles M. & Anilkumar M.	Aquaculture	183	207-213	Tolerance of <i>Macrobrachium rosenbergii</i> to white spot syndrome virus.	IEP, NIEP
	1999	Hao, N. V., Thuy, D. T., Loan, L. T. T., Phi, T. T., Phuoc, L. H., Duong, H. H. T., Corsin, F. and Chanratchakool, P.	Asian Fisheries Sci.	12	309-325	Presence of the two viral pathogens WSSV and MBV in three wild shrimp species (<i>Penaeus indicus</i> , <i>Metapenaeus ensis</i> and <i>Metapenaeus lysianassa</i>) cultured in the mangrove forest of Ca Mau Province	NO
34	2002	Wang, Y.T., W. Liu, J.N. Seah, C.S. Lam. J.H. Xiang, V. Korzh, J. Kwang	Diseases of Aquatic Organisms	52	249-259	White Spot Syndrome Virus (WSSV) Infects Specific Hemocytes of the Shrimp <i>Penaeus merguensis</i>	NO
35	1998	Wang Y-C. , C-F. Lo, P-S. Chang, G-H. Kou	Aquaculture	164	221-231	Experimental Infection of White Spot Baculovirus in Some Cultured and Wild Decapods in Taiwan.	NO, NIEP PCR Testing only but wild animals used in experiments Neg->pos
	1996	Lo, C.F., Ho, C.H., Peng, S.E., Chen, C.H., Hsu, H.E., Chiu, Y.L., Chang, C.F., Liu, K.F., Su, M.S., Wang, C.H. & Kou, G.H.	Dis. Aquat. Org.	27	215-225	White spot syndrome baculovirus (WSBV) detected in cultured and captured shrimp, crabs and other arthropods.	NO PCR Testing – none recorded data for TEM and Histopathology mentioned
36	2001	Hossain M. S. , A. Chakraborty, B. Joseph, S.K. Otta, I. Karunasagar, I. Karunasagar	Aquaculture	198	1-11	Detection of New Hosts for White Spot Syndrome Virus of Shrimp Using Nested Polymerase Chain Reaction	NO PCR only No clinical signs noted
	2002	Chakraborty A. , S.K. Otta, B. Joseph, S. Kumar, M.S. Hossain, I. Karunasagar, M.N. Venugopal, I. Karunasagar	Current Science	82	1392-1397	Prevalence of White Spot Syndrome Virus in Wild Crustaceans along the Coast of India	NO PCR only No clinical signs noted
37	2003	Hameed, A.S. Sahul , Balasubramanian, G., Syed Musthaq, S. & Yoganandhan, K.	Dis. Aquat. Org.	57	157-161	Experimental infection of twenty species of Indian marine crabs with white spot syndrome virus (WSSV).	IEP, NIEP No clinical signs of infection mortalities for both methods of infection and tested PCR

positive

38	2003	Hameed, A.S. Sahul , Balasubramanian, G., Syed Musthaq, S. & Yoganandhan, K.	Dis. Aquat. Org.	57	157- 161	Experimental infection of twenty species of Indian marine crabs with white spot syndrome virus (WSSV).	IEP, NIEP No clinical signs of infection mortalities for both methods of infection and tested PCR positive
39	1996	Lo, C.F., Ho, C.H., Peng, S.E., Chen, C.H., Hsu, H.E., Chiu, Y.L., Chang, C.F., Liu, K.F., Su, M.S., Wang, C.H. & Kou, G.H.	Dis. Aquat. Org.	27	215- 225	White spot syndrome baculovirus (WSBV) detected in cultured and captured shrimp, crabs and other arthropods.	NO PCR Testing – none recorded data for TEM and Histopathology mentioned
40	1998	Maeda M., Itami T., Furumoto A., Hennig O., Imamura T., Kondo M., Hirono I., Takashi A. & Takahashi Y.	Fish Pathol.	33	373- 380	Detection of penaeid rod- shaped DNA virus (PRDV) in wild-caught shrimp and other crustaceans. .	NO, NIEP, IEP Tested with PCR only - no clinical signs noted in these species
	1996	Kimura T., Yamano K., Nakano H., Momoyama K., Hiraoka M. & Inouye K.	Fish Pathol.	31	93-98	Detection of penaeid rod- shaped DNA virus (PRDV) by PCR.	????????? Suspect IEP
41	2002	Chakraborty A. , S.K. Otta, B. Joseph, S. Kumar, M.S. Hossain, I. Karunasagar, M.N. Venugopal, I. Karunasagar	Current Science	82	1392- 1397	Prevalence of White Spot Syndrome Virus in Wild Crustaceans along the Coast of India	NO PCR only No clinical signs noted
42	2008	Bateman, K., G. Stentiford	Cefas			Crustacean Disease Research in Europe Current and Emerging Issues	IEP, NIEP
43	2003	Hameed, A.S. Sahul , Balasubramanian, G., Syed Musthaq, S. & Yoganandhan, K.	Dis. Aquat. Org.	57	157- 161	Experimental infection of twenty species of Indian marine crabs with white spot syndrome virus (WSSV).	IEP, NIEP No clinical signs of infection or mortality but tested PCR positive
44	2001	Corbel V. , Zuprizal, Z Shi, C. Huang, Sumartono, J-M. Arcier, J-R. Bonami	Journal of Fish Diseases	24(7)	377- 382	Experimental Infection of European Crustaceans with White Spot Syndrome Virus (WSSV)	IEP NIEP IEP only for this species
45	2001	Corbel V. , Zuprizal, Z Shi, C. Huang, Sumartono, J-M.	Journal of Fish Diseases	24(7)	377- 382	Experimental Infection of European Crustaceans	NIEP, IEP

		Arcier, J-R. Bonami				with White Spot Syndrome Virus (WSSV)	
46	2003	Hameed, A.S. Sahul , Balasubramanian, G., Syed Musthaq, S. & Yoganandhan, K.	Dis. Aquat. Org.	57	157-161	Experimental infection of twenty species of Indian marine crabs with white spot syndrome virus (WSSV).	IEP, NIEP Clinical signs of infection, mortalities noted and histology summarized and tested PCR positive NIEP
47	1998	Lightner, D.V., K.W. Hasson, B.L. White, R.M. Redman	Journal of Aquatic Animal Health	10	271-281	Experimental Infection of Western Hemisphere Penaeid Shrimp with Asian White Spot Syndrome Virus and Asian Yellow Head Virus	NIEP
48	1998	Lightner, D.V., K.W. Hasson, B.L. White, R.M. Redman	Journal of Aquatic Animal Health	10	271-281	Experimental Infection of Western Hemisphere Penaeid Shrimp with Asian White Spot Syndrome Virus and Asian Yellow Head Virus	NIEP
	1998	Lightner, D.V., K.W. Hasson, B.L. White, R.M. Redman	Journal of Aquatic Animal Health	10	271-281	Experimental Infection of Western Hemisphere Penaeid Shrimp with Asian White Spot Syndrome Virus and Asian Yellow Head Virus	NIEP
49	2007	Laramore, S.E.	J. Shellfish Res.	26	623-627	Susceptibility of the Peppermint Shrimp <i>Lysmata wurdemanni</i> to the White Spot Syndrome Virus	IEP, NIEP No controls in some experiments, only WSSV detected in one experiment
50	2000	Sahul Hameed A.S., Xavier Charles M. & Anilkumar M.	Aquaculture	183	207-213	Tolerance of Macrobrachium rosenbergii to white spot syndrome virus.	IEP, NIEP (Three species of Macrobrachium were tested)
51	2000	Sahul Hameed A.S., Xavier Charles M. & Anilkumar M.	Aquaculture	183	207-213	Tolerance of Macrobrachium rosenbergii to white spot syndrome virus.	IEP, NIEP
52	2002	Chakraborty A. , S.K. Otta, B. Joseph, S. Kumar, M.S. Hossain, I. Karunasagar, M.N. Venugopal, I. Karunasagar	Current Science	82	1392-1397	Prevalence of White Spot Syndrome Virus in Wild Crustaceans along the Coast of India	NO PCR only No clinical signs noted
	2001	Hossain M. S. , A. Chakraborty, B. Joseph, S.K. Otta, I. Karunasagar, I. Karunasagar	Aquaculture	198	1-11	Detection of New Hosts for White Spot Syndrome Virus of Shrimp Using Nested Polymerase Chain Reaction	NO PCR only No clinical signs noted
53	1998	Chang P-S. , H-C. Chen, Y-C.	Aquaculture	164	233-	Detection of White Spot	NIEP

		Wang		242		Syndrome Associated Baculovirus in Experimentally Infected Wild Shrimp, Crab and Lobsters by <i>in situ</i> Hybridization	
54	2002	Chakraborty A. , S.K. Otta, B. Joseph, S. Kumar, M.S. Hossain, I. Karunasagar, M.N. Venugopal, I. Karunasagar	Current Science	82	1392-1397	Prevalence of White Spot Syndrome Virus in Wild Crustaceans along the Coast of India	NO PCR only No clinical signs noted
	2001	Hossain M. S. , A. Chakraborty, B. Joseph, S.K. Otta, I. Karunasagar, I. Karunasagar	Aquaculture	198	1-11	Detection of New Hosts for White Spot Syndrome Virus of Shrimp Using Nested Polymerase Chain Reaction	NO PCR only No clinical signs noted
55	2002	Chakraborty A. , S.K. Otta, B. Joseph, S. Kumar, M.S. Hossain, I. Karunasagar, M.N. Venugopal, I. Karunasagar	Current Science	82	1392-1397	Prevalence of White Spot Syndrome Virus in Wild Crustaceans along the Coast of India	NO PCR only No clinical signs noted but wild animals used in experiments Neg->pos
	1998	Wang Y-C. , C-F. Lo, P-S. Chang, G-H. Kou	Aquaculture	164	221-231	Experimental Infection of White Spot Baculovirus in Some Cultured and Wild Decapods in Taiwan.	NO, NIEP PCR Testing only No clinical signs noted
56	2003	Hameed, A.S. Sahul , Balasubramanian, G., Syed Musthaq, S. & Yoganandhan, K.	Dis. Aquat. Org.	57	157-161	Experimental infection of twenty species of Indian marine crabs with white spot syndrome virus (WSSV).	IEP, NIEP Clinical signs of infection, mortalities and histology summarized Tested PCR positive
57	2002	Chakraborty A. , S.K. Otta, B. Joseph, S. Kumar, M.S. Hossain, I. Karunasagar, M.N. Venugopal, I. Karunasagar	Current Science	82	1392-1397	Prevalence of White Spot Syndrome Virus in Wild Crustaceans along the Coast of India	NO PCR only No clinical signs noted
58	2003	Hameed, A.S. Sahul , Balasubramanian, G., Syed Musthaq, S. & Yoganandhan, K.	Dis. Aquat. Org.	57	157-161	Experimental infection of twenty species of Indian marine crabs with white spot syndrome virus (WSSV).	IEP, NIEP No clinical signs of infection or mortality but tested PCR positive
59	2001	Hossain Md Shahadat , S.K. Otta, Indrani Karunasagar & Iddyia Karunasagar	Fish Pathol.	36(2)	93-95	Detection of white spot syndrome virus (WSSV) in wild captured shrimp and in non-cultured crustaceans from shrimp ponds in Bangladesh by polymerase chain	NO PCR only No clinical signs noted

60	2002	Chakraborty A. , S.K. Otta, B. Joseph, S. Kumar, M.S. Hossain, I. Karunasagar, M.N. Venugopal, I. Karunasagar	Current Science	82	1392-1397	reaction. Prevalence of White Spot Syndrome Virus in Wild Crustaceans along the Coast of India	NO PCR only No clinical signs noted
	2001	Hossain M. S. , A. Chakraborty, B. Joseph, S.K. Otta, I. Karunasagar, I. Karunasagar	Aquaculture	198	1-11	Detection of New Hosts for White Spot Syndrome Virus of Shrimp Using Nested Polymerase Chain Reaction	NO PCR only No clinical signs noted
61	2002	Chakraborty A. , S.K. Otta, B. Joseph, S. Kumar, M.S. Hossain, I. Karunasagar, M.N. Venugopal, I. Karunasagar	Current Science	82	1392-1397	Prevalence of White Spot Syndrome Virus in Wild Crustaceans along the Coast of India	NO PCR only No clinical signs noted
62	1998	Chang P-S. , H-C. Chen, Y-C. Wang	Aquaculture	164	233-242	Detection of White Spot Syndrome Associated Baculovirus in Experimentally Infected Wild Shrimp, Crab and Lobsters by <i>in situ</i> Hybridization	NIEP
	1998	Wang Y-C. , C-F. Lo, P-S. Chang, G-H. Kou	Aquaculture	164	221-231	Experimental Infection of White Spot Baculovirus in Some Cultured and Wild Decapods in Taiwan.	NO, NIEP PCR Testing only No clinical signs noted
	1999	Hao, N. V., Thuy, D. T., Loan, L. T. ., Phi, T. T., Phuoc, L. H., Duong, H. H. T., Corsin, F. and Chanratchakool, P.	Asian Fisheries Sci.	12(4)	309-325	Presence of the two viral pathogens WSSV and MBV in three wild shrimp species (<i>Penaeus indicus</i> , <i>Metapenaeus ensis</i> and <i>Metapenaeus lysianassa</i>) cultured in the mangrove forest of Ca Mau Province	NO PCR and Histology sample analyses
63	1999	Hao, N. V., Thuy, D. T., Loan, L. T. T., Phi, T. T., Phuoc, L. H., Duong, H. H. T., Corsin, F. and Chanratchakool, P.	Asian Fisheries Sci.	12(4)	309-325	Presence of the two viral pathogens WSSV and MBV in three wild shrimp species (<i>Penaeus indicus</i> , <i>Metapenaeus ensis</i> and <i>Metapenaeus lysianassa</i>) cultured in the mangrove forest of Ca Mau Province	NO PCR and Histology sample analyses
64	2001	Hossain Md Shahadat , S.K. Otta, Indrani Karunasagar & Iddyia Karunasagar	Fish Pathol.	36(2)	93-95	Detection of white spot syndrome virus (WSSV) in wild captured shrimp and in non-cultured crustaceans from shrimp ponds in Bangladesh by polymerase chain reaction.	NO PCR only No clinical signs noted
	1999	Rajendran, K.V., Vijayan,	J. Fish Dis.	22(3)	183-	Experimental host range	NIEP, IEP

		K.K., Santiago, T.C. & Krol, R.M.		191		and histopathology of white spot syndrome virus (WSSV) infection in shrimp, prawns, crabs and lobsters from India.	
65	2002	Chakraborty A. , S.K. Otta, B. Joseph, S. Kumar, M.S. Hossain, I. Karunasagar, M.N. Venugopal, I. Karunasagar	Current Science	82	1392-1397	Prevalence of White Spot Syndrome Virus in Wild Crustaceans along the Coast of India	NO PCR only No clinical signs noted
	2001	Hossain M. S. , A. Chakraborty, B. Joseph, S.K. Otta, I. Karunasagar, I. Karunasagar	Aquaculture	198	1-11	Detection of New Hosts for White Spot Syndrome Virus of Shrimp Using Nested Polymerase Chain Reaction	NIEP PCR only No clinical signs noted
66	1999	Rajendran, K.V., Vijayan, K.K., Santiago, T.C. & Krol, R.M.	J. Fish Dis.	22(3)	183-191	Experimental host range and histopathology of white spot syndrome virus (WSSV) infection in shrimp, prawns, crabs and lobsters from India.	IEP, NIEP Genus was NOT speciated
67	1998	Maeda M., Itami T., Furumoto A., Hennig O., Imamura T., Kondo M., Hirono I., Takashi A. & Takahashi Y.	Fish Pathol.	33(4)	373-380	Detection of penaeid rod-shaped DNA virus (PRDV) in wild-caught shrimp and other crustaceans. .	IEP, NIEP Wild species tested with PCR only - no clinical signs
68	2001	Corbel V. , Zuprizal, Z Shi, C. Huang, Sumartono, J-M. Arcier, J-R. Bonami	Journal of Fish Diseases	24(7)	377-382	Experimental Infection of European Crustaceans with White Spot Syndrome Virus (WSSV)	IEP, NIEP
69	1999	Lo C.F., Hsu H.C., Tsai M.F., Ho C.H., Peng S.E., Kou G.H. & Lightner D.V.	Dis. Aquat. Org.	35	175-185	Specific genomic DNA fragment analysis of different geographical clinical samples of shrimp white spot syndrome virus.	Virus samples came from Dr. Lightner's collection
70	2004	Jiravanichpaisal P. , K. Söderhäll, I. Söderhäll	Fish and Shellfish Immunology	17(3)	265-275	Effect of water temperature on the immune response and infectivity pattern of white spot syndrome virus (wssv) in freshwater crayfish.	IEP INJ only
71	2001	Corbel V. , Zuprizal, Z Shi, C. Huang, Sumartono, J-M. Arcier, J-R. Bonami	Journal of Fish Diseases	24(7)	377-382	Experimental Infection of European Crustaceans with White Spot Syndrome Virus (WSSV)	IEP, NIEP
72	1999	Rajendran, K.V., Vijayan, K.K., Santiago, T.C. & Krol, R.M.	J. Fish Dis.	22(3)	183-191	Experimental host range and histopathology of white spot syndrome virus (WSSV) infection in shrimp, prawns, crabs and lobsters from India.	IEP, NIEP
73	1998	Wang Y-C. , C-F. Lo, P-S. Chang, G-H. Kou	Aquaculture	164	221-231	Experimental Infection of White Spot Baculovirus in Some Cultured and Wild	NO, NIEP PCR Only

74	1998	Wang Y-C. , C-F. Lo, P-S. Chang, G-H. Kou	Aquaculture	164	221-231	Decapods in Taiwan. Experimental Infection of White Spot Baculovirus in Some Cultured and Wild Decapods in Taiwan.	NO, NIEP PCR only
75	1998	Chang P-S. , H-C. Chen, Y-C. Wang	Aquaculture	164	233-242	Detection of White Spot Syndrome Associated Baculovirus in Experimentally Infected Wild Shrimp, Crab and Lobsters by <i>in situ</i> Hybridization	NIEP
	1998	Wang Y-C. , C-F. Lo, P-S. Chang, G-H. Kou	Aquaculture	164	221-231	Experimental Infection of White Spot Baculovirus in Some Cultured and Wild Decapods in Taiwan.	NO, NIEP PCR Testing only
76	1999	Rajendran, K.V., Vijayan, K.K., Santiago, T.C. & Krol, R.M.	J. Fish Dis.	22(3)	183-191	Experimental host range and histopathology of white spot syndrome virus (WSSV) infection in shrimp, prawns, crabs and lobsters from India.	IEP, NIEP
77	1998	Chang P-S. , H-C. Chen, Y-C. Wang	Aquaculture	164	233-242	Detection of White Spot Syndrome Associated Baculovirus in Experimentally Infected Wild Shrimp, Crab and Lobsters by <i>in situ</i> Hybridization	NIEP
78	2003	Hameed, A.S. Sahul , Balasubramanian, G., Syed Musthaq, S. & Yoganandhan, K.	Dis. Aquat. Org.	57	157-161	Experimental infection of twenty species of Indian marine crabs with white spot syndrome virus (WSSV).	IEP, NIEP clinical signs of infection, mortalities, histology summarized and tested PCR positive
79	2001	Hossain M. S. , A. Chakraborty, B. Joseph, S.K. Otta, I. Karunasagar, I. Karunasagar	Aquaculture	198	1-11	Detection of New Hosts for White Spot Syndrome Virus of Shrimp Using Nested Polymerase Chain Reaction	NIEP PCR only No clinical signs noted
80	2001	Hameed A.S. Sahul , K. Yaganandhan, S. Sathish, M. Rasheed, V. Murugan, K. Jayaraman	Aquaculture	201	179-186	White Spot Syndrome Virus (WSSV) in Two Species of Freshwater Crabs (<i>Paratelphusa hydrodomous</i> and <i>P. pulvinata</i>).	IEP, NIEP
81	2001	Hameed A.S. Sahul , K. Yaganandhan, S. Sathish, M. Rasheed, V. Murugan, K. Jayaraman	Aquaculture	201	179-186	White Spot Syndrome Virus (WSSV) in Two Species of Freshwater Crabs (<i>Paratelphusa hydrodomous</i> and <i>P. pulvinata</i>).	IEP. NIEP
82	2003	Hameed, A.S. Sahul , Balasubramanian, G., Syed	Dis. Aquat. Org.	57	157-161	Experimental infection of twenty species of Indian	IEP, NIEP Clinical signs of

		Musthaq, S. & Yoganandhan, K.				marine crabs with white spot syndrome virus (WSSV).	infection, mortalities, histology summarized and tested PCR positive
83	2002	Chakraborty A. , S.K. Otta, B. Joseph, S. Kumar, M.S. Hossain, I. Karunasagar, M.N. Venugopal, I. Karunasagar	Current Science	82	1392-1397	Prevalence of White Spot Syndrome Virus in Wild Crustaceans along the Coast of India	NO PCR only No clinical signs noted
	2000	Sahul Hameed A.S., Xavier Charles M. & Anilkumar M.	Aquaculture	183	207-213	Tolerance of Macrobrachium rosenbergii to white spot syndrome virus.	IEP, NIEP
	1998	Wang Y-C. , C-F. Lo, P-S. Chang, G-H. Kou	Aquaculture	164	221-231	Experimental Infection of White Spot Baculovirus in Some Cultured and Wild Decapods in Taiwan.	NO, NIEP PCR Testing only
84	2002	Chakraborty A. , S.K. Otta, B. Joseph, S. Kumar, M.S. Hossain, I. Karunasagar, M.N. Venugopal, I. Karunasagar	Current Science	82	1392-1397	Prevalence of White Spot Syndrome Virus in Wild Crustaceans along the Coast of India	NO PCR only No clinical signs noted
	2000	Sahul Hameed A.S., Xavier Charles M. & Anilkumar M.	Aquaculture	183	207-213	Tolerance of Macrobrachium rosenbergii to white spot syndrome virus.	IEP, NIEP
	1998	Wang Y-C. , C-F. Lo, P-S. Chang, G-H. Kou	Aquaculture	164	221-231	Experimental Infection of White Spot Baculovirus in Some Cultured and Wild Decapods in Taiwan.	NO, NIEP PCR only No clinical signs noted
85	1998	Maeda M., Itami T., Furumoto A., Hennig O., Imamura T., Kondo M., Hirono I., Takashi A. & Takahashi Y.	Fish Pathol.	33	373-380	Detection of penaeid rod-shaped DNA virus (PRDV) in wild-caught shrimp and other crustaceans. .	IEP, NIEP Wild species tested with PCR only. No clinical signs noted in these species
86	2003	Hameed, A.S. Sahul , Balasubramanian, G., Syed Musthaq, S. & Yoganandhan, K.	Dis. Aquat. Org.	57	157-161	Experimental infection of twenty species of Indian marine crabs with white spot syndrome virus (WSSV).	IEP, NIEP No clinical signs of infection or mortality. Tested PCR positive
87	2003	Hameed, A.S. Sahul , Balasubramanian, G., Syed Musthaq, S. & Yoganandhan, K.	Dis. Aquat. Org.	57	157-161	Experimental infection of twenty species of Indian marine crabs with white spot syndrome virus (WSSV).	IEP, NIEP Clinical signs of infection, mortalities and histology summarized and tested PCR positive
88	2002	Chakraborty A. , S.K. Otta, B. Joseph, S. Kumar, M.S.	Current Science	82	1392-1397	Prevalence of White Spot Syndrome Virus in Wild	NO PCR only

		Hossain, I. Karunasagar, M.N. Venugopal, I. Karunasagar				Crustaceans along the Coast of India	No clinical signs noted
89	2002	Chakraborty A. , S.K. Otta, B. Joseph, S. Kumar, M.S. Hossain, I. Karunasagar, M.N. Venugopal, I. Karunasagar	Current Science	82	1392-1397	Prevalence of White Spot Syndrome Virus in Wild Crustaceans along the Coast of India	NO PCR only No clinical signs noted
90	1999	Momoyama, K., M. Hiraoka, C.A. Venegas	Fish Pathol.	34	183-188	Pathogenicity of Penaeid Rod-shaped DNA Virus (PRDV) to Juveniles of Six Crustacean Species.	IEP, NIEP
91	1998	Chang P-S. , H-C. Chen, Y-C. Wang	Aquaculture	164	233-242	Detection of White Spot Syndrome Associated Baculovirus in Experimentally Infected Wild Shrimp, Crab and Lobsters by <i>in situ</i> Hybridization	NIEP
	1998	Wang Y-C. , C-F. Lo, P-S. Chang, G-H. Kou	Aquaculture	164	221-231	Experimental Infection of White Spot Baculovirus in Some Cultured and Wild Decapods in Taiwan.	NO, NIEP PCR only No clinical signs noted
92	2002	Chakraborty A. , S.K. Otta, B. Joseph, S. Kumar, M.S. Hossain, I. Karunasagar, M.N. Venugopal, I. Karunasagar	Current Science	82	1392-1397	Prevalence of White Spot Syndrome Virus in Wild Crustaceans along the Coast of India	NO PCR only No clinical signs noted
93	2002	Chakraborty A. , S.K. Otta, B. Joseph, S. Kumar, M.S. Hossain, I. Karunasagar, M.N. Venugopal, I. Karunasagar	Current Science	82	1392-1397	Prevalence of White Spot Syndrome Virus in Wild Crustaceans along the Coast of India	NO PCR only No clinical signs noted
	2001	Hossain M. S. , A. Chakraborty, B. Joseph, S.K. Otta, I. Karunasagar, I. Karunasagar	Aquaculture	198	1-11	Detection of New Hosts for White Spot Syndrome Virus of Shrimp Using Nested Polymerase Chain Reaction	NIEP
94	1999	Rajendran, K.V., Vijayan, K.K., Santiago, T.C. & Krol, R.M.	J. Fish Dis.	22	183-191	Experimental host range and histopathology of white spot syndrome virus (WSSV) infection in shrimp, prawns, crabs and lobsters from India.	IEP, NIEP
95	2001	Corbel V. , Zuprizal, Z Shi, C. Huang, Sumartono, J-M. Arcier, J-R. Bonami	Journal of Fish Diseases	24	377-382	Experimental Infection of European Crustaceans with White Spot Syndrome Virus (WSSV)	IEP, NIEP
96	1999	Otta, K., Shubha, G., Joseph, B., Chakraborty, A., Karunasagar, In.,	Dis. Aquat. Org.	38	67-70	Polymerase Chain Reaction (PCR) Detection of White Spot Syndrome	NO PCR only

		Karunasagar, Id.				Virus (WSSV) in Cultured and Wild Crustaceans in India.	
97	1998	Kanchanaphum, P., Wongteerasupaya, C., Sitidilokratana, N., Boonsaeng, V., Panyim, S., Tassanakajon, A., Withyachumnarnkul, B. & Flegel, T.W.	Dis. Aquat. Org.	34	1-7	Experimental transmission of white-spot syndrome virus (WSSV) from crab to shrimp <i>Penaeus monodon</i> .	IEP, NIEP
98	2002	Chakraborty A. , S.K. Otta, B. Joseph, S. Kumar, M.S. Hossain, I. Karunasagar, M.N. Venugopal, I. Karunasagar	Current Science	82	1392-1397	Prevalence of White Spot Syndrome Virus in Wild Crustaceans along the Coast of India	NO PCR only No clinical signs noted
	2001	Hossain M. S. , A. Chakraborty, B. Joseph, S.K. Otta, I. Karunasagar, I. Karunasagar	Aquaculture	198	1-11	Detection of New Hosts for White Spot Syndrome Virus of Shrimp Using Nested Polymerase Chain Reaction	NO
99	2002	Chakraborty A. , S.K. Otta, B. Joseph, S. Kumar, M.S. Hossain, I. Karunasagar, M.N. Venugopal, I. Karunasagar	Current Science	82	1392-1397	Prevalence of White Spot Syndrome Virus in Wild Crustaceans along the Coast of India	NO PCR only No clinical signs noted
	2001	Hossain M. S. , A. Chakraborty, B. Joseph, S.K. Otta, I. Karunasagar, I. Karunasagar	Aquaculture	198	1-11	Detection of New Hosts for White Spot Syndrome Virus of Shrimp Using Nested Polymerase Chain Reaction	NO PCR only No clinical signs noted
100	2002	Chakraborty A. , S.K. Otta, B. Joseph, S. Kumar, M.S. Hossain, I. Karunasagar, M.N. Venugopal, I. Karunasagar	Current Science	82	1392-1397	Prevalence of White Spot Syndrome Virus in Wild Crustaceans along the Coast of India	NO PCR only This genus is not speciated.
101	2003	Hameed, A.S. Sahul , Balasubramanian, G., Syed Musthaq, S. & Yoganandhan, K.	Dis. Aquat. Org.	57	157-161	Experimental infection of twenty species of Indian marine crabs with white spot syndrome virus (WSSV).	IEP, NIEP Clinical signs of infection, mortalities histology summarized and tested PCR positive NIEP
102	1998	Chang P-S. , H-C. Chen, Y-C. Wang	Aquaculture	164	233-242	Detection of White Spot Syndrome Associated Baculovirus in Experimentally Infected Wild Shrimp, Crab and Lobsters by <i>in situ</i> Hybridization	
	1998	Wang Y-C. , C-F. Lo, P-S. Chang, G-H. Kou	Aquaculture	164	221-231	Experimental Infection of White Spot Baculovirus in Some Cultured and Wild Decapods in Taiwan.	NO, NIEP PCR only
103	1998	Kanchanaphum, P.,	Dis. Aquat.	34	1-7	Experimental	IEP, NIEP

		Wongteerasupaya, C., Sitidilokratana, N., Boonsaeng, V., Panyim, S., Tassanakajon, A., Withyachumnarnkul, B. & Flegel, T.W.	Org.			transmission of white- spot syndrome virus (WSSV) from crab to shrimp <i>Penaeus</i> <i>monodon</i> .	
104	1998	Maeda M., Itami T., Furumoto A., Hennig O., Imamura T., Kondo M., Hirono I., Takashi A. & Takahashi Y.	Fish Pathol.	33	373- 380	Detection of penaeid rod- shaped DNA virus (PRDV) in wild-caught shrimp and other crustaceans. .	IEP, NIEP Wild species tested with PCR only - no clinical signs.

[...]

Article 9.6.3.

Importation or transit of aquatic animals and aquatic animal products for any purpose from a country, zone or compartment not declared free from white spot disease

1. *Competent Authorities* should not require any WSD related conditions, regardless of the WSD status of the *exporting country, zone or compartment* when authorising the importation or transit of the following *aquatic animals and aquatic animal products* from the species referred to in Article 9.6.2. intended for any purpose and complying with Article 5.3.1.:

a.....

- a) heat sterilised hermetically sealed crustacean products (i.e. a heat treatment at 121°C for at least 3.6 minutes or any time/ temperature equivalent);

Rationale : Editorial
