



**White Spot Disease of Prawns  
Queensland Response 2016-17  
Scenario Planning Advisory Panel  
Report**

Ron Glanville  
Peter Neville  
Peter Walker

February 2017

*The conclusions and suggested strategies contained in this report are those of the Scenario Planning Advisory Panel and do not represent Australian or Queensland government policy.*

## Table of Contents

Executive Summary .....	3
Introduction and Background.....	5
Disease Response.....	7
Terms of Reference.....	8
Potential for Natural Spread of WSSV from the Logan/Albert River System .....	9
Living with WSSV .....	10
Scenario Analysis.....	11
Objectives behind the scenario considerations .....	11
Option 1 - Eradication with the aim of returning Australia to freedom from WSSV	12
Description of Scenario .....	12
Future Biosecurity Strategies Assuming Eradication .....	13
Feasibility .....	16
Option 2—Containment, control and zoning with the aim of placing restrictions in areas in which WSSV infection is endemic to prevent spread to uninfected areas	19
Description of Scenario .....	19
Future Biosecurity Strategies .....	19
Feasibility .....	21
Option 2(b) .....	22
Option 3—Control and mitigation with the aim of mitigating the impacts of WSD if it is accepted that the virus will remain endemic in Australia.....	23
Description of Scenario .....	23
Future Biosecurity Strategies .....	23
Feasibility .....	25
Discussion of response scenarios and relative likelihood. ....	26
Impacts .....	27
Impacts on Prawn Farming Industry .....	27
Impacts on the Community .....	27
Impacts on Associated Marine Ecosystems .....	28
Impacts on the Commercial and Recreational Fisheries .....	28
Marketing.....	29
Possible Revenue Streams.....	30

## Executive Summary

The Queensland Department of Agriculture and Fisheries (DAF) has been responding to an outbreak of White Spot Disease (WSD) of prawns caused by the highly contagious white spot syndrome virus (WSSV), previously exotic to Australia. WSD has had devastating impacts on prawn farming throughout Asia and the Americas since 1992, prompting major changes to the way that prawn farms are operated in those countries. However, while WSSV causes high mortalities in prawns under certain farming conditions, there is no evidence that WSSV has significantly impacted on production from wild prawn fisheries. The virus poses no risk to human health.

Since December 2017 the disease has spread to all 7 active prawn farms in the Logan River area south of Brisbane. Disease control activities implemented by DAF involve the destruction of all crustaceans on these farms and disinfection of ponds, as well as significant restrictions on taking of crustaceans and some other species from the river system to prevent further spread. WSSV has also been detected in limited numbers of wild prawns in the vicinity of some of these farms. The most likely source of the outbreak was the use of imported green prawns for bait either in the Logan River or drainage channels associated with prawn farms, although other possible pathways cannot be fully discounted.

This report has been produced to advise the Queensland Government on future options for dealing with WSD in Queensland. Three broad options were examined, namely: (1) eradication with the aim of returning Australia to freedom from WSSV; (2) containment, control and zoning to prevent its further spread to uninfected areas; and (3) mitigating the impacts of WSD if it is accepted that the virus will remain endemic in Australia.

Option 1 is the current strategy being adopted and includes a two year, “proof of freedom” monitoring period and a ban on commercial and recreational fishing for all crustaceans in the Logan River area. The probability of successful eradication of WSSV from individual Logan River prawn farms is high. However, success in terms of total eradication of the virus is currently looking increasingly unlikely given that WSSV has been detected in wild prawns caught in the Logan River (albeit at very low prevalence levels) and perhaps more significantly, at high prevalence from limited samples of tiger prawns caught in a channel of southern Moreton Bay in the vicinity of the water inlets for two of the infected prawn farms. Current knowledge of crustacean movements in the area, as well as overseas experience with WSSV, suggests that the infection will spread naturally within marine ecosystems, even if this occurs slowly. Given the above, any future prawn farming operations will need to include enhanced biosecurity practices to prevent re-infection from the wild, particularly during the proof of freedom phase where it must be assumed that the virus could be present in water taken onto farms from the Logan River or surrounds. The level of compulsion around these enhanced biosecurity measures requires further discussion with industry.

Option 2 is currently considered the most likely scenario for the above reasons. Under this scenario, attempts would be made to restrict the spread of infection to other areas of Queensland and Australia through movement controls (assuming that the virus will only spread slowly through natural means). In designing the associated mandatory biosecurity measures, an appropriate balance will need to be reached between prevention of spread and the implications for both the aquaculture industry and capture fisheries, particularly those associated with increased costs or foregone

income. A narrow approach that attempts to restrict infection to the Logan River system is unlikely to be technically successful and will also prevent any prawn and crab fishing in the Logan system indefinitely. A more technically feasible approach may involve a larger infected zone (for example, all or part of Moreton Bay plus associated river systems). This approach could include conditions that would allow prawn fishing within the zone but not allow movements of green prawns out of the zone (cooked prawns would be able to be moved out of the zone).

Under option 3, WSSV would be endemic or assumed to be endemic and there would be no further restrictions on fishing operations, although a broader zoning approach could be considered to protect our northern prawn fisheries and fisheries in other states. Prawn farms would likely operate with appropriate levels of biosecurity under a voluntary code of practice.

The report discusses a range of impacts on stakeholders affected by this disease under the various scenarios, including the community, prawn farmers and fishers, both recreational and commercial, as well as the marketing of Australian prawns generally. It is likely that prawn farmers will be affected under each of the scenarios to a greater or lesser extent, with enhanced on-farm biosecurity being required on either a voluntary or mandatory basis. The impacts on wild prawn fishers vary greatly depending on the final scenario, which needs to be a major consideration during future policy development. It is considered that the current restrictions on the take of sand crabs and mud crabs can be lifted under each scenario, given that the release of live or green crabs into another waterway would be a very rare event.

Attention to public education and communication with reference to movement controls, as well as product safety and market perceptions, will be required under all scenarios to both minimise the impact of this outbreak on the marketing of prawns and also to assist in ensuring that future disease control strategies are effective. Future management of WSD in Australia may also require additional revenue streams owing to the multi-faceted impacts of the various scenarios. Funds will likely be required for issues as diverse as enhanced biosecurity, research and development, ongoing monitoring, marketing and promotion, as well as public communication.

## Introduction and Background

This report has been produced by the White Spot Disease (WSD) Advisory Panel to advise the Queensland Government, through the Department of Agriculture and Fisheries (DAF), on future options for dealing with WSD in Queensland.

White spot syndrome virus (WSSV), which causes WSD, is a highly contagious virus that infects all crustaceans, as well as polychaete worms, although WSD is mainly seen in farmed prawns. The virus is primarily spread through the movement of infected animals or contaminated water and there are no available treatments for WSD. Consuming infected prawns does not pose any human health risk.

It is important to make the distinction between WSD and WSSV, as the virus does not cause disease in most crustaceans and even those species that are susceptible to disease commonly carry the virus for life without any disease signs. WSD occurs only when susceptible crustaceans (such as prawns) are exposed to stress or if they are infected with very high levels of virus such as would occur during a disease outbreak in a pond.

The first reported outbreak of WSD was in China in 1992, with subsequent outbreaks in Taiwan, Japan and Korea and then throughout most of South and South-east Asia. By 2011, the disease had spread through Central and South America, and Saudi Arabia. Although white spot disease has had devastating impacts on the prawn farming industries in these countries, prawn farmers have developed ways of living with the virus and maintaining profitable operations (discussed further later).

In October 2009 Biosecurity Australia published an import risk analysis for prawns and prawn products<sup>1</sup>. This report recommended that the importation of raw, uncooked prawns and prawn products could be permitted subject to compliance with measures to manage the quarantine risks of a range of significant pathogenic agents to a very low level, in line with Australia's conservative approach to quarantine. These pathogenic agents included WSSV, yellow head virus (YHV), Taura syndrome virus (TSV) and necrotising hepatopancreatitis bacterium (NHPB). The recommended risk management measure for raw, uncooked prawns from countries endemic for these diseases was:

*“having the head and shell removed (the last shell segment and tail fans permitted), and each imported batch held on arrival in Australia under quarantine control, tested and found to be free of WSSV and YHV. Testing is based on the polymerase chain reaction tests in the current version of the World Organization for Animal Health (OIE) Manual of Diagnostic Tests for Aquatic Animals, or equivalent, and a sampling regimen that would provide 95% confidence of detecting the agent if present at 5% prevalence”.*

Importation of prawns under these conditions was approved in 2008. However, a ban on the importation of uncooked prawns from overseas was announced on 6 January 2017 as a consequence of the current outbreak, outlined below.

On 30 November 2016, test results were reported positive for WSSV, in samples submitted to the DAF, Queensland Biosecurity Sciences Laboratory from a prawn farm on the Logan River in southeast Queensland. Prawns on this farm had been observed behaving unusually on 22 November. WSSV-positive results were subsequently confirmed by the Australian Animal Health Laboratory (AAHL) on 1 December 2016.

---

<sup>1</sup> <http://www.agriculture.gov.au/biosecurity/risk-analysis/animal/prawns>

WSD is prohibited matter under schedule 1 of the *Biosecurity Act 2014* and an emergency response (described later) was initiated as a result of this detection. Subsequent detections have been:

- A second prawn farm returned a positive result on 6 December 2016.
- A third property tested positive for WSSV on 8 December 2016.
- Six prawns collected on 5 December from the Logan River adjacent to farm water outlets tested positive for WSSV.
- A fourth premises returned a positive result on 13 December 2016. The first four infected premises are in the same vicinity of Alberton upstream on the Logan River.
- A fifth premises returned a positive result on 28 December 2016 downstream at Woongoolba. This is by far the largest farm in the region and operationally complex.
- One tiger prawn caught in the Logan River on 27 January 2017 returned a positive PCR result for WSSV.
- A sixth premises was designated an infected property on 27 January 2017.
- On 25 and 27 January 2017, 108 tiger prawns were sampled from a location south of the mouth of the Logan River. The prawns were of various sizes. All tested positive for WSSV. It is unknown whether they were “escapees” from one of the prawn farms or a self-sustaining population (tiger prawns are relatively rare in Moreton Bay). At the same time, positive results were obtained from three other prawn species caught at the same location, but only four individual prawns.
- On 13 February 2017 WSSV was detected on the last remaining farm in the Logan River area.

At least two of these premises include prawn hatcheries that provide post-larvae (PLs) for annual seeding of ponds locally and for farmers elsewhere in Australia.

This is the first detection of WSD in Queensland. However, the virus was detected on one previous occasion in crabs and prawns in the Darwin Aquaculture Centre (DAC) in the Northern Territory. In November 2000, 5 of 12 crabs and 2 of 4 prawns caught at the outlet of the DAC tested positive for WSSV. In December 2001, 0 of 42 crabs caught at the outlet of the DAC tested positive for WSSV. In 2002, 166 samples (prawns and crabs) collected from four sites in Darwin Harbour and the Blackmore River all tested negative for WSSV. The disease was thought to have arrived with imported commodity prawns. Subsequent surveillance and testing could not demonstrate the continuing presence of WSSV and it has been presumed to have “died out”.

The aquaculture industry in the Logan River area is focused on prawns for the domestic market, and produce is worth more than \$20 million per annum. Prawn aquaculture production in Queensland was worth \$82.6 million in 2014/15 and \$80.5 million in 2015/16. Overall aquaculture production for Queensland was worth \$119.9 million in 2014/15 and \$120.2 million in 2015/16.

The Logan River and surrounds is also an important commercial fishery for crabs and bait prawns, which are sold throughout Queensland and interstate, as well as a significant recreational fishery for fish, prawns and crabs.

## Disease Response

The current response to this outbreak is aimed at eradication with a view to a return to freedom from disease for Australia under Office International des Epizooties (OIE - World Organization for Animal Health) guidelines, viz:

- The *OIE Aquatic Animal Health Code (16/06/2015), Chapter 9. 7<sup>2</sup>, White spot disease, article 9.7.4: Country free from white spot disease* outlines the requirements for a country that made a self-declaration of freedom from WSD and subsequently lost its disease-free status due to the detection of WSD. Conditions for return to a disease-free status are as follows:
  - *On detection of the disease, the affected area was declared an infected zone and a protection zone was established; and*
  - *Infected populations have been destroyed or removed from the infected zone by means that minimise the risk of further spread of the disease, and the appropriate disinfection procedures (as described in the Aquatic Manual) have been completed; and*
  - *Previously existing basic biosecurity conditions have been reviewed and modified as necessary and have continuously been in place since eradication of the disease; and*
  - *Targeted surveillance, as described in Chapter 1.4. has been in place for at least the last two years without detection of WSD.*

*In the meantime, part or all of the non-affected area may be declared a free zone provided that such a part meets the conditions in point 3 of Article 9.7.5.*

A Biosecurity Emergency Order (BEO) was declared on 11 December 2016 for infected properties and the Logan River from Jabiru Weir and Luscombe Weir to the mouth of the river. The BEO restricts the movement of all potential carriers of the virus out of the area<sup>3</sup>. This includes crustaceans such as prawns and crabs, as well as polychaete worms. The geographic area includes boat ramps and intake channels. Restrictions are also in place regarding the use of apparatus for catching crustaceans such as beam trawling, pots, dillies, traps for catching crabs, cast nets and yabby pumps.

Commercial and recreational fishers are encouraged not to operate in the area as they will be unable to retain their catch if it is a potential WSSV carrier and intended to be removed from the area uncooked. Biosecurity Queensland and Queensland Boating and Fishing Patrol are advising river users of the movement controls and penalties may apply to people who breach these conditions.

Surveillance is ongoing in the Logan River, Pine River, Moreton Bay and the Brisbane River to determine the scale of the disease spread in the marine environment.

Eradication of WSSV on the infected prawn farms has proceeded swiftly, with all ponds being progressively treated with liquid chlorine, with a subsequent decontamination/ spelling period, cleanout and control of wild crustaceans. Some early harvesting of ponds was permitted prior to destruction.

<sup>2</sup> [http://www.oie.int/index.php?id=171&L=0&htmfile=chapitre\\_wsd.htm](http://www.oie.int/index.php?id=171&L=0&htmfile=chapitre_wsd.htm)

<sup>3</sup> Note that the ability exists to amend the specific provisions of future BEOs (or other legal instruments) to suit the biosecurity approach considered appropriate at the time.

Tracing and epidemiological investigations are ongoing to assist with determining the source of infection while also informing potential spread. Ongoing surveillance will continue to establish proof of freedom (or otherwise). A broad community and industry engagement campaign has been implemented to inform people about the disease, the restrictions that have been implemented and the lack of risk to human health.

There is no formal cost sharing arrangement in place among the Commonwealth and State Governments, or with industry, for aquatic disease emergencies such as this. This response is being funded solely by the Queensland Government. However, the Aquatic Consultative Committee on Emergency Animal Diseases (AqCCEAD) is meeting regularly to provide advice to the Queensland Chief Veterinary Officer (CVO) on the response.

## Terms of Reference

Specifically, the WSD Advisory Panel (the Panel) has been requested to:

1. Provide analyses on a range of possible end states/scenarios for WSD in Queensland and Australia – on a spectrum across the three possible response options for WSD control in Australia are outlined in AQUAVETPLAN<sup>4</sup>:
  - Option 1 — eradication with the aim of returning Australia to freedom from WSSV
  - Option 2 — containment, control and zoning with the aim of placing restrictions in areas in which WSSV infection is endemic to prevent its further spread to uninfected areas
  - Option 3 — control and mitigation with the aim of mitigating the impacts of WSD if it is accepted that the virus will remain endemic in Australia.
2. Provide advice on the feasibility of possible responses to scenarios
3. Provide advice on impacts and responses of the aquaculture industry, wild-harvest fisheries, recreational fishing industry/the community and associated marine ecosystems
4. Provide advice on possible revenue streams for various scenarios for government and industry
5. Provide considered professional and technical advice on emerging response issues as required separate to the reports addressing the ToR objectives as required.

The Panel was requested not to:

1. Provide advice on disease entry pathways for this particular incident
2. Provide advice or review current response and surveillance operations/plans

---

<sup>4</sup> <http://www.agriculture.gov.au/animal/aquatic/aquavetplan>

## Potential for Natural Spread of WSSV from the Logan/Albert River System

Excluding finfish, which are not impacted by the virus in terms of being a host or carrier, the most susceptible species in the Logan/Albert Rivers are prawns and crabs, which are both economically and socially important species to commercial and recreational fishers. This river system is important as a source of income to commercial fishers – principally through beam trawling (up to 7 operators rely wholly or partly on the river primarily for bait prawns supplied to bait outlets for recreational fishers and others) and pot crabbing for mud and sand crabs (approximately 20 operators who rely partly on the river for their operations). A range of prawn species are taken in the river, including black tiger prawns (*Penaeus monodon*), white banana prawns (*Fenneropenaeus merguensis*) and greasyback prawns (*Metapenaeus bennettiae*), with both commercial and recreational fishers engaged using various apparatus. As such, it is a very heavily fished river system important to both commercial and recreational fishers.

Importantly, the river system connects directly to Moreton Bay, which is one of the most important and heavily used fishing grounds for both recreational and commercial fishers in Queensland. It also contains important Marine Park areas with critical habitats such as seagrass beds and reef, which benefit vulnerable and endangered species and the community as a whole.

In terms of the natural movement of the more significant species under investigation here, in general, prawns of the genus *Penaeus* mate and spawn in offshore waters with their planktonic larvae migrating inshore to settle in coastal and estuarine nursery grounds. Thus black tiger prawns, greasyback prawns, school prawns (*Metapenaeus macleayi*) and banana prawns are essentially inhabitants of river systems and near inshore areas. They don't migrate much away from these habitats but certainly would move into Moreton Bay and up and down the near foreshores and adjacent river systems. Seasonal rainfall flushes in the rivers assist with such movement. Other prawn species caught in the area in lesser numbers are known to travel much further along the coast and further offshore, for example, eastern king prawns (*Melicertus plebejus*). Of the major crab species, the female mud crab (*Scylla serrata*) and sand crabs (*Portunus armatus*) certainly move offshore to spawn, through Moreton Bay and outside the bay, while the male mud and sand crabs are more restricted to river, estuarine and shallower parts of Moreton Bay. Thus there is certainly an intermingling and movement of species from the river environment to outside areas of Moreton Bay and adjacent river systems. All of these crustacean species are susceptible to WSSV infection, although the disease is unlikely to be observed in the wild.

## Living with WSSV

This section is included in order to provide a picture of what the future may look like for the wild catch and prawn farming industries in Australia if WSSV becomes endemic in this country.

Although Australia has until now remained free of the disease, WSSV is endemic in most prawn farming countries around the world. Despite severe initial production losses and widespread infection in wild crustacean populations, farm production in many countries has gradually recovered and continued to increase in volume. By adopting various biosecurity measures to prevent or limit production losses, prawn farmers have learned to live with WSSV. In general, biosecurity practices are designed to: (i) prevent WSSV entering ponds at seeding or during grow-out; and (ii) prevent disease outbreaks in ponds in which low levels of WSSV infection may be present, by managing pond conditions and the production cycle.

A crucial aspect of this approach has been the availability of uninfected PLs for pond seeding. This can be achieved by either:

- WSSV-screening of wild captured broodstock and PLs in hatcheries prior to seeding; or alternatively,
- the use of specific pathogen-free (SPF) broodstock that have been bred in captivity and screened continuously for detection of the virus.

The availability of large numbers of SPF white Pacific shrimp (*Litopenaeus vannamei*) from breeding programs based primarily in Hawaii has led to their widespread adoption through Asia and the Americas. Selectively bred *L. vannamei* also have a shorter production cycle and excellent feed conversion ratios. This led to an almost complete switch by Asian farmers to this species during the 2000s. Prawn imports to Australia from Asia for human consumption are now almost exclusively this species. However, *L. vannamei* is not resistant to WSSV and the species is naturally exotic to Asia and Australia, raising serious environmental issues associated with their translocation (since introduction, escapes from farms to the wild in Asia have commonly occurred).

The introduction of *L. vannamei* (or other exotic species) into Australia is prohibited, and the Panel certainly does not propose any change to that policy. However, access to WSSV-free seed, by screening of captured broodstock and/or breeding under biosecure containment, would be a crucial need for farmers if the virus were to become endemic in Australian prawns. Other aspects of 'living with the virus' could be readily adapted from experience overseas. However, it is important to note that some government assistance to farmers (cost-sharing, etc) for implementation of farm biosecurity measures has occurred in major prawn-producing countries overseas. The cost structure of the Australian prawn farming industry is already much higher, owing largely to higher labor costs.

With respect to wild crustacean fisheries, there is no evidence that WSSV has impacted on the wild catch, even in countries where the prevalence of infection in wild crustaceans is very high. This was reviewed at length by Baldock<sup>5</sup> in 1999 and there have been no reports of impacts on wild fisheries since that time. This is likely because WSSV infection does not cause disease in all susceptible crustacean species. Further, disease only occurs in prawns when viral loads are very high. In the farming environment, this is usually precipitated by stress and sustained by high stocking densities, neither of which commonly occur in wild crustaceans. Hence, WSSV appears to pose little or no risk to wild fisheries.

---

<sup>5</sup> *Environmental impact of the establishment of exotic prawn pathogens in Australia*, AQIS, 1999

## Scenario Analysis

In this report, we consider the potential impacts on various stakeholders in Queensland of three possible scenarios. The stakeholders include the Queensland Government and all those impacted directly by the disease or indirectly through fishing bans, movement bans, import bans and market reactions to the disease, primarily:

- prawn farmers and hatcheries in the Logan River area;
- prawn farmers and hatcheries in northern Queensland (and other parts of Australia);
- fishers in Moreton Bay and its environs (commercial and recreational; prawns and crabs; bait and seafood);
- users of other wild fisheries, potentially throughout Australia;
- seafood marketers;
- seafood importers and exporters; and
- the community at large.

The detailed analysis of impacts under the three scenarios is provided below. A summary of the scenario analysis is at Attachment 1.

### Objectives behind the scenario considerations

In considering the various scenarios, a number of common objectives are appropriate and have influenced the direction of this report. These are:

1. to contain and prevent the further spread of the WSSV as much as is practicably possible (including eradication if possible);
2. to allow the continued reasonable use of the wild fisheries and the operation of aquaculture facilities, whilst adopting a prudent and practical approach to risk mitigation strategies;
3. to be aware of the extent and feasibility of any cost impositions on industry, government and the community in order to achieve any proposed new management arrangements; and
4. to allow for provision of appropriate communication and education material to ensure that respective markets and the community at large are informed of the absence of risk to human health and to counter any inappropriate perceptions.

## Option 1 - Eradication with the aim of returning Australia to freedom from WSSV

### Description of Scenario

The response to the WSD outbreak on Logan River prawn farms is currently directed towards eradication of WSSV. This scenario is the working premise of the current Emergency Animal Disease Response Plan (EADRP), i.e., “eradication in the shortest possible time, while minimising socio-economic impacts, using stamping out on managed premises supported by a combination of strategies”. This approach was justified by:

- the focal nature of the outbreak (not involving other prawn farming areas);
- preliminary surveillance evidence suggesting that WSSV infection may not have been established in wild crustacean populations; and
- the high likelihood of being able to eradicate the disease from farmed populations.

Given the most recent surveillance results from wild prawn populations, this scenario is looking increasingly unlikely. However, the following discussion is included for completeness. There is also a small chance that the infection detected in the wild to date is a transient “spillover” from infection on farms and may “die out”, primarily through natural predation of infected carriers by non-susceptible species such as fish.

The basic eradication strategy involves:

#### Infected Premises

- Containment to prevent infection of other premises or wild populations;
- Destruction and safe disposal of all susceptible and potentially infected crustaceans on infected farms;
- Disinfection of production, settlement and reservoir pond water, as well as channel water, before any discharge;
- Decontamination of the pond floor and any remaining debris and other water reservoirs by drying out and subsequent treatments; and
- Enhanced surveillance to detect disease spread.
- Controlled restocking to assess eradication effectiveness.

#### Delimiting and early warning surveillance

- Enhanced passive surveillance
- Active surveillance of uninfected farms to ensure rapid limitation of further spread
- Active surveillance of the Logan River and other waterways to determine if the virus is present in wild crustacean populations:
  - Logan River
  - South-east Queensland
  - Queensland more broadly
- Active surveillance of prawn farms outside of the Logan River area.

#### Control of further spread outside of the Logan River system

- Prohibition on the removal of live crustaceans (prawns, crabs, yabbies) and polychaete worms from the Logan River by commercial or recreational fishers.

- Public awareness program.

### Proof of Freedom

The objective of eradication is "proof of freedom" from disease. This is defined by the OIE as targeted surveillance for at least 2 years without detection of the WSSV. To achieve "proof-of-freedom", this surveillance should allow detection of the virus in farmed and wild crustaceans at a prevalence of 2% or less, with overall confidence of 95%.

## Future Biosecurity Strategies Assuming Eradication

### Proof of Freedom Phase

Assuming successful eradication and no further infection in wild populations (see more below), the industry (and government) will still need to consider additional risk mitigation strategies for the future.

We may never know with certainty how or when WSSV was introduced into Queensland, despite the most likely pathway being use of infected prawns as bait in the Logan River. However, the Panel notes that the current data is not entirely consistent with this pathway as being the cause of the outbreak, given our knowledge of WSSV infection in overseas wild prawn populations. Of particular note is the very low prevalence in wild crustaceans in the Logan River, which suggests that WSSV has either failed to become established or is present only at very low levels. This tends to indicate that infection of the index infected prawn farm through this pathway may have been a very low probability event and that subsequent infection of the other prawn farms could have occurred by transfer of infected material through mechanisms such as bird scavenging. Given the above, other possible pathways should remain under consideration. Use of bait prawns in drainage channels associated with prawn farms may be a more plausible infection pathway.

It appears that farmers who wish to restock and recommence operations for next season (Q4, 2017), i.e., prior to the 2 years "proof of freedom" being completed, may be permitted to do so if decontamination of affected farms is completed. The view of the Panel is that those farmers and hatchery owners electing to re-stock will need to do so with significantly enhanced on-farm biosecurity in place. This could include some of the following options:

- filtration or treatment of intake water (sedimentation and chemical treatment ponds) to eliminate WSSV and infected crustaceans;
- treatment for decontamination of waste water;
- crab fences and other barriers to prevent wild crustaceans entering ponds or burrowing in pond banks;
- screening of broodstock and seed (using commercially-available PCR kits) to ensure absence of WSSV;
- bird netting and/or other methods of bird control;
- PCR monitoring of stock during grow-out for evidence of WSSV infection and to assist decisions on stock management;
- reduced or zero water exchange during grow-out and/or water recirculation on farm; and
- adjustments to stocking/ harvest dates to avoid high risk periods (i.e., avoid pond water temperatures < 28°C).

As hatcheries in the Logan area currently supply up to 70% of PLs to the entire prawn farming industry in Queensland, there would also need to be some agreement on the conditions of export of seed to prawn farms in other regions. Hatcheries would need to treat and/or filter intake water and would need to implement WSSV PCR testing procedures for screening broodstock and quality control of PLs. This may require formal accreditation or certification of hatcheries for operation and export from the Logan River area to the satisfaction of receiving areas. While the above measures should be acceptable from a biosecurity perspective, it is noted that there may be some ongoing market resistance to product from the Logan River area. Verbal advice from representatives of the northern prawn farming industry indicates that they may be unwilling to risk sourcing PLs from the Logan River area.

Prawn farmers in northern regions of Queensland are likely to continue operations during the “proof of freedom” phase but may adopt increased biosecurity measures to counter a perceived risk of further spread or re-emergence of the disease. Market resistance to use of PLs produced from Logan River hatcheries may cause a shortage of PLs in the coming grow-out seasons. Alternative hatchery arrangements may be implemented to overcome the potential shortage of PLs.

Enhanced biosecurity measures will require capital investment, increased operating costs and reduce profit margins, at least in the short-medium term. The capacity to implement these measures may vary from farm-to-farm, depending on their financial position, ability to allocate land and/or sacrifice production ponds for water treatment, and individual assessments of risks and financial viability of biosecure operation. Some farmers and/or hatcheries may elect not to stock. Government and industry will need to reach agreement on the minimum biosecurity measures that should be in place, prior to commencement of the prawn growing season.

Given that a new regulatory instrument replaced the BEO at the end of January 2017, it is assumed that any mandatory biosecurity measures can be included within the provisions of that instrument. However, it is also noted that prawn farmers have indicated a preference for a largely industry-driven approach to future biosecurity requirements through an industry-developed Code of Practice. However, non-compliance issues would need to be addressed. Compliance with the code could be achieved through its adoption being made mandatory as part of a control program under the *Biosecurity Act 2014*. An alternative approach may be to include on-farm biosecurity as a condition under existing prawn farming licences.

During the proof of freedom phase, fishers who previously operated in the Logan River area will continue to be severely affected, particularly beam trawlers targeting bait prawns. During this period, it must be assumed that WSSV infection could be present in wild populations; hence, the taking of bait prawns that could be used in other areas could not be permitted. As discussed later, mud and sand crabs taken from the Logan River are not likely to be released into other river systems and the current restrictions on these species could be eased.

As discussed above, achieving eradication and establishing “proof of freedom” is looking increasingly unlikely. The detection of WSSV in all 108 tiger prawns and 4 prawns of other species sampled from the Canaipa Passage is of most concern. Although these may be infected “escapees” from a prawn farm, they represent a significant centre of infection in the wild. It has been proposed that this population could be removed by intensive trawling in the area. However, such an operation is unlikely to be effective if surveillance indicates further spread into wild crustacean populations. There are also other difficulties associated with this proposal. Firstly, the area is currently designated as a “no trawl” area as part of the overall protection provided to the benthic habitats such as seagrass beds within the Moreton Bay Marine Park. Intensive trawling effort targeting this area would damage valuable

seagrass areas, which are important habitat for a range of fish and crustaceans, not just tiger prawns. Secondly, recreational fishers routinely use cast nets to catch prawns here for use in other areas thus it is likely the virus may have spread already.

### Post Proof of Freedom

Although formal eradication would be achieved under this scenario, it may not be possible to say with absolute certainty that infection is no longer present in wild populations, as the current sampling strategy will detect a prevalence of 2% or less, with a confidence of 95%. It is unclear whether WSSV can remain present in wild populations at much lower prevalence levels. Overseas experience is that it is generally present at higher than 2% prevalence once it becomes endemic, although amplification of the virus on infected farms and re-introduction to wild populations may contribute to these higher levels.

Hence, ongoing active surveillance for WSSV in the Logan River would probably need to continue for a number of years post eradication. This may include regular sampling of bait prawns and crab catches, as well as a program of structured sampling of crustaceans within the river itself.

Under this scenario, following the 2 years “proof of freedom” period, the river would be open to all forms of fishing for both commercial and recreational fishers, as well as general boating. The community needs in terms of the products from the fishing industry would be met, as well as the social benefits of a sustainable commercial and recreational fishery. There would also be minimal risk of the spread of the virus to other wild fisheries under this scenario.

However, as well as the ongoing active surveillance, it would still be prudent to continue to use commercial and recreational fishers in a “sentinel” role, through public communication and education, and to have them more closely observe their catch and immediately report any suspicious observations.

Following the two-year proof of freedom phase, provided no further infection is detected, there are several possible sub-options for operation of aquaculture farms:

- Least cost to industry and government is to return to operations as before the outbreak, i.e., industry implements no enhanced biosecurity standards. This would be on the basis that the disease threat is no longer present. However, relevant considerations include the following.
  - This approach does not manage the risk that a similar event could happen again (given that the source of the current episode is not certain).
  - It is not yet known whether the ban on import of green prawns will continue. This would provide added confidence to adopt this approach.
  - Policy would need to be agreed regarding the approach if another outbreak occurs, given that this may indicate that eradication has failed. The government response in the future will be informed by the lessons learnt in dealing with this event. The likely approach is to develop an industry managed protocol for managing detections of WSSV or outbreaks of WSD on farms. However, if government declares “proof of freedom”, this may mean that a more strict regulatory approach is still appropriate, particularly if a cost-sharing deed is agreed at the national level.
  - It should also be noted that under the *Biosecurity Act 2014*, there is a general biosecurity obligation (GBO), which states that a person has an obligation to take all reasonable and practical measures to prevent or minimise a biosecurity risk. There are offence provisions for when

people do not discharge their GBO and codes of practice may be established to assist in determining whether the GBO has been met.

- A second sub-option is for government to formally implement a policy encouraging industry to adopt a new voluntary code of practice for prawn farm and hatchery operations, with measures as suggested for the proof of freedom phase. Relevant considerations include:
  - This is likely to be the most prudent approach to minimise ongoing risks.
  - The code would particularly focus on enhanced preventative biosecurity, for example:
    - Filtration and/or treatment of inflow water.
    - Crab fencing and exclusion of crustaceans
    - Bird netting
    - WSSV PCR testing of broodstock/PLs.
  - Similar considerations to the previous sub-option apply regarding the future policy for dealing with new outbreaks of WSD. Again, formal disease response policy is likely to be linked to establishment of a cost sharing Deed, including compensation arrangements.
- A further sub-option involves the industry code of practice, but its adoption becomes mandatory under a biosecurity prevention program.
- There may also be other variations or combinations of the above sub-options, for example regional variations in what industry may need to implement.

## Feasibility

All of the above biosecurity strategies are feasible. However, the primary issues to consider are:

- The economic feasibility for prawn farms of implementing biosecurity prevention practices.
- Government's appetite for implementing future controls, either mandatory prevention strategies and / or mandatory eradication responses.
- The outcome of a (presumed) future review of prawn import conditions.
- Whether the virus has persisted or become established in wild crustacean populations. Elsewhere in the world, it has not been possible to eradicate infection in these populations. Essentially, the effectiveness of the current response will depend on whether the low levels of infection initially detected remain, or whether the disease failed to become established (for example the initial infection level may have been too low to be sustained and/or infected prawns were subject to predation by fish).

Ongoing freedom of wild populations from infection appears increasingly unlikely. The detection of a high prevalence of WSSV in tiger prawns captured in the Canaipia Passage outside of the Logan River near the outlet to 7IP and 8IP is of particular concern. These may have been prawns that "escaped" from the infected farm, but even if this is the case, they are likely to establish an ongoing, infected population.

- The efficiency of surveillance in wild fisheries (hence our confidence in freedom).

Again, it should be noted that prevalence in wild crustaceans is often high in countries where WSSV is endemic. However, comparison is difficult as in most other countries there are very many more farms and the virus had

entered and spread in wild populations before any biosecurity or disease control strategies were implemented.

Farmers have advised that sale of prawns grown in the Logan River area is already difficult because of market perceptions that product is damaged or unsafe. Hatcheries in the Logan River region also face difficulties associated with perceptions that the PLs they produce may be infected. These factors, along with the reactions of financial institutions and the community generally, will also influence decisions by farmers/hatcheries on continued operation or closure, or amalgamation/shift to north Queensland aquaculture areas

In the longer term, there are two possible outcomes of this option:

1. Eradication (as defined above) is achieved.

A return to a disease-free status will take a minimum of 2 years, after which prawn farmers, commercial and recreational fishers and other affected parties could return to pre-outbreak operations. However, farmers are unlikely to operate in the future without enhanced biosecurity arrangements as:

- surveillance may fail to detect the virus in farmed and wild crustaceans at a prevalence of less than 2%, lowering confidence that eradication has been achieved; and
- although imported green prawns used for bait have been identified as a probable source of the outbreak, it is unlikely that the entry pathway will be clearly established.

Therefore, the enhanced on-farm biosecurity arrangements discussed above are likely to remain in place indefinitely once eradication is declared. Enhanced biosecurity measures are also likely to be implemented progressively by prawn farmers and hatcheries operating elsewhere in Queensland, as perceptions of increased risk of WSD will persist. Some farms/hatcheries may still elect either to close their businesses permanently (or temporarily) or move their operations elsewhere in Australia.

2. Eradication is not achieved within the 2-year time frame

WSSV has a very broad host range amongst crustaceans (it infects most or all crustacean species); it is transmitted both vertically (broodstock to progeny) and horizontally (via infected water or ingestion of infected tissue); and it persists and remains infectious in infected crustaceans for life, often with no obvious signs of disease. Predation by non-susceptible species (e.g., fish) is the most likely mechanism for natural reduction in prevalence within infected wild crustacean populations. Therefore, unless halted very early following introduction into wild populations, the virus may prove impossible to eradicate.

Failure to eradicate would be evident through either or both of the following scenarios.

- The detection of WSSV in significant numbers of crustaceans or sentinel species (e.g., oysters) collected from the Logan River or beyond.
- The detection of WSSV and/or a WSD outbreak in prawn farms/hatcheries in subsequent seasons.

Either of these scenarios would cause re-evaluation of the eradication option and very likely lead to adoption of option 2 (containment, control and zoning), or possibly option 3.

The first scenario (detection of WSSV in wild populations) appears increasingly likely as indicated above. The timing of a declaration to shift to Option 2 (or Option 3) may present some difficulties and is likely to require further evidence. This would need to be considered by AqCCEAD.

The second scenario (detection of WSSV on farms or in hatcheries) may present other issues, particularly around policy for who becomes responsible for containment and decontamination. It is likely that this would fall entirely on affected farmers, with government's role limited to validating the initial detection and providing advice on disease management. In the current emergency response, the use of calcium hypochlorite for destocking and pond water decontamination has been the major contribution to costs. Farmers have indicated that they would find these costs prohibitive and have suggested the use of alternative approaches, such as the use of Trichlorfon (organophosphate insecticide) for destocking as well as pond decontamination prior to restocking.

A requirement that farmers may be responsible for the costs of destocking and decontamination of their farms in the event of future WSD outbreaks will be a significant risk factor that could influence their decision on continued operation. Hence, other safe and effective decontamination methods should be explored.

## Option 2—Containment, control and zoning with the aim of placing restrictions in areas in which WSSV infection is endemic to prevent spread to uninfected areas

### Description of Scenario

In this scenario, WSSV either is endemic or is considered to be endemic in limited wild crustacean populations, primarily centred around the Logan River area and associated nearby environs at the southern end of Moreton Bay and it has not been detected elsewhere in Queensland. The aim of the response under this scenario is to:

- prevent spread from wild populations to aquaculture facilities;
- prevent spread of WSSV to aquaculture facilities in other areas of Australia;
- limit further spread of WSSV from prawn farms when outbreaks occur;
- prevent the spread to wild fisheries outside the area; and
- conduct early warning surveillance to detect WSSV in areas where WSSV is not known to be present.

Under this option, the Logan River (and possibly other nearby designated areas) would be identified as an infected zone in which WSSV is considered to be endemic in wild crustacean populations. Measures would be adopted to prevent movement of crustaceans out of the zone. Movement controls similar to those adopted during the emergency response phase may need to remain in place indefinitely. These would include:

- prohibition of the removal of live crustaceans from the infected zone, with some possible exceptions (see below);
- targeted surveillance for WSSV in wild crustacean populations and/or sentinel species in a surrounding control zone; and
- enhanced on-farm biosecurity measures for farms/hatcheries operating within the infected zone.

Movement controls may be supported by surveillance (targeted or passive) of bait wholesalers/suppliers and commercial and recreational fishers operating in the zone and targeting crustacean species.

### Future Biosecurity Strategies

Under this scenario, given that a major aim is to prevent spread of WSSV out of the Logan River area, the ban on commercial and recreational take of defined aquatic species would need to continue. However, prudent approvals for movement of some product should be possible using a risk assessment approach. Particularly:

- It should be possible to allow movement of some live product from aquaculture farms out of the zone, for example PLs but only if tested by PCR and certified as WSSV-free.
- The commercial and recreational take of mud crabs and sand crabs would appear to be low risk, as the live crabs are immediately removed from the river (or small crabs/female crabs returned to the river) and sent to market for cooking and consumption, or cooked and consumed by recreational fishers. Hence the probability of spread to other rivers/ fisheries is minimal.

Movement of green prawns (or small crabs) caught in the area could not be permitted as there is no guarantee that they would not be used for bait in other

fisheries. However, catching of crustaceans, for example yabbies for immediate use within the same area could be considered.

The use of fishing boats would not be considered a risk to this strategy.

A further option of requiring all product (mud crabs, sand crabs and prawns) to be cooked before being removed from the river is likely to be impractical as commercial fishers don't have cooking facilities on board the small vessels, and crabs are traditionally sold live to market. As indicated earlier, most prawns taken from the Logan River are sold as bait, so cooking would render them unsuitable for this and, as they are very small prawns, they have little or significantly reduced market value for consumers.

Under this strategy, there would continue to be a risk of the virus being spread into adjacent wild fisheries in Moreton Bay by prawns or crabs. In fact, eventual spread to other fisheries may be inevitable in the long term. The current very low prevalence of the virus suggests that spread may be very slow. However, overseas experience suggests that prevalence levels can change rapidly. Irrespective, there will be a need for an ongoing monitoring program, with industry and recreational support, in the southern parts of Moreton Bay. A surveillance program will be mandatory if, for international trade purposes, Australia wishes to declare other regions of the country free of WSSV.

Implementation of strategies under this scenario could be achieved through:

- declaration of a control / prevention program under the *Biosecurity Act 2014*, which:
  - limits activities within defined and agreed infected areas based on risk, as discussed above;
  - requires development of a mandatory or voluntary code of practice and enforcement of the general biosecurity obligation (GBO). The primary aim is to ensure adoption of on-farm biosecurity strategies to reduce the probability of outbreak (see below); and
  - reduces virus prevalence and limits spread as quickly as possible in the face of an outbreak. This most likely involves obligations on farm owners to deal with infection quickly.
- ongoing surveillance for establishment of WSSV infection in other natural ecosystems or a significant change in prevalence in the Logan area; and
- ongoing control of imports of uncooked prawns.

A new code of practice for prawn farm / hatchery operations would include enhanced preventative biosecurity as detailed under scenario 1, that might include for example:

- filtration and/or treatment of inflow water;
- crab fencing and exclusion of crustaceans;
- bird netting; and
- monitoring for WSSV.

Under this scenario, it is anticipated that adoption of the code of practice by individual prawn farms would be mandatory within the control zone and voluntary elsewhere.

However, feedback from some members of the prawn farming industry indicated a preference for a non-regulatory approach. A compromise may be inclusion of biosecurity requirements as a condition within existing prawn farming licences.

Possible trigger points for transition to option 3 may include:

- detection of WSSV in wild crustaceans in other fisheries; or
- outbreaks of WSD in prawn farms elsewhere in Queensland.

## Feasibility

The primary issues to consider under this scenario are:

- the economic feasibility for prawn farms of implementing biosecurity prevention practices;
- whether prawn farms can and will implement effective on farm actions in the face of an outbreak, including financial implications (see previous discussion on the cost of pond decontamination);
- the ongoing impact on commercial and recreational fishing, particularly the catching of prawns for bait in the Logan River and associated area; and
- the outcome of a (presumed) future review of prawn import conditions.

A shift to Option 2 would have significant ongoing cost implications for government and could have negative impacts on local prawn farmers, as well as bait wholesalers/suppliers and commercial and recreational fishermen that historically have operated in the infected zone.

Costs to government would be associated primarily with maintaining surveillance and regulating movement of crustaceans from the control zone as well as on-going sampling/monitoring of the wild fishery for WSSV prevalence.

Logan River prawn farmers would need to operate under strict biosecurity. They would:

- incur up-front costs associated with the installation of biosecure infrastructure;
- face increased operating costs associated with maintaining biosecure operations;
- intermittently face crop loss or emergency harvest and reduced yield if/ when biosecurity measures fail;
- bear the additional cost burden of decontamination in the event of a disease outbreak; and
- need to overcome market perceptions of risk associated with product from the region.

Hatcheries may find it difficult to operate in the Logan River area. Although broodstock could be sourced from WSSV-free areas and biosecure hatchery operation would be possible by using a filtered and decontaminated water supply, movement restrictions on live crustaceans from the infected zone and/or market perceptions potentially prevent sale of PLs to farmers within or outside the Logan area. A formal accreditation / certification process for hatcheries could resolve this but market perceptions may continue to affect sales. Consequently, some hatcheries may close. As discussed earlier, this would have national implications for seed supply in the short-to-medium term as Logan River hatcheries currently supply up to 70% of PLs to Australian farms.

Commercial beam trawl operators who target bait prawns may choose to leave the river and shift operations to other areas (assuming that crabbing operations can be exempted) but this would cause increased costs and increased competition from existing fishermen in these other areas and place additional fishing effort on stocks in those fisheries. Further, this could only happen if other nearby river systems flowing into Moreton Bay were not included in the control zone and thus not also closed to fishing. Up to 36 commercial fishing operations for bait / school prawns could be affected, as well as bait supplies to the market and recreational fishers.

The likelihood of success of Option 2 will depend upon:

- the potential for natural spread of WSSV infection in wild crustacean populations; and
- effectiveness and capability of enforcement of movement controls on live crustaceans from the infected zone.

#### Option 2(b)

Given the difficulties presented by option 2, particularly the almost inevitable spread of WSSV within wild populations and the very significant impacts of movement controls on commercial fishers, especially prawns caught for commercial bait sales, an alternative option (2b) should be considered. Under this scenario:

- A broader area of south-east Queensland would be declared a WSSV infected zone (noting that option 2 involves an infected zone limited to the Logan River and immediate environs). More work would be required to define the exact boundary of this zone and this would need to be informed by surveillance results. It could include all or part of Moreton Bay and associated river systems.
- Prawn farmers in the Logan area would operate under a code of practice in relation to biosecurity standards.
- There would generally be no restrictions on fishing and take of crustaceans within the zone. However, commercial bait prawns caught in the zone could only be used by recreational fishers within the zone. This could be achieved through a mechanism such as; on delivery to the wholesaler they would be packaged with a label: "Not to be sold/used outside the WSSV infected zone". This would be the main focus for regulatory activity. Similarly, recreational fishers taking green prawns for bait would be encouraged to use the prawns within the zone only.
- Restrictions on the sale of green prawns caught within the zone for human consumption may also be considered, given that they could potentially be used for bait. However, there would need to be a specific provision to allow the entry, sale and movement of green prawns that originate from outside of the area.
- As indicated earlier, no restrictions on the take of sand crabs or mud crabs are anticipated.
- A further measure worth considering may be closures to recreational fishing in drainage channels associated with prawn farms and in the Logan River in close proximity to drainage outlets.
- Targeted surveillance would continue to map the spread of WSSV in the wild.

This option recognises that WSSV will eventually spread naturally and is likely to have no direct impact on crustaceans in the wild, but still includes measures to prevent the spread of WSSV to areas of Queensland and interstate through the use of bait. However, it would directly affect a larger number of commercial fishers than option 2 and its practicality / effectiveness would depend on the commercial reality of the bait prawn industry.

The infected zone would also need to include areas where WSSV is not known to exist. This is considered prudent biosecurity practice, given that mapping the spread of WSSV through surveillance in the wild will always lag behind the actual spread of the virus. Hence, a buffer around known infection is required. A broad, rather than narrow buffer would avoid frequent changes to infected zone boundaries if surveillance was indicating a steady spread of infection.

### Option 3—Control and mitigation with the aim of mitigating the impacts of WSD if it is accepted that the virus will remain endemic in Australia.

#### Description of Scenario

This option would be adopted if WSSV or WSD were detected in Australia outside the designated infected zone and there was no agreement to either extend the designated infected zone or to designate new infected zones. Under this option, WSSV would be declared endemic in Australia. There would be no requirement for national movement restrictions on live or uncooked crustaceans. International trade restrictions may be imposed on the export of Australian prawns to disease-free countries, potentially affecting wild prawn fisheries. As a disease endemic to Australia, WSD would not be relevant to future assessment of risks associated with the importation of crustaceans or crustacean products.

It is likely that the aim of Australia's policy would be to reduce the number and impacts of future WSSV outbreaks involving aquaculture farms and, in doing so, reduce the likelihood of increasing WSSV prevalence in the wild fishery. However, Australian prawn farmers would be largely responsible for managing risks for their operations associated with WSD.

The commercial and recreational fisheries would continue to operate in much the same manner as they do currently, although it may be prudent to adopt any feasible measures aimed at preventing any increase in prevalence of the virus in wild fisheries.

A further sub-option under this scenario would be to adopt a broad zoning approach. For example, if WSSV was not known to exist in northern waters, zoning to restrict movements (and hence limit WSSV spread) from a southern infected zone may be considered. This is similar to option 2(b) as discussed earlier. As discussed under that scenario, a targeted monitoring, surveillance and enforcement strategy would be required to maintain disease-free zones.

Overseas experience has shown that any disease impact on the wild caught fisheries will be minimal or not observable. Evidence from Thailand, China and Japan has shown that WSSV has not impacted on the production from wild capture fisheries despite high prevalence of the virus in the wild. However, the real issue will be managing the market and public perceptions of the on-going "clean and green" image of our wild fisheries.

#### Future Biosecurity Strategies

Although WSSV would be declared endemic under this scenario, strategies would need to be adopted to limit its impact, viz.:

- the development of an industry code of practice for operation of prawn farms, including how to manage outbreaks of WSD;
- an obligation on people under the GBO to take reasonable measures to not spread WSSV into new areas;
- a possible broader zoning approach (or compartmentalisation) if significant areas remained uninfected;
- ongoing surveillance to map the distribution of WSSV over time. This could include pre-season sampling of wild fisheries through the assistance of commercial fishers; and

- government / industry investment in R&D to develop new mitigation strategies, particularly development of WSSV-resistant breeding lines of *Penaeus monodon*.

#### Biosecure farm operation

The underlying principles of biosecure operation would be similar to those adopted in WSSV-endemic countries elsewhere in the world (outlined under Option 1). However, the operational cost structure of Australian farms (primarily labour costs) is considerably higher than in the major prawn-producing countries in Asia and the Americas. Biosecure operation will add to production costs and this will likely be reflected in the price of locally-produced prawns. This may potentially impact on farmers' ability to compete with imported products. This would be offset by reduced competition if the ban on imported green prawns were to continue.

#### Broodstock supply

Continued supply WSSV-free broodstock would be a critically important aspect of industry operation. Broodstock in Queensland are currently sourced from various locations along the East Coast and Joseph Bonaparte Gulf (on the border of the Northern Territory and Western Australia). Domesticated lines are derived primarily from Joseph Bonaparte Gulf and the Gulf of Carpentaria. East Coast stock have also been used for genetic enrichment of domesticated lines.

As the natural spread of WSSV in wild crustacean populations is likely to be relatively slow, WSSV-free broodstock should be available from unaffected locations in the short-medium term, and perhaps indefinitely for broodstock sourced from locations in far northern Australia. However, the market price of broodstock may well increase and supply in sufficient numbers to meet industry needs may become an issue. There has also been a trade in Australian broodstock to parts of Asia, which may be affected by a perception that there is a risk of WSSV infection. In the longer term, there is a prospect of widespread WSSV infection in wild tiger prawn stocks. In this scenario, domesticated stock bred under strict biosecurity may become the industry norm.

Domesticated stock in Australia are currently held by several large farms, one of which is located in the Logan River area (5IP); the farm also holds stock at a second site near Mossman. These stock can provide a clean source of PLs, offering the farms a considerable advantage in managing WSSV. Under Option 3 and with the availability of WSSV-free wild broodstock becoming an issue, access by the wider prawn farming industry to domestically bred broodstock or PLs would be an important consideration.

It would be possible to allow individual farms or hatcheries to operate as a disease-free compartment within the infected zone. To achieve this, a farm would need to operate as a closed system and demonstrate freedom from WSSV infection through targeted surveillance for 2 years. However, it is unlikely that this option would be attractive to farmers unless they are primarily servicing disease-free export markets, such as New Zealand. Most farmed prawns in Australia are marketed locally.

#### Import of live prawns and prawn products

The Import Risk Analysis for Prawns and Prawn Products (Australian Government, 2009) identified the introduction of WSSV to Australia through importation of uncooked prawns or prawn products as high likelihood and high consequence without risk mitigation. A declaration to OIE that WSSV is endemic in Australia would remove the disease from considerations of import risks. However, as other exotic diseases (e.g., yellow head virus) were also considered to present risks that exceed

Australia's Appropriate Level of Protection (ALOP), risk-mitigation measures should still apply.

### Feasibility

Issues to consider under this option include:

- the ability of prawn farms more widely to adopt mitigation strategies and the impacts on farm viability;
- the time it will take for WSSV to become widely distributed (for example a number of years), providing the broader prawn farming industry time to implement transition strategies;
- the need for ongoing research and development to support industry viability, particularly risk mitigation strategies and disease resistant prawn varieties;
- consideration of the ongoing ban on the import of uncooked prawns would still be required; and
- the need to address adverse industry and community concerns about marketing and consumption of prawns and crabs that may be carrying the virus but which present no human health risk.

## Discussion of response scenarios and relative likelihood.

It is difficult to say at this stage which of the three scenarios is the most likely. In particular:

- WSSV infection has been detected in wild crustaceans in the Logan River (albeit at low levels) and at a high prevalence in a limited population of tiger prawns in the southern areas adjacent to Moreton Bay. The probability that this level of infection will fail to persist in natural populations is unknown. Put another way, we do not know what the minimum self-sustaining level of WSSV may be in an Australian ecosystem context.
- However, if infection in the Logan River was the source of the outbreak on the index farm, there must have been sufficient WSSV prevalence in wild crustaceans to cause the outbreak. It is difficult to imagine that this was not an established infection.
- Given the above, proof of absolute freedom (or detecting infection) in the wild may be very difficult.
- If present at very low levels in the Logan River system, it may be difficult to know whether it is present in other rivers / ecosystems. That is, assuming the source of infection was imported prawns used for bait, how many times has infection transfer from bait occurred in the past? We do not know that this was a one-off event, given that potentially infected green prawns have been imported into Australia for a number of years.
- It is difficult to predict how quickly infection will spread from the Logan River system to other ecosystems, but will probably occur with time (see previous section).

Given all of the above, the panel considers that option 2 is the most likely scenario at this stage and that a transition to option 3 may occur at some time in the future.

Possibly the best-case scenario for Australia is that WSSV was introduced through another (unknown) pathway into the index prawn farm, that the environmental positive samples resulted from outflow from the infected farms, and that this infection did not or will not persist. This may present the best prospect of achieving the aims of Option 1, although again, this is looking less likely to be the case as of 2 March 2017.

An analysis of each scenario with impacts on each sector is provided in attachment 1. Given the current state of the response and the likelihood that WSSV has or will become established in wild prawn populations, the panel considers that the focus in the future should be on striking an effective balance between minimising the spread of WSSV, particularly to other fisheries, preventing the spread of WSSV to other prawn farming areas and minimising the impact on commercial and recreational fishing operations. The panel also notes that unless the latter is achieved, effective compliance with any regulatory conditions may be compromised in any case, that is there will be an incentive to not comply.

Currently the panel considers that option 2(b) best achieves this balance.

## Impacts

### Impacts on Prawn Farming Industry

Impacts on prawn farmers will vary depending on the success of response options as has been discussed above in some detail. The principal impacts will be an immediate loss of income for farms in the affected area and increased future operational costs associated with operations that involve significantly enhanced biosecurity and the prospect of further disease outbreaks. The risk of closure of some hatcheries and potential future difficulties in sourcing WSSV-free broodstock (option 3) may also have industry-wide impacts on the supply of PLs in the short to medium term.

The shape of the Queensland industry may also change. It is likely to effectively split into two separate and isolated areas, with little exchange between the areas. The considerations above concerning enhanced biosecurity will equally apply to North Queensland and impact on its cost structure and market strategies.

### Impacts on the Community

Impacts on the community will vary depending on the final option / scenario and the degree of success in eliminating or controlling the disease. As these river systems are very popular for recreational fishers in the community, there will be ongoing concerns and restrictions relating to their ability to continue to use these areas, including restrictions on bait sources and perhaps apparatus restrictions. Other community members will have concerns about the ongoing viability of commercial fishing operations and the possibility of the disease spreading further into wild fisheries, perhaps restricting their choice and availability of seafood. Further, there will be perceptions (unfounded) about the possible effect of the disease on human health and on the very health of the river systems themselves. This could translate into an undermining of the “clean and green” reputation of our seafood across the board, involving both wild caught and aquaculture product.

Thus there will need to be a comprehensive public education and communication program to inform the community of the real impacts of the disease and the measures taken to mitigate any impacts. Cooperation should be sought from the community to comply with whatever restrictions are necessary, for example, not using imported uncooked prawns as bait (should these become available), not moving caught product out of any zones established as a control measure, reporting any abnormal or dead crustaceans for early detection etc.

Reports to date indicate a very high level of co-operation and compliance from the community around the existing restrictions in the Logan River. The community appears to understand the reason for these controls and people are aware of the signage and communication material supporting the controls.

It will require a combined effort from industry, recreational fishers and government to contribute to this program.

## Impacts on Associated Marine Ecosystems

Based on overseas experience, the disease itself is not likely to adversely impact on marine ecosystems. However, sampling for the presence of the virus has been expanded to include a range of possible hosts, e.g., oysters, planktonic copepods, as well as continuing with the existing sampling regime of wild prawns, crabs, worms, etc. If the virus were to become endemic (scenario 3), no restrictions on use of fisheries are envisaged. However, if the disease was shown to be impacting in the wild, then a range of restrictions on the take of various elements within the ecosystem may be considered.

## Impacts on the Commercial and Recreational Fisheries

As discussed throughout this report, the discovery of the virus in prawn and crab samples in the Logan River wild fishery has resulted in significant disruptions to both the commercial and recreational fisheries. This followed from the need to take appropriate biosecurity actions to detect and prevent any further spread of the virus in the wild fishery. This resulted in the closure of the river system to commercial beam trawling and crab potting, as well as the banning of the use of a range of fishing apparatus operated by commercial and recreational fishers targeting crustaceans.

The losses sustained by the commercial fishers involved significant loss of income, as well as the costs in attempting to relocate their fishing operations elsewhere, which has not proved possible in many cases. This is because of the limitations on their licences as to where they are permitted to fish, as well as the shift in fishing effort to others areas, potentially causing resource allocation issues (overcrowding etc) and intensified pressure on prawn and crab populations. Recreational fishers have continued to take fish from the Logan River zone but have been prevented from crab potting, cast netting for prawns and pumping yabbies for bait.

The marketing sector has also faced reduced supplies of bait prawns and crabs for subsequent resale with the associated likelihood of price movements resulting from reduced supply.

Potential future impacts will vary depending on the option chosen, particularly the size, extent and restrictions associated with any future control / infected zone, viz.:

- Under option 1 there will continue to be significant impacts on operators who have traditionally worked the Logan River during the proof of freedom phase, but minimal impacts in the longer term.
- Under option 2, these impacts will be in place indefinitely.
- Under option 2(b), there will be less impact on the take of crustaceans within the infected zone, but there will be significant limitations of the marketing of bait prawns outside of the zone.
- Under option 3, there should be little or no impact on the taking and marketing of crustaceans, unless a broader zoning policy is implemented.

There remain real concerns among commercial and recreational fishers, as well as the community itself, that the virus will continue to spread through the wild fishery outside of the existing Logan River environs, with some impacts on the wider fisheries as discussed earlier. Should the current strategy of eradication be successful, it is likely that there will be little, if any, long term impacts on the wild fisheries, but if not successful, there will be continuing impacts which will have to be managed as discussed in this report.

## Marketing

While cultured prawns are sold in the domestic markets around Australia, the wild caught prawning industry sells on both the domestic and export markets. The value of domestic cultured prawn production for Australia is approximately \$86m, with Queensland's share at \$81m. The value of Australia's wild caught prawn production is \$272m, while Queensland's share of this is \$63m. Thus the industry as a whole faces both a domestic public perception issue about the presence of WSD in farms and in the wild fishery, as well as an uncertain export market reaction.

The largest single prawn fishery is the Northern Prawn Fishery, which is situated in the Gulf of Carpentaria. It is managed by the Commonwealth Government, Australian Fish Management Authority (AFMA) as it is fished by vessels from Western Australia, the Northern Territory and Queensland. Its catch is sold both domestically and overseas. There are several other significant prawn fisheries spread throughout the whole length of the Queensland east coast. Some of this catch is also exported, but much is sold domestically throughout Australia. The bait prawn industry based on river systems along the coast, sells prawns domestically throughout Queensland and many Australian states.

The value of prawn exports is approximately \$94m and is focused on the larger species, which are sought after in a range of overseas countries, principally Hong Kong, Japan, China, Singapore and Vietnam. Returns from these markets are heavily influenced by movements in the value of the Australian dollar, competition from other suppliers and any international trading agreements. The reaction of overseas markets to Australian prawns will depend on the options eventually adopted but government, and industry will need to address possible adverse reactions, or retaliation, from the export markets. It should be noted that if WSD is declared endemic to Australia (Scenario 3), then there are likely to be calls to suspend restrictions on imports from a range of overseas countries, which would then compete with local prawns. However, as discussed earlier there are technical reasons to retain these restrictions owing to a number of other disease threats that remain exotic to Australia.

Under each scenario there is a concern about the public and market reaction to the presence of WSSV in prawns/crabs sold for human consumption. This would apply to both cultured and wild prawns and crabs. The long-term reputation of Australia's prawns/crabs could be damaged in a market sense, with a consequential loss of returns. Also, restrictions on access to markets, either domestically or overseas, could follow, requiring a new certification system to be implemented to overcome this and retain our "clean and green" image. Funding would have to be put into a marketing campaign to attempt to regain or stabilise the industry's reputation and it is noted that such a scheme already exists for part of the Australian prawn industry.

Whether the recently introduced ban on imported green prawns will remain in the long term is unknown at this stage. However, the ban may provide an offsetting impact for some local operators, with a rise in price resulting from the reduced availability of green prawns, given that the demand for green prawns has to be met from somewhere. However, the community itself may still be wary of consuming any prawns, despite there being no danger to human health. This could provide an opportunity for an industry based certification scheme, possibly with government partnering with industry to establish the scheme. It is also possible that the public

“memory” of the WSSV issue may be short term and that there will be no longer term impact on consumption.

Under option 2, for the purpose of keeping international trading markets open, Australia could identify free and infected zones (compartmentalization) but would need to maintain a defined surveillance strategy to maintain a claim to freedom of disease in the free zone.

Under option 3, Australia would be declared as a country in which WSSV is endemic and this could adversely affect international trade in crustaceans. However, there may still be an option to establish WSSV-free compartments or zones if some areas remained free. However, there would need to be strict adherence to conditions including surveillance.

Ultimately, surveillance is likely to be a key and expensive future activity if we move to options 2 or 3.

### Possible Revenue Streams

Revenue needs to be considered in the broadest sense here because of the multi-faceted impacts of the various scenarios. Funding will be needed for a variety of different activities carried out by a number of different participants. Funds will be required:

- by individual operators to adjust their production systems/fishing operations;
- for ongoing monitoring and assessment by government /private contractors;
- for new research and development by various organisations, and
- for marketing and promotion programs etc.

The necessary funds can be acquired from a number of sources and strategies.

Bodies can re-prioritise existing funding to meet emerging needs, individuals can invest in improved on farm biosecurity arrangements, groups can work more co-operatively to better utilise existing funds and/or resources or new sources of funds can be sought. A range of short term and possible long term funding sources could be explored. Some of these are:

1. Redirect existing government funds into WSD programs; and/or increase government allocations towards biosecurity programs. This has recently occurred in Queensland following a review of the biosecurity arrangements, although not for a specific disease / industry issue.
2. Greater collaboration across government departments/agencies/NRM organisations/not for profit groups etc., which have programs/interests related to biosecurity matters. There are common interests involved here which could be more targeted at critical areas.
3. Increase departmental contributions to Fisheries Research and Development Corporation (FRDC) in order to leverage greater funds in return for biosecurity research and development programs.
4. Assist industry in applying for research/development funds from the FRDC Biosecurity sub-program.
5. Government to require a “Biosecurity bond” as part of the aquaculture lease, which could be accessed to respond to incidents; this would follow from the requirement of the new Act that individuals have a general biosecurity obligation. However, this would be difficult to apply in the current circumstances.

6. Government to expand a “cost recovery” policy for identified activities necessary for “public good” protections; this is partially applied under current arrangements.
7. Develop third party arrangements with the private sector to more cost effectively deliver key services. This may assist but has uncertain revenue implications.
8. Access available Commonwealth Government emergency incident response funds to assist with response costs - currently being applied for.
9. Implement a biosecurity fund / levy as has been introduced for other industries in states such as South Australia and Western Australia. This needs to be carefully designed from a constitutional perspective and the resource base in the prawn industry may mean that it is not worthwhile.
10. Develop a cost sharing Deed to cover aquatic animal health/emergency disease incidents or, in the absence of a formal deed, negotiate a collective agreement among national partners for a cost sharing approach. This is currently under active consideration.

It should be noted that the above options need to be carefully considered, as they will have implications for both operating costs and revenue streams for government and farmers. The latter are already facing crippling productivity losses and cost increases for implementation of biosecurity measures