Role of CSIRO Australian Animal Health Laboratory in the emergency response to the white spot disease outbreak in farmed prawns in Queensland, 2016-17
Prawn aquaculture globally

- Crustaceans: A$47,535,300,000 (FAO, 2015)
  - *Penaeus vannamei*: A$24,258,000,000
  - *Penaeus monodon*: A$5,113,810,000

- Australia imports a lot of prawns

Vietnam  China  Thailand

http://www.greenpeace.org

Nick Moody | AAHL WSSV response
AFDL’s role in aquatic disease responses

Diagnostic submissions from State authorities:

Category 1: Routine samples (e.g. health surveillance, no disease suspected, fee-for-service)

Category 2: Exotic disease exclusion (low likelihood) – test results required within 72 hours

Category 3: Exotic disease exclusion/confirmation (high likelihood) – test results required within 24 hours. Diagnostic test report issued to submitting laboratory, CVO of the submitting state, Australian CVO and Director of AAHL.
Category 3 submissions (aquatic)

1. State CVO contacts head of AAHL Fish Diseases Laboratory (AFDL)

2. Head of AFDL notifies staff to expect Category 3 samples and briefs Director of AAHL on the situation

3. Samples arrive and testing strategy confirmed

4. Testing conducted immediately and continuously until a result is obtained

5. Results discussed with Director of AAHL

6. Diagnostic test report forwarded to (1) submitting laboratory, (2) state CVO and (3) the Australian CVO (Australian OIE delegate) within 24 hours (even if it is only an interim report with final report to follow as soon as testing is complete)

7. Positive results will trigger aqCCEAD teleconference
Prawns submitted for WSSV confirmation

November 30, 2016: Samples received from Queensland laboratory at 8:30pm

December 1, 2016: WSSV qPCR POSITIVE result at ~1:00am, WSSV OIE PCR POSITIVE and sequence reported at 9:30am, aqCCEAD convened, OIE notified
Index pond was very positive

OIE WSSV qPCR amplification curves for samples (orange) and positive (black) and negative (blue) controls.

CSIRO WSSV qPCR amplification curves for samples (orange) and positive (black) and negative (blue) controls.
Confirmation by sequence analysis

Shares 100% nucleotide identity with WSSV in the NCBI database, including WSSV:

TTCTCTTGTGATAGCTAGAGCAAAGGCATTTTGGTTAGTATTTGGTGGACAGTTAGTATAGTCAGAAGAAATATTACGTTCGATATCGTTGAGGATATCCTTGAATTCAGCATCAGTTACTTGCT

TTCTCTTGTGATAGCTAGAGCAAAGGCATTTTGGTTAGTATTTGGTGGACAGTTAGTATAGTCAGAAGAAATATTACGTTCGATATCGTTGAGGATATCCTTGAATTCAGCATCAGTTACTTGCT

TTCTCTTGTGATAGCTAGAGCAAAGGCATTTTGGTTAGTATTTGGTGGACAGTTAGTATAGTCAGAAGAAATATTACGTTCGATATCGTTGAGGATATCCTTGAATTCAGCATCAGTTACTTGCT

TTCTCTTGTGATAGCTAGAGCAAAGGCATTTTGGTTAGTATTTGGTGGACAGTTAGTATAGTCAGAAGAAATATTACGTTCGATATCGTTGAGGATATCCTTGAATTCAGCATCAGTTACTTGCT

Whole genome sequencing at AAHL of samples from 1IP, 5IP and northern Moreton Bay indicate it was not a multiple source incursion

Nick Moody | AAHL WSSV response
Variable interlaboratory test results

Laboratories for Emergency Animal Disease Diagnosis and Response (LEADDR)

• **Strategy**
  
The network will standardize or otherwise harmonise testing services and coordinate large-scale testing capacity to provide effective diagnosis and management of outbreaks of EAD. The network will predominately focus on diseases of livestock, but may also include EADs of non-livestock species.

• **Objectives**
  
  1. To establish a national system for the surveillance and diagnosis of EADs using harmonised laboratory testing services across a network of approved laboratories.
  
  2. Establish a network-supported national surge capacity for EAD outbreak.

• **Options**
  
  1. LEADDR coordinator can observe CCEAD meetings and update LEADDR Coordinating Committee if appropriate
  
  2. LEADDR Coordinating Committee can establish a working group to investigate any issues with diagnostic test results

→ Nationally co-ordinated approach to diagnostic testing for EADs
Enacted the AAHL EDRP – 9 December, 2016

- AAHL Emergency Disease Response Plan
  - This plan has been drawn up to describe the range of resources that must be provided within AAHL in the event of responding to an outbreak of an emergency disease and to outline the organisational structure required to meet the demand for technical excellence, quality performance and efficient laboratory output.
  - The activation of the plan is the responsibility of AAHL’s Director (or delegate) who will also appoint the Laboratory Response Coordinator. It is the Laboratory Response Coordinator’s responsibility to implement the plan, together with the assistance of the Scientific Services, Veterinary Services and Resources Coordinators.
  - Role descriptions and responsibilities are set out in job cards. To ensure that the handover of a role is carried out with minimal loss of function, debriefing will take place.

- Laboratory Response Co-ordinator: Dr Debbie Eagles
- Veterinary Services Co-ordinator: Dr Mark Crane
- Scientific Services Co-ordinator: Dr Peter Mohr
- Resource Co-ordinator: Dr Nick Moody

- Everyone in AAHL available for the response
- End of Emergency Laboratory Response – 19 July, 2017
Largest disease outbreak in Australia

WSSV Emergency Response 2016-17
- 22,449 Farmed and wild samples (43,731 tests)
- Process ~1000 samples/day
- 1,687 Commodity samples (15,183 tests)
- Various other submissions
- 45+ teleconferences
A logistical challenge

• Specimen receipt (4-8 staff)
  • Unpacking, specimen registration, tube labelling
  • Sorting to 96-well format

• Sample preparation (8-10 staff)
  • 8 staff
  • PBSA to bead beating tubes, samples to bead tubes, bead beating (5 bead-beaters)
  • Limited robotics

• Nucleic acid extraction (3-4 staff)
  • Sample clarification, buffer preparation
  • 2 x MME-96 systems
  • Very important robotics

• Real-time PCR (3-4 staff)
  • Loading
  • Data retrieval and analysis
  • 6 x 7500 FAST Thermal Cyclers
A logistical challenge

- 203 x 5ml TaqMan Fast Universal Master Mix
- 44 x 5x MagMax-96 Viral 1 Kit
- 29,000 x 2mL Lysis Matrix M tubes (purchased the entire Australian stock – twice)
- Purchase Order with Thermo Fisher (Life Technologies)
- Other companies happy for me to pay when I got the invoice
A logistical challenge

Nick Moody | AAHL WSSV response
Potential sources

- People fishing in the Logan River using supermarket prawns as bait
  - Supermarket prawns: WSSV POSITIVE (different labs)
  - Raw, unprocessed prawn import ban: 6 Jan, 2017 (ended)
  - Historical WSSV levels in prawns tested post-arrival: 4 – 23% WSSV POSITIVE
  - Enhanced surveillance testing: up to 72% WSSV POSITIVE, some C_T values <20
  - Six importers with licences suspended – ongoing investigations

- Senate Estimates Committee: Rural and Regional Affairs and Transport 24/5/17

- Still no definitive cause (may never be known)

- Whole genome sequencing (within and between country variation)
  - 2016: shortage of prawns in Vietnam and China so imports form other countries for processing and export
Summary

• **WSSV** resulted in destruction of all farmed prawns in the Logan River area
Summary

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- **WSSV** has been detected in wild prawns and crabs in Moreton Bay
- **WSSV** has been detected over 72% of retail prawns tested
Summary

- **WSSV** resulted in destruction of all farmed prawns in the Logan River area
- **WSSV** has been detected in wild prawns and crabs in Moreton Bay
- **WSSV** has been detected up to 72% of retail prawns tested

We really should try and keep exotic pathogens exotic
Summary

• Should be a review to look at what worked well and what didn’t work so well.

• What’s the plan if it happens again in the same area, or occurs somewhere else?
Acknowledgements

Staff from all areas of AAHL have been involved in the emergency disease response:

- AFDL Aquatic Diagnostic Capability Team
- AAHL Senior Management
- AAHL Fish Diseases Laboratory
- Diagnosis, Surveillance and Response teams
- Health & Biosecurity
- Engineering
- Stores
- Laundry
- Finance
- Administrative staff

- LabCabs
- SFS Pharma Logistics

- Department of Agriculture and Water Resources
Thank you

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Senior Research Scientist

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