

2013 Shrimp Pathology Short Course Industry Bursary

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AUSTRALIAN
SEAFOOD
COOPERATIVE
RESEARCH CENTRE

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NON-TECHNICAL SUMMARY

PROJECT NO: SHRIMP PATHOLOGY SHORT COURSE 2013

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OBJECTIVES OF RESEARCH TRAVEL GRANT/ INDUSTRY BURSARY

Initial objectives of the industry bursary were to attend and complete the 2013 Shrimp Pathology Short Course at the University of Arizona. Then, with the knowledge attained, publish and present a reference booklet on farmed penaeid prawn diseases to farmers at the Australian Prawn Farmers Association's annual conference.

OUTCOMES ACHIEVED TO DATE

- 14/06/13: Completed Shrimp Pathology Course
- 1/08/13: Presented speech "Lessons learned from Shrimp Pathology Short Course" at APFA Conference
- 31/08/13 Submitted application for funding for a training exercise with CSIRO to further develop the industry's diagnostic skills and attain valuable information on an endemic disease of economic importance to industry

(PROJECT) OUTPUTS DEVELOPED AS RESULT OF TRAVEL GRANT/ INDUSTRY BURSARY:

Output objectives were revised upon completion of the course to better suit the reflectively apparent needs of the industry. The lessons learnt during the pathology course highlighted the gaps in current understanding of diseases endemic to Australia as well as the necessity of an immediate and strategic response by farmers to disease outbreak events. Training of farm staff in practical disease management skills including preliminary diagnosis of diseases, sampling, preparation and preservation of specimens, was regarded as an activity which would greatly improve disease response management. Thus the revised outcome for this bursary was to instigate a plan of action that would incorporate both research into endemic diseases and dissemination of practical diagnostic skills to the broader prawn farming community.

ABOUT THE PROJECT/ACTIVITY

BACKGROUND AND NEED

In terms of prawn diseases of significant importance to aquaculture, Australia is the lucky country. To date our isolation has acted as biosecurity measure preventing serious disease outbreaks decimating our industry such as: Infectious Hematopoietic Necrosis Virus (IHHNV); Taura Syndrome Virus (TSV); White Spot Syndrome Virus (WSSV) ; Yellow Head Virus (YHV) and most recently EMS (Early Mortality Syndrome)/Acute Hepatopancreatic Necrosis Syndrome (AHNP), which have ravaged farming regions in the Americas and Asia. Though the industry has been fortunate to date, this does not justify a lapse in vigilance in biosecurity measures and active disease research. Many Australian prawn farms operate within close limits to large shipping ports where ballast waters carried from other regions act as potential disease vectors. The major fishing grounds for wild captured broodstock are situated in the waters off the Northern Territory, and spread of disease through water currents from neighbouring Asian countries to these stocks is a tangible threat. Most alarming, are the recent reports of a new strain of Yellow Head Virus (YHV-7) impacting production on a number of farms in Queensland in 2013. The strain is yet to be characterised and there is no indication of how virulent the disease may be. These recent events illustrate that the Australian biosecurity measures are not infallible and it is imperative we remain vigilant in our biosecurity and disease diagnostic programs ensuring there are adequate resources and expertise capable of dealing with on-going and emerging disease threats.

Central to the success of a health and biosecurity support network for prawn aquaculture is training of industry members. Without an understanding of specific diseases and their mechanisms, it is difficult to correctly diagnose an outbreak and carry out appropriate biosecurity measure in response to contain and prevent further spread. Training of technical farm staff is important to reduce potential deleterious impacts of disease outbreaks on the industry and is essential to safeguard our small yet resilient farming community.

This industry bursary was intended to facilitate the training of one such farm technician in the detection and diagnosis of known diseases of significance to global prawn production. Attending the annual Shrimp Pathology Short Course run by the pre-eminent world expert Dr Don Lightner at his University of Arizona laboratory, provided a wealth of information and practical skills which could be applied not only at a company level but could also be disseminated to other industry members via the channels of the Australian Prawn Farmers Association.

RESULTS

The course was attended and completed between 3/06/13 and 14/06/13 at the University of Arizona, Tuscon. The content covered was extensive with a mixture of: lectures; microscopic examination of case study slides; and practical exercises and demonstrations of diagnostic methods. Much of the course focused on viral diseases of current economic importance to global prawn aquaculture, their pathology, characterisation and methodologies for detection and diagnosis. Other lecture topics included: diseases of various other aetiologies (bacterial, fungal, parasitic & fouling, nutritional, environmental and toxic aetiologies); anatomy/normal histology and disease defence mechanisms of prawns; detection and diagnostic methods including various Polymerase Chain Reaction (PCR) techniques, histology, molecule based techniques and bioassays; options for disease management; and reporting protocols for relevant organisations (FAO/OIE). Practical sessions provided an opportunity to become familiar with equipment and protocols used for various diagnostic methods including: DNA and RNA extraction; PCR and RT-PCR; monoclonal antibody strip tests; bacteria plating and isolation; API tests; collection and preservation of tissue samples; and preparation and examination of histological slides. Practical sessions also provided an opportunity to establish connections with other industry professionals and disease experts. Speaking to faculty members and other course participants about their current projects and endeavours gave valuable and up-to-date insight into diseases of current concern to prawn farming regions around the world. The two week course culminated with an exam covering both the theory and practical content learnt, after which certificates of completion were presented.

COMMUNICATION OF PROJECT OUTCOMES, INDUSTRY IMPACT AND EXTENSION ACTIVITIES

The opportunity provided by the Australian Prawn Farmers Association to speak at their annual conference offered a unique chance to communicate with farmers directly the desired outcomes of this bursary. The themes covered in the speech included: the Australian prawn farming industry's unique situation in terms of prawn disease research; How the knowledge obtained through the industry bursary can be directly applied for the benefit of the industry, with an example of an experimental design to address current farm stocking issues; and the importance of maintaining a strong discourse between farmers and researchers (Full script and slides presented in Appendix A). The presentation received positive responses from farmers and researchers alike, with Commonwealth Scientific and Industrial Research Organisation (CSIRO) staff offering to collaborate on a funding application for the presented project design. Weeks of drafting and redesigning culminated in the submission of an expression of interest application under the FRDC Aquatic Animal Health training scheme in late August 2013 (Appendix B). Depending on funding approval the proposed disease challenge study and concomitant technician training exercise will be carried out in late 2014 (November/December). This will provide a

unique opportunity for Farm and Hatchery technicians from several prawn aquaculture operations to develop disease diagnostic skills under the tutelage of Australian prawn disease experts. It will also technicians to witness firsthand the clinical signs and disease progression of what is currently the most economically significant disease endemic to Australia, Gill Associated Virus (GAV), all within the biosecure confines of a dedicated research facility. The disease challenge study itself will gain valuable disease tolerance data for the various broodstock lines used commercially. The results obtained will have an immediate impact on the industry with their analysis and application potentially improving management of broodstock sourcing and farm stocking. If the project is deemed successful and considered a valuable exercise by the APFA there is potential for replication in the future to maintain the skills base within the industry.

In summary, although this bursary's initial objectives were to train a single member of the prawn farming industry in disease diagnostics, the project proposal developed as a bursary output will potentially impact majority of farms directly through training of technicians in disease response methodologies, and results from the associated research will benefit all farm and hatchery operations.

ACKNOWLEDGEMENTS

I wish to acknowledge the help provided by Australian Prawn Farms, without their financial support this project would not have been possible and I would like to express my very great appreciation to Matthew West, Farm Manager, in particular for his continued support and advice throughout the entire project.

Furthermore, I would like to extend my thanks to Helen Jenkins and the Australian Prawn Farmers Association for providing me with the wonderful opportunity of presenting at the APFA annual conference, and providing support for both this bursary and the pending FRDC project proposal.

My special thanks are extended to the staff of CSIRO's future food flagship division, Dr Melony Sellars, Dr Jeff Cowley and Dr Greg Coman for their collaborative efforts on the project design and proposal for FRDC funding application and also to Ingo Ernst, Director of the Aquatic Animal Health Program at the Australian Government Department of Agriculture, Fisheries and Forestry, his constructive feedback during the drafting stage of the funding application was greatly valued.

APPENDIX (IF APPLICABLE)

Appendix A – Presentation speech at APFA Conference (1/08/2013)

Ahoy hoy,

For those of you who I haven't met yet, my name is Cait. I've worked at Australian Prawn Farms for the past 3 years and I currently have the unfortunate job of being Matt West's 2ic – though I probably won't have it for much longer after saying that.

So it appears I'm the last presentation before we break for Afternoon Tea, and just because nice I'm going to ease you into it. So start gearing down your information sponging apparatus I promise I won't get very technical.

So what am I doing up here beside rocking a mad boot tan and seeing if I can produce a bit of brow sweat (who doesn't love public speaking)?

Well, I was privileged enough to have the opportunity to attend a short course on shrimp pathology under the tutelage of Dr Don Lightner a couple of months ago, for which I would sincerely like to thank the seafood CRC as well as Australian Prawn Farms for facilitating. As part of the agreed outputs of the bursary I received from the CRC I'm here to share with you today some of the valuable lessons I learnt from the course.

(Slide)

Histopathology, which I discovered on the first day of the course, to my surprise has nothing to do with the appreciation of Batik design but instead involves the microscopic study of changes in body tissues caused by disease. Evidently, it plays a major role in diagnostics and thus for 80% of the course I spent my time staring down the eyepiece of a microscope trying to decipher innocuous pinky purple blobs from the very serious crop devastating pinky purple blobs. Those hours spent as a kid reading Where's Wally finally came to good use. It's not any easy skill to pick up and I'm far from an expert at it so I'm not going to talk so much about the course contents today rather how studying prawn diseases from around the globe has given me a perspective on the Australian prawn farming industry and how to approach disease issues.

(Slide)

The key topics I'm going to brush over today are:

- The Australian prawn farming industry's unique positioning in terms of prawn disease research
- How learning about research methods used to characterise emerging diseases in Asia and the Americas has given me a better footing to pave a course of action to find disease management solutions. I'm going to use an example of an idea for research that may help facilitate stocking decisions.

-and finally, I'd like to discuss the importance of maintaining a strong discourse between farmers and researchers.

(Slide)

So, why is it necessary to have a strong scientific community focused on prawn disease research in Australia? Why can't we just ride on the coat tails of research done by other larger industries who have more money to throw around such as the cattle or sheep industry? Well this kid is special. His immune system is very different to those of vertebrates, which means many of the technologies developed to deal with livestock and even fish diseases can't be crossed over and used to help prawns, a good example of this is the use of vaccines, great for fish sure, absolutely useless for all crustaceans. We also don't have the luxury that the Barra farmers nextdoor do, they can knock ideas off the much larger and well established Salmon farming industry. In terms of crustacean aquaculture we are the large fries, there is no one else to look up to. So if we want to know something we have to find it out for ourselves.

What makes the Australian prawn industry so unique in terms of disease research is how isolated we are. With respect to diseases that pose a potentially devastating threat to farming we really are the lucky country. Our natural biosecurity measure of being isolated has so far prevented us from facing the wrath of many serious global penaeid pandemics such as IHHNV, Taura Syndrome, Whitespot, Yellowhead and EMS. This isolation has also created a niche, as farming of *monodon* has been replaced by *vannamei* in many regions, turning black tiger prawns into a minority species and thus research efforts have been balanced out accordingly. Isolation also works against us with our endemic diseases. With very little threat of spread to other regions and species, there is basically no global interest in Australian prawn diseases. We're on our own. As the size of our industry is only modest we have our work cut out for us in the disease research department and in case it wasn't hard enough already you can add to that the shrinking financial support received from the government in the current economic climate.

So sitting in here today listening to numerous scientists present on their current projects we should be really proud of ourselves as an industry as to how much we've achieved off our own backs, and let this serve as a reminder of how important it is for farmers to support the research community. These are the people who we will be turning to for answers if a serious disease threatens our farms. To give ourselves a fighting chance at surviving an emerging disease as an industry we need to fully support the goals researches are trying to achieve at present.

(Slide)

Alright, I'll get off the soapbox because I'd talk about something practical I learnt from my study tour. As I was saying before the major diseases affecting Asia and the Americas are fortunately still exotic to Australia, so most of the information I learnt wasn't directly relevant to farming in Australia. However, many of the scientific methods and technologies that have been developed to characterise and study mechanisms of these diseases are adaptable. As a farmer being able to understand what's possible in the realms of science I

now have a clearer idea of how to develop a plan of attack when faced with a management issue associated with disease. I'd like to use an example of one of the problems our farm has to illustrate this.

A couple of months ago we all sat down to discuss where we were going to source our wild broodstock from for this season. The season before last we had stocked the farm with wild East Coast progeny and we had a pretty average crop, several of the ponds were clearly affected by Gill Associated Virus achieving poor growth rates and suffering low level mortalities through each moult. A couple ponds had to be harvest earlier than planned due to poor condition. In an attempt to prevent this happening again last season we got our hands on some Northern Territory Animals to put through the hatchery and stock the farm with as we had heard they performed well and weren't affected by GAV. It paid off. They achieved decent growth rates and didn't skip a beat through the moults and beside the usual seasonal problems with *Heterosigma* it was quite an easily manageable crop. However, CSIRO performed for us some viral screening on 100 day old animals from a suite of 20 our ponds and found low to moderate levels of GAV in 30% of them. Bearing in mind the results achieved the last two seasons and our knowledge of GAV's presence in both crops it was a tough to decide which stocks to use. Did the Northern Territory animals perform better than the East Coast as a consequence of having better environmental conditions in the ponds last season resulting in lower stress levels or are they more tolerant of GAV? We don't know. With the future success of the season relying on choosing the right broodstock, it's a massive call to make with such a lack of information to back it up. So how do we find out if there is a difference in tolerance to GAV between available stocks? Enter my new found knowledge of disease research.

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Part of the work that the aquaculture pathology team at University of Arizona does includes carrying out viral challenge studies, often in collaboration with private hatcheries to develop Specific Pathogen Resistant Lines of domesticated stocks. It involves a very straightforward experimental design that could be adapted to find an answer to our question. It would require progeny from East Coast, Northern Territory and potentially you could even throw in there some domesticated lines. Using only health animals of a similar size (probably between 5-10g), You would probably have to use four different treatment groups. One treatment would receive an injection with a moderate dose of GAV, one would receive a high dose and one would receive an injection without any virus to act as an injection control. There would also be a treatment group that did not receive any injections to act as a standard control. Then animals would be kept in replicate tanks for each treatment and pleopod clips sampled on day zero and at regular intervals until the trial is finished. Clinical observations would also be recorded. The trial would run until no more mortality is likely to occur. GAV load quantified PCR would then be carried out on the samples taken which will enable tracking of loading in the individual treatments throughout the trial. So it would be possible to determine at what GAV loading mortality occurs in each of the lines as well as how long they can survive for. I think this a neat little idea for a project and with GAV costing the industry an estimated 15 million USD a year, its definitely a project worth pursuing. It would only take a

few months to run the viral challenge and perform the subsequent lab work, with potential outputs immediate. If findings show a particular stock performs significantly better, farmers can use that information straight away to assist in broodstock selection and those hatcheries with domestication programs can use the information to begin looking at developing GAV resistant lines.

Slide

So in summing up I would definitely have to say that the two weeks studying in Tuscon was worthwhile as it has helped me to understand what the capabilities of the scientific community are and how technologies and methodologies can be applied to help find solutions to some of our farms issues. Now not every farmer is going to have the same background in science that I do and I'm definitely not saying you should all go out there and read a bunch of journal articles to try and understand the latest research. But what this does highlight though is the importance of having a strong discourse between farms and the scientific community. You may have a problem that could be solved with some research but unless you are communicating to members of the scientific community, who can provide you options of potential avenues of investigation, you will never know. That's why it's so important to take advantage of opportunities such as the surveys sent out through the APFA, the CSIRO's newly developed evaluation model and event's such as this where you can score valuable face time with experts, for free! Just talk to them, you'd be surprised what's possible.

As a closing remark, It is my opinion that considering the size of our industry we have been producing an impressive amount of prawn disease related research, and to be able to carry on reaping its benefits we need to ensure that continued support and unobstructed dialogue is upheld between farmers and the scientific community.

