

Research Travel Grant

**World Seafood Congress and
collaboration with Dr Salina Parveen to
discuss comparisons of *Vibrio
parahaemolyticus* models for Australian
Pacific, Sydney rock and American oysters
at the University of Maryland**

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AUSTRALIAN
SEAFOOD
COOPERATIVE
RESEARCH CENTRE

Project No. 2011/752

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NON-TECHNICAL SUMMARY

PROJECT NO: 2011/752 RTG: World Seafood Congress and collaboration with Dr Salina Parveen to discuss comparisons of *Vibrio parahaemolyticus* models for Australian Pacific, Sydney rock and American oysters at the University of Maryland

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(PROJECT) OBJECTIVES OF RESEARCH TRAVEL GRANT/ INDUSTRY BURSARY

- 1) to demonstrate to an international audience of seafood industry and policy makers that *Vibrio parahaemolyticus* grows differently in Australian oysters (*Crassostrea gigas* and *Saccostrea glomerata*) compared to the American oyster (*Crassostrea virginica*)
- 2) to demonstrate the utility of the ASCRC Oyster Refrigeration Index as a supply chain risk management tool to predict *V. parahaemolyticus* levels and oyster shelf-life (Total Viable Count [TVC])
- 3) to learn how the Oyster Refrigeration Index may be integrated in traceability systems
- 4) to compare the performance of the Oyster Refrigeration Index *V. parahaemolyticus* model with that of a new USA *V. parahaemolyticus* model for American oysters

NON TECHNICAL SUMMARY:

Vibrio spp. are bacteria that naturally occur in oysters. Some *Vibrio* spp. such as *V. parahaemolyticus* cause human disease when levels are high and oysters are eaten raw. Predictive tools can be used to estimate *V. parahaemolyticus* levels in oysters, and to monitor and design cold chains that enhance oyster safety and quality.

Historically, international risk management strategies have been driven mostly by data and predictive models generated in the USA for the American (Eastern) oyster. This presents a risk to Australian companies if USA models are not relevant to *V. parahaemolyticus* growth profiles in Australian oyster species.

ASCRC projects 2007/700 and 2008/719 produced predictive models that confirmed *V. parahaemolyticus* shows a different temperature growth profile in Pacific and Sydney rock oysters. Results of these projects were communicated to an international audience of industry and government representatives at the World Seafood Congress. This activity advanced relationships with key USA and international policy makers that could influence commercial markets for Australian oysters. The meeting also provided a forum to interact with key researchers in the field, resulting in better definition of research programs that may benefit Australian companies.

The travel grant also provided an opportunity to meet with Dr Salina Parveen, a key collaborator with USA Food and Drug Administration (USFDA) in the development of predictive models used to manage the risk of *Vibrio* species in oysters. As a result, a

forthcoming manuscript will be published that shows separate predictive models are needed for Australian oyster species.

OUTCOMES ACHIEVED TO DATE

- The USAFDA, which regulates commerce of national and imported oysters, now recognises that the growth characteristics of *V. parahaemolyticus* are different between Australian and USA oysters. This has been demonstrated in a joint publication between USFDA co-authors and the PI, submitted to the high-ranking journal, *Applied and Environmental Microbiology*.
- The United Nations Food and Agriculture Organisation (FAO)/World Health Organisation (WHO) risk assessment group also recognise these differences between USA and Australian models. This occurred as a result of submitting ASCRC data to FAO/WHO in 2010, discussions with the senior FAO fishery officer at the World Seafood Congress on 3-5 October 2011, and the PI serving on a FAO/WHO risk assessment panel on 17-18 October 2011.

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

- 1) to demonstrate to an international audience of the seafood industry and policy makers that *Vibrio parahaemolyticus* grows differently in Australian oysters (*Crassostrea gigas* and *Saccostrea glomerata*) compared to the American oyster (*Crassostrea virginica*)

An invited paper was presented at the World Seafood Congress, titled "The Oyster Refrigeration Index-a tool to manage vibrios and spoilage bacteria in supply chains"

- 2) to demonstrate the utility of the ASCRC Oyster Refrigeration Index models as a supply chain risk management tools to predict *V. parahaemolyticus* densities and oyster shelf-life (Total Viable Count)

The above invited paper addressed this objective.

- 3) to learn how the Oyster Refrigeration Index may be integrated in traceability systems

The PI attended a Traceability workshop that preceded the World Seafood Congress (3 Oct 2011), presented by USFDA (Barbara Blakistone) and GS1 Global Standard (Michele Southall). The workshop content included an overview of seafood hazards and traceability systems. Contacts were also made with a South African seafood company and a traceability data management company, both expressing interest in the Oyster Refrigeration Index project outputs. There is no specific output for this activity as of the date of this report.

- 4) to compare the performance of the Oyster Refrigeration Index *V. parahaemolyticus* model with that of a new USA *V. parahaemolyticus* model for American oysters

As a result of the meeting with Dr Parveen at the University of Maryland-Eastern Shore, a paper co-authored by the USFDA was submitted to the journal of *Applied and Environmental Microbiology*. This paper demonstrates that *V. parahaemolyticus* shows less growth in Australian, compared to USA American oysters.

Manuscript title and authors:

Development and Validation of a Predictive Model for the Growth of *Vibrio parahaemolyticus* in Post-Harvest Shellstock Oysters. Salina Parveen^{1*}, Ligia Dasilva¹, Angelo DePaola², John Bowers³, Chanelle White¹, Kumudini Apsara Hettiarachchi¹, Kathy Brohawn⁴, Meshack Mudoh¹ and Mark Tamplin⁵

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ABOUT THE PROJECT/ACTIVITY

BACKGROUND AND NEED

Vibrio spp. are naturally-occurring in seawater and accumulate in oysters via filter-feeding. Some *Vibrio* spp. such as *V. parahaemolyticus* cause human disease when eaten raw. Predictive tools can be used to estimate *V. parahaemolyticus* levels in oysters, monitor and design cold chains, as well as meet regulatory action levels.

Historically, international risk management strategies have been driven by data and predictive models generated in the USA for the American (Eastern) oyster. This presents a risk to Australian companies if the USA models are not relevant for *V. parahaemolyticus* growth in Australian oyster species. ASCRC projects 2007/700 and 2008/719 produced predictive models that confirmed *V. parahaemolyticus* shows a different temperature growth profile in Pacific and Sydney rock oysters.

Attendance at the World Seafood Congress would advance relationships with key USA and international policy makers that influence commercial markets for Australian oysters. The meeting would also provide a forum to interact with key researchers in the field, resulting in better definition of research programs that benefit Australian companies. In addition, the meeting would an opportunity to interact with the FAO in advance of an expert panel addressing market standards for shellfish, scheduled for 17-18 October in Ottawa, Canada.

The same travel grant also provided an opportunity to meet with Dr Salina Parveen who is a key collaborator with USFDA in the development of predictive models used to manage the risk of *Vibrio* species in oysters.

RESULTS

As a result of the travel, attendees of the World Seafood Congress are now aware of the utility of the Oyster Refrigeration Index to manage supply chain risks for *V. parahaemolyticus* and oyster shelf-life.

There is now more capability in the ASCRC about the use of traceability systems in seafood supply chains.

The USFDA and FAO/WHO know that *V. parahaemolyticus* shows less growth in Australian oysters, compared to that predicted in USAFDA risk assessment based on the USA American oyster (*C. virginica*). This is demonstrated by a joint publication soon to be published in the journal *Applied and Environmental Microbiology*.

INDUSTRY IMPACT

PROJECT OUTCOMES (THAT INITIATED CHANGE IN INDUSTRY)

Different potential outcomes can be identified from this project.

As a consequence of the travel and associated outputs, it is anticipated that importing countries will recognise Australian exporting companies that use the Oyster Refrigeration Index oysters to manage supply chains.

Codex Alimentarius, which develops guidelines for international trade, will understand that unique risk management models are needed for Australian oysters. This can have significant implications in international trade, in that importing countries will recognise the models produced from this project are appropriate, and should not default to the USAFDA models that predict higher *V. parahaemolyticus* growth.

A greater number of persons now understand that Sydney rock oysters do not allow the growth of *V. parahaemolyticus*, *Salmonella* and *E. coli* up to 25°C, and that this may translate into more flexible logistic plans.

WHAT FUTURE AND ONGOING CHANGES ARE EXPECTED?

With time, a broader audience will understand the growth characteristics of *V. parahaemolyticus* and TVC bacteria. This will result from communication among networks of persons that attended the World Seafood Congress, within USFDA and the international research community. Also, news will spread when the manuscripts authored by Fernandez et al. and Parveen et al. are published.

WHAT BARRIERS ARE THERE FOR CHANGES TO OCCUR?

Change will primarily depend on publication of the manuscripts authored by Fernandez et al. and Parveen et al, as peer-reviewed data are normally required for regulatory acceptance.

The Fernandez et al. paper has been published. The Parveen et al. paper was submitted, returned with relatively simple comments and is expected to be published in February or March 2012.

WHAT IS THE LIKELIHOOD THAT THESE CHANGES WILL OCCUR?

There is high probability that WHO/FAO, USFDA and Australian regulatory bodies will adopt the models.

WHAT BARRIERS ARE THERE TO ADOPTION OF THESE CHANGES AND WHAT ACTION COULD BE TAKEN TO OVERCOME THESE?

Acceptance and use of the models depend on publication of the research in a scientific journal.

COMMUNICATION OF PROJECT/EXTENSION ACTIVITIES

WHAT IS THE OUTPUT THAT NEEDS TO BE COMMUNICATED?

Pacific oyster farmers - the Oyster Refrigeration Index is internationally recognized as a tool to monitor on-farm cooling rates, maximize oyster stacking options and forecast the effects of high harvest temperatures on shelf-life and safety. The Index can be an effective tool to train farm workers about the effects of product storage temperature on oyster quality and safety.

Sydney rock oyster farmers – *Vibrio parahaemolyticus*, *E. coli* and *Salmonella* do not grow in Sydney rock oysters between 4 and 25⁰C, whereas *V. parahaemolyticus* grows in Pacific oysters between 15 and 25⁰C. The NSW Food Authority may consider changing holding temperature requirements based on this research, leading to reduced refrigeration costs while still maintaining quality and safety. In addition, Sydney rock oysters may be the preferred species for long supply chains, especially into international markets.

Oyster supply chain managers – the Oyster Refrigeration Index can help managers design and measure the performance of supply chains to maximise both safety and quality. The Index provides special value to companies that are, or are planning to, export to countries that may have maximum limits for TVC and *V. parahaemolyticus*.

Shellfish regulators - regulatory organisations can recognise the value of the Index because it is based on validated scientific research and provides the industry with a useful tool to manage food safety risk. The project data were part of Australia's input into the international CODEX Alimentarius standard on *Vibrio* spp. in seafood. This

raised Australia's standing in the international community and will assist the oyster industry with greater access into future export markets.

WHO IS/ARE THE TARGET AUDIENCE/S?

Oyster industry
Shellfish regulators
Researchers

WHAT ARE THE KEY MESSAGES?

- 1) The FAO/WHO and USFDA recognise differences in *V. parahaemolyticus* growth among oyster species.
- 2) *V. parahaemolyticus*, *E. coli* and *Salmonella* do not grow in Sydney rock oysters between 4 and 25°C
- 3) Results of the ASCRC project have been published in the peer-reviewed literature.
- 4) A forthcoming publication, that includes USFDA authors, recognises that *V. parahaemolyticus* has a different growth profile in Australian oyster species.

WHAT IS THE CALL TO ACTION?

(What is it you want people to do once you communicate the key message to them – i.e. what change of behaviour or action do you want them to take?)

- 1) Use the Oyster Refrigeration Index to design and manage oyster safety and quality in supply chains.
- 2) Contact the project PI for training.
- 3) Develop a new project to produce a *Vibrio* remote sensing tool for Australia.

COMMUNICATION CHANNELS

<i>Channel</i>	<i>Who by</i>	<i>When</i>
Seafood CRC magazine	CRC/Fernandez/Tamplin	Completed 2011
Workshops/meetings	Researchers/Regulatory agencies	Completed 2010

LESSONS LEARNED AND RECOMMENDED IMPROVEMENTS

WHAT IS YOUR FEEDBACK?

The PI recommends Research Training Grants as an effective means to extend the benefits of project research for stakeholders.

FURTHER ACTION REQUIRED IN REGARDS TO COMMERCIALISATION?

Work with companies to integrate the Index into data-logging software.

ACKNOWLEDGEMENTS

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