



## In this issue

*From the Subprogram Leader.....1*  
*New projects.....1*  
*STC/SAC Meetings .....2*  
*Health Subprogram Website.....2*  
*Announcements.....2*  
*Completed AAHS Project Summaries.....2*  
*Aquatic Animal Health Technical Forum.....4*  
*Australian Seafood CRC Postgraduate Scholarship..5*  
*Dept Primary Industries Victoria PhD opportunity...7*  
*Summary of Active Projects.....9*  
*Subprogram Contact Details.....10*

Some of the participants of the 2010 Aquatic Animal Health Technical Forum (AAHTF) workshop held at CSIRO AAHL, Geelong on 17-19 March 2010 [see information about this project on page 3].



## From the Subprogram Leader

### FRDC Aquatic Animal Health Subprogram R&D Plan

The FRDC Aquatic Animal Health Subprogram R&D Plan has been revised following internal and external review. The new plan - "FRDC Aquatic Animal Health Subprogram Research and Development Plan 2009-2012" - has now been finalised and is available on request (by email to [mark.crane@csiro.au](mailto:mark.crane@csiro.au)).

### DAFF/FRDC Aquatic Animal Health Training Scheme

*Health Highlights* subscribers in Australia will be aware of a joint DAFF/FRDC initiative to enhance aquatic animal health services by supporting health service providers with their further education and professional development. The DAFF/FRDC Aquatic Animal Health Training Scheme was launched in May 2010 and ten applications were received following the first call for expressions of interest. Five of these were successful in receiving conditional support from this scheme:

1. Marianne Douglas (DPIPWE, Tasmania) to undertake molecular diagnostics training.
2. Lynette Williams (CSIRO-AAHL) to coordinate the Aquatic Animal Health Forum and Skills Training Workshop.
3. Roger Chong (DEEDI, Biosecurity Queensland) to undertake fish pathology certification through the Fish Health Section of the American Fisheries Society.

4. Kevin Ellard and Debbie Grull (DPIPWE, Tasmania) to attend the AusVet Animal Health Services practical disease surveillance workshop.
5. Nick Gudkovs (CSIRO-AAHL) to undertake training in phylogenetic analysis of protozoan pathogens.

It is anticipated that there will be a second call for expressions of interest later this year. Further information on how to apply for a training scholarship will be available following a review of the first round.

### 2011 FRDC Aquatic Animal Health Scientific Conference

At the last AAHS committee meeting it was decided to convene the next AAHS Conference in Cairns on 5-8 July 2011. Please make a note of these dates in your diary and plan to make a presentation. We plan to make the 2011 Conference an **Australasian Aquatic Animal Health Conference** by opening it up to potential participants from the Asian region. An announcement promoting the conference will be posted out shortly but please inform your aquatic animal health contacts in Asia about this new development for the Cairns Conference.

## New Projects

Aquatic Animal Health Subprogram projects that were successful for the 2010-2011 funding cycle were:

2010/034. Aquatic Animal Health Subprogram: Investigation of an emerging bacterial disease in wild Queensland goppers, marine fish and stingrays with production of diagnostic tools to reduce the spread of disease to other states of Australia (Principal Investigator: Rachel Bowater, DEEDI, Biosecurity Queensland).

2010/036. Aquatic Animal Health Subprogram: Improved fish health management for integrated inland aquaculture through Better Management Practices (BMPs) (Principal Investigator: Tracey Bradley, DPI Victoria).

## **STC/SAC Meetings**

The FRDC AAHS met on 13 May 2010 to review pre-research proposals for the 2011-2012 funding cycle. Feedback was provided to the proponents and draft full proposals were received and reviewed at the AAHS meeting on 21 July 2010. AAHS feedback on draft full proposals has been forwarded to PIs. Revised draft full proposals that address AAHS comments should be submitted to AAHS via the FRDC FishNet website by 31 August for review and comment.

## **Health Subprogram Website**

Our website is located at the FRDC site and can be accessed directly under:

<http://www.frdc.com.au/research/Animal-Health>

There you can view this issue and all previous issues of *Health Highlights*.

## **Announcements**

All final reports are available through the FRDC. Go to [www.frdc.com.au](http://www.frdc.com.au) to purchase a copy.

### **ADVERTISEMENTS**

#### **Australian Seafood Cooperative Research Centre (CRC) Postgraduate Scholarship**

**2010**

#### **“Fishing-to-market: product-quality-based harvest strategies to increase profitability for greenlip abalone”**

For information on this Australian Seafood CRC Scholarship please go to page 5 of this newsletter.

#### **Dept Primary Industries Victoria and The University of Melbourne**

#### **PhD opportunity: Disease control in farmed Murray cod**

For information on this PhD opportunity please go to page 7 of this newsletter.

## **2011 FRDC Aquatic Animal Health Scientific Conference**

At the last FRDC AAHS committee meeting it was decided to convene the next Aquatic Animal Health Scientific Conference in Cairns on 5-8 July 2011. Please make a note of these dates in your diary and plan to make a presentation. We plan to make the 2011 Conference an **Australasian** Aquatic Animal Health Conference opening it up to potential participants from the Asian region. An announcement promoting the conference will be posted out shortly but please inform your aquatic animal health contacts in Asia about this new development for the Cairns Conference.

## **Newsletter submissions**

The Aquatic Animal Health Subprogram welcomes contributions to *Health Highlights* on all aquatic animal health R&D news and events – both within and outside the FRDC. We aim to assist the widespread exchange of information by including any of the following in each quarterly edition: project updates, milestone reports, final reports, research papers, project communication and extension outputs, info sheets, and letters to the editor. Announcements of conferences, workshops, meetings, etc are also welcome.

**Please forward contributions for the next edition of *Health Highlights* (December 2010) to Joanne Slater before 30 November 2010.**

## **Mailing list**

*Health Highlights* is distributed biannually to stakeholders via hard copy and email as well as being posted on the FRDC website at: <http://www.frdc.com.au>. To change contact details or to ensure inclusion on the *Health Highlights* mailing list, contact Joanne at:

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# Completed AAHS Project Summaries

**Project No. 2006/227:** Aquatic Animal Health Subprogram: Rapid strain identification of the bacterial fish pathogen *Streptococcus iniae* and development of an effective polyvalent vaccine for Australian barramundi.

## OBJECTIVES

1. Characterise the genetic and molecular basis by which biotypes of *S. iniae* vary in relation to capsular and surface protein antigen presentation and strain variation
2. Develop and implement a rapid antigen typing scheme for *S. iniae* and transfer rapid identification technology to regional laboratories
3. Develop a polyvalent vaccine against all known Australian strains of *S. iniae*
4. Verify the effectiveness of the vaccine in experimental challenge studies initially using the intraperitoneal injection route of immunisation in comparison with immersion.

## NON-TECHNICAL SUMMARY

### OUTCOMES ACHIEVED TO DATE

The genetic and molecular basis for serotype variation in *S. iniae* has been determined and serotype was found to be controlled by a limited number of genes within the large capsular operon. This information has enabled development of a reliable typing system that has been used to determine the variability of *S. iniae* isolates from farms in Australia. This knowledge has enabled several outcomes. Firstly, we have been able to direct formulation of current vaccines to ensure that vaccines for particular farms contain the necessary isolates making them more effective. Secondly, we have written a manual to enable accurate typing of future isolates from outbreaks of disease in Australia such that veterinary laboratories may advise vaccine companies when new strains arise. Finally, by determining the scope of variability amongst strains in Australia, we can recommend a vaccine formulation that should protect against all current isolates in Australia. This will permit registration of a universal (or generic) vaccine for use in Australia.

Fish can be routinely vaccinated against diseases caused by bacteria in the same way that other animals and humans are vaccinated. Vaccination exploits the natural immune system of the animal to remember and respond to a particular disease if it encounters it again. *Streptococcus iniae* is a bacterium that causes disease in farmed fish similar to meningitis and blood poisoning in humans. Treating this infection with antibiotics is difficult because antibiotics have to be fed to the fish and when the fish are sick, they don't eat the medicated feed. There is also the problem of bacteria

becoming resistant to antibiotic treatment, and this resistance can be transmitted to other bacteria that may be harmful to humans. Furthermore, specific food safety requirements such as maximum residue levels (MRLs) must be met before farmers are able to sell food animals, so a 'withdrawal period' may be required. This causes problems for the farmer, particularly if the fish are close to market size.

Vaccinating against *S. iniae* is possible in fish but it is not always successful because *S. iniae* can change its surface antigen (coat or capsular polysaccharide), meaning that vaccinated fish may not recognize and respond to the new strains and still become diseased. This is similar to flu in humans, where different strains arise each year and new vaccines have to be manufactured and distributed. With flu, it is very easy to type the virus based on two proteins on the surface, H (the haemagglutinin) and N (the neuraminidase), thus two genes can be identified to determine the virus type or types (e.g. H5N1) that are circulating through a population and therefore ensure that these types are in the 'flu shot' vaccine. Typing the surface of *S. iniae* is much more difficult as it has a carbohydrate coat which is indirectly controlled by a large suite of genes (more than 20).

The objectives of the present project were several-fold: Firstly, to see how many of these genes vary in *S. iniae*. Then to determine how many variants of each gene there are from farmed fish in Australia. With this information we can a) make sure that all of the correct variants from a particular farm are included in the vaccines for that farm; and b) potentially design a vaccine containing all relevant variants in Australia that can be produced as a single vaccine to be used on all farms.

The variability of the structure of the surface capsule (sugar coat) of *S. iniae* can be attributed to changes in 5 genes. Three of these genes are involved in determining the *amount* of capsule. One gene determines the *type* of sugars (the ratio of glucose to galactose) in the capsule, and one gene determines the *length* of the sugar chains. All three of these features can potentially change the way that the surface is 'seen' by the fish immune system, although a vaccination trial indicated that the gene that controls polymer chain length may be less important in determining how the fish immune system responds to the capsule. Even though variability was limited to few genes, the degree of variability in the genes that regulate the *amount* of capsule was unexpectedly high.

A reproducible and accurate typing system was developed and a manual drafted and disseminated to veterinary laboratories. This will enable accurate detection of any new isolates should they arise in the future.

Objective 3 was partially met: Based on the information generated from the typing, it is possible to recommend a range of isolates that should offer broad protection against Australian *S. iniae* isolates

and therefore formulate a polyvalent generic vaccine.

We were unable to meet objective 4, as a challenge model for *S. iniae* was insufficiently robust for vaccine testing and we were unable to resolve this during the present project lifespan or budget.

Based on results in this report it is possible to recommend formulation of a generic vaccine for Australian barramundi. Future work should include further typing of isolates, but it should focus predominantly on testing generic vaccine formulations in fish to ensure cross protection and on generating a dossier to permit registration of the vaccine.

**KEYWORDS:** Barramundi, aquaculture, disease, *Streptococcus iniae*, vaccines, diagnosis.

## ***Aquatic Animal Health Technical Forum***

In addition to the DAFF/FRDC Aquatic Animal Health Training Scheme, the Aquatic Animal Health Technical Forum (AAHTF) (FRDC Project No. 2008/357) is another initiative aimed at enhancing the professional development of technical staff at diagnostic laboratories in particular – but also aquaculture farm staff. Participation from the following groups involved in aquaculture/aquatic animal health is encouraged:

- Recent/new graduates/employees in the aquatic animal field
- Technicians
- Science graduates
- Veterinary graduates
- Aquaculture farm employees
- Honours and PhD students

An inaugural meeting of the forum was convened at the Fourth National FRDC Aquatic Animal Health Scientific Conference held in July 2009 and the concept received strong support from the then current forum members as well as other conference participants. Consequently, a second meeting incorporating an Aquatic Animal Health Technical Workshop was planned for the following year. This was convened at CSIRO Livestock Industries, Geelong in March 2010. Participants played an active role in ensuring the success of the workshop in that there was open and frank discussion of issues in an informal, non-competitive environment. Over the course of the workshop it was clear that a good rapport developed among the participants and, in addition to facilitating transfer of technical information, the workshop also provided a means to build trust among the forum members. While the forum has only been operating for a short time, with further promotion, the likelihood is that it will grow and develop into an essential part of the aquatic animal diagnostic laboratory network.

The forum also provides the participants with professional and personal development opportunities. The enhanced skills and expertise

gained by participants in the forum is likely to form an important part of laboratory staff training and competency development which are important aspects of National Association of Testing Authorities (NATA) accreditation for veterinary testing laboratories.

In summary, in its short life to date the forum has been able to enhance aquatic animal health outputs, strengthen the network of aquatic animal health experts and research providers and provide a training opportunity for young scientists interested in aquatic animal health.

The FRDC AAHS views this forum as an important part of the aquatic animal health laboratory network and the on-going professional development of aquatic animal health specialists. For these reasons the AAHS supported on-going funding for this forum from FRDC through the DAFF/FRDC Aquatic Animal Health Training Scheme. It is pleasing to announce therefore that FRDC has provided some further funding to subsidise activities of the forum for a second year (2010-11). Planning for the 2011 AAHTF workshop has commenced. At the last workshop, participant feedback indicated that more practical sessions would be useful. For those of you who are already AAHTF members please let Nette Williams know your preferences for the workshop. For those of you who are not members and wish to receive more information about AAHTF, or if you are interested in joining the forum and receiving participant benefits, please contact Nette Williams (email: lynette.williams@csiro.au).

## **Australian Seafood Cooperative Research Centre (CRC) Postgraduate Scholarship**

**2010**

### **“Fishing-to-market: product-quality-based harvest strategies to increase profitability for greenlip abalone”**

In collaboration with Flinders University, SARDI Aquatic Sciences and the University of South Australia, the Australian Seafood CRC invite applications for a PhD top-up scholarship to complete research on product-quality-based harvest strategies designed to increase the profitability of greenlip abalone.

This scholarship will provide an indexed, tax-free, PhD top-up of ~\$6,500 pa for up to three years, subject to satisfactory progress. If the successful applicant is an Australian or New Zealand citizen, or Australian Permanent Resident, they will receive a Research Training Scheme place, which provides an exemption from tuition fees. The scholarship has an additional operating budget of ~\$22 000 per year for 3 years and \$300 towards thesis binding in the 3<sup>rd</sup> year. A further \$1 000 per year is also available for defined mentor activities to be approved by the CRC. As a Seafood CRC student the successful candidate will be fully engaged in the CRC PhD program which will support the development of the student as a scientist in a number of innovative ways through annual workshops and mentoring programs (see [www.seafoodcrc.com](http://www.seafoodcrc.com)).

#### **Project Description**

Greenlip abalone support valuable wild-harvest fisheries, primarily in SA, Tas and WA. The largest of these is in SA, where the greenlip abalone TACC is ~390 t.yr<sup>-1</sup>. Increasing the volume of “premium” greenlip abalone product to the market will enhance market share and product image, and increase the current profitability of the fishery. This is due to the large beach price difference (up to \$10.kg<sup>-1</sup>) between “premium” and “non-premium” greenlip abalone, which is important in the current economic climate that includes a strong Australian Dollar and rising harvest costs.

Current knowledge on appropriate quality characteristics and measures, along with the cost and potential value of spatial and temporal variability in quality, is not well understood. Similarly, approaches to exploit this variation through targeted harvest strategies to improve product quality and consistency, and increase profitability are not well developed. Consequently, this project is focussed around understanding and predicting spatial and temporal variation in quality, and to use this information to develop harvest strategies that maximise yield, product value and profitability.

The objectives of the project are:

1. Document current knowledge and perceptions of spatial and temporal variation in greenlip abalone product quality characteristics;
2. Identify a suite of measures for industry-based indexing of greenlip abalone product quality traits;
3. Determine the range of variation, and associated scale of spatial and temporal variability, in greenlip abalone product quality characteristics from wild populations;
4. Model and evaluate the profitability, practicality and predictability of harvest strategies that maximise product quality attributes; and
5. Test effectiveness of current freezing technology using measures identified in Objective 2.

The student will be enrolled at Flinders University, Adelaide, but the position will be based at the Lincoln Marine Science Centre, Port Lincoln, South Australia. The project will require some travel to Eyre and Yorke Peninsulas for the collection of samples and interaction with the supporting industry, and to Adelaide for sample processing. The student will be co-supervised by Dr Stephen Mayfield and Dr Ben Stobart (SARDI Aquatic Sciences), Dr Trent D’Antignana (Flinders University) and Dr Miguel de Barras Lopes (University of South

Australia). External collaborators in the project include two industry mentors: Mr Jim George (Western Abalone Processors) and Mr Jonas Woolford (President: Abalone Industry Association of SA).

This scholarship will only be available to those who: are in receipt of or will be in receipt of a base rate scholarship at Flinders University such as an APA, FURS or FSERA; have completed at least four years of tertiary education studies at a high level of achievement and have an appropriate Honours 1 or high 2A (or equivalent) undergraduate degree; and are enrolled as full-time students in a PhD by **1 September 2010**.

### **Selection of Candidate**

#### *Selection criteria – essential*

1. An Honours (1<sup>ST</sup> or 2A) degree, Master's degree (Distinction average) or equivalent in a relevant discipline (e.g., Biological Sciences, Fisheries and Aquaculture);
2. Ability and experience in working both independently and as part of an interdisciplinary team;
3. Strong written and oral communication skills, including an ability to publish and present results of scientific research and to communicate effectively in a variety of scientific and non-scientific forums; and
4. Knowledge, understanding and commitment to Equal Employment Opportunity, Occupational Health and Safety, Workplace Diversity and Employee Participation.

#### *Selection criteria – desirable*

1. A commitment to applied research and an interest in supporting the development of Australia's seafood industry; and
2. An understanding of the biology, ecology and fisheries for greenlip abalone.

The final decision on the award of this scholarship will be based on an assessment of the requirements of the total Selection Criteria. The decision will be final but feedback may be given to unsuccessful candidates as to how to improve their future applications.

### **Additional information**

For additional information regarding this scholarship, organisational environment and other aspects of pursuing a PhD at Flinders University and with the Australian Seafood CRC, please contact: **Dr Stephen Mayfield** (SARDI Aquatic Sciences) on (08) 8207 5427 or 0401 122 108 or [stephen.mayfield@sa.gov.au](mailto:stephen.mayfield@sa.gov.au) or **Dr Trent D'Antignana** (Flinders University) on (08) 8683 2542 or [trent.dantignana@flinders.edu.au](mailto:trent.dantignana@flinders.edu.au)

### **Further information**

For information on how to apply, see the following link:

[http://www.flinders.edu.au/scholarships-system/main-display-scholarship-details.cfm?scholarship\\_id=3091](http://www.flinders.edu.au/scholarships-system/main-display-scholarship-details.cfm?scholarship_id=3091).

Applications for APA or equivalent scholarships are available at:

<http://www.flinders.edu.au/scholarships/postgrad-scholarships.cfm>.

International applicants must meet the English language requirement – see:

<http://www.flinders.edu.au/international-students/>

### ***PhD opportunity: Disease control in farmed Murray cod***

An exciting opportunity exists for a PhD studentship in a pioneering area of integrated aquaculture in Murray cod.

Horticultural properties in the north west of Victoria have begun utilising their large water holdings for Murray cod aquaculture. However, the farmers are geographically isolated, have little technical support and minimal research has been completed on this species in these settings.

This PhD project is suitable for those with an interest in veterinary epidemiology and pathology. The successful candidate will develop a high level of knowledge in the diseases that occur in farmed Murray cod. They will use this understanding to assist farmers to develop a series of management practices they can use to better predict when diseases are likely to occur and how to avoid them.

This project is funded by the Fisheries Research and Development Corporation in collaboration with the Victorian Department of Primary Industries (DPI) and the University of Melbourne.

#### **Project summary**

Murray cod aquaculture is a new and developing industry in inland Australia. Much of the existing industry is currently integrated into existing horticulture enterprises, and there is enormous potential for farming of Murray cod in agricultural dams.

Good fish health and biosecurity practices are critical to profitable production in these systems. However there are currently a range of health issues affecting productivity in Murray cod aquaculture. Many of these centre around the farmers' lack of control over water quality and supply in integrated systems, along with limited access to pathology services and veterinary professionals.

Through on-farm monitoring and sampling, the PhD student will investigate the prevalence of disease on farms, and their association with a range of environmental variables. The student will have the opportunity to develop skills in aquatic gross pathology and histopathology, epidemiology and farm management. The student will work closely with farmers to assist them in developing their own basic disease identification skills and gain a holistic understanding of how disease events can interact with water quality and management issues. The student will work in close collaboration with DPI and University of Melbourne researchers, along with other fish health specialists.

Disease surveillance data will be collected and used to develop formal fish health Better Management Practices which will equip farmers with an understanding of likely major disease outbreaks, causes, and how to mitigate negative affects on productivity. The findings from this project will help inform other Murray cod aquaculture enterprises in other parts of Australia.

#### **Academic criteria**

A four-year honours degree in a biological science or veterinary science from an Australian university, or a qualification or combination of qualifications considered by the Research Higher Degrees Committee to be equivalent. Applicants should have achieved an overall H1 (80-100%) or H2A (75-79%) grade in the relevant honours or masters degree, however

applicants who have completed a Bachelor of Veterinary Science will be assessed individually.

Applicants are normally required to have completed a research project / component that accounts for at least 25% of their year's work at 4th year or at masters level. Graduates of a Bachelor of Veterinary Science from an Australian institution are normally deemed to have met this requirement.

### **What does the scholarship provide?**

Applicants will apply for an Australian Postgraduate Award, which will provide a tax-free living allowance of \$22,500 per annum (2010 rate) if granted.

Project funds will cover the costs of fieldwork and project expenses.

For more information please contact:

#### **Dr Tracey Bradley**

Principal Veterinary Officer – Aquatic Animal Health

Department of Primary Industries:

Tel: +61 3 9217 4171

Email: [Tracey.Bradley@dpi.vic.gov.au](mailto:Tracey.Bradley@dpi.vic.gov.au)

### **How to apply**

Applicants should submit their application via the online form at Research Future Students: [www.futurestudents.unimelb.edu.au/grad/research/application/apply.html](http://www.futurestudents.unimelb.edu.au/grad/research/application/apply.html)

## Summary of Active Projects

Project No.	Project Title	Principal Investigator
2004/084	AAHS: Investigating and managing the <i>Perkinsus</i> -related mortality of blacklip abalone in NSW Phase 1 ( <i>Associated species: Haliotis</i> spp.)	Dr Geoff Liggins Department of Primary Industries, NSW Phone: 02 9527 8411 Email: geoff.liggins@dpi.nsw.gov.au
2007/225	AAHS: Metazoan parasite survey of selected macro-inshore fish of south-eastern Australia, including species of commercial interest ( <i>Associated species: multi-species</i> )	Dr Kate Hutson James Cook University, QLD Phone: 07 4781 6216 Email: kate.hutson@jcu.edu.au
2008/030	AAHS: Development of a DNA microarray to identify markers of disease in pearl oysters ( <i>Pinctada maxima</i> ) and to assess overall oyster health ( <i>Associated species: Pinctada maxima</i> )	Dr Brian Jones Department of Fisheries WA Phone: 08 9368 3649 Email: bjones@agric.wa.gov.au
2008/30.20	AAHS: Development of a DNA microarray to identify markers of disease in pearl oysters ( <i>Pinctada maxima</i> ) and to assess overall oyster health ( <i>Associated species: Pinctada maxima</i> )	Dr David Raftos Department of Biological Sciences Macquarie University Phone: 02 9850 8402 Email: draftos@rna.bio.mq.edu.au
2008/031	AAHS: Investigation of Chlamydiales-like organisms in pearl oysters, <i>Pinctada maxima</i> ( <i>Associated species: Pinctada maxima</i> )	Dr Brian Jones Department of Fisheries WA Phone: 08 9368 3649 Email: bjones@agric.wa.gov.au
2008/039	AAHS: Strategic planning, project management and adoption ( <i>Associated species: multi-species</i> )	Dr Mark Crane CSIRO AAHL Fish Diseases Laboratory Phone: 03 5227 5118 Email: mark.crane@csiro.au
2008/041	AAHS: Tools for investigation of the nodavirus carrier state in marine, euryhaline and freshwater fish and control of NNV through integrated management ( <i>Associated species: multi-species</i> )	Prof Richard Whittington University of Sydney, Camden, NSW Phone: 02 9351 1619 Email: richardw@camden.usyd.edu.au
2008/317	AAHS: Intensive pathology training workshop for laboratory diagnosticians ( <i>Associated species: multi-species</i> )	Dr Les Gabor EMAI, DPI NSW, Menangle NSW Phone: 02 4640 6371 Email: les.gabor@dpi.nsw.gov.au
2008/357	AAHS: Aquatic Animal Health Technical Forum ( <i>Associated species: multi-species</i> )	Nette Williams CSIRO AAHL Fish Diseases Laboratory Phone: 03 5227 5442 Email: nette.williams@csiro.au
2009/032	AAHS: Characterisation of abalone herpes-like virus infections in abalone ( <i>Associated species: Haliotis</i> spp.)	Dr Mark Crane CSIRO AAHL Fish Diseases Laboratory Phone: 03 5227 5118 Email: mark.crane@csiro.au
2009/044	AAHS: Surveys of ornamental fish for pathogens of quarantine significance ( <i>Associated species: multi-species</i> )	Prof Richard Whittington University of Sydney, Camden, NSW Phone: 02 9351 1619 Email: richardw@camden.usyd.edu.au
2010/034	AAHS: Investigation of an emerging bacterial disease in wild Queensland gropers, marine fish and stingrays with production of diagnostic tools to reduce the spread of disease to other states of Australia ( <i>Associated species: multi-species</i> )	Dr Rachel Bowater DEEDI, Biosecurity Queensland Phone: 07 4760 1592 Email: rachel.bowater@deedi.qld.gov.au
2010/036	Aquatic Animal Health Subprogram: Improved fish health management for integrated inland aquaculture through Better Management Practices (BMPs) ( <i>Associated species: Maccullochella</i> spp)	Dr Tracey Bradley DPI Victoria Phone: 03 9217 4171 Email: tracey.bradley@dpi.vic.gov.au

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