



In this issue

<i>From the Subprogram Leader.....</i>	<i>1</i>
<i>STC/SAC Meetings</i>	<i>1</i>
<i>Health Subprogram Website.....</i>	<i>1</i>
<i>Announcements.....</i>	<i>1</i>
<i>Courses and Workshops.....</i>	<i>2</i>
<i>Aquatic Animal Health Technical Forum.....</i>	<i>3</i>
<i>Completed AAHS Project Summaries.....</i>	<i>3</i>
<i>Summary of Active Projects.....</i>	<i>9</i>
<i>Subprogram Contact Details.....</i>	<i>10</i>

From the Subprogram Leader

First FRDC Australasian Scientific Conference on Aquatic Animal Health

Planning for the 1st FRDC Australasian Scientific Conference on Aquatic Animal Health is well underway. You should all know by now that the conference will be held, 5-8 July 2011, in Cairns at a new venue for the FRDC AAH Scientific Conference – The Pullman Reef Hotel (see hotel details at <http://www.accorhotels.com/gb/hotel-2901-pullman-reefhotel-casino/media.shtml>). The hotel is working closely with us to ensure that the conference is a success. A second announcement about the conference, with the conference registration form and abstract proforma, will be forwarded in the New Year. Furthermore, I am delighted to announce that the Keynote Presenter at the 2011 conference will be Dr. Teruo Miyazaki – Professor, Dept. Life Science, Fish Pathology, Graduate School of Bioresources, Mie University, Japan. Prof. Miyazaki is a member of the Iridovirus WG of the International Committee of Taxonomy of Viruses (ICTV) and recognized international expert on a range of aquatic animal health issues. Prof. Miyazaki will make a significant contribution to the Cairns conference and I urge you to take this opportunity to come to Cairns and network with aquatic animal health specialists from throughout the region. In addition to the **Keynote Speaker**, we expect to have one or two **Invited Speakers** from overseas to further enhance the conference program.

The Pullman Reef Hotel, Cairns – Venue for the First Australasian Scientific Conference on Aquatic Animal Health, July 2011. See information on this page and look out for the second announcement coming soon.



FRDC News: New application process to be implemented for the 2012/13 funding cycle

Please be advised that FRDC is implementing a new application process for funding. Further details will be available in the New Year.

STC/SAC Meetings

The FRDC AAHS met on 8 September 2010 to review second draft full proposals and on 9 December 2010 to review final full proposals. AAHS feedback on the second draft full proposals was forwarded to PIs. AAHS review of aquatic animal health proposals for the 2011/12 funding round has been completed and advice has been forwarded to the FRDC Board.

Health Subprogram Website

Our website is located on 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* - in addition to finding other information about the FRDC Aquatic Animal Health Subprogram.

Announcements

All final reports are available through the FRDC. Go to www.frdc.com.au to purchase a copy.

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* (July 2011) to Joanne Slater before 30 May 2011.

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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Courses and Workshops

1st NEW ZEALAND AND AUSTRALIA FISH IMMUNOLOGY WORKSHOP 2011

Hosted by:

**The Centre for Aquaculture and Biotechnology
National Institute of Water and Atmospheric
Research Ltd.
Greta Point, Wellington
15-18 March 2011**

Organizers: Dr. I. Salinas, NIWA, New Zealand; Dr. B. Nowak, The Australian Maritime College, University of Tasmania

Duration: 4 days

Workshop fees: NZ\$750.00. Fees include workshop materials, lunch, morning and afternoon tea. Accommodation or travel expenses are not included.

Total number of students: 16

Description: The objective of the present workshop is to provide participants with advanced knowledge, both theoretical and practical, on the immune system of fish. The workshop will introduce basic and advance knowledge on fish welfare, immunoprophylaxis in aquaculture and the evolution of the immune system. It is directed to academic and company researchers as well as technicians and management staff in the aquaculture industry.

Program: full program to be announced. It will cover a combination of 1h lectures and lab practical sessions on fish innate and adaptive immune responses, immunopathology of relevant diseases in fish farming, assessment of vaccine effectiveness, fish immune cells and organs.

Master and PhD students may be eligible for a reduced fee.

For further information contact: Dr. I. Salinas (i.salinas@niwa.co.nz)

FISH HISTOPATHOLOGY WORKSHOP 2011

The University of Tasmania, National Centre for Marine Conservation and Resource Sustainability AMC at Launceston, is offering the following workshop:

Fish Histopathology – Tuesday 8 February to Thursday 10 February, 2011

Fee: \$700 plus GST

Laboratory style (limit 12) - conference microscopes and teaching software

The courses are taught by Dr Judy Handler, Dr Stephen Pyecroft, Dr Brian Jones and Professor Barbara Nowak. Small (4 participants) groups ensure teaching addresses the level of individual experience. The course caters for everyone: from beginners to advanced. A one-day introduction to histology could be arranged on Monday 7 February if any participants were interested (additional cost). We look forward to receiving your application.

For further information and application forms please contact Karine Cadoret kcadoret@amc.edu.au or Barbara Nowak B.Nowak@utas.edu.au

Please see registrations details in the appendix to this newsletter.

FISH IMMUNOLOGY WORKSHOP

Wageningen

April 17–21, 2011

Please see information about this workshop in the appendix to this newsletter.

Aquatic Animal Health Technical Forum

Please note that the Aquatic Animal Health Technical Forum (AAHTF) has funding for a further workshop to be held in 2011 (see below). For general information about AAHTF please contact Nette Williams (email: lynette.williams@csiro.au).

Aquatic Animal Health Technical Forum Workshop

Wednesday 30th March to Friday 1st April 2011

Workshop to be hosted by
Fish Health Unit

Department of Primary Industries, Parks, Water and Environment

Accommodation is available at Quest Apartments Launceston
16 Paterson Street
Launceston TAS 7250
Phone 03 63 333 555

AAHTF subsidy of approximately \$250 is available to each participant. The number of participants is limited but there are still a few places available.

For information about this workshop and registration please contact Belinda Jones (email: belinda.jones@dpiwwe.tas.gov.au) at DPIWWE, Tasmania.

Completed AAHS Project Summaries

Project No. 2004/084: AAHS: Investigating and managing the *Perkinsus*-related mortality of blacklip abalone in NSW Phase 1 (*Associated species: Haliotis spp.*)

OBJECTIVES:

1. Compile and document the historical evidence about the spread of *Perkinsus*-related mortality of abalone in NSW.
2. Describe the pathogenesis and make initial investigations of the epizootiology of the

mortality of abalone with particular reference to the role of *Perkinsus*.

3. Contribute to the development of strategies to manage populations of abalone that have, or might be, affected by *Perkinsus*-related mortality and, in particular, evaluate the need for a second phase of research.

NON-TECHNICAL SUMMARY

OUTCOMES ACHIEVED TO DATE

All objectives of this project have been achieved. Historical evidence about mass mortalities of abalone in NSW was collected through structured interviews with divers and the timing and locations of these events was documented. Based on information from interviews with divers, fishery-dependent catch and effort data from the fishery and fishery-independent survey data, the depletion of abalone stocks prior to and since documented mortality events was estimated.

A broad-scale survey of the prevalence and intensity of *Perkinsus* infections in abalone and related analyses and conclusions concerning the geographic distribution of *Perkinsus* sp., *P. olsenii* and variant strain or species (*Perkinsus* sp.-variant ITS), patterns of prevalence and intensity of infections among locations and among sites within locations and underpinned analyses concerning the pathogenesis and epizootiology associated with documented mortalities and perkinsosis.

Information about the pathogenesis of *Perkinsus* sp. and *P. olsenii* infections in abalone came from examination of the histology associated with a subset of samples from the broad-scale survey. Findings including the systemic nature of infections associated with substantial tissue necrosis, organ damage and haemocyte activity provided direct evidence that *Perkinsus* sp. and specifically, *P. olsenii*, is pathogenic to blacklip abalone in NSW.

Investigations of the epizootiology of perkinsosis and associated mortalities of abalone included: investigation of infection prevalence and intensity related to population variables; a small-scale survey to identify alternative host species; the likelihood of environmental variables contributing to the cause of documented mortalities; analyses of the consistency of available evidence with alternative hypotheses concerning factors involved in the cause of documented mortalities; the consistency of available evidence with alternative hypotheses concerning the historical distribution of *Perkinsus* sp. along the NSW coast; and identification of mechanisms of transmission (passive and active) that may have been involved in the spread of perkinsosis and associated mortalities.

Based on current knowledge of the geographic distribution of *Perkinsus* sp., pathogenesis and epizootiology of *Perkinsus* sp. in NSW and findings from other studies in Australia and internationally, options of management of the population of

abalone and fisheries in NSW were reviewed. To gain further understanding of the epizootiology of perkinsosis and related mortalities and inform management in the future, multiple high-priority monitoring and research programs were recommended.

Since the early 1990's, a significant proportion of blacklip abalone (*Haliotis rubra*) along approximately 500 km of the NSW coastline between Port Stephens and Jervis Bay have died. Sporadic histological examination of moribund abalone since 1992 and a survey of infection prevalence in abalone using Ray's test in 2002 confirmed infections of a protistan parasite, *Perkinsus* sp., in abalone. It has been assumed that the species is *P. olsenii*, but this has not been confirmed (prior to this project). It has been unclear to what extent mortality of abalone has been caused by *Perkinsus*. Other factors may also have been responsible for the mortalities. Should the *Perkinsus*-related mortality spread further south into increasingly high density stocks of abalone, there would be a rapid escalation of impacts.

Against this background, there was a need to: document historical evidence about the spread of *Perkinsus*-related mortality of abalone in NSW; describe the pathogenesis and epizootiology associated with the mortality of abalone and the role of *Perkinsus*; and to contribute to the development of management strategies to manage populations of abalone that have, or might be affected by *Perkinsus*-related mortality and evaluate the need for further research.

Based on structured interviews of divers, mass mortalities of abalone occurred during the year (+/-1 year): 1992 on the Central Coast of NSW, 1993 at Sydney-Wollongong, 1996 at Kiama and 2000 at Port Stephens. A sudden decline in abundance of abalone, unaccompanied by observations of morbidities or mortalities, occurred at Jervis Bay during 2000–2002.

Indices of abundance of abalone were derived from fishery-dependent catch and effort data, fishery-independent surveys and estimates provided by interviewed divers. Stocks of abalone between Port Stephens and Jervis Bay were significantly depleted by at least 63%, due to mortality, prior to the documented mortality events in the 1990's. Stocks were further depleted by an estimated 74% due to a combination of the documented mass mortality events during the 1990's and limited fishing. These estimates suggest that the stock of abalone between Port Stephens and Jervis Bay may have been depleted to less than 10% of virgin abundance. Given limited larval dispersal and localised recruitment in abalone populations, the recovery of stocks of blacklip abalone between Port Stephens and Jervis Bay is likely to be a slow process.

A broad-scale survey of the prevalence and intensity of *Perkinsus* infections in abalone in 2005 involved the collection of 1190 abalone from 59 sites within 12 locations along the NSW coast. Three diagnostic methods were used to identify infections of *Perkinsus*: Ray's test on samples of gill tissue from all abalone sampled; histology on multiple organs/tissues on a subset of abalone; and polymerase chain reaction (PCR) assays and subsequent gene sequencing on gill and mantle tissue from a subsample of abalone.

Ray's test was the most sensitive diagnostic method for the detection of *Perkinsus*. Histology detected only 33% of the infections and PCR detected only 54% of the infections detected by Ray's test. *P. olsenii* was positively identified, by PCR and gene sequencing, as a *Perkinsus* species infecting blacklip abalone in NSW. Identification, by PCR and gene sequencing, of a *Perkinsus* sp. with a previously unknown ITS-region gene sequence (referred to as *Perkinsus* sp.-variant ITS) suggests the presence of a variant strain of *P. olsenii*, or alternatively, a previously undescribed *Perkinsus* species.

In 2005, *Perkinsus* sp. infections in abalone were identified at multiple survey sites, within multiple survey locations between Point Perpendicular (near Laurieton) on the north coast of NSW) and St. Georges Head (near Jervis Bay) on the south coast of NSW. *Perkinsus* sp. was also identified at a single isolated site (Merimbula) on the far south coast of NSW. Detection of *Perkinsus* sp. infections in abalone during 2005, at locations to the north and south of the previously documented range, represents an extension of the documented geographic range of *Perkinsus* sp. infections in blacklip abalone in NSW. Actual extension of geographic range since 2002 cannot be concluded because the northern and southern boundaries of distribution identified in 2005 were outside the geographic range of the 2002 survey. Within the documented geographic range of *Perkinsus* sp., *P. olsenii* was identified by PCR between Port Perpendicular (within location "North Coast") and St. Georges Head (within location "South Jervis Bay"). *Perkinsus* sp.-variant ITS was identified by PCR between Crowdy Head North (within location "Crowdy Head") and St. Georges Head (within location "South Jervis Bay") and on the far south coast at Merimbula (within location "Tathra / Eden").

Prevalence of *Perkinsus* sp. infections in abalone in 2005 differed significantly among locations and among sites within locations. Prevalence was greatest in populations of abalone at the northern and southern margins of the infected zone between locations North Coast and South Jervis Bay (excluding the "outpost" of infection at Merimbula). This was consistent with the pattern of prevalence found in 2002, when maximum prevalence occurring at the northern (Port Stephens) and

southern (South Jervis Bay) boundaries of the infected zone.

Intensity of *Perkinsus* sp. infections in abalone (based on Ray's test grade) differed significantly among locations in 2005. Although there was no significant difference in the prevalence of *Perkinsus* sp. infections in abalone in 2005 compared to 2002, intensity of infections was significantly greater in 2002 compared to 2005. The greater intensity of *Perkinsus* sp. infections in 2002 compared to 2005 explains the better relative sensitivity of Ray's test and histology in 2002 compared to 2005. This is because the relative sensitivity of these diagnostic methods is better for high-grade infections than low-grade infections.

Infections of *Perkinsus* sp. in abalone, identified by histology, were generally systemic with intestine, gill, kidney, stomach and heart most frequently infected. Less frequently infected were epipodium, the digestive gland, oesophagus, muscle and haemolymph within the hemocoel. These observations were consistent with findings from a previous study on samples from a survey in 2002-03.

Substantial tissue and organ damage occurred in abalone with high-intensity infections. Necrotic tissue associated with *Perkinsus* sp. trophozoites and tomites was observed in samples from 2002-03 and 2005. In the most severe infections (2002-03), disruption of the gut epithelium and infarction in the gills, suggested impairment to normal nutrient absorption and respiration. Infiltration and aggregation of haemocytes provided evidence of host response and there was a positive relationship between infection intensity (Ray's test grade) and haemocyte activity. The evidence of substantial tissue necrosis, organ damage and haemocyte activity associated with *Perkinsus* sp. cells in samples from both 2002-03 and 2005 provides solid evidence that *Perkinsus* sp. is pathogenic to blacklip abalone in NSW. More specifically, pathology associated with the 5 specimens from 2005, within which *P. olsenii* was positively identified by PCR, provides solid evidence of *P. olsenii* as a pathogen in blacklip abalone in NSW. Because there was no observation of *Perkinsus* by histology for any of the 5 abalone identified by PCR and gene sequencing as having *Perkinsus* sp.-variant ITS infections, the pathogenicity of *Perkinsus* sp.-variant ITS remains unresolved.

Infection intensity did not affect the length-weight condition of abalone sampled in 2005. Because extremely high-grade infections of *Perkinsus* sp. (Ray's grade > 4) were absent from samples in 2005, this conclusion is restricted to abalone with lower infection intensity (i.e., < Ray's grade 3). The lack of encapsulation of *Perkinsus* sp. cells by haemocytes, as described for *P. olsenii* infections in South Australian blacklip abalone, suggests a difference in the virulence of *P. olsenii* (or strain of *P. olsenii* or *Perkinsus* sp.) and/or a difference in the

resistance of blacklip abalone in NSW compared to South Australia.

No pathogens other than *Perkinsus* sp. were identified by histology in tissue samples from the 2005 survey. Nor were any other pathogens identified in samples from the 2002-03 survey.

The importance of population variables including gender and size on prevalence and intensity of infections was examined. Prevalence of *Perkinsus* sp. infections was gender-specific with infections more frequent in female (10.9%) than in male (5.0%) abalone in 2005. There was no gender-specific difference in infection intensity. Prevalence and intensity of *Perkinsus* sp. infections in abalone during 2005 was not dependent on the size (length) of abalone.

A small-scale survey to identify *Perkinsus* sp. infections in alternative mollusc hosts, at sites where *Perkinsus* sp. was prevalent in abalone (in the vicinity of Jervis Bay), did not identify any alternative host species.

Investigations were made of the likelihood of environmental variables (acting alone or as auxiliary factors operating with *Perkinsus* sp.) as the cause of documented mortality events. There were no environmental factors that were consistently associated by interviewed divers with mortality events that were consistent across the documented mortality events. The potential to examine associations between water quality and observed mortality events was limited by the spatial and temporal scales at which such data was available. The documented mortality events at specific locations in specific years were not consistently associated with increases, decreases, maximum or minimum values in any of the indices of water temperature examined. Mortality events were, however, associated with indices of water temperature in excess of 20°C and the greater intensity of infections identified in 2002 compared to 2005 corresponded with greater water temperature in 2002 compared to 2005.

Based on the consistency of findings from this project and from other studies in Australia and internationally, with hypotheses concerning factors involved in the cause of documented mortality events, the likelihood of alternative hypotheses of cause being correct was graded "low", "medium" or "high". It was concluded highly likely that *Perkinsus* sp. was a necessary factor for the documented mortality events. The likelihood that water temperature (above some threshold) was an additional component of cause was also considered high. Whether or not another environmental factor(s) was also a component of cause was indeterminate. It was also considered likely, based on available evidence, that *Perkinsus* sp. has not been endemic and broadly distributed along the NSW coast for many years prior to the documented mortality events. The spatial and temporal pattern

of documented mortalities and finding that *Perkinsus* sp. Infections were greatest at the boundaries of the infected zone were consistent with a progression of *Perkinsus* sp. through naïve populations of abalone.

Transmission of *Perkinsus* sp. within and among populations of abalone at locations along the NSW coast may have resulted from passive or active mechanisms. Multiple fishing-related activities were identified that could have translocated abalone infected with *Perkinsus* sp. and facilitated active transmission of the parasite into populations of abalone that were disease-free. Activities that involved translocations at spatial scales of less than 100's of km included: harvesting of abalone by divers at individual drops; hanging of abalone over the side of the boat or pumping water over abalone in the boat during a day's fishing; hanging of catch during multi-day trips; and shucking of abalone and discard of viscera. Activities that involved translocation of abalone at greater spatial scales included: movement of divers, boats and equipment between locations; movement of catches to processors and distributors; and the distribution of abalone viscera as bait.

In addition to these possible mechanisms for active transmission, experiments involving the translocation of abalone from the wild to a breeding facility and the subsequent translocation of hatchery-reared juveniles and larvae from the facility to the wild between 1999 and 2001 could have inadvertently translocated abalone carrying *Perkinsus* sp. infections.

Whereas the spatial and temporal pattern of documented mass mortality events and of *Perkinsus* sp. infections between the north coast of NSW and South Jervis Bay was consistent with the passive transmission of *Perkinsus* sp. among adjacent populations of abalone, possibly supplemented by active mechanisms of transmission, the isolated "outpost" of *Perkinsus* sp. infection in abalone at Merimbula is likely to have resulted from an active mechanism of transmission. The mechanism could have involved a mobile marine species or bird acting as a vector, the fishing-related activities that involved translocation of abalone or abalone viscera over 100's of km, or perhaps the translocation/reseeding experiments that included the release, in 2001, of hatchery-reared juvenile abalone at Tura Pt (5 km to the north of the Merimbula site at which *Perkinsus* sp. was identified in 2005).

A precautionary approach to the management of populations of abalone affected by *Perkinsus* sp. in NSW is warranted. Whilst this project has made significant in-roads into understanding the pathogenesis and epizootiology of perkinsosis and the documented mortality of abalone during the 1990's, understanding of the epizootiology of perkinsosis in NSW and in other Australian jurisdictions is incomplete. There is potential for

further impact of the disease on the commercial and recreational fishery concentrated on the south coast of NSW.

Closures to fishing in areas where *Perkinsus* sp. is known to be present, accompanied by closures in buffer zones between infected areas and disease-free areas is one option for limiting the possibility of transmitting *Perkinsus* sp. from areas where the parasite is known to occur into disease-free areas. This would involve, in NSW, an extension of the existing closure between Port Stephens and Jervis Bay to the north coast of NSW, a buffer zone implemented south of St. Georges Head (South Jervis Bay) and another closure, including buffer zones, implemented in the vicinity of Merimbula.

Another approach to minimising the risk of *Perkinsus* sp. transmission concerns modification of existing fishing practices that involve a risk of transmission. The development of "Standard Operating Procedures" for the decontamination of equipment (tools, boats, people and clothing, transport containers) provides a means of minimising this risk of translocating viable cells of *Perkinsus* sp. resulting from the movement of divers, boats and equipment between locations. Standard operating procedures already exist as a voluntary code of conduct. The level of compliance with this code of conduct is unknown and the option of legally requiring and enforcing standard operating procedures needs to be evaluated.

In the absence of closures preventing the harvesting of abalone potentially infected with *Perkinsus* sp., it is inevitable that abalone infected with *Perkinsus* sp. will be received by abalone processors. A review of current procedures used by processors and audit against best practice procedures is recommended.

To counter the risk of transmitting *Perkinsus* sp. (and abalone viral ganglioneuritis), the distribution and use of abalone viscera as bait or burley was made illegal in NSW in December 2007.

Given the absence of fishery-dependent data since the closures to commercial fishing between Port Stephens and Jervis Bay and limited fishery-independent survey sites, assessment of the current status of the severely depleted abalone stocks in this region is problematic. A structured fishing survey, done in 2007, involved a limited number of commercial abalone divers fishing at specified drops (specific locations) between Port Stephens and Jervis Bay. The specified drops at which fishing occurred were selected from "historically productive drops" identified by the commercial abalone divers interviewed during this project. Continued monitoring of abundances of abalone at fishery-independent survey sites within this region also provides a means of monitoring abundance and recovery of stocks in this region of the fishery and will inform management decisions concerning access of fishers to the resource.

Whether abalone stocks in *Perkinsus* sp.-affected areas of Region 1 can sustain commercial harvesting has not yet been determined. In addition to controlling risks of transmission of *Perkinsus* sp., a future harvest strategy for this region will need to recognise the possibility that there may be future mortality events due to *Perkinsus* sp. in addition to mortality from future fishing.

Given the incomplete understanding of the epizootiology of perkinsosis and associated mortality of abalone in NSW, priorities for future monitoring and research were identified. Future repeats of the broad-scale survey completed in 2005 would facilitate monitoring of any future expansion in the geographic range of *Perkinsus* sp. infections in abalone. Monitoring and associated sampling of future mortality events is also fundamental to furthering understanding of epizootiology. Surveys, supplementary to repeats of the broad-scale survey, could be done to examine intra-annual and inter-annual variations in prevalence and intensity of *Perkinsus* sp. infections. As a component of future broad-scale surveys, application of a suitably sensitive testing methodology for the identification of *P. olseni* and *Perkinsus* sp.-variant ITS (ideally real-time PCR), across multiple organs would provide further evidence for the presence/absence of *Perkinsus* sp. infections in abalone sampled from sections of the NSW coast for which infections were not detected during the 2005 survey. Sampling of mollusc species other than abalone and subsequent testing for the presence of *Perkinsus* sp. infections, in conjunction with a repeat of the broad-scale survey, would directly address the uncertainty associated with the identification of alternative hosts.

As an adjunct to the next repeat of the broad-scale survey, or as a stand-alone survey, identification of the existence of *Perkinsus* sp. infections at survey sites where juvenile abalone were released on the south coast of NSW during the reseeding experiments during 1999 – 2001 and at control sites (where reseeding did not occur) would provide a test of the hypothesis that *Perkinsus* sp. infections exist in abalone at sites in close proximity to reseeding sites but do not exist at sites away from reseeding sites on the south coast of NSW.

Uncertainty about sufficiency of the presence of *Perkinsus* sp. and water temperature elevated above some threshold as the cause of the development of perkinsosis and subsequent mortality of abalone can be further investigated in several ways. In particular, there is a need for controlled laboratory-based experiments concerning the role of water temperature in disease progression.

Development and establishment, in Australia, of real-time PCR assays for the diagnosis of *P. olseni* and *Perkinsus* sp.-variant ITS infections in tissue samples is recommended and underpins the fast

and efficient identification of *Perkinsus* in samples from future surveys and experiments. Clarification of the genetic and taxonomic status and geographic distribution of *Perkinsus* sp.-variant ITS is also required.

KEYWORDS: *Perkinsus* sp., *Perkinsus olseni*, perkinsosis, Ray's test, histology, PCR, pathogenesis, epizootiology

Project No. 2008/317: AAHS: Intensive pathology training workshop for laboratory diagnosticians (*Associated species:* multi-species)

OBJECTIVES:

1. To facilitate the opportunity of intensive training of new pathologists from diagnostic veterinary laboratories
2. To facilitate updating of pathology skills in senior pathologists
3. Expose both experienced and new pathologists to Dr J Handler prior to retirement
4. Facilitate interaction of pathology staff at the State Veterinary laboratories of the Tasmanian and NSW governments

NON-TECHNICAL SUMMARY

OUTCOMES ACHIEVED TO DATE

From the fish specific training perspective, the senior pathologists from the NSW system have had minimal aquaculture experience. Additionally, the four new pathologists developed an excellent fundamental background base from Dr Handler upon which to build further expertise.

The reciprocal training session undertaken by the principal author at the DPI Tasmania laboratory assisted the group of training pathologists prepare for further formal examinations.

During the week of 16-21/1/09, Dr Judith Handler visited the Veterinary Laboratory, DII, EMAI Menangle for five days of intensive histological and general aquatic diagnostic pathology training. Present were: Drs R Reece, S Hum, A Thompson, Z Spiers, E Lee, M Gabor, J Go, L Gabor from DII NSW and Drs M Dennis (U Syd), M Landos (Future Fisheries) and C Sangster (Taronga Zoo). Additional invitations were made to Private pathologists, and, other government agencies. Augmented by teaching modules already produced on behalf of AAPSP, Dr Handler spent significant time examining actual cases, production issues and health issues at the multiheaded microscope. A reciprocal visit by the author to the Tasmanian laboratory was undertaken in January, the aim of which was to expose some of the more senior pathologists to specialist level training.

KEYWORDS: Pathology, aquaculture, training.

Project No. 2008/357: AAHS: Aquatic Animal Health Technical Forum (*Associated species:* multi-species)

OBJECTIVES:

1. Establish an email discussion group initially consisting of contacts from known aquatic animal health laboratories.
2. Develop a current listing of aquatic animal health technical forum members and their capabilities.
3. Organise an inaugural meeting of potential forum participants attending the AAHS Cairns conference, July 2009.
4. Following the inaugural meeting prepare an operational plan for the further development of the forum.
5. Plan a workshop in March 2010, including technical presentations and a business meeting.
6. Review the effectiveness of the forum (e.g. level of participation and participant feedback on benefits for professional development).

NON-TECHNICAL SUMMARY

OUTCOMES ACHIEVED TO DATE

The overall outcome of this project has been the successful establishment of an aquatic animal health technical forum - a core group of aquatic animal health specialists with varying levels of expertise – that is used as a means for information transfer and skills development.

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. Eighteen 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 national aquatic animal diagnostic laboratory network.

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

gained by 18 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 national network of aquatic animal health experts and research providers and provide a training opportunity for young scientists interested in aquatic animal health

KEYWORDS: Aquatic animal health; diagnostics; technology transfer

Summary of Active Projects

Project No.	Project Title	Principal Investigator
2007/225	AAHS: Metazoan parasite survey of selected macro-inshore fish of south-eastern Australia, including species of commercial interest (<i>Associated species</i> : multi-species)	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</i> : <i>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</i> : <i>Pinctada maxima</i>)	Dr David Raftos Macquarie University NSW 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</i> : <i>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</i> : multi-species)	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</i> : multi-species)	Prof Richard Whittington University of Sydney, Camden, NSW Phone: 02 9351 1619 Email: richardw@camden.usyd.edu.au
2009/032	AAHS: Characterisation of abalone herpes-like virus infections in abalone (<i>Associated species</i> : <i>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</i> : multi-species)	Prof Richard Whittington University of Sydney, Camden, NSW Phone: 02 9351 1619 Email: richardw@camden.usyd.edu.au
2009/072	AAHS: Risk Analysis – Aquatic Animal Diseases Associated With Bait Translocation (<i>Associated species</i> : multi-species)	Dr Ben Diggles DigsFish Services Pty Ltd Phone/fax 07 3408 8443 Mob. 0403 773 592 Email: ben@digsfish.com
2009/075	TRF AAHS: Determining the susceptibility of remnant populations of abalone previously exposed to AVG (<i>Associated species</i> : Abalone)	Vin Gannon Victorian Abalone Divers Association Phone: 03 5529 2001 Mob. 0418 292 004 Email: vin@vada.com.au
2009/315	PD Program: scholarship program for enhancing the skills of aquatic animal health professionals in Australia (<i>Associated species</i> : multi-species)	Jo-Anne Ruscoe FRDC Phone: 02 6285 0423 Email: jo-anne.ruscoe@frdc.com.au
2010/034	AAHS: 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 (<i>Associated species</i> : multi-species)	Dr Rachel Bowater DEEDI, Biosecurity Queensland Phone: 07 4760 1592 Email: rachel.bowater@deedi.qld.gov.au

2010/036	AAHS: Improved fish health management for integrated inland aquaculture through Better Management Practices (BMPs) (Associated species: <i>Maccullochella</i> spp)	Dr Tracey Bradley DPI Victoria Phone: 03 9217 4171 Email: tracey.bradley@dpi.vic.gov.au
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Subprogram Contact Details

Name	Telephone	Fax	Email
Mark Crane, <i>Aquatic Animal Health Subprogram Leader</i>	03 5227 5118	03 5227 5555	mark.crane@csiro.au
Joanne Slater, <i>Aquatic Animal Health Subprogram Coordinator</i>	03 5227 5427	03 5227 5555	joanne.slater@csiro.au
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Crispian Ashby, <i>Fisheries Research & Development Corporation</i>	02 6285 0416	02 6285 4421	crispian.ashby@frdc.com.au
Scientific Advisory Committee (SAC)			
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Nick Moody, <i>AAHL Fish Diseases Laboratory, AAHL, CSIRO LI, Geelong, Victoria</i>	02 5227 5749	02 5227 5555	nick.moody@csiro.au
Barbara Nowak, <i>University of Tasmania, Launceston, Tasmania</i>	03 6324 3814	03 6324 3804	B.Nowak@utas.edu.au

FISH HISTOPATHOLOGY WORKSHOP

Registration Form / Tax Invoice

University of Tasmania, Launceston Tas. 7250 ABN 30 764 374 782

Please print clearly.

A. Delegate Information

Title: Given name: Family name:

Organisation:

Street address:

Suburb: Postcode:

Telephone: : Email:

Histopathology background:

Special Dietary Requirements/Allergies:

B. Registration Fee *(registration includes conference sessions and all catering breaks including lunches)*

Fish Histopathology Workshop (8-10.02.2011)	<input type="checkbox"/> \$770 (includes GST)
Introduction to Fish Histopathology (7.02.2011)	<input type="checkbox"/> \$220 (includes GST)

Total payment \$ _____ (including GST)

C. Payment Options *(upon payment, this registration form will become a tax invoice for GST purposes. A separate invoice will not be issued)*

Enclosed is a cheque for total \$ _____ (including GST)

made payable to: University of Tasmania

Please charge a total \$ (including GST) Mastercard Visa

Card Number _ _ _ _ - _ _ _ _ - _ _ _ _ - _ _ _ _ Expiry Date: _ _ / _ _ .

Card holder name:

Signature

Forward this form and payment by post or fax to:

Karine Cadoret NCMCRS, Locked Bag 1370, LAUNCESTON 7250

tel: 03 6324 3854; fax: 03 6324 3804; email: Karine.Cadoret@amc.edu.au

Cancellation policy: Cancellations must be received in writing. Cancellations received less than 14 days prior to event commencement will forfeit 50% of the total registration payable (GST included).

Cancellations received less than 3 days prior to event will not be refunded.

Disclaimer: Please note that registration places are limited and will be allocated in a strictly first in payment basis. IN the event that no space is available you will be notified immediately. If you do not receive written confirmation notice please call to confirm registration. AMC reserves the right to make change to the program as circumstance dictate. Every effort will be made to ensure a program of equivalent standard.



FISH HISTOPATHOLOGY WORKSHOP

Tuesday 8 February 2011 to Thursday 10 February 2011

Science Building, Old School Road NEWNHAM.

BEGINNERS TO ADVANCED

Laboratory style delivery (limit 12) - conference microscopes and teaching software. Small (4 participants) groups ensure teaching addresses the level of individual experience. The course caters for everyone: from beginners to advanced.

DELIVERY:

The course is taught by Dr Judy Handlinger, Dr Stephen Pyecroft, Dr Brian Jones, Dr Mark Adams and Professor Barbara Nowak.

RESOURCES:

We will have some copies of Gill Histopathology on CD ROM available for purchase at the workshop. Order forms (European Association of Fish Pathologists and Aqua Education) for the CD ROM will also be available.

ACCOMMODATION:

Please contact hotels directly for accommodation (ask for government or corporate rates and indicate a business visit to the Australian Maritime College at the University of Tasmania).

A range of accommodation is available in Launceston including:

Peppers Seaport Hotel - 4 star, hotel style, 5 minutes from CBD, taxi or bus required to campus. 28 Seaport Boulevard Launceston.
Ph 03 6345 3333

Hotel Grand Chancellor - 4 star, hotel style, central location, walking distance to restaurants and pubs, taxi required to campus (approx 10 mins) or bus (from Busy Bee Takeaway, every 20 minutes). 29 Cameron St Launceston Ph 03 6334 3434

Alanvale Apartments and Motor Inn located at Archers Manor - 3 star, apartment style, 3 minute walk to campus, taxi required to the city centre, motel room (single or double) or unit. 17 Alanvale Road, Mowbray. Ph: 03 6326 3662, fax 03 6326 3186

AMC (Australian Maritime College) Accommodation - staff style accommodation, ensuite, hotel room style, 3 minutes walk from teaching location, taxi required to city centre. Ph: 03 63354703, Fax 03 63263032,

For further information about the workshop please contact: Karine Cadoret
tel: 03 6324 3854; fax: 03 6324 3804; email: Karine.Cadoret@amc.edu.au



PRELIMINARY PROGRAMME

Sunday 17th April

Evening registration

Monday 18th April

- The use of animals in experimental research (Frauke Ohl, Utrecht Univ)
 - Pattern recognition receptors (Inge Fink, CBI)
 - Innate immune (Ig-like) receptors (Anders Østergaard, CBI)
 - Macrophage polarisation (Geert Wiegertjes, CBI)
 - Cytotoxic T lymphocytes (Uwe Fischer, FLI)
 - Chemokines (Lidy van Kemenade, CBI)
 - The power of the immune system (Huub Savelkoul, CBI)
- Evening poster session (i)

Tuesday 19th April

- Koi herpesvirus: a fascinating virus for fundamental sciences (Alain Vanderplasschen, Univ. Liège)
- Of T cells and antibodies (Bernd Köllner, FLI)
- IFNs, IFN receptors and IFN induced genes in fish (Pierre Boudinot, INRA)
- Vaccination against yersiniosis (Barbara Nowak, Univ Tasmania)

Practicals choose between two programmes

- Cellular assays in innate immunity (technical staff CBI) or
- Microarrays (Sam Martin, Univ Aberdeen)

Evening poster session (ii)

Wednesday 20th April

- Novel adjuvants in vaccination (Virgil Schijns, CBI)
- Tumor Necrosis Factor alpha (Maria Forlenza, CBI)
- Zebrafish as an infection model (Annemarie Meijer, Leiden Univ)

Practicals choose between two programmes

- Humoral responses (technical staff CBI) or
- Gene discovery through synteny (Steve Bird, Univ Aberdeen)

Evening Workshop dinner

Thursday 21st April

- Programmed cell death in immune responses (Nuno Simoes dos Santos, IBMC)
- T cell immunity in sea bass (Giuseppe Scapigliati, Univ Tuscia)
- Antimicrobial peptides (Chris Secombes, Univ Aberdeen)
- Workshop evaluation (Geert Wiegertjes, CBI)

Farewell Symposium Jan Rombout

- Introduction (Huub Savelkoul, CBI)
- History of fish vaccination (Willem van Muiswinkel, CBI)
- Fish gut immunity: past, present and future (Jan Rombout, CBI)
- Friendly interactions between man and microbe (Ger Rijkers, UMC)
- Pre- and probiotics in infants (Prescilla Jeurink-Rombout, Danone Research)



Cell Biology & Immunology



FISH IMMUNOLOGY WORKSHOP

Wageningen
April 17 – 21, 2011

BACKGROUND

The Wageningen fish immunology / vaccination workshops have been organised annually since 1998. Typically, the workshops are characterised by one-hour presentations given by experienced lecturers, taking time to thoroughly introduce each subject. This year's (2011) subject is **FISH IMMUNOLOGY**. The 2011 workshop includes two afternoons with a choice between hands-on practicals or updates on recent molecular advances in microarray analysis and gene synteny. Further, participants are asked to send an abstract of their research and be given the opportunity to bring a poster, with the best one awarded the poster prize. The official workshop language is English.

OBJECTIVES

The objective of the present workshop is to provide participants with advanced knowledge, both theoretical and practical, on the immune system of fish. During the workshop we will discuss the latest insights in the evolution of the immune system but also related issues such as vaccination and (experimental) animal welfare.

TARGET GROUP

The level of the workshop is targeting academic and company researchers as well as management staff in the aquaculture industry. In particular, we more than welcome PhD students, who have a reduced registration fee.

FAREWEL SYMPOSIUM JAN ROMBOUT

The Thursday afternoon programme is a farewell to Jan Rombout, who will retire in 2011. Jan Rombout has worked a lifetime in fish immunology, specialising in subjects such as early development of the immune system, (oral) vaccination and mucosal immunity. The afternoon programme is open to the participants, only after 15.00 h the programme is for invited guests only.

REGISTRATION

The number of participants is limited to 35 persons, admitted on a 'first-come' basis. Registration fee is 350 € (Ph.D. students), 500 € (post-doc, academic staff) or 700 € (company staff). For ALL-IN registration (including accommodation and all meals) add 400 € for the whole workshop period. You can find more information on registration and accommodation on our website WWW.CBI.WUR.NL/UK

ORGANISATION

CELL BIOLOGY & IMMUNOLOGY (CBI)

Wageningen University
Geert F. Wiegertjes
Maria Forlenza
P.O. Box 338
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The Netherlands
Phone: +31 31748 2732/3336
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For questions contact us at
fish.workshop@wur.nl



OUR PARTNERS

Leiden University, NL
Institute of Biology



University of Utrecht, NL
Division of Laboratory Animal Science



University of Aberdeen, Scotland
Scottish Fish Immunology Research Centre,
SFIRC



INRA
France



Fed Res Inst Animal Health, Germany
Friedrich-Loeffler Inst (FLI)



Université de Liège, Belgium
Veterinary medicine,
Laboratory of Immunology – Vaccinology



University of Tasmania, Aquafin CRC Health,
School of Aquaculture, Tasmania



IBMC - Instituto de Biologia Molecular e Celular
Porto – Portugal



University of Tuscia
Viterbo, Italy



Universitair Medisch Centrum
UMC, NL



Danone Research

