Australian Government
Fisheries Research and Development Corporation

Health Highlights

Aquatic Animal Health Subprogram Newsletter
Volume 11, Issue 1, July 2011

In this issue

The Pullman Reef Hotel, Cairns – Venue for the First Australasian Scientific Conference on Aquatic Animal Health, July 2011

From the Subprogram Leader

First FRDC Australasian Scientific Conference on Aquatic Animal Health

The 1st FRDC Australasian Scientific Conference on Aquatic Animal Health was held, 5-8 July 2011, in Cairns at The Pullman Reef Hotel. Based on a number of parameters, it is safe to say that the 2011 conference was the most successful of the FRDC-sponsored aquatic animal health biennial conferences to date (which have been held since 2003). It is the first FRDC conference to go international and the response was very promising for the future. There were in excess of 120 registrations for the conference who were treated to 72 presentations including those from the conference Keynote Presenter, Dr. Teruo Miyazaki – Professor, Dept. Life Science, Fish Pathology, Graduate School of Bioresources, Mie University, Japan and Invited Speakers, Dr Niels Jørgen Olesen (Head of EU Reference Laboratory for Fish Diseases, Denmark), Dr Isabelle Arzul (Head of EU Reference Laboratory for Mollusc Diseases, France) and Dr Ed Peeler (epidemiologist at CEFAS Weymouth Laboratory UK). In addition to sponsorship from FRDC, we were fortunate to obtain further sponsorship from DAFF, Schering-Plough/Intervet, and ABIN who launched the aquatic animal health project NEPTUNE. The conference included sessions on vertebrate viruses, bacterial and fungal infections of finfish, emergency disease response (sponsored by DAFF), finfish parasites, finfish pathology, finfish immunology and vaccines, crustacean health, mollusc health and diagnostics. Preliminary feedback from participants has been very favourable. I would like to express my thanks to all those involved in its organization (in particular, Joanne Slater), the organizing committee, session chairs, and all presenters and participants for their support of this event.

FRDC International Workshop on Ostreid Herpesvirus

On the weekend following the Cairns conference, FRDC sponsored an international workshop on ostreid herpesvirus. By holding this workshop back-to-back with the conference, we were able to take advantage of having a number of international experts contribute to the workshop which was facilitated by Angus Cameron (AusVet Animal Health Services). There were in excess of 30 participants including scientists, regulators and industry representatives from Europe, New Zealand, Taiwan and Australia. The purpose of the workshop was to summarise the current state of knowledge on this virus and the disease it causes and to guide future research priorities. Initial feedback from participants has been very complimentary and a special thank you should go to Angus for the excellent job of workshop facilitator.

STC/SAC Meetings

The FRDC AAHS met on 4 July 2011 to review Expressions of Interest for the 2012-13 funding cycle. AAHS feedback has been provided to the EoI proposers.

Health Subprogram Website

Our website is located of 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* (December 2011) to Joanne Slater before 31 October 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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Health Highlights is funded by the Fisheries Research and Development Corporation.

Courses and Workshops

Wildlife pathology short course
Camden, February 2012

The course is been run by the Australian Registry of Wildlife Health and contains modules on aquatic animals. Further information can be found at **http://www.arwh.org/short-course**

Aquatic Surveillance Workshop
funded by the Aquatic Animal Health Training Scheme (FRDC/DAFF)

The University of Adelaide
School of Animal & Veterinary Sciences
Roseworthy Campus, South Australia
December 12-16, 2011

Experts with international, national and local perspective in aquatic surveillance will instruct:
- Dr. Angus Cameron, a renowned veterinary epidemiologist, specialized in surveillance programs including for aquatic diseases and co-director of AusVet.
- Dr. Larry Hammell, a renowned aquatic epidemiologist from Canada, co-author of the OIE (World Organisation for Animal Health) guidelines on aquatic surveillance and co-director of the OIE collaborative centre for aquatic epidemiology and risk assessment.
- Dr. Marty Deveney, a locally-engaged aquatic animal health expert from SARDI/PIRSA with experience in surveillance in the SA aquaculture industry.

Contact Dr Charles Caraguel, School of Animal and Veterinary Sciences, The University of Adelaide (email: charles.caraguel@adelaide.edu.au) for further information.

Completed AAHS Project Summaries

Project No. 2007/225: AAHS: Metazoan parasite survey of selected macro-inshore fish of southeastern Australia, including species of commercial importance

OBJECTIVES:

1. To complete a parasite survey of selected finfish species in Australia
2. To provide taxonomic revisions of copepods, monogeneans and trematodes including redescriptions of poorly described taxa and description of new species
3. To provide a host-parasite checklist with biogeographical relevance
4. To use DNA sequences to distinguish blood fluke species and enable diagnostic tools for industry

5. Provide risk analyses for the parasites identified to understand a) the likelihood of parasite establishment and proliferation and b) the consequence of establishment and proliferation for sustainable aquaculture
6. Identify parasites of potential threat to the sustainability of the sea-cage aquaculture industry
7. Develop pathological case studies of parasites of potential threat to aquaculture
8. Identify appropriate husbandry practices to manage and control parasite infections and thereby reduce morbidity and mortality in fish stocks
9. Enable appropriate site selection for expansion of the industry away from infection sources
10. Develop an interactive product (i.e. website) that enables rapid identification of marine parasite species for the public, recreational anglers and sea-cage aquaculture industry

NON-TECHNICAL SUMMARY

Parasites have the potential to limit the growth of Australian fishing industries, especially aquaculture, through mortality, morbidity and reduced marketability. A majority of the parasites of recreational, commercial and farmed Australian finfish has not been collected, studied or described. We surveyed 12 important finfish species and documented their parasite assemblages, placing emphasis on parasitic crustaceans (e.g. sea-lice) and helminths (e.g. flukes). Morphological methods and, in some cases, molecular tools were used to facilitate parasite identification. More than 120 parasite species were identified. Parasites were used as biological tags to identify geographic population structure in one commercial fish species, the southern garfish. We assessed parasite risks to sea-cage aquaculture for two species of finfish in Australia, mulloway and barramundi, and indicate appropriate methods to adopt in animal husbandry in the event of parasite outbreaks in mulloway and barramundi culture which will help improve the viability of the industries. A comprehensive, user-friendly, richly illustrated website (MarineParasites.com) has been created that details parasite biology, pathology and host-specificity, enabling lay people to identify different types of parasites in common fish species encountered in Australia.

For clarity, the original 10 objectives (presented in brackets) are reported under seven main chapters as follows:

Chapter 2: Metazoan parasites of important fishes in Australia

To complete a parasite survey of selected finfish species in Australia (1)

Abstract: Accurate identification of fishes and their parasites is fundamental to the development, management and sustainability of fisheries and aquaculture worldwide. We examined a total of 29 fish species including currently farmed fish species, candidate aquaculture species and commercial and recreational species to determine their metazoan parasite assemblages and infection parameters. We identified more than 120 parasite species. Host tissue samples for fish studied and at least one voucher specimen of each parasite species were deposited in recognised curated museum collections. Although a range of parasite fauna was encountered, we placed taxonomic emphasis on copepod, monogenean and aporocotylid (blood fluke) species, because these parasite groups are frequently associated with pathology, morbidity and/or mortality in finfish aquaculture. During the course of this study, redescriptions have been provided for the monogeneans *Microcotyle arripis* Sandars, 1945 and *Kahawaia truttae* Dillon and Hargis, 1965 from *Arripis georgianus* and *A. truttaceus*, respectively and the copepod *Kabataia ostorhinchi* Kazatchenko, Korotaeva & Kurochkin, 1972 from knifejaw *Oplegnathus woodwardi* in Chapter 4. A new blood fluke (*Paradeontacylix* n. sp.) from *Seriola hippos* in described in Chapter 5.

Chapter 3: Biogeographical relevance of parasite-host checklists: a case study

To provide a host-parasite checklist with biogeographical relevance (3)

This chapter has been published and may be cited as: Hutson, K.S., Brock, E.L. & Steer, M.A. (2011). Spatial variation in parasite abundance: evidence of geographical population structuring in southern garfish *Hyporhamphus melanochir*. *Journal of Fish Biology* 78, 166-182.

Abstract: Southern garfish *Hyporhamphus melanochir* were examined for metazoan parasites from nine sites in three regions (Spencer Gulf, Gulf St Vincent and northern Kangaroo Island) in South Australia to document parasite assemblages, identify candidate species suitable for use as biological tags and investigate spatial variation in parasite abundance. Four ectoparasite species and ten endoparasite species were identified representing Cestoda, Trematoda, Monogenea, Nematoda, Acathocephala, Copepoda and Isopoda. *Lernaeenicus hemirhamphi*, *Micracanthorhynchina hemirhamphi*, *Mothocya halei* and *Philometra* sp. were suggested ‗permanent' biological markers. Multivariate discriminant function analysis showed that most sites could be distinguished based on differences in parasite abundance. Four endoparasite species (*Conohelmins* sp., *Hysterothylacium* sp., *Micracanthorhynchina hemirhamphi* and *Philometra* sp.) were most important for site characterisation. Limited spatial variation in permanent endoparasite abundance among localities in northern Spencer Gulf provides evidence for a distinct northern Spencer Gulf population with little inter-regional mixing. In contrast, considerable spatial variation in permanent endoparasite abundance between localities sampled off Kangaroo Island implies

limited local movement and suggests *Hyporhamphus melanochir* may comprise a metapopulation structure. These results largely align with recent evidence from otolith chemistry that indicates fine-scale geographical population structuring in South Australian waters.

Chapter 4: Parasite redescriptions

To provide taxonomic revisions of copepods, monogeneans and trematodes including redescriptions of poorly described taxa & description of new species (2)

This section has been published and may be cited as: Catalano, S.R., Hutson, K.S., Ratcliff, R. & Whittington, I.D. 2010. Redescriptions of two species of microcotylid monogeneans from three arripid hosts in southern Australian waters. *Systematic Parasitology* **76**, 211-222.

Abstract: *Microcotyle arripis* Sandars, 1945 is redescribed from *Arripis georgianus* from four localities: Spencer Gulf, Gulf St. Vincent, off Kangaroo Island and Coffin Bay, South Australia. *Kahawaia truttae* (Dillon and Hargis, 1965) Lebedev, 1969 is reported from *A. trutta* off Bermagui, New South Wales and is redescribed from a new host, *A. truttaceus*, from four localities in South Australia: Spencer Gulf, Gulf St. Vincent, off Kangaroo Island and Coffin Bay. Phylogenetic analysis of the partial 28S ribosomal RNA gene (28S rRNA) nucleotide sequences for both microcotylid species and comparison with other available sequence data for microcotylid species across four genera contributes to our understanding of relationships in this monogenean family.

Chapter 5: Morphological and molecular tools to distinguish blood fluke parasites

To provide taxonomic revisions of copepods, monogeneans and trematodes including redescriptions of poorly described taxa & description of new species (2)

To use DNA sequences to distinguish blood fluke species and enable diagnostic tools for industry (4)

Enable appropriate site selection for expansion of the industry away from infection sources (9)

Abstract: Three wild *Seriola* species including amberjack *Seriola dumerili* (Risso, 1810), Samson fish *S. hippos* Günther, 1876 and yellowtail kingfish *S. lalandi* Valenciennes, 1833, (Perciformes: Carangidae), were examined for parasitic fish blood flukes in the Indian, Southern and Pacific Oceans off the southern coast of Australia. Four *Paradeontacylix* species (Digenea: Aporocotylidae) were found: *P. sanguinicoloides* McIntosh 1934, *P. godfreyi* Hutson & Whittington 2006, *P.* cf. *kampachi* and a new species. *Paradeontacylix* n. sp. was detected in all *Seriola* spp. examined and is described from the heart of *S. hippos* Günther, 1876 (type host) from the Indian Ocean off Rottnest Island, Western Australia (type locality). A key to the species of *Paradeontacylix* is provided. The new species is most easily distinguished from other *Paradeontacylix* species by a combination of: (1) a body length of ~2,800–3,650 µm; (2) enlarged posterior tegumental spines; (3) a bi-lobed posterior margin; (4) a maximum number of 15 marginal tegumental spines in rows; (5) 46–48 intercaecal testes; (6) a testicular field occupying 30–41% of the total body length; (7) a portion of the uterus (58–105 µm) descending posterior to the seminal receptacle. The new species most closely resembles *P. sanguinicoloides*, which differs by having short, rose-thorn shaped posterior tegumental spines. New locality records are provided for *P. godfreyi* at Sir John Young Banks, New South Wales and *P. sanguinicoloides* and *P.* cf. *kampachi* off Rottnest Island, Western Australia. A phylogenetic analysis is provided for *Paradeontacylix* spp. based on molecular sequence data from two genes (nuclear ribosomal 28S and mitochondrial cytochrome oxidase I (COI)). Monophyly of *Paradeontacylix* was supported strongly in the Bayesian inference analyses of COI data (Posterior Probability [PP] 95%) and 28S rDNA data (PP 97%). The Aporocotylidae was not monophyletic in the analyses of COI or 28S rDNA data. In the 28S rDNA analysis inclusion of numerous outgroups resulted in two non-aporocotylid taxa (*Clinostomum* spp.) being included with all aporocotylid species, but this relationship was not strongly supported (PP 57%). Following submission of this Chapter for publication, the new species will be formally named and described, type and voucher specimens will be accessioned in museums and sequences will be lodged in GenBank™.

Chapter 6: Potential parasitic threats to southern Australian finfish aquaculture

Identify parasites of potential threat to the sustainability of the sea-cage aquaculture industry (6)

Develop case studies of parasites of potential threat to aquaculture (7)

This Chapter has been published and may be cited as: Catalano, S.R. & Hutson K.S. 2010. Harmful parasitic crustaceans infecting wild arripids: a potential threat to southern Australian finfish aquaculture. *Aquaculture* **303**, 101-104.

Abstract: Parasitic crustaceans are responsible for severe disease outbreaks in finfish aquaculture. We provide the first report of five marine ectoparasitic crustacean species including *Argulus diversicolor* Byrnes, 1985 (Branchiura: Argulidae), *Caligus bonito* Wilson, 1905, *C. longipedis* Bassett-Smith, 1898, *C. pelamydis* Hewitt, 1963 and *C. punctatus* Shiino, 1955 (Copepoda: Caligidae) on wild arripid hosts, *Arripis georgianus* (Valenciennes, 1841), *A. trutta* (Forster, 1801) and *A. truttaceus* (Cuvier, 1829) (Perciformes: Arripidae) in southern Australian waters. *Caligus pelamydis* and *C. punctatus* are new Australian records. All five crustacean species exhibit low host-specificity and *Argulus* spp., *C. longipedis*, *C. pelamydis* and *C. punctatus* have been associated with mass mortalities in cultured fishes outside Australia.

Given the propensity for arripids to aggregate at sea-cage aquaculture sites, awareness of these five parasitic crustacean species may allow health managers to identify and anticipate potential outbreaks on southern Australian fish farms.

Chapter 7: Assessing parasite risk and identifying appropriate husbandry

Provide risk analyses for the parasites identified to understand a) the likelihood of parasite establishment and proliferation and b) the consequence of establishment and proliferation for sustainable aquaculture (5)

Identify parasites of potential threat to the sustainability of the sea-cage aquaculture industry (6)

Identify appropriate husbandry practices to manage and control parasite infections and thereby reduce morbidity and mortality in fish stocks (8)

Abstract: Reliable parasite identification and assessment of the risk that parasite species present is a vital pre-requisite for effective management of parasites in sea-cage farms. A qualitative risk assessment for parasite species known to infect mulloway (*Argyrosomus japonicus*) and barramundi (*Lates calcarifer*) was undertaken to recognise parasite species that present serious risks for fish farmed in sea-cages and their wild conspecifics. Risk was estimated by considering the likelihood and consequence of parasite establishment and proliferation in sea-caged stock. The monogenean *Benedenia sciaenae* was considered to present a high risk to *A. japonicus* while two monogenean species, *Neobenedenia melleni* and *B. epinepheli,* were considered a high risk to *L. calcarifer*. Future research on the life cycle parameters of moderate to high risk parasite species under various environmental conditions will enable identification of management strategies that can break life cycles and minimise the potential for outbreaks appropriate to the biology of the parasite species.

Chapter 8: MarineParasites.com

Develop an interactive product (i.e. website) that enables rapid identification of marine parasite species for the public, recreational anglers and sea-cage aquaculture industry (10)

Abstract: The website MarineParasites.com was developed to enable increased accessibility to information on parasites of marine fishes. More than 3,525 unique visitors from 114 countries have viewed the website to date. Positive feedback has been received from representatives of the target audience including recreational fishers, scientists and members of the aquaculture industry. The website has facilitated further communication and extension through national television and has made a major contribution to the availability of knowledge about parasites infecting recreational, commercial and farmed finfish in Australia.

Conclusions

Discovery and documentation of parasite fauna of wild and farmed fish should be incorporated into any ongoing sampling programs for effective parasite management and risk assessment (Chapters 2, 4-7). Effective mitigation of parasite species infecting fishes in sea-cage farms can only be achieved through reliable parasite identification (Chapters 2-5), knowledge of their biology (Chapter 6) and assessment of appropriate management methods (Chapter 7). Recognition of parasite species that may decrease profitability through reduced marketability, morbidity and/or mortality of stocks is crucial (Chapters 5-7). Parasites also enable further insight into the geographic population structure of fish stocks (Chapter 6) which is critical for fisheries management. This research delivered on its objective to identify parasites of potential threat to the sustainability of the Australian sea-cage aquaculture industry (Chapters 2, 5-7). Husbandry practices were identified that will enable development of the most appropriate management strategies to avoid outbreaks in Australian aquaculture (Chapter 7). Knowledge gained from this project is accessible to the wider public through the development of a professional, user friendly website (Chapter 8).

This research has generated biological material (including new and poorly known parasite species) that could involve several more years of further taxonomic work to produce several more publications - far beyond the means of this three year research project. Our research has emphasised the diversity of parasites that occur in the marine ecosystem and how scant our knowledge is. We plan to continue to work on this material and will continue to publish the results (Appendix 5). This identifies and underscores the need to continue to fund similar projects and continue the partnership with FRDC and ABRS, in order to generate the information required to manage wild fisheries sustainably, ensure the welfare of farmed fishes and also to train marine parasitologists of the future.

Advancing aquatic biosecurity

Marine Innovation South Australia (MISA) has recently commissioned an Aquatic Biosecure Facility, located within The University of Adelaide's new Veterinary Health Centre at Roseworthy Campus, north of Adelaide. MISA, an initiative of the South Australian Government, was formed in September 2005 to boost South Australia's capability in aquatic research and educational opportunities and support the growth of the South Australian seafood industry. MISA partners – SARDI, the University of Adelaide, Flinders University, the South Australian Museum, Department of Environment and Water Resources, Primary Industries and Resources South Australia (PIRSA) and the seafood industry – have since

worked collaboratively with many notable outcomes.

The Aquatic Biosecure Facility has six 5000 L tanks and fourteen 200L tanks, each with individual recirculation, filtration, aeration and UV treatment. Seawater for marine research is supplied from a 75,000 L tank that is filled by a bulk liquid tanker and freshwater is available from mains supply and can be dechlorinated. The facility was designed in consultation with SARDI and University staff to meet PC2 aquatic specifications, with a heating system to decontaminate outflow water to ensure destruction of all pathogens or pests.

The location allows immediate access to the adjacent Veterinary Diagnostic laboratory's facilities for research projects and provides access to the expertise of veterinary pathologists, an aquatic virologist and epidemiologist who have recently joined the school.

The facility also offers opportunities for education and training in the aquatic health stream within the veterinary curriculum with improved access to research material and student research projects in the tank facility itself supervised by University and SARDI researchers.

The facility is available to all legitimate aquatic animal health researchers for studies on pathogen transmission, pathology, epidemiology and decontamination, and aquatic pest studies on growth, invasion dynamics and control.

The biosecure aquatic facility offers large-scale facilities to study pests and pathogens that were previously unavailable in Australia. Enquiries should be directed to Dr Marty Deveney, MISA Biosecurity Node Leader at SARDI Aquatic Sciences: marty.deveney@sa.gov.au

Summary of Active Projects

Project No.	Project Title	Principal Investigator
2008/030	AAHS: Development of a DNA microarray to identify markers of disease in pearl oysters (*Pinctada maxima*) and to assess overall oyster health (*Associated species: Pinctada maxima*)	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 (*Pinctada maxima*) and to assess overall oyster health (*Associated species: Pinctada maxima*)	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, *Pinctada maxima* (*Associated species: Pinctada maxima*)	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 (*Associated species:* 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 (*Associated species:* 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 (*Associated species: Haliotis* 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 (*Associated species:* 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 (*Associated species:* 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 (*Associated species:* 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 (*Associated species:* 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 gropers, marine fish and stingrays with production of diagnostic tools to reduce the spread of disease to other states of Australia (*Associated species*: 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: *Maccullochella* spp)	Dr Tracey Bradley DPI Victoria Phone: 03 9217 4171 Email: tracey.bradley@dpi.vic.gov.au

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