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From the Subprogram Leader

Time has flown since the 2nd FRDC Aquatic Animal Health Subprogram Scientific Conference in Cairns on 26-28 July 2005. The proceedings are still in the process of being compiled but will be available soon (I promise), as agreed, on CD and forwarded to all conferees. The delay has got nothing to do with England winning back the Ashes.

Thank you to all those who supported the conference, especially to those who made presentations and to those who assisted with its planning and organisation. Based on the feedback received, the conference was enjoyed by all, and the opportunity for the Australian aquatic animal health community to get together to exchange ideas was greatly appreciated by the participants. As with the Geelong conference, the highlight was the opportunity to hear an international expert present three keynote lectures on specific aspects of aquatic animal health. Through the efforts of Barbara Nowak we were fortunate to have Prof. Chris Secombes, Head of the School of Biological Sciences at the University of Aberdeen as the keynote speaker. His trip to Australia was sponsored by the *International Science Linkages* programme established under the Australian Government's innovation statement *Backing Australia's Ability*. During his visit Prof. Secombes gave lectures at the School of Aquaculture, University of Tasmania, Launceston and the invited keynote addresses at the FRDC Aquatic Animal Health Subprogram conference in Cairns.

The next AAHS Scientific conference is planned for 2007. Any (useful) suggestions regarding the 2007 conference can be emailed to either Joanne Slater or Mark Crane.



Participants at the AAHS Scientific Conference held in Cairns in July.

STC/SAC Meetings

The Subprogram Steering Committee and Scientific Advisory Committee held meetings in Melbourne on 24 August 2005 to review research preproposals, and on 5 October 2005 to review draft full proposals. The AAHS review process is complete, and advice was forwarded to project Principal Investigators in time for submission of the finalised full proposals to FRDC by 1 November 2005.

Health Subprogram Website

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

<http://www.frdc.com.au/research/programs/aah/index.htm>

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

Announcements

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

Securing the Future

The Australian Government Department of Agriculture, Fisheries and Forestry commissioned four projects through the FRDC AAHS with "Securing the Future" (STF) funds for the fiscal year 2004-2005. These are:

Project No. 2005/620: Aquatic Animal Health Subprogram: Development of national investigation and reporting protocols for fish kills in recreational and capture fisheries (PI: Barbara Nowak, University of Tasmania).

Project No. 2005/621: Aquatic Animal Health Subprogram: Establishment of a national aquatic animal health diagnostic network (PI: Richard Whittington/Matt Landos, University of Sydney).

Project No. 2005/640: Aquatic Animal Health Subprogram: technical guidelines for the translocation of live aquatic animals (PI: Brian Jones, Department of Fisheries, Government of Western Australia).

Project No. 2005/641: Aquatic Animal Health Subprogram: current and future needs for aquatic animal health training and for systems for merit-based accreditation and competency assessments (PI: Brian Jones/Matt Landos).

Project No. 2005/620 has been completed and the non-technical summary is reproduced below. The draft final report for Project No. 2005/640 has been received and is being reviewed. Projects 2005/621 and 2005/641 are both in progress, as discussed at the AAHS Scientific Conference in Cairns.

Completed Projects

The following projects have been completed recently:

Project No. 2001/214: Aquatic Animal Health Subprogram: Development of a disease zoning policy for *Marteilia sydneyi* to support sustainable production, health certification and trade in the Sydney rock oyster (PI: Rob Adlard, Queensland Museum).

Project No. 2003/216: Aquatic Animal Health Subprogram: Aquatic Animal Health Subprogram: detection and management of yellowtail kingfish (*Seriola lalandi*) health issues (PI: Mark Sheppard, Sakana Veterinary Services Ltd.)

Project No. 2003/645: Aquatic Animal Health Subprogram: The development of media tools to increase the awareness of aquatic animal diseases (PI: Wayne Tindall, Big Time Solutions Pty Ltd)

Project No. 2005/620: Aquatic Animal Health Subprogram: Development of national investigation and reporting protocols for fish kills in recreational and capture fisheries (PI: Barbara Nowak, University of Tasmania).

Project summaries are reproduced below.

Completed AAHS Project Summaries

Project No. 2001/214: Aquatic Animal Health Subprogram: Development of a disease zoning policy for *Marteilia sydneyi* to support sustainable production, health certification and trade in the Sydney rock oyster

OBJECTIVES:

1. The primary objective is to implement and field-test the zoning policy framework developed under Aquaplan in a practical context and to facilitate the development of further zoning policies for other significant diseases of aquatic animals. This will be conducted using 'QX Disease'- aetiological agent *Marteilia sydneyi*, as a case study to develop an effective zoning policy that is consistent with internationally recognised (OIE) standards. The zoning policy will aim to:
 - Reduce the risk of introducing this pathogen into the remaining disease-free production areas; and
 - Facilitate domestic and international market access for the industry.
2. The sub-objectives necessary to achieve this are to:
 - Identify through sampling and appropriate diagnosis 'QX Disease'-free and 'QX Disease'-endemic estuaries within oyster culture areas;
 - Determine the specific identity of *Marteilia* sp. from positive samples through ultra-structural and molecular diagnostics;
 - Develop a rational and effective program of surveillance for 'QX Disease' based on occurrence and an assessment of risk for each oyster producing estuary;
 - In consultation with fisheries managers and industry, develop a coastal zoning plan for 'QX Disease'.

OUTCOMES ACHIEVED

The identification of areas of risk to commercial culture of the Sydney Rock Oyster through the presence of the oyster pathogen *Marteilia sydneyi*, agent of QX disease, has been detailed through a comprehensive survey of estuaries in southeast Queensland and New South Wales (2001-2004).

The outcomes from this project have immediately effected changes in the domestic management of QX disease in oysters. The NSW and Queensland oyster industry and Department of Primary

Industries of each state have adapted their disease management plans to recognize the wide geographic distribution of the disease. Furthermore, the presence of the QX pathogen in estuaries where disease has not been recorded has emphasised the likely role played by the dynamics of the parasite's lifecycle together with host immune defence and likely environmental factors as regulators of QX disease outbreaks in rock oysters.

NON TECHNICAL SUMMARY:

The edible oyster industry in Australia is currently valued at around \$62.5 million annually of which rock oyster production accounts for approx 56%. For the industry to survive in the long-term requires the ability to service what may become a premium domestic market demanding a high quality product. The expansion of the industry is likely to be available only from international export, which in turn requires compliance with international regulations on oyster health with a transparent health audit trail. The rock oyster is potentially positioned for re-emerging export success, being a unique product with an extended shelf-life relative to other oyster species (e.g. the Pacific oyster, *Crassostrea gigas*) and this is an opportunity that should be exploited by the industry.

Within Australia, the Sydney Rock Oyster industry is subjected to periodic outbreaks of disease induced by a range of parasitic organisms that produce significant mortality and morbidity of commercial oyster stocks. The most significant of these is the agent responsible for 'QX disease' (caused by the protistan parasite *Marteilia sydneyi*) affecting the Sydney rock oyster, *Saccostrea glomerata*. Management of this disease has been based on quarantine of affected estuaries enforced through limitation on the movement of potentially infected stock. In this context, it was obvious that the oyster industry required a disease zoning policy based on scientifically defensible data to allow domestic best practice in oyster farming and to maximise market accessibility for the industry. This host/parasite system then formed the basis for a test of the zoning policy framework developed under the federal government's 'AQUAPLAN'.

A number of key issues related to zoning and surveillance for specific diseases were addressed through this project. Initially the design of field collection and the appropriate test to use for diagnosis were assessed to maximise, and allow quantification of, disease detection limits in the surveillance program.

1. The design of field sampling to identify disease infected oysters was critical in order to reach a statistically robust probability of disease detection. Global animal health standards (Office Internationale des Epizooties) recommend random sampling from a zone to detect a prevalence of 2% or greater disease in a population. This was fulfilled using a computer generated random selection of geographic co-

ordinates under which individual oysters were sampled (Angus Cameron, AusVet).

2. The appropriate method for diagnosis of disease, another critical issue in disease surveillance programs, was assessed by comparing the sensitivity and specificity of: tissue imprints (cytology); or tissue sections (histology); or the presence of specific parasite DNA (by polymerase chain reaction - PCR). Our analysis showed clearly that PCR was the most sensitive diagnostic test followed by cytology then histology. PCR also detected the presence of sub-clinical infections which could not be unambiguously identified using either histology or cytology. Confirmatory diagnosis (following PCR) at sub-clinical levels was undertaken using DNA in situ hybridisation tests designed to stain the QX organism specifically in tissue section.

Combined surveillance results from 2001 (NSW estuaries only), 2002-03 (NSW and Queensland estuaries) and 2004 (Queensland estuaries only) demonstrated some significant departures from the geographic distribution expected for QX disease. In 2001 diagnosis was undertaken using cytology and no unexpected occurrences of the disease were observed, with positives recorded only from the Clarence River (1.5% of sample infected), Georges River (47% of sample infected). In 2002 the distribution of disease was significantly different to that expected. Initially using cytology for diagnosis there were no apparent unusual infections with Southern Moreton Bay (0.8% of sample infected), Richmond River (40.8% of sample infected), Clarence River (22% of sample infected) and Georges River (16% of sample infected) recording oysters positive for the disease. However, when PCR techniques were used for diagnosis in estuaries that had never recorded the presence of the disease agent it became obvious that the organism was more widespread than indicated by previous diagnostic testing or previous occurrences of disease outbreaks. In total 142 unexpected positives for *Marteilia sydneyi* were found in oysters scored as negative by cytological examination during surveillance in this project. Of these, 61 were identified in oysters sampled from estuaries with no prior record of *Marteilia sydneyi*. These represent oysters from Hastings River, Wallis Lake, Port Stephens, Bateman's Bay, Tuross Lake, Narooma and Merimbula.

Further testing of these infections confirmed the identity of the QX organism and found it to be present in the oyster tissues at a sub-clinical level i.e. prior to reaching the oyster's digestive gland where the parasite would normally produce spores. At this stage of development, pathology in the oyster is reduced and the condition factor of oysters is not seriously compromised.

In 2003 surveillance and diagnosis using PCR techniques showed a reduced impact of QX disease with Southern Moreton Bay (0.67% of

sample infected), Brunswick River (1.3% of sample infected), Richmond River (13.3% of sample infected), Clarence River (6% of sample infected) and Georges River (0.67% of sample infected).

This project has had a significant impact on our understanding of QX disease in rock oysters as it applies to management. Rather than the disease agent being limited geographically to those estuaries that experience periodic outbreaks, the agent has been identified in most rock oyster growing areas on the east coast of Australia. As such there is the potential for outbreaks of QX disease in all commercial growing areas (indeed such an outbreak occurred in 2004 (with seasonal re-occurrence in 2005) in the Hawkesbury River) and that disease is likely to be regulated through a combination of the dynamics of the parasite lifecycle and the level of oyster fitness. Furthermore, in any aquatic system the environment will play an equally significant role in the outcomes of host/parasite interactions both through direct impact on stages (spores, infective stages) in the lifecycle of the parasite and indirectly through its impact on host fitness.

In the light of our new understanding of the distribution of the QX disease agent it could be argued that management through quarantine of identified QX-endemic estuaries is no longer appropriate. However, the biology of *Marteilia sydneyi* (dynamics of the life cycle of the parasite, interactions with alternate hosts) and its interaction with the host oyster's immune system are incompletely understood and the precautionary principle should be upheld especially in the case of such a serious disease.

While estuaries which undergo periodic outbreak should remain closed to export of oysters for relaying live in water elsewhere, local management will focus on disease seasonality and stock rotation to avoid the high risk periods in mid to late summer. These periods should be identified with accuracy to maximise available growth periods in disease endemic areas of estuaries. The ongoing projects to develop QX disease resistant oysters (NSW DPI and collaboration with Macquarie University) should run parallel with a program of incremental addition to the biological knowledge of this pathogen. Specifically, an absence of our ability to maintain a laboratory based infection model hampers research on identifying those factors (pathogen-specific, oyster-specific and environment-specific) which promote disease.

KEY WORDS: Sydney rock oyster, QX disease, *Marteilia sydneyi*, aquaculture, zoning policy, diagnostic method.

Project No. 2003/216: Aquatic Animal Health Subprogram: Aquatic Animal Health Subprogram: detection and management of yellowtail kingfish (*Seriola lalandi*) health issues (PI: Mark Sheppard, Sakana Veterinary Services Ltd.)

OBJECTIVES:

1. Review and compile yellowtail kingfish (YTK, *Seriola lalandi*) health information from the industry, scientific literature and research organisations.
2. Determine the objectives and needs of a generic farm-level YTK disease identification programme.
3. Identify the obstacles and opportunities for the recognition and diagnostic confirmation of YTK diseases.
4. Provide the YTK industry with a qualitative and relative fish health risk assessment, and propose generic health management control measures.
5. Develop a photographic handbook on disease recognition for the YTK farmers and others.

NON-TECHNICAL SUMMARY:

Since 1999, the kingfish (YTK, *Seriola lalandi*) aquaculture industry has been a significant investor in South Australia's regional economy. Currently, the annual YTK production is 2,000 tonnes and is anticipated to approach 7,000 tonnes by 2008 with a retail value of \$55 million. The industry provides both direct and indirect jobs for up to 1050 workers in regional communities. Although still in its infancy, this aquaculture industry has been a major success story in the expansion of the Australian seafood and food-animal industries, and there is tremendous potential for the continued development of a sustainable and economically successful Australian finfish aquaculture industry. However, international experience has shown that one of the most pervasive and persistent limits to the growth and viability of a new finfish sector is disease. To date, the YTK industry of South Australia has enjoyed limited losses due to disease, nevertheless, anticipating, preventing and dealing with future diseases is a priority of industry, government and researchers. Consequently, disease identification, risk analysis and health management were deemed key approaches for this FRDC project.

Interviews and questionnaires in Australia and Japan elicited important information from four (4) main groups of experts: fish culturists, government officers, researchers and laboratory service professionals. Little is known or published about the infectious disease aspects of *Seriola lalandi*, specifically, so an extensive literature search was performed, looking for diseases and related topics reported in fishes of the same genus, *Seriola*. Pathology reports and papers published in Japanese (with English abstracts or translated with assistance) were also included. A substantial bibliography, literature review, a list of 41 plausible hazards to YTK health, and a risk analysis developed as a result. These outputs of the project will provide researchers and professionals with a useful information about YTK health, diagnostic and husbandry information and they will better identify research needs, funding priorities and facilitate

more informed health management decisions. The lack of published information about YTK is, in itself, a noteworthy risk to the health of kingfish and supports proposals to enhance data collection, monitoring and surveillance of kingfish.

Training, diagnostic services and ongoing financial support from the State's lead agency (PIRSA) were identified as top-priority issues by those interviewed. Fish culturists and divers have exhibited a keen willingness to be trained and conduct routine disease assessments of YTK as basic "Level 1" fish health specialists. The YTK industry recognizes that fish health and diagnostics begin at the enterprise level. As such, a generic document summarizing guidelines for managing fish health has been authored and submitted to the YTK industry for consideration as part of a proposed best management practice (BMP) endeavour. That document may also serve to facilitate any future industry or government surveillance programs. A great need is also evident for a cost-effective private (or state government joint venture) mobile diagnostic service.

Australian stakeholders expressed concerns about: a) potential diseases of YTK, b) fish health and diagnostic services (i.e. what is available, essential, affordable and timely?), c) sustained fish health versus economic (and market) sustainability, and d) communication and differing mandates of industry versus government. It is clear that industry and government agencies must work in synergy to anticipate, prevent and deal with any potential future infections that might arise in cultured YTK. Yet a lack of public funds and resource personnel remain key inhibitors to disease prevention in South Australia. A view, widely shared by fish farmers, is that public benefactors of healthy, wholesome seafood and marine ecologies should allot public funds (via PIRSA) to subsidize the diagnostic and preventative surveillance measures taken by fish culturists. Consumers of other food-animals raised in South Australia benefit from this significant diagnostic support, yet aquaculture is treated somewhat differently.

Very little documentation or peer-reviewed information about the health hazards of *S. lalandi* exists. Consequently, the YTK risk analysis is subjective and qualitative. The overall health risks ranged from negligible to high yet the majority (27 of 41, or 66%) have been ranked as negligible, very low and low risks. Eleven (11, or 27%) of 41 were calculated as moderate overall risks, and three (3, or 7%) as high-risk hazards. Any pre-emptive and applied R&D efforts that arise from this report should be targeted at the fourteen (14) moderate and high risk hazards; ten (10) of which have already been identified in South Australian kingfish facilities. Tools of prevention and control of disease should be considered a priority.

A 64-page guidebook entitled "**A Photographic Guide to the Diseases of Yellowtail (*Seriola*) Fish**" (ISBN 0-920225-14-4) has been published as

an adjunct component of this project to facilitate the training, recognition and identification of relevant diseases. The book is designed as an immediate diagnostic field guide for farm staff, fish health specialists and students.

OUTCOMES ACHIEVED TO DATE:

The literature review, risk analysis, guidelines to management and photographic pathology book have stimulated a much greater awareness of potential and future needs, opportunities and safeguards for the YTK aquaculture industry of South Australia for PIRSA, researchers and diagnostic service personnel. This project may form the basis for (or at least stimulate) further applied R&D and the development of tools to control diseases. The development of best management practices, integrated health management procedures, disease surveillance programs or amendments to current fish health regulations may also arise, provided industry and government bodies work as partners with mutual intentions.

KEY WORDS: aquaculture, yellowtail, kingfish, *Seriola lalandi*, disease, fish health, risk analysis.

FRDC 2003/645: Aquatic Animal Health Subprogram: the development of media tools to increase the awareness of aquatic animal diseases (PI: Wayne Tindall, Big Time Solutions Pty Ltd)

OBJECTIVES

1. To create an interactive resource on aquatic animal disease emergencies. This includes research, production, distribution options and promotion of the final kit.
2. To create a resource that is a valuable aid for learning institutions, students, veterinarians, aquaculture practitioners and government agencies.
3. To create a web-based support mechanism that can facilitate ongoing information updates.
4. To create critical awareness on 'aquatic animal health issues' and the availability of the resources mentioned above by way of a 12 monthly animated newsletter.

OUTCOMES ACHIEVED TO DATE

- a) The provision of a comprehensive interactive CD, web-based and print-based resource for Australian aquaculture practitioners, trainers and students allowing instant access to valuable case study and data driven information on "aquatic animal health in Australia".
- b) An on-going "on-line" resource that allows the FRDC to continue to update the material above by way of a unique 'software application'. This benefits trainers of the subject matter and those located in remote areas.
- c) An ongoing "on-line" discussion forum where questions and answers can be fielded by parties interested in the project and interested in the subject matter. This benefits all interested

parties and provides an ongoing BULLETIN BOARD where difficult and or specific information can be discussed in a non threatening manner.

- d) Response to the above by aquaculture practitioners, trainers, students and government agencies has been extremely positive with the attached website being used to facilitate the launching of further CD-Rom material and the on going web-based emails accruing a large database of interested individuals and organisations.

The Disease Watch website can be found at: www.disease-watch.com.au

Keywords: Training, Awareness Kit, Aquatic Animal Disease Emergencies, CD-Rom, Web-based, Video Clips, e-Newsletter.

FRDC 2005/620: Aquatic Animal Health Subprogram: Development of national investigation and reporting protocols for fish kills in recreational and capture fisheries (PI: Barbara Nowak, University of Tasmania)

OBJECTIVES:

1. To improve investigation and reporting of major fish kills in recreational and capture fisheries.
2. To publish national investigation and reporting protocols for fish kills in recreational and capture fisheries.

NON TECHNICAL SUMMARY:

OUTCOMES ACHIEVED TO DATE

A workshop was conducted and draft national investigation and reporting protocols for fish kills in recreational and wild capture fisheries were developed and accepted by workshop participants that included representatives of native fish Australia, Federal Government Department of Agriculture, Fisheries and Forestry, State and Territory Government agencies and the Australian wildlife health network.

Wild fish kills happen regularly across Australia. The more spectacular kills are reported in the media, but many remain relatively obscure. Often the causes of fish kills remain unknown. This can be a problem, particularly if pollution or some other human activity is to blame and if further fish kills are to be avoided.

Timely sampling of dying fish and their environment is critical to achieving a reliable diagnosis. Identification of the causes of significant wild fish kills is important to the public, environmental groups, recreational, aquaculture and wild capture fisheries. It is important to detect exotic diseases, and major pollution events (both accidental and deliberate) as soon as possible to both minimise harm and to support Australia's surveillance and monitoring capability at the international level. This activity underpins export market access and strengthens our national biosecurity initiatives.

The sampling of dead and dying fish is a complicated procedure. There needs to be a system for reporting incidents and getting trained staff to the site quickly with appropriate sampling equipment. Since many fish kills are associated with poisoning events, there are significant OH&S issues involved. If prosecutions are to be successful, legal issues must be addressed and forensic sampling techniques (chain of custody etc.) must be employed. Planning and funding fish kill responses therefore requires detailed planning and funding across agencies within jurisdictions. The ability to respond to fish kills varies greatly between Australian jurisdictions.

The National Aquatic Animal Health Technical Working Group (NAAH-TWG) identified the need for a consistent approach to investigating fish kills as an important component of the national biosecurity initiative. The concept of a national workshop to progress this issue was endorsed by the Aquatic Animal Health Committee (AAHC) and was incorporated into the national AQUAPLAN 2005-2010 initiative. There has been strong positive feedback from stakeholders to the concept of a workshop.

The funding provided through the Budget Initiative was seed money for the project. The objective of this project is consistent with the objectives of the new Australian Government's *Securing the Future – Protecting our Industries from Biological, Chemical and Physical Risk* budget initiative.

This project's two objectives were to improve investigation and reporting of major fish kills in recreational and capture fisheries and to publish national investigation and reporting protocols for fish kills in recreational and capture fisheries.

The first output of this project was to run a fish kill workshop that would bring together people with expertise and/or an interest in fish kill management from around Australia to develop a consistent set of protocol to deal with fish kills. This project's second output was to document and distribute the outcomes of this workshop.

KEYWORDS: fish kills; natural resources sustainability; wild-catch fisheries, recreational fisheries

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*
to Joanne Slater before 31 January 2006**

Mailing list

Health Highlights is distributed quarterly to stakeholders via hard copy and email as well as being posted on the FRDC website at: <http://www.frdc.com.au>. To be included on the *Health Highlights* mailing list, contact:

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Summary of Active Projects

FRDC Project No.	Project Title	Principal Investigator
2001/621	Aquatic Animal Health Subprogram: molecular diagnostic tests to detect epizootic ulcerative syndrome (<i>Aphanomyces invadens</i>), and crayfish plague (<i>Aphanomyces astaci</i>) <i>Associated species:</i> Multi-	Ms Nicky Buller Department of Agriculture, WA Phone: 08 9368 3425 Email: nbuller@agric.wa.gov.au
2001/628	Aquatic Animal Health Subprogram: vibrios of aquatic animals: development of a national standard diagnostic technology <i>Associated species:</i> Multi-	Dr Jeremy Carson DPIWE, Tasmania Phone: 03 6336 5207 Email: jeremy.carson@dpiwe.tas.gov.au
2002/043	Aquatic Animal Health Subprogram: the production of nodavirus-free fish fry and the nodaviruses natural distribution <i>Associated species:</i> Barramundi and other marine finfish species	Dr Ian Anderson Department of Primary Industries, Qld Phone: 07 4722 2610 Email: ian.anderson@dpi.qld.gov.au
2002/044	Aquatic Animal Health Subprogram: pilchard herpes virus infection in wild pilchards <i>Associated species:</i> Pilchards	Dr Brian Jones Department of Fisheries, WA Phone: 08 9368 3649 Email: bjones@agric.wa.gov.au
2002/653	Aquatic Animal Health Subprogram: Aquavet aquatic disease disinfection manual <i>Associated species:</i> Multi-	Dr Kevin Ellard DPIWE, Tasmania Phone: 03 6233 6828 Email: kevin.ellard@dpiwe.tas.gov.au
2003/620	Aquatic Animal Health Subprogram: establishment of diagnostic expertise for detection and identification of red sea bream iridovirus (RSIV) <i>Associated species:</i> Multi-	Dr Mark Crane CSIRO Livestock Industries AAHL Fish Diseases Laboratory Phone: 03 5227 5118 Email: mark.crane@csiro.au
2003/649	Aquatic Animal Health Subprogram: industry's emergency preparedness and response to mass mortality of yellowtail kingfish <i>Seriola lalandi</i> : development of plans and protocols <i>Associated species:</i> Yellowtail kingfish	Mr Mark Sheppard Sakana Veterinary Services Ltd. 173 Engles Road, Campbell River British Columbia, Canada, V9H 1J4 Phone: +1-250-926-0291 Email: svsv@oberon.ark.com
2004/079	Aquatic Animal Health Subprogram: Strategic planning, project management and adoption <i>Associated species:</i> Multi-	Dr Mark Crane CSIRO Livestock Industries AAHL Fish Diseases Laboratory Phone: 03 5227 5118 Email: mark.crane@csiro.au
2005/621	Aquatic Animal Health Subprogram: Establishment of a national aquatic animal health diagnostic network <i>Associated species:</i> Multi-	Prof Richard Whittington University of Sydney Phone: 02 9351 1619 Email: richardw@camden.usyd.edu.au
2005/640	Aquatic Animal Health Subprogram: Technical guidelines for the translocation of live aquatic animals <i>Associated species:</i> Multi-	Dr Brian Jones Department of Fisheries, WA Phone: 08 9368 3649 Email: bjones@agric.wa.gov.au

2005/641	Aquatic Animal Health Subprogram: Current and future needs for aquatic animal health training and for systems for merit-based accreditation and competency assessments <i>Associated species:</i> Multi-	Dr Brian Jones Department of Fisheries, WA Phone: 08 9368 3649 Email: bjones@agric.wa.gov.au
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