FINAL REPORT

aquatic animal health subprogram

Aquatic Animal Health Subprogram: development of a training course on exotic diseases of aquatic animals

Kenneth A. McColl and Mark St. J. Crane

June 2004

FRDC Project No. 2002/654

Australian Government
Department of Agriculture, Fisheries and Forestry

CSIRO

Australian Government
Fisheries Research and Development Corporation

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Non-technical Summary

2002/654	Aquatic Animal Health Subprogram: development of a training course on exotic diseases of aquatic animals

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OBJECTIVES:

1. Prepare material to be used in providing a training course on recognition and management of exotic disease outbreaks.

2. Organise material into a format which will facilitate delivery and up-date of a training course, at Australian Animal Health Laboratory (AAHL), on recognition and management of exotic disease outbreaks.

NON-TECHNICAL SUMMARY:

OUTCOMES ACHIEVED

The major outcomes of this project are: (1) there is now a well-organized resource available for current, and future, training of aquaculture health specialists in those diseases that are of prime importance to the aquaculture industries of Australia, i.e., the diseases on the “National List of Reportable Diseases”; and (2) each State/Territory now has one or two specialists who have recently been updated on the exotic diseases of the aquaculture industries in Australia (i.e., diseases on the *National List of Reportable Diseases*). Their improved knowledge and awareness, and their capacity to improve the knowledge and awareness of many of their colleagues, will encourage greater confidence in the ability of regional aquaculture health specialists to recognize, and manage, incursions of exotic diseases. This, in turn, will assist Australian aquaculture industries to maintain their enviable status with respect to freedom from the major aquatic animal diseases of the world.

In the past 5 years the value of Australian aquaculture has doubled to approximately $750 million (ABARE 2002) and is expected to increase to $2.5 billion by 2010 (ACIL Consulting 1999). As the industry expands and intensifies, the risk of infectious disease outbreaks also increases and there is a need for an increased level of expertise nation-wide on aquatic animal diseases. Moreover, as aquaculture

activities in Australia expand, and world-trade and travel increases, the threat of new and emerging diseases to the aquaculture and wild fisheries sectors in Australia also increases.

This ever-increasing list of internationally significant aquatic animal diseases adds to the workload of Australia's relatively few aquatic animal health specialists. Thus it is recognised that training courses for diagnosticians and fish health specialists will assist greatly to maintain Australia's proficiency to detect and diagnose aquatic animal diseases, and maintain the confidence of our trading partners. This project was aimed at developing a training course for Australian aquatic animal health specialists on the recognition, and management, of exotic disease outbreaks. The course was run in 2004, and it is anticipated that the course format is such that up-date of the information for future courses, if considered desirable, will be easily achieved.

Teaching materials used in the training course included resources from AAHL Fish Diseases Laboratory's (AFDL) reference collection of histological materials and kodachromes pertaining to exotic diseases of aquatic animals. In addition, as a result of a study tour where the Principal Investigator visited a number of international aquatic animal disease centres of excellence, two fully-catalogued collections of histological slides, one collection with a single copy of each slide (67 slides), and another collection comprising two copies of each slide (87 slides) were produced. Together, these sets of slides constitute a comprehensive collection of histological material covering almost all of the diseases on the *National List of Reportable Diseases* of aquatic animals.

The Training Course, run at the Australian Animal Health Laboratory, was conducted from Monday, 29 March 2004 to Friday 2 April 2004. A number of guest lecturers participated in the course: Dr Franck Berthe (mollusc expert from IFREMER, France), Dr David Groman (finfish expert from the Atlantic Veterinary College, Canada) and Dr Barbara Nowak (aquatic animal disease expert from University of Tasmania, Launceston). Thirteen aquatic animal health specialists from States and Territories around Australia were selected to participate. A training course CD, featuring much of the material presented through the week, will be distributed to all course participants and their jurisdictions. It is anticipated that the CD will be suitable for participants to use in in-house training sessions on return to their own State/Territory. This would maximise the impact of the training course.

This project aimed to obtain resource material for inclusion in a training course on exotic diseases of aquatic animals. The material has been organised to allow storage in CD-ROM format. Such a format will facilitate (a) future training course delivery (if necessary), (b) up-date of the course material, as required, and (c) transfer of the material to stakeholders for in-house training purposes, if desired. Content of the training course included lecture notes and practical sessions on exotic viral, fungal, bacterial and parasitic diseases of finfish, crustaceans and molluscs. Diseases covered were selected from those exotic diseases that are currently listed on the *National List of Reportable Diseases of Aquatic Animals*. Resources were limited for some diseases, particularly some mollusc diseases, and AFDL will aim to rectify this situation for any future courses that may be held.

Depending on the perceived value of the training course and the need to provide further training on a regular basis (e.g. once per year or two years) consideration will be given to develop the course further, such as up-dating the information on the CD,

in anticipation of future courses. Reference material on new diseases, exotic to Australia, which will emerge overseas can be accessed and added to the set of course material.

KEYWORDS: aquatic animal exotic diseases, training course, histopathology

Acknowledgements

Many of the resources, and much of the information, that have been used to develop the training course were supplied by people from laboratories around the world: Dr F Berthe, IFREMER, La Tremblade, France; Dr V Blazer, USDA/ARS National Center for Cool and Cold Water Aquaculture, Leetown, USA; Dr A Bolland, Intervet, The Netherlands; Dr D Bruno, FRS Marine Laboratory, Aberdeen, Scotland; Drs O Dale, K Falk and T Mo, National Veterinary Institute, Oslo, Norway; Drs D Elliott and J Winton, Western Fisheries Research Center, Seattle, USA; Drs S Feist and D Alderman, CEFAS, Weymouth Laboratory, UK; Dr A Goodwin, University of Arkansas, USA; Dr J Grizzle, Auburn University, USA; Dr D Groman, Atlantic Veterinary College, Canada; Dr L Hanson, Mississippi State University, USA; Dr J Hawke, Louisiana State University, USA; Drs R Hedrick and D Baxa, University of California, Davis, USA; Dr S Kanchanakhan, Kasetstart University, Thailand; Drs J Kurita and M Sano, National Research Institute of Aquaculture, Japan; Dr M Lancaster, Primary Industries Research Victoria – Attwood, Australia; Dr S La Patra, Clear Springs Inc., Idaho, USA; Dr D Lightner, University of Arizona, Tucson, USA; Drs N Moody and I Anderson, Oonoonba Veterinary Laboratory, Queensland, Australia; Drs N-J Olesen, E Ariel and BD Schyth, Danish Veterinary Laboratory, Aarhus, Denmark; Dr S Pyecroft, DPIWE, Tasmania, Australia; Dr R Reuter, IDEXX VPS, South Australia; Dr J Schuh, Applied Veterinary Pathobiology, Bainbridge Island, USA; Dr F Stephens, Western Australia Marine Research Laboratories, Australia; Dr M Stephenson, Department of Fisheries and Oceans, Moncton, Canada; Dr T Wahli, University of Bern, Switzerland; and, Dr M Yoshimizu, Hokkaido University, Japan.

A number of people at AAHL, although not directly involved in this project, also made valuable contributions. Kelly Steeper, Gemma Carlile, Dr Serge Corbeil, Lynette Williams and Tamasine Chamberlain gave valuable advice and assistance with aspects of the training course.

Background

AAHL Fish Diseases Laboratory (AFDL) had a proposal to run an exotic disease course on aquatic animal diseases (FRDC Project Number 2002/666) approved. In that proposal it was recognised that while an exotic disease course was highly desirable, currently such a course was not fully developed. Thus it was recommended that the AFDL submit a proposal for the development of the exotic disease course that would allow full development of a comprehensive course on aquatic animal diseases which would be run at AAHL in 2004.

Need

In the past 5 years the value of Australian aquaculture has doubled to approximately $750 million (ABARE 2002) and is expected to increase to $2.5 billion by 2010 (ACIL Consulting 1999). As the industry expands and intensifies, the risk of infectious disease outbreaks also increases and there is a need for an increased level of expertise nation-wide on aquatic animal diseases.

Overseas, the number of significant aquatic animal pathogens discovered is, as ever, increasing. Infectious salmon anaemia, originally confined to Norway, has appeared in UK, Canada and the Faroe Islands. Nodaviruses, viral haemorrhagic septicaemia virus, iridoviruses, Rickettsia-like organisms, to name a few, are more widespread than previously thought. Gyrodactylosis, caused by *Gyrodactylus salaris*, is a recent addition to the *OIE Manual of Diagnostic Tests for aquatic animals* as are the crustacean diseases Taura syndrome, white spot disease and yellow head disease. Moreover, as aquaculture activities in Australia expand, and world-trade and travel increases, the threat of new and emerging diseases to the aquaculture and wild fisheries sectors in Australia also increases.

This ever-increasing list of significant diseases adds to the workload of Australia's relatively few aquatic animal health specialists. Thus it is recognised that training courses for diagnosticians and fish health specialists will assist greatly to maintain Australia's proficiency to detect and diagnose aquatic animal diseases, and maintain the confidence of our trading partners. This project is aimed at developing a training course with the most current and relevant information for Australian aquatic animal health specialists. The first course will be run in 2004 and it is anticipated that the course format will be such that up-date of the information, so that it remains current, will be facilitated, and future courses, if considered desirable, will continue to provide relevant information to assist in not only the recognition of exotic disease but also management of disease emergencies. It would be anticipated that new graduates entering the field of aquatic animal health will have access to this information.

Objectives

1. Prepare material to be used in providing a training course on recognition and management of exotic disease outbreaks.

2. Organise material into a format which will facilitate delivery and up-date of a training course, at AAHL, on recognition and management of exotic disease outbreaks.

Methods

Development of existing material

AFDL has certain resource material in-house that can be utilised during the training course. Prior to the training course, this material needed to be organised and developed further to facilitate its use during the course. Thus photomicrographs were produced from histological slides demonstrating lesions resulting from infection with exotic agents. Other resources, such as kodachromes demonstrating various aspects of exotic diseases were duplicated. High quality images of these materials needed to be captured to CD-Rom as part of the training course material.

In addition, there are paraffin blocks of fixed tissues from experimental infections carried out at AFDL that could be utilised. A selection of these was processed for histological procedures, immunoperoxidase tests and in situ hybridisation tests. Sections from each of these blocks were cut, the procedures tested on a sample from each of the blocks to ensure that the sections represent good positive controls. Then sufficient numbers of sections were cut to meet the training course needs.

Other course material

Other material, sourced from overseas or developed in-house, was required to supplement existing material. The most efficient way to access required material from overseas was for a member of AFDL staff to visit OIE Reference Laboratories, not only to collect reference material for the training course but also to gain knowledge and some experience in the diagnosis of OIE listed diseases from the international experts. A further benefit from these visits included the strengthening of Australia's relationships with these laboratories. In addition, it is through this personal contact that some of the world's leaders in aquatic animal diseases can be persuaded to participate as presenters at the planned training course in exotic diseases of aquatic animals (FRDC Project No. 2002/666).

In addition, to supplement AFDL's reference collection, a study tour was planned to encompass visits to centres of excellence concerned with aquatic animal disease diagnosis and research. Visits to the following laboratories were undertaken:

European Community Reference Laboratory for Fish Diseases
Danish Veterinary Institute
Aarhus
DENMARK

The FRS Marine Laboratory
Aberdeen
Scotland UK

Western Fisheries Research Centre
Seattle WA
USA

Department of Fisheries
Moncton
New Brunswick
CANADA

Dr Ken McColl, Veterinary Pathologist AFDL, undertook the proposed study tour. The itinerary, outlined above, included discussions with the following OIE experts/Reference Laboratories:

Dr. J. Winton (infectious haematopoietic necrosis)
Western Fisheries Research Center, Seattle, Washington, USA

Dr. N-J. Olesen (viral haemorrhagic septicaemia)
Danish Veterinary Laboratory, Aarhus, Denmark

Training Course Presenters and Course Development

Course presenters were identified and were requested to provide notes on lectures and practical sessions to be included in the course and on the training course CD. Presenters included recognised experts in their field. Diseases covered were selected from those exotic diseases which are currently listed on the *National List of Reportable Diseases of Aquatic Animals*.

Each lecturer, once selected, was advised of the diseases for which they would be responsible, and each lecturer undertook to:

1. Supply a set of written notes on each of these diseases. The format for these notes has been designed to be informative and concise (see Appendix 2 for a guide to the lecture notes).
2. Give a series of lectures that covers their particular diseases. The lectures will complement the lecture-notes, and will emphasize the practically important issues (with respect to clinical signs, pathology, diagnosis, control) associated with each disease.
3. Participate in laboratory exercises, eg, sessions on histopathology, laboratory diagnosis of certain crustacean and mollusc diseases, etc.
4. Supply photographic material of many of the diseases of interest. Much of this material will be reproduced on the CD that will be supplied to all participants of the course.
5. Supply some histopathological slides that can be used in the course. AAHL has already gathered a certain amount of histological material (as noted earlier); additional material from the presenters will, in some cases, supplement that which is already available, and, in other cases, overcome deficiencies in some diseases for which it has proven difficult to obtain material.

Once the training course dates were firmly established travel itineraries for our guest lecturers were finalised. A mailing list to advertise the course to potential Australian participants was developed. This course was to be directed primarily at pathologists involved in any, or all, of the finfish, mollusc or crustacean industries in Australia. The CVO and/or the Director of Fisheries in each State or Territory of Australia were, by

the middle of January 2004, invited to nominate a participant from each region for a fully-funded position in the course. In addition, there were a further four fully-funded positions available for which expressions of interest from each of the States were invited.

It was anticipated that the course presenters could have been drawn from a relatively large pool of experts (as indicated in FRDC Project 2002/666):

- Viral diseases of finfish: Jim Winton (USA), Niels Jorgen Olsen (Denmark), Mark Crane, Serge Corbeil
- Bacterial diseases of finfish: Nick Gudkovs, Jeremy Carson
- Parasitic diseases of finfish: Bob Lester
- Viral diseases of crustaceans: Tim Flegel (Thailand), Peter Walker, Don Lightner (USA), Leigh Owens
- Fungal diseases of crustaceans: Brian Jones, David Alderman (UK)
- Parasitic diseases of molluscs: Mike Hine (NZ), Bob Lester, Rob Allard
- Clinical signs of disease: Kevin Ellard, Brian Jones, Judith Handlinger, Mike Hine
- Submission of samples for laboratory investigation: Kevin Ellard, Nette Williams
- Control and Prevention of finfish diseases: Niels Jorgen Olsen
- Control and Prevention of crustacean diseases: Brian Jones, Ian Anderson, Tim Flegel
- Control and Prevention of molluscan diseases: Mike Hine
- Emergency Disease Management: Eva-Maria Bernoth, Barry Hill (UK), Iain East, Kevin Ellard
- Legislation: Linda Walker, Kevin Ellard
- Histopathology: Tim Flegel, Brian Jones, Ken McColl, Judith Handlinger, Richard Whittington, Dick Callinan, Barbara Nowak
- In situ hybridisation: Joanne Slater, Ken McColl
- Immunoperoxidase test: Niels Jorgen Olesen, Knut Falk (Norway), Mark Crane, John Young
- Electron Microscopy: Alex Hyatt

However, as the planning of the course progressed, following the study tour undertaken by the project PI (Dr Ken McColl), it became clear that there was a unique opportunity to obtain the services of a few, high-level international experts who were willing to provide the majority of course materials and undertake lecture presentations and lead the practical sessions. These international lecturers would be able to provide a perspective based on direct experience with many of the diseases to be covered in the training course. This was an opportunity too good to overlook.

Three international experts were targeted, one for each of the main topics:

- Diseases of Finfish
- Diseases of Crustaceans
- Diseases of Molluscs

Presentations by these three main lecturers would be supplemented with presentations by Australian experts on topics that required local knowledge.

Results and Discussion

Training Course Dates

The dates for the Training Course at AAHL were established as Monday, 29 March 2004 to Friday 2 April 2004. This is slightly later than had been anticipated in the original proposal, but it was the first available time that was convenient for our overseas presenters, and for AAHL staff involved in the course.

Course Materials

AFDL's reference collection of histological materials (H&E stained sections, unstained sections, paraffin blocks) and kodachromes (external signs, internal signs, histopathology, immunohistochemistry, agent isolation, immunocytochemistry etc.) pertaining to exotic diseases of aquatic animals was reviewed, organised, reproduced as needed, and catalogued (Appendix 4, Table 1. Note that this List was updated in September 2003). During this process it became clear that this collection is relatively limited and required supplementation with a broader range of materials for each exotic disease.

To supplement AFDL's reference collection, a study tour was planned to encompass visits to centres of excellence concerned with aquatic animal disease diagnosis and research. It was considered that the most efficient way to access required material from overseas was for a member of AFDL staff to visit OIE Reference Laboratories, not only to collect reference material for the training course but also to gain knowledge and some experience in the diagnosis of OIE listed diseases from the international experts. A further benefit from these visits included the strengthening of Australia's relationships with these laboratories. In addition, it was through this personal contact that some of the world's leaders in aquatic animal diseases were persuaded to participate as presenters at the planned training course in exotic diseases of aquatic animals (FRDC Project No. 2002/666).

Largely as a result of this tour, AFDL has been able to establish two fully-catalogued collections of histological slides, one collection with a single copy of each slide (67 slides), and another collection where there are two copies of each slide (87 slides). Together, these sets of slides constitute a comprehensive collection of histological material covering almost all of the diseases on the National List of Reportable Diseases of fish and crustaceans. There are still deficiencies with respect to slides of the diseases of molluscs (but AFDL will continue to address this deficiency in the future).

Course Presenters

The following people accepted our invitation to take a leading role in the course:

Dr Franck Berthe (mollusc expert)
IFREMER
Dept des Resources Aquacoles
Laboratoire de Genetique et Pathologie
BP 133, 17390 La Tremblade, FRANCE Accepted 09-Sept-2003

Dr David Groman (finfish expert)
Aquatic Diagnostic Services
Atlantic Veterinary College
University of Prince Edward Island
550 University Avenue
Charlottetown, PEI, CANADA
C1A 4P3 Accepted 15-Oct-2003

Dr Carlos Pantoja (crustacean expert)
University of Arizona
1117 E Lowell St
Bldg 90, Rm 114
Tucson AZ 85721
USA Accepted 21-Nov-2003

Unfortunately, about one month prior to the exotic disease course taking place, Dr Carlos Pantoja (USA) had to withdraw from the course. At very short notice, Dr Barbara Nowak, University of Tasmania, Launceston stepped in and presented lectures and practical sessions on crustacean diseases.

Course Participants

All States and Territories were contacted and invited to send two participants to the training course on exotic diseases of aquatic animals. All States and Territories responded, and responses to the invitation to participate in the exotic disease training course were very positive. Due to the low level of aquaculture in ACT and the low numbers of staff, the ACT CVO, although interested, could not justify attendance at the course. The Australian Government Department of Agriculture, Fisheries and Forestry (Aquatic Animal Health Unit) was also invited to send a participant.

Course Materials

The guest lecturers provided lecture notes, histological sections and other materials for use during the course and for use in compiling a training course CD which will be distributed to all course participants and their jurisdictions. Unfortunately, because much of the material for the CD was supplied by the guest lecturers when they arrived at the Course, it was not possible to have the CD completed for distribution to participants during the Course. It is anticipated that the CD will be suitable for participants to use in in-house training sessions on return to their own State/Territory. This would maximise the impact of the training course.

Course Assessment

We decided to ask all participants to provide their frank assessment of the Training Course in order to determine if the course was of value to them and to the aquaculture industry that each of them served or represented. Assessment would be by completion of the Assessment sheet (Appendix 4, Table 2). A score (1 through 10, where 1 is the lowest rating and 10 the highest) would be assigned to each activity in the Course, and mean values would then determined for each activity.

Training Course CD

The CD contains a wealth of information for the use of Course participants (and others in their respective State/Territories). Information includes:

- PowerPoint presentations from each and every disease lecture given during the week of the Course. This includes lectures on diseases of finfish, crustaceans and molluscs.
- Selected photomicrographs of histological lesions from many of the diseases on the National List of Reportable Diseases.
- PowerPoint presentations from each of the remaining presentations that occurred during the week of the course, for example, “Collection and dispatch of specimens”, “Exotic disease management and legislation”, “Disease control” forum, and the “Media awareness” presentation.

Conclusions

Overall, the project has been very successful as judged by the level to which each of the Objectives has been satisfied:

Objective 1

Material for use in a training course on the recognition and management of exotic disease outbreaks in aquaculture species has been gathered, and catalogued, from many sources, and is ready for use. The primary material was accessed from AFDL itself, and from numerous overseas laboratories. In some cases the material was derived from experimental cases of particular diseases, but, in many cases, the source was natural field cases of the disease. The most difficult resource to assemble has been the collection of histological slides that encompasses most of the diseases on the *National List of Reportable Diseases of Aquatic Animals*, There are still deficiencies in the collection of mollusc diseases but attempts will be made to rectify this deficiency in the future. In addition to the slides, the three specialist presenters at the course (covering finfish, crustacean and mollusc diseases) provided a set of PowerPoint presentations that included images of clinical signs and gross lesions for many of the diseases under consideration. The latter is a resource that can be readily updated for use at any subsequent training courses. In addition, the PowerPoint presentations and photomicrographs of lesions from many of the diseases of interest will provide an invaluable teaching resource for participants in the planned training course (and, by continual updating of the presentations, for future training courses).

The major outcome of these outputs is that there is now a well-organized resource available for current, and future, training of aquaculture health specialists in those diseases that are of prime importance to the aquaculture industries of Australia, i.e., the diseases on the *National List of Reportable Diseases of Aquatic Animals.*

Objective 2

Using the resources that have been gathered, a training course in the recognition and management of exotic diseases has been organized and provided in March/April, 2004. Thirteen participants from Australian States and Territories took part in the course that was held in both the secure and non-secure sections of the Fish Diseases Laboratory (AFDL) at the Australian Animal Health Laboratory. The course lecturers consisted of two overseas experts (one on diseases of finfish, and the other on diseases of molluscs), and an Australian expert (on diseases of crustaceans). As a result, participants were exposed not only to the latest information, but also to a perspective heavily influenced by experience and practical considerations when dealing with these diseases. Furthermore, each participant will receive a CD that contains much of the information that was presented at the course, thus allowing further in-house training when the participants returned home.

The major outcomes of these outputs are that: each State/Territory now has one or two specialists who have recently been updated on the exotic diseases of the aquaculture industries in Australia (i.e., diseases on the *National List of Reportable*

Diseases of Aquatic Animals). Their improved knowledge and awareness, and their capacity to improve the knowledge and awareness of many of their colleagues, will encourage greater confidence in the ability of regional aquaculture health specialists to recognize, and manage, incursions of exotic diseases. This, in turn, will assist Australian aquaculture industries to maintain their enviable status with respect to freedom from the major exotic diseases of the world.

Benefits

Undoubtedly, the most important benefit to be derived from the Training Course will be the presence of aquaculture health specialists in each State/Territory who have a heightened awareness of the exotic diseases that are important to the industries in their region. In addition, participants in the training course gained diagnostic skills for a range of exotic diseases of finfish, crustaceans and molluscs. It is to be hoped that they are able to share their newfound, or updated, knowledge and skills with many of their local colleagues, thereby dramatically improving the regional capacity for the recognition of exotic disease incursions.

Australian aquaculture industries enjoy enormous benefits as a result of our freedom from many of the important diseases that exist overseas. Maintaining this status relies primarily upon rapid recognition of any incursions, and the subsequent management of any such incursion, were it to occur. If recognition and management were undertaken rapidly and professionally, this would provide the best opportunity of regaining the nation's status of being free of that particular disease. With this in mind, it is clear that the major beneficiaries of this project are the various finfish, crustacean and mollusc aquaculture industries around Australia. The ability to respond quickly and decisively to any incursion (and thereby resume our former disease-free status) could potentially save enormous amounts of money to the industries involved in the outbreak.

Further Development

This project aimed to obtain resource material for inclusion in a training course on exotic diseases of aquatic animals. The material has been organised to allow storage in CD-ROM format. Such a format will facilitate (a) future training course delivery (if necessary), (b) up-date of the course material, as required, as well as (c) facilitate transfer of the material to stakeholders for in-house training purposes, if desired. Content of the training course included lecture notes and practical sessions on exotic viral, fungal, bacterial and parasitic diseases of finfish, crustaceans and molluscs. Diseases covered were selected from those exotic diseases which are currently listed on the *National List of Reportable Diseases of Aquatic Animals*. Clearly, some diseases are more important to Australia than others and, while every effort was made to provide a comprehensive set of material, advice on content was also sought from stakeholders. Thus specific outputs included a series of lecture notes and other resource material such as photographs of diseased aquatic animals, gross lesions, histological lesions, information on diagnostic techniques and procedures, as well as information on emergency disease management. As far as possible, all information was transferred to CD in a format of the highest quality with the currently available resources. Extension of this project would include delivery of the training course to, in the first instance, a limited number of aquatic animal health specialists (FRDC Project number 2002/666). A copy of the CD would be provided to all participants. Extra CDs will also be available to other parties, as required. As alluded to, such a CD could form part of the teaching resources to lecturers in aquatic animal diseases at various tertiary institutions.

Depending on the perceived value of the training course and the need to provide further training on a regular basis (e.g. once per year or two years) consideration will be taken to develop the course further, such as updating the information on the CD, in anticipation of future courses. Reference material on new diseases, exotic to Australia, which will emerge overseas can be accessed and added to the set of course material.

Planned outcomes

This project provided high quality resource material on a range of exotic diseases of aquatic animals which will be developed and organised in a training course format. Such a course could then be delivered to aquatic animal health specialists throughout Australia. In the first instance, it is anticipated that participants (12-14 individuals) will include aquatic animal pathologists and health specialists from all States and Territories with significant aquaculture industries. On completion of the course, participants will have gained increased knowledge on exotic diseases of finfish, crustaceans and molluscs, and this will have been provided by recognised experts from within Australia and from overseas.

Training course participants will (a) be better prepared to recognise exotic disease outbreaks, (b) understand the issues involved in emergency disease management at both theoretical and practical levels, and thus (c) be better prepared to implement procedures aimed at protecting industry, wild-life and other natural resources from potentially devastating effects of an exotic disease incursion and its consequences.

“Graduates” from the course will be provided with a copy of the training CD which, in theory, could be used for some limited in-house training of other resident aquatic animal health specialists. Other aspects of the course, due to the exotic nature of some of the material, could only be carried out at AAHL. Thus it is expected that a full course, with updated material including hands-on experience with exotic disease agents, would be run at AAHL on an as-needs basis i.e. when interest from sufficient numbers of potential participants has been expressed.

References

1. ABARE 2002. Australian Fisheries Statistics 2001, Canberra, ACT.
2. ACIL Consulting 1999. Aquaculture beyond 2000. Facilitator's Report, prepared by Denis Hussey, Senior Associate, ACIL Consulting on a workshop, Changing Direction, held 23-24 August 1999, Canberra.

Appendix 1 - Intellectual Property

All information arising from this project has been used for the development and/or holding of a training course on exotic diseases of aquatic animals. No intellectual property has been identified.

Appendix 2 - Guide for guest lecturers on the content of lecture notes

AETIOLOGY

Name of organism (plus a general taxonomic description of the organism) e.g., IPN virus (family *aquabirnaviridae*)

EPIDEMIOLOGY

Distribution

- Geographic?
- Any species predilection?
- Seasonal?

Transmission

Anything else that you think is important but that doesn't conveniently fit into any of the other categories!

PATHOGENESIS (If known)

For most diseases this probably won't be known, but, where it is, I find that a fundamental understanding of pathogenesis (by which I mean only 2-3 sentences) allows a person to predict what the clinical signs of disease might be, and what the lesions will be (it certainly works for mammals, but the lack of information about pathogenesis of fish diseases may preclude a similar sort of approach).

CLINICAL SIGNS OF DISEASE

Very brief, unless there is something quite characteristic. Emphasize what you're most likely to see in a real disease situation.

PATHOLOGY (GROSS AND MICROSCOPIC)

Again, very brief and emphasizing the lesions that are most likely to be seen.

There will probably be a mix of pathologists and non-pathologists at the Training Course, although we will be trying to encourage the participation of pathologists. Certainly, there will be some emphasis on participants looking at slides during the course, so it would be good if you could supply them with key lesions to look for when they're examining slides. I'm hoping the histology sessions will be extremely valuable.

DIAGNOSIS

Provide the basics, and emphasize the practical, the most practised and the important.

CONTROL AND PREVENTION

Again, provide the basics, and emphasize the practical, the most practised and the important.

Appendix 3 – Staff

Name	Position	Section
Dr Ken McColl	Senior Research Vet	AAHL Fish Diseases Laboratory
Kelly Steeper	Experimental Scientist	
Dr Mark Crane	Project Leader, AFDL	
Lynette Williams	Senior Technical Officer	
Tamasine Chamberlain	Senior Technical Assistant	
Gemma Carlile	PhD student	

Appendix 4 – Tables

Table 1. National List of Reportable Diseases of Aquatic Animals

Disease	Notifiable to the OIE	NACA Listed	Exotic	Resources at AAHL
Finfish				
Epizootic haematopoietic necrosis	✓	✓		I, H, K
Infectious haematopoietic necrosis	✓	✓	✓	I, H
Oncorhynchus masou virus disease	✓	✓	✓	I
Spring viraemia of carp	✓	✓	✓	I
Viral haemorrhagic septicaemia	✓	✓	✓	I, H, K
Channel catfish virus disease		✓	✓	I
Viral encephalopathy and retinopathy		✓		I, H, K
Infectious pancreatic necrosis		✓	✓	I, H
Infectious salmon anaemia		✓	✓	I, H, K
Epizootic ulcerative syndrome (*Aphanomyces invaderis*)		✓		
Bacterial kidney disease (*Renibacterium salmoninarum*)		✓	✓	I, H
Enteric septicaemia of catfish (*Edwardsiella ictaluri*)		✓	✓	I
Piscirickettsiosis (*Piscirickettsia salmonis*)		✓	✓	H, NA
Gyrodactylosis (*Gyrodactylus salaris*)		✓	✓	
Furunculosis (*Aeromonas salmonicida* subsp. *salmonicida*)			✓	I, H, K
Aeromonas salmonicida - atypical strains				I
Whirling disease (*Myxobolus cerebralis*)			✓	NA
Enteric redmouth disease (*Yersinia ruckeri* – Hagerman strain)			✓	I
Red sea bream iridoviral disease		✓	✓	
White sturgeon iridoviral disease		✓	✓	
Molluscs				
Bonamiosis *Bonamia ostreae* *Bonamia* sp.	 ✓ ✓	 ✓ ✓	 ✓	
Haplosporidiosis *Haplosporidium costale* *Haplosporidium nelsoni*	 ✓ ✓	 ✓ ✓	 ✓ ✓	
Marteiliosis *Marteilia refringens* *Marteilia sydneyi*	 ✓ ✓	 ✓ ✓	 ✓	
Mikrocytosis *Mikrocytos mackini* *Mikrocytos roughleyi*	 ✓ ✓	 ✓ ✓	 ✓	
Perkinsosis *Perkinsus marinus* *Perkinsus olseni*	 ✓ ✓	 ✓ ✓	 ✓	
Iridoviroses		✓	✓	
Akoya oyster disease			✓	
Crustaceans				
Baculoviral midgut gland necrosis		✓	✓	
Nuclear polyhedrosis baculoviroses *Baculovirus penaei* *Penaeus monodon*-type baculovirus		 ✓ ✓	 ✓	
Infectious hypodermal and haematopoietic necrosis		✓	✓	I
Yellowhead disease	✓	✓	✓	I, H
Crayfish plague (*Aphanomyces astaci*)		✓	✓	
White spot disease	✓	✓	✓	I, H
Taura syndrome	✓	✓	✓	
Gill-associated virus		✓		
Spawner-isolated mortality virus disease		✓		
Necrotising hepatopancreatitis		✓	✓	

Legend: I:Isolates available
H: Histological sections available (including paraffin blocks)
K: Kodachromes available
NA: Nucleic acid preparations available

Table 2. Aquatic Animal Health Subprogram: training course in exotic diseases of aquatic animals – Participant assessment of the course

	General	Finfish	Crustacean	Mollusc
Lectures				
Content				
Presentation				
Teaching value				
Lab classes				
Content				
Presentation				
Teaching value				
Histopathology sessions				
Content				
Presentation				
Teaching value				
Discussion forum (Tues evening - Disease control)				
Specimen collection/dispatch				
Content				
Presentation				
Teaching value				
Exotic disease management/Legislation				
Content				
Presentation				
Teaching value				
Catering				
At AAHL				
At Course dinner				
Overall value of course				

* Participants will be asked to assign a score (1 through 10, where 1 is the lowest rating and 10 is the highest) for each of the activities in the Training Course. The final score will be the mean value for the participants who respond.