

FINAL REPORT



Aquatic Animal Health Subprogram: Database of Diseases and Pathogens of Australian Aquatic Animals

Gustad Boman and Steve Jones

July 2004

FRDC Project No. 2003/646



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Aquatic Animal Health

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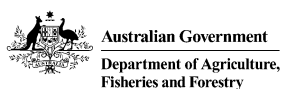


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Non-technical Summary

2003/2004 Australian Aquatic Animals Diseases and Pathogens Database

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OBJECTIVE:

Gather requirements and analyse, design and develop a system (database) that will provide rapid access to information on the viral, bacterial and parasitic diseases of marine and freshwater finfish, shellfish and crustaceans in Australia. Through this system, policy makers, managers, scientists and academics would gain rapid access to what information has to be published on specific disease agents, their hosts and their distribution.

OUTCOMES ACHIEVED TO DATE

A capability that enables:

- Rapid access to information on viral, bacterial and parasitic diseases of marine and freshwater finfish, shellfish and crustaceans in Australian, and
- Rapid access to the information that has been published on specific disease agents, their hosts and their distribution for use by policy maker, managers, scientists and academics.

KEYWORDS:

AQUATIC ANIMAL HEALTH
AQUATIC DISEASES
AQUATIC PATHOGENS
TAXONOMY
PARASITIC DISEASES
VIRAL DISEASES
BACTERIAL DISEASES
FINFISH
SHELLFISH
CRUSTACEANS
NON-VIRAL

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2. **Dr Brian Jones**, Senior Fish Pathologist, Department of Fisheries, Government of Western Australia
3. **Dr Mark Crane**, Project Leader, AAHL Fish Diseases Laboratory, Australian Animal Health Laboratory, CSIRO Livestock Industries.
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8. **Paul Batum**, Software and Database Designer, F1 Solutions.
9. **Stephen Winning**, Quality Assurance, F1 Solutions.
10. **Zarthost Boman**, Documentation, F1 Solutions.

BACKGROUND

Following the 2001 Fish Pathologists Workshop, the FRDC Aquatic Animal Health Subprogram Steering Committee (STC) with its Scientific Advisory Committee (SAC) considered potential projects for funding through the Federal Budget Initiative Building a National Approach to Animal and Plant Health Program. One project seen as a priority was the establishment of a database of known pathogens/agents of aquatic animals in Australia.

The database would provide rapid access to information on the viral, bacterial and parasitic diseases of marine and freshwater finfish, shellfish and crustaceans in Australia. Through this system policy makers, managers, scientists and academics would gain rapid access to what information has been published on specific disease agents, their hosts and their distribution.

The project will follow a staged approach to design, develop and deploy the database of diseases and pathogens of Australian aquatic animals. However, this R&D Funding Application is for Stage 1 of the project. On successful completion of Stage 1 this application may be extended to include the remainder stages or a new application for the remainder stages may be submitted.

The stages of the project are:

1. Stage 1 – Requirements gathering and systems analysis and design. This includes identifying and analysing business functions and associated data; solution architecture and technical design; data model and database design; infrastructure – web/windows/database management system/security; interface with other systems; data migration/conversion; high level project plan; and high level application specification.
2. Stage 2 – System Development. This includes user interface specifications; application software and database development; change control; quality assurance - unit testing and functional testing by end-users; development environment and status reporting; test plan and user acceptance.
3. Stage 3 – Implementation. This includes installation in production; on-site support; training – formal and informal; documentation – online, user manual and technical manual.
4. Stage 4 – Maintenance and on-going support. This includes warranty; help desk support; bug fixes; and enhancements and modifications.

NEED

This project is a priority issue for the FRDC Aquatic Animal Health Subprogram Steering Committee (STC) and Scientific Advisory Committee (SAC).

The range of potential beneficiaries of the database is rather wide and varied. However, a key technical/scientific group is the National Aquatic Animal Health - Technical Working Group (NAAH-TWG). All SAC members are also members of the NAAH-TWG. Another group – operating at a more strategic level – is the Aquatic Animal Health Committee (AAHC). The subprogram leader is a member of AAHC

OBJECTIVE

Gather requirements and analyse, design and develop a system (database) that will provide rapid access to information on the viral, bacterial and parasitic diseases of marine and freshwater finfish, shellfish and crustaceans in Australia. Through this system, policy makers, managers, scientists and academics would gain rapid access to what information has to be published on specific disease agents, their hosts and their distribution.

SOLUTION BREAKTHROUGHS

The solution provides two design breakthroughs of significance for the users of the system.

1. This system design addresses a key user requirement for searching current biological database systems which give them the ability to search on a single taxonomical name for an organism, and obtain results for any other previous, or future, taxonomical (re-)names of that organism. The system achieves this by storing lists of organism names synonyms. In this way, searchers do not need to know about, nor repeatedly enter, such synonyms, in order to get a comprehensive search result set.
2. The 'Case Concept' embodied in the system design, is a significant improvement over the way Cases are handled within traditional scientific publications, because it allows for a single Case to be made up of multiple Investigations.

In this system a Case is a single Collection of like Australian Aquatic Animal specimen(s) (ie. potential Host(s)). A Case, in essence, details the one or many Investigations of this specimen(s) for the presence or absence of associated Pathogens and Diseases. Traditional literature, by its nature, makes it difficult to associate and locate disparate publications on multiple Investigations of a single Host Collection. The Case Concept can be expected to facilitate better and quicker understanding of the ultimate truths which underlie the results of these individual Investigations.

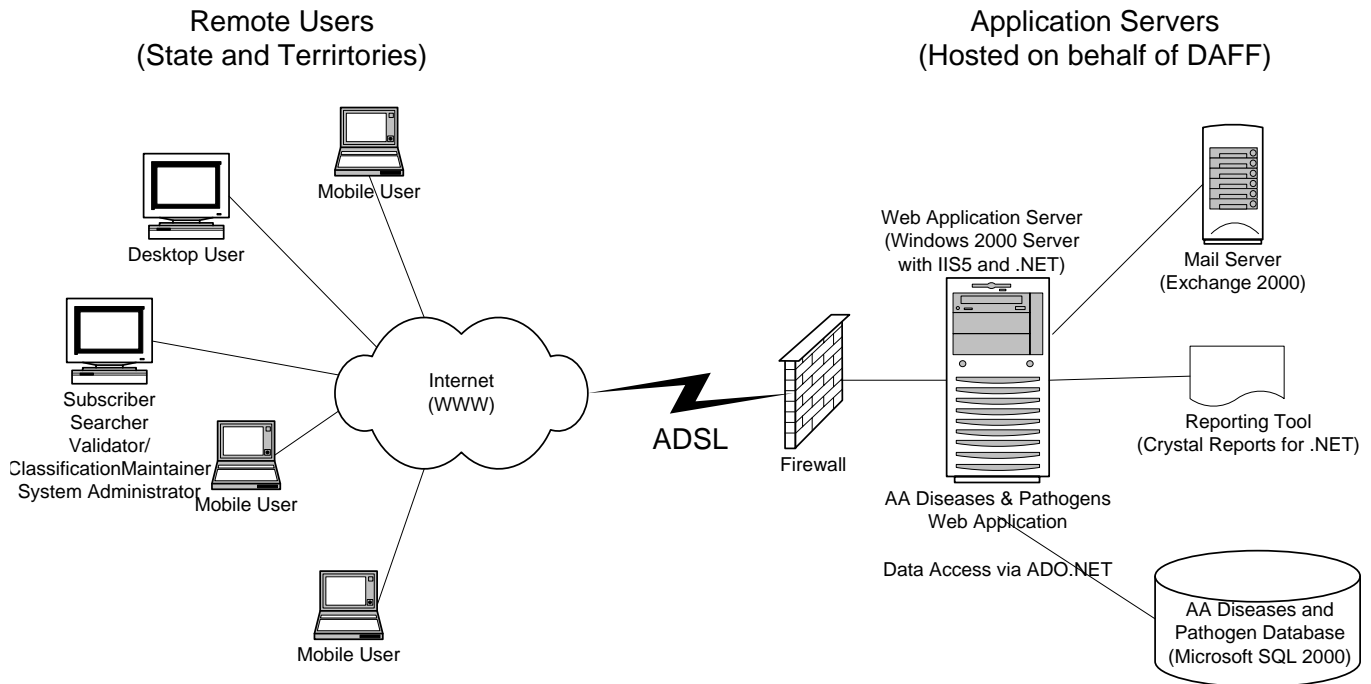
SYSTEM DESIGN

Case Concept

The system is designed around the Case Concept. A Case is a single Collection of like Australian Aquatic Animal specimen(s) (ie. potential Host(s)). A Case, in essence, details the Investigation(s) of this specimen(s) for the presence or absence of associated Pathogens and Diseases. A Case also includes details of the Storage of the specimen(s).

The system is designed to accept, store, validate, search and return Cases.

System Overview



Infrastructure

The application software is developed in Microsoft's .Net technology. ASP.Net and C# are used to develop the code and user interface. ASP.Net developed applications lend themselves to be scalable, flexible and maintainable. Therefore, the system can be enhanced, supported and extended cost effectively.

The user interface is via the Internet Explorer web browser. All the functions of the system can be performed using the web browser interface.

Microsoft SQL Server database will be the data repository to store, manipulate and retrieve the data relating to the aquatic animal diseases and pathogens. SQL Server is a comprehensive database system which is optimised to interact with ASP.Net.

Security

There are divergent views on whether the Submitter and/or Searcher roles should be publicly accessible or accessible by authorised users only. The key consideration would seem to be that the more limited, and known, the audience is, the more likely it is that Submitters would be willing to submit potentially sensitive Cases for mutual benefit. Therefore it may be that if access is to be securely restricted, in anticipation of greater information sharing, then an Access Policy should be developed to reinforce the confidence of authorised users that their data will not be exposed to a wider audience at some future time without appropriate recognition of the terms on which the data was originally submitted.

Performance

The database design, application technology and database technology have been combined to create a system that delivers acceptable response time over a public network (internet). The system design and the underlying technology are scalable thus giving the option to continue to deliver acceptable response time should the volume of transactions and/or the volume of data increase.

System Functions and Rules

User Login

The system requires the user to login. Following successful login the user is authorized to perform functions that are consistent with the permissions set for his role(s) by the system administrator.

The possible roles are:

- Submitter
- Validator / Classification Maintainer – the system will allow each taxonomic Family to be assigned to a single User with this role
- Searcher
- System Administrator

Submitting Cases / Investigations

The system will provide the ability for an authorised user to submit:

- new Cases; and /or
- new Investigations within an existing Case

To facilitate accurate and easily searchable data the submitter will be presented with drop-down lists associated with the following:

- Names of Host
- Names of any associated Pathogen(s)
- Diseases
- Clinical Signs / Sites
- Identification Methods

The submitter has the option to submit non-listed values for Host and Pathogen names but these values would only be added to the appropriate lists when, and if, they are accepted by the validator.

Non-Viral Organisms are identified primarily by Genus/mandatory; Species/optional.

Viruses are identified primarily by Family/mandatory; Genus/optional; Species/optional.

Validating Cases

Submissions are validated by a Validator. It is expected that the Validator will be a person with expertise in the Host organism submitted in the Case. Validator privileges will be assigned to an individual by the systems administrator and will be established at login.

Validation of a Case allows a Validator to:

- enter alternate Pathogen(s),
- enter Notes, and
- invalidate 'bogus' Cases and/ or Investigations

Validators are notified of new Submission(s) requiring Validation by email notification(s). Where no Validator has been assigned the notification is sent to the System Administrator.

Failure by a Validator to validate submissions in a timely manner will cause an email notification to be sent to the System Administrator.

Searching and Outputting Cases

The system provides for searches of the Cases; and for the results of these searches to be output.

Search Criteria

The system allows for values to be specified on the following search criteria:

- Host *
- Clinical Sign and / or Site
- Pathogen * (or absence of Pathogen)
- Disease (or absence of Disease)
- Identification Methods Used
- Submission Date
- Collection Date
- Collection Location
- Collection System Type
- Validation Status (ie. Validated, Not Validated or All)

**** Cases are searchable using “Smart Criteria” for the names of Host and/or associated Pathogen(s). For example, select an organism name from drop-down list(s) and automatically get results for any other previous, or future, taxonomical (re-)names of that organism.***

Content of Results

The results returned by a search are a list of summaries of matching Cases, with the ability to drill down to an individual Case. The list is sortable on each of the summary fields. At the level of the individual Case all the entered fields of the Case are returned.

Output Format

The system provides for the results of searches of the Cases to be output to the screen, file, or printer.

Maintenance

The system provides for the maintenance of the Taxonomic Classifications and other required database entities.

Taxonomic Classifications

The system provides for the maintenance of taxonomical data by Classification Maintainers (ie. typically people with expertise in a particular area of taxonomy).

Taxonomical data is maintained to facilitate:

- more efficient and accurate entry of Hosts and Pathogens, and

- searching of Cases using “Smart Criteria”

Taxonomic Classifications Maintenance includes the following tasks:

- validating new names of Hosts and Pathogens which may be submitted,
- managing the lists of organism name synonyms which underlie the “Smart Criteria”, and
- maintaining lists of Common Names

General

The system provides for the maintenance of the data on the following database entities:

- Development Phases,
- Diseases,
- Identification Methods,
- Signs,
- Sites, and
- Users / Permissions

BENEFITS

1. Improve productivity and effectiveness of aquatic animal research by providing rapid access to information on viral, bacterial and parasitic diseases of marine and freshwater finfish, shellfish and crustaceans in Australian
2. Improve Australia's export potential and/or prohibit import of certain species based on accurate and timely information.
3. Provide factual information to prevent new diseased aquatic animal from being imported. For example, aid Biosecurity Australia when preparing risk assessment to import certain fish species.
4. Efficient use of research resources.
5. Better policies resulting from having access to specific disease agents, their hosts and their distribution.
6. Provide up-to-date and accurate resource information.

7. FURTHER DEVELOPMENTS

1. The system has the potential to be extended and expanded to include research information from other sources to further enrich the information required by research scientists, policy makers and other parties.

APPENDIX 1 – Intellectual Property

F1 Solutions has ownership of the intellectual property of the system. F1 Solutions assigns IP rights to DAFF for its use.

APPENDIX 2 – Staff

1. **Gustad Boman**, Principal Investigator, F1 Solutions.
2. **Steven Jones**, Business Analyst, F1 Solutions.
3. **Long Tran**, Solution Architect, F1 Solutions.
4. **Andrew Dapre**, Solution Architect, F1 Solutions.
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