Final Report

AQUAFIN CRC – FRDC SOUTHERN BLUEFIN TUNA
AQUACULTURE SUBPROGRAM: COORDINATION,
FACILITATION AND ADMINISTRATION

Steven Clarke and Jane Ham

February 2009

Aquafin CRC Project 5B.1(2)
(FRDC Project No. 2004/216)
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NON-TECHNICAL SUMMARY

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OBJECTIVES:

The FRDC Southern Bluefin Tuna (SBT) Aquaculture Subprogram had as its objectives:

1. Strategic Planning: provide a coordinated research and development program addressing the focus areas of the Strategic R&D Plan: 2001-2006 for the SBT Aquaculture Industry and the specified R&D objectives and outcomes of the Aquafin CRC Commonwealth Agreement. Review and update the R&D Plan on an annual basis.
2. Administration: coordinate and manage project, subprogram and program milestones, variations, budgets, communications and meetings relevant to the SBT (southern bluefin tuna) Aquaculture Subprogram.
3. Information Technology Transfer: disseminate information to facilitate the uptake and commercialisation of research outcomes via “Tuna-brief” newsletters, an annual industry conference (including published Conference Proceedings), industry workshops, meetings with individual companies and a regularly updated website.

PLANNED OUTCOMES:

The planned outcomes of the SBT Aquaculture Subprogram were:

1. An orderly and structured approach to research and development associated with SBT aquaculture meeting the needs of the Industry and research managers/funders (measured by the level of Industry, Aquafin CRC and FRDC satisfaction in the Subprogram).
2. An up-to-date R&D Plan meeting the needs of Industry participants (measured by the number and success of new research applications).
3. Efficient management and administration of the Subprogram achieving the specified milestones, outcomes and outputs (measured by the timeliness of milestone and final reports).

4. Efficient and coordinated use of the limited resources available for SBT aquaculture related research and development (measured by the diversity, suitability and satisfaction with the research platforms in use).

5. Appropriately managed communications disseminating research results (measured by the level of communication and absence of negative media issues).

ACHIEVEMENTS:

This project implemented the agreed Strategic R&D Plan for the SBT aquaculture industry for the period of 2004 – 2008 and in doing this provided the key linkage with the Fisheries Research and Development Corporation and the Aquafin CRC.

It provided an administrative framework and processes that:

- engaged stakeholders, specifically the SBT aquaculture industry and the State managers responsible for its development and regulation, in the process of identifying and prioritising research needs and monitoring the projects designed to meet those needs;
- enabled research groups to shape their programs to the needs of industry, government and other stakeholders;
- maximised and coordinated the use of the limited research infrastructure available;
- led to the development of additional research infrastructure, equipment and people capability; and
- maximised the transfer of useful information from research projects to end-users.

As a consequence, all the projects undertaken within the SBT Aquaculture Subprogram research portfolio were directed at outcomes strongly supported by end-users. The projects all involved a high level of active collaboration between researchers and with the SBT industry, and adoption of the successful research outcomes was rapid. As measured by the Aquafin CRC, the impact of a wide range of research outcomes has already been substantial.

Key outcomes of the SBT Aquaculture Subprogram have been:

- facilitation of the development and distribution of a new SBT Aquaculture Strategic R&D Plan for the Industry;
- continuing strong involvement in the Aquafin CRC;
- the development, initiation and management of a wide range of research projects;
- further development, training and education of industry and research personnel;
- publication and distribution of considerable extension material to industry; and
• further development of the SBT Aquaculture Subprogram password protected website to act as a comprehensive depository of information for the industry.

The SBT Aquaculture Subprogram has over the current and past project (FRDC Project No. 2001/250) addressed the challenges that have arisen, and successfully delivered the desired outcomes (Clarke et al, 2005). The Subprogram over the past 4 years managed 23 projects worth about $9.44 million (Aquafin CRC and FRDC funds, not including research organisation and industry in-kind; Aquafin CRC figures), building on the portfolio of the previous Subprogram.

KEYWORDS:

Southern bluefin tuna, Aquaculture, SBT Aquaculture Subprogram, South Australia, Aquafin CRC, and FRDC.
ACKNOWLEDGEMENTS

We wish to gratefully acknowledge all of the people who have contributed to the success of the SBT Aquaculture Subprogram. In particular:

Steering Committee: Rob Lewis (Chair), Richard Stevens (previous Chair), Peter Montague, Patrick Hone, Brian Jeffriess, David Ellis, Daryl Evans, David Warland (previous member), Justin Nelligan (previous member), Ian Nightingale, Pauline Mooney, Mehdi Doroudi, Barbara Nowak, John Volkman, Chris Carter and Anthony Cheshire (previous member).

Scientific participants (including from the Australian Southern Bluefin Tuna Industry Association - ASBTIA): Jeff Buchanan, Robert van Barneveld, Philip Thomas, Kathy Schuller, Trent D’Antignana, Mark Thomas, Roger Seymour, Quinn Fitzgibbon, Andrew Pointon, John Carragher, Richard Musgrove, David Padula, Ben Daughtry, Kathy Ophel-Keller, Nathan Bott, Craig Hayward, Hamish Aiken, Jason Tanner, Maylene Loo, Milena Fernandes, Sam Mc Clatchie, John Middelton, Pru Bonham, Lesley Clementson, Mike Hertzfeld, Nugar Margvelishvilli, Peter Thompson, Karen Wild-Allen, Kirsten Rough and Danielle Foote.

And the SBT farming companies and their employees: Ajka Pty Ltd, Australian Fishing Enterprises Pty Ltd, Australian Tuna Fisheries Pty Ltd, Blaslov Fishing Pty Ltd, Eyre Tuna Pty Ltd, Emily Kristina (Aust) Pty Ltd, Marnikol Fisheries Pty Ltd, KIS Tuna Pty Ltd, Sarin Marine Farm Pty Ltd, Sekol and Sams Tuna Pty Ltd.
BACKGROUND

**SBT Aquaculture Industry**

The aquaculture of southern bluefin tuna (SBT) commenced in 1990 and over the last 18 years has expanded rapidly, today producing about 7500 tonnes worth about $138 million (2006-07 production figures; ABARE, 2008). In recent years the industry has been challenged by increased production of northern bluefin tuna in the Mediterranean and Mexico, and the appreciation of the Australian dollar against the Japanese Yen, causing the value of SBT farming to drop from its peak of $311 million in 2000-01 (ABARE, 2008) to its current value.

Despite this, the SBT industry in 2006-07 is the third largest export orientated Australian fishing industry (excluding pearls), with most of its value coming from aquaculture (ABARE, 2008). It has also had a significant impact on the Eyre Peninsula region, directly and indirectly employing around 1200 people, generating a total of $278.3 million (indirect and flow on effects) in the region (Econosearch, 2007).

Despite SBT aquaculture now including most of the Australian SBT quota, opportunity exists for continued industry growth in sales volume from the improved survival of farmed SBT; the farming of SBT for longer periods of time; and the potential farming of overseas based quota and the aquaculture of hatchery produced SBT. Improvements in product quality and advances in feeds, feeding strategies and farming technology have the opportunity to lead to better market prices and reduced operating costs, respectively.

The SBT Aquaculture Subprogram over the past 4 years sought to optimise the position of the SBT Aquaculture Industry with respect to these trends through well prioritised and coordinated research and development, and in doing so to address the key issues that maintain or enhance the Industry's competitiveness.

**SBT Aquaculture Subprogram**

The SBT Aquaculture Subprogram was formed by FRDC in 1997 to manage research addressing this industry's key research and development priorities and in doing so increase industry’s ownership of the processes involved. The structure and resources used reflected best practice based on some of the other FRDC Subprograms at the time: a Steering Committee with independent chairperson, Communications Subcommittee, Scientific Advisory Committee, and Program Leader supported by a part-time Subprogram Project Officer.

Primary sources of communication to industry were through working closely with representatives of the SBT industry association (previously the Tuna Boat Owners Association of Australia - TBOASA and more recently the Australian Southern Bluefin Tuna Industry Association – ASBTIA); by way of the "Tuna-brief", a dedicated newsletter; an annual industry conference; R&D planning and technical workshops; and through direct communication with industry members and companies. Another important source of communication was the SBT Aquaculture Subprogram
website that has a public area, and two password protected sections, one for industry members and the other for the Steering Committee.

**NEED**

This project was essential for the development of a cohesive research and development approach aimed at meeting the priority needs of the SBT Aquaculture Industry. The industry had developed rapidly since its initiation in 1990 and had the opportunity to continue to do so; however targeted research and development was needed to underpin this development and to assure the long-term sustainability of the industry in an increasingly competitive international market.

This project provided the basis for the continuation and further development of the SBT Aquaculture Subprogram and its objectives, as well as ensuring that appropriate inputs and outcomes were delivered to the Aquafin CRC (the SBT Industry was a key participant and the Production and Value Adding Programs were led by the Subprogram Leader).

Support of the SBT Aquaculture Subprogram provided the opportunity for an ongoing management structure to oversee the active research projects and ensure that the desired outcomes could be achieved; provide a focused strategy for disseminating research results to industry and obtaining feedback; and setting research priorities. In doing this it also had the opportunity to ensure that the minimum level of duplication occurred in the provision of research services; provide a focus for developing SBT aquaculture related research infrastructure and people; address industry priorities by establishing a mechanism to empower industry's involvement in their research; establish a framework to ensure that SBT aquaculture research is orderly and targeted; and disseminate, where appropriate, research information to stakeholders.

The cost of the Subprogram against research funds over the 4 year period was approximately 4.62% (not including In Kind funds). The subprogram throughout this period also supported a number of additional projects, such as the development of an online SBT Industry Micro-algal Database and supporting Real-time environmental data coming from the telemetry system located in the Boston Island SBT Farming Zone (and in the future data from another telemetry system in the Rabbit Island Zone) available on the SBT Aquaculture Subprogram website.

**OBJECTIVES**

1. Strategic Planning: provide a coordinated research and development program addressing the focus areas of the Strategic R&D Plan: 2001-2006 for the SBT Aquaculture Industry and the specified R&D objectives and outcomes of the Aquafin CRC Commonwealth Agreement. Review and update the R&D Plan on an annual basis.
2. Administration: coordinate and manage project, subprogram and program milestones, variations, budgets, communications and meetings relevant to the SBT Aquaculture Subprogram.
3. Information Technology Transfer: disseminate information to facilitate the uptake and commercialisation of research outcomes via “Tuna-brief”
newsletters, an annual industry conference (including published Conference Proceedings), industry workshops, meetings with individual companies and a regularly updated website.

METHODS

The project outlined here focused on the coordination, facilitation and administration of research undertaken within the SBT Aquaculture Subprogram (i.e. by the Aquafin CRC and FRDC).

Management

The Subprogram was managed by a Steering Committee that obtained advice from the Scientific Advisory Committee as required. Representation on both committees was sector and expertise based, and included membership of the FRDC (Program Manager), Aquafin CRC (CEO, and Program Leaders - observers), ASBTIA (Executive Director, Research Manager and two SBT Farm Managers), Government representatives (Executive Director – PIRSA Aquaculture) and representatives with appropriate scientific expertise (CSIRO or SARDI). The Subprogram Leader provided leadership, coordination and administration functions. Industry provided input to the Subprogram through committee members, involvement in industry workshops and conferences, and direct communication with the Subprogram Leader and Principal Investigators of operational projects.

Key Subprogram tasks were to provide direction on industry research and development priorities, and coordinate and manage Aquafin CRC and FRDC grant applications in association with state based FRABs and the FRDC. The Subprogram Leader also liaised with and provided support to relevant companies and researchers seeking alternative funding sources (e.g. AusIndustry) to address industry priorities. The structure, policy and operations of the Subprogram are documented as part of the Southern Bluefin Tuna Aquaculture Strategic R&D Plan – Towards 2012: Striving for a Profitable and Sustainable Future.

Policy Development

The SBT Aquaculture Subprogram, as the key body coordinating research and development, continued to develop and document the policies agreed upon by the Steering Committee and made these more accessible by providing them on the SBT Aquaculture Subprogram website. The Subprogram also disseminated the relevant policies of the Aquafin CRC and FRDC. A communications policy existed for the Subprogram and was monitored through a Communications Subcommittee.

R&D Priority Setting and New Project Assessment

The SBT aquaculture industry’s research and development priorities continued to be reviewed annually as part of the June meetings in order for targeted research project proposals to be developed. All farm owners and managers were invited. Several meetings were also held to discuss the development of the new SBT Aquaculture Strategic Plan – Towards 2012, ensuring that research priorities reflected the needs of
the SBT industry. Individual projects were then assessed to ensure that they met the priorities of the current strategic plan, as well as the objectives and outcomes published in the Aquafin CRC Commonwealth Agreement.

As previously, new project pre-proposals were sourced through the existing FRAB processes. These were reviewed by the Scientific Advisory Committee, where necessary using the feasibility-attractiveness model used by the SAFRAB, and recommendations provided to the Steering Committee who undertook a similar assessment procedure in conjunction with the relevant five year Strategic R&D Plan. Applicants were advised of the outcome and the desirability to proceed with a full application, and relevant FRABs advised of the outcomes. Full applications were then received in October each year and the same process repeated. Subprogram recommendations as to the priority ranking of new projects were then provided to the relevant FRABs and FRDC in December of each year.

**Infrastructure**

The field infrastructure available in Port Lincoln to the SBT Aquaculture Subprogram was primarily provided by the SBT industry as for most of the period of this project research involving live tuna was undertaken on commercial farms, although some short-term and small scale research requiring calm conditions was undertaken on a lease held by SARDI in Rotten Bay, south of Boston Island. The details of each coming year's activities were incorporated in the Annual Operating Plan provided to FRDC in December of each year.

Office space at SARDI Aquatic Sciences and the Lincoln Marine Science Centre were used by the Subprogram Leader and the Subprogram Project Officer, as well as a number of researchers working on SBT related Aquafin CRC-FRDC projects. These facilities were contributed by the South Australian Government through the South Australian Research and Development Institute (SARDI) and Flinders University of South Australia (FUSA). The extensive outdoor tank facilities at the SARDI South Australian Aquatic Sciences Centre (SAASC), West Beach, Adelaide were used for some nutrition research using surrogates. SARDI also provided access to its Australasian Experimental Stockfeed Extrusion Centre (AESEC) and PPPI analytical nutrition laboratory at the University of Adelaide's campus at Roseworthy.

**Operational Plans and Budgets**

The SBT Aquaculture Subprogram provided FRDC with an Annual Operating Plan at the end of each year, which confirmed/clarified outcomes and expenditure for the previous year, as well as a detailed forward operational plan. Each project within the Subprogram reported face-to-face to the Subprogram Steering Committee twice per year and completed milestone reports as specified in their approved application.

**Budget Reporting**

For each project the Principal Investigator's organisation continued to receive and be accountable for the income and expenditure associated with the funds received from the Aquafin CRC and the FRDC and offered in-kind in that project. Each Principal Investigator, following liaison with the Program Leader, reported expenditure to the
Aquafin CRC and the FRDC as part of their six monthly progress report. The Subprogram Leader also collated, summarised and provided data for all projects to the Aquafin CRC and the FRDC as part of the six monthly progress reports for this project.

Any income received from consultancy trials, royalties, publication and SBT sales, where these resources were owned by the Aquafin CRC and the FRDC, were credited to the relevant project budget line and reported in six monthly progress reports to the Aquafin CRC and the FRDC along with expenditure.

**Communication and Technology Transfer**

One of the objectives of this project was to optimise industry interaction to ensure that decisions were aligned with industry direction and to transfer research results rapidly and comprehensively to industry. Early in this project a number of strategic directions were identified to improve these activities including David Ellis, Research Manager for the SBT aquaculture industry, increasingly taking on the responsibility for the coordination between the Subprogram researchers and industry members. It was also proposed that the industry established its own R&D committee to discuss and provide a more cohesive input to the Subprogram Steering Committee. This has recently been achieved with the establishment of the ASBTIA Research Committee.

The Subprogram ensured effective technology transfer through a variety of mechanisms which included:

- Regular industry newsletters ‘Tuna-brief’, proving industry with regular updates on research outcomes.
- Organising an annual industry workshop, including a workshop proceedings, proving a forum for industry and researchers to discuss the past years results and the future direction of research.
- Organising six monthly science group meetings that focussed on research.
- Organising quarterly Steering Committee meetings (two face to face and two teleconferences) to monitor the progress of each project within the Subprogram; discuss the priority of project proposals; to ensure that project were aligned to the Strategic R&D Plan; and to generally deal with any governance issues related to the Subprogram.
- Facilitating other focussed industry workshops (e.g. SBT health workshop, product quality workshop, workshops on how to use software developed as part of the Aquafin CRC - SBT Aquaculture Subprogram, etc.).
- Further developing and maintaining an SBT Aquaculture Subprogram website. This included a public areas and two password protected areas, one for the tuna industry and one for the Steering Committee.
**Strategic Planning**

A Strategic R&D Plan had been developed under the previous SBT Aquaculture Subprogram project – Southern Bluefin Tuna Aquaculture Strategic R&D Plan 2001-2006: Sustainability & Innovation for the Future. The Strategic R&D Plan was revisited annually, either through dedicated workshops or as part of annual conferences and ad-hoc workshops, to ensure that the plan was still relevant to the industry. This was extensively revised in consultation with stakeholders as part of the current project to produce a new five year plan – Southern Bluefin Tuna Aquaculture Strategic R&D Plan – Towards 2012: Striving for a Profitable and Sustainable Future.

**RESULTS AND DISCUSSION**

**Industry Development**

During the time of this project, 2004 to 2008, the SBT aquaculture industry has produced a relatively constant volume of product of between about 8000 to 9000 tonnes per annum, primarily dictated by the set Australian quota of 5265 tonnes/annum, most of which is used for farming. However, over this same period there has been a steady increase in the sale price of product from about 1400 to 2100 yen/kg (Figure 1, ASBTIA data), and this has been responsible for the partial recovery of the per annum value of the industry to its peak in 2000–01 (ABARE 2008).

![Figure 1. Weight (tonnes) and value (yen/kg) of southern bluefin tuna produced in South Australia over the period 1993-2007 (figures sourced from the Australian Southern Bluefin Tuna Industry Association).](image)
Research Funding

The ASBTIA (previously TBOASA) has and continues to voluntarily pay 0.25% of its gross value of production (GVP) to FRDC each year based on a MOU, which has ensured that the capacity existed to leverage funds to address industry priority R&D issues on a competitive national basis. ASBTIA committed a total of approximately $2.73M to FRDC over the years 2001-2008 (Aquafin CRC figures).

Over this seven-year period the total cash expenditure on SBT projects managed by the SBT Aquaculture Subprogram was estimated to be $15.35M (Aquafin CRC figures).

This expenditure (not including research organisation and industry in-kind) is contributed as follows:

- TBOASA/ASBTIA: $2.73M
- FRDC (excl ASBTIA): $2.92M
- SA Government: $3.30M
- CRC (incl Flinders, Gibsons): $6.39M

The leverage on ASBTIA funds over this time is thus just over 5.6:1 in cash terms. Inclusion of in-kind contributions by research organisations approximately doubles this value to 11:1.

Actual expenditures in the Aquafin CRC varied widely from year to year as payments are made on a milestone-completed basis and as projects began and finished.

Research funds over this period were allocated across the six Aquafin CRC Program Areas (Propagation; Production; Value-adding; Health; Environment; and Subprogram Management) as shown in figure 2.

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**Figure 2. Breakdown of Aquafin CRC Southern Bluefin Tuna Research funds (including contributions from Aquafin CRC, FRDC, ASBTIA, and the SA Government), into Aquafin CRC Program Areas (Propagation; Production; Value-adding; Health; Environment and Subprogram Management).**
**Strategic Planning**

The previous Strategic Plan ‘Southern Bluefin Tuna Aquaculture Strategic R&D Plan 2001-2006: Sustainability & Innovation for the Future’ outlined nine focus areas ‘Feeds and Nutrition; Environment; Farm Husbandry and Management; Health; Product Diversification, Quality and Management; Propagation; Communication; People Development and Support; and Work Environment’. All of these nine focus areas were well addressed through Aquafin CRC and FRDC projects that were part of the previous (FRDC Project No. 2001/250) and current Subprogram projects.

As part of the current Subprogram project a new Strategic R&D Plan was developed. The new strategic plan ‘Southern Bluefin Tuna Aquaculture Strategic R&D Plan – Towards 2012: Striving for a Profitable and Sustainable Future’ describes the local and international environment in which the SBT Aquaculture Subprogram operates to achieve the desired R&D outcomes and the strategies to achieve the desired outcomes.

The SBT Aquaculture Strategic R&D Plan – Towards 2012 covers the strategic direction of the wild-caught SBT Aquaculture industry only and does not include the strategic directions of the hatchery-reared SBT Aquaculture industry sector, a decision of the Steering Committee.

The ASBTIA have undertaken to amend this document in the future to include the strategic direction of the SBT wild fisheries sector.

A summary of the present aims and strategies associated with SBT farming as per the SBT Aquaculture Strategic R&D Plan – Towards 2012, is listed below (Table 1).
### 1. A Responsive Regulatory Environment & Abundant Resources

<table>
<thead>
<tr>
<th>Aim</th>
<th>Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>To ensure a ready supply of stock for farming.</td>
<td>• Support the management of a sustainable SBT wild fishery through the provision of relevant farm based research.</td>
</tr>
</tbody>
</table>
| To ensure availability of lease sites is not limiting for existing or future SBT farmers. | • Ensure adequate environmental knowledge exists to allow for development of appropriate policy  
  • Engage government regulatory agencies and the community in R&D outcomes.  
  • Through independent research maintain community and government confidence in industry practices. |
| To optimise baitfish availability and quality for use as feed. | • Support the management of sustainable baitfish wild fisheries through the provision of relevant farm based research. |
| To plan for environmental change so as to optimise benefits and minimise risks. | • Support climate change R&D that characterises possible benefits, risks and management options. |
| To ensure a ready source of capable employees. | • Contribute to the development and review of education and training programs.  
  • Ensure that R&D outcomes are rapidly incorporated into curricula.  
  • Workshops (training). |
## 2. Cost-Efficient & Responsible Production Systems

| To grow the size and value of the industry. | - Support longer term holding initiatives by participating in industry trials, collating the resultant information and improving feeding strategies.  
- Improve overall growth consistency by better handling practices to reduce stress, and optimising feeding strategies for different age classes of SBT. |
|---|---|
| To improve the efficiency of industry farming operations so as to decrease operating costs. | - Understand and better manage the effects of stress on SBT growth, condition and survival.  
- Increase SBT production efficiency through targeted R&D to further refine baitfish feeds and feeding techniques.  
- Understanding tuna physiology to target better nutrition to improve growth and feed efficiency  
- Further improve manufactured pelleted feeds for use as supplementary or primary feeds by enhancing their acceptance by SBT and reducing costs through optimal ingredient selection (including fishmeal and oil replacement). Improve growth rates on manufactured pelleted feeds and reduce feed conversion ratios.  
- Support engineering R&D to develop or introduce and refine existing farm husbandry infrastructure (e.g. fouling management). |
| To minimise the possible environmental and disease risks associated with tuna farming through a proactive approach and enhanced knowledge. | - Establish real time or early environmental warning systems, relevant environmental trigger points, and farm husbandry and management responses to address the key issues identified.  
- Continuously refine SBT farming data and existing hydro-biogeochemical models of the tuna farming regions to proactively define, evaluate and manage risks.  
- Support proactive research that identifies potential disease issues, develops rapid and cost effective diagnostic capabilities, and addresses the epidemiology of diseases thereby potentially enhancing solutions through animal husbandry and farm management practices (e.g. *Uronema*).  
- Reduce SBT losses and stress related issues through optimised management of predators. |
### 3. An Optimised & Integrated Supply Chain

| To optimise product quality and safety so as to maximise financial returns and improve market competitiveness. | ● Continue to align sampling methodologies and collect appropriate environmental residue data to proactively address changing trade standards for existing and new markets.  
● Develop and implement a sophisticated and reliable product trace system to achieve world’s best practice in safety management and provide for markets increasingly desiring more knowledge of their product.  
● Enhance mechanisms to control and optimise product quality characteristics  
● Leverage R&D outcomes to promote the reputation of farmed SBT and its differentiation from competitors.  
● Develop integrated bioeconomic farm support systems in the forms of models and software. |

| To develop a market & consumer culture. | ● Through market R&D (consumers, wholesalers and retailers) identify and improve farmer and researcher knowledge of the key factors affecting product purchases and how these factors can be enhanced along the whole-of-supply chain. |

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### 4. People & Partnerships

| To empower industry to effectively participate in and influence key decision making. | ● Support the continuation of the SBT Aquaculture Subprogram in providing industry leadership in identifying, managing and communicating R&D outcomes, as well as forging strong relationships between industry, Government regulators and researchers. |

| To strive for world’s best R&D that delivers a profitable, innovative and continuously improving industry. | ● Establish world leading R&D by supporting the development of infrastructure and organisational capability to attract people that can efficiently and effectively address SBT R&D needs.  
● Manage R&D expenditure to develop and retain capable R&D resources.  
● Establish linkages with preferred service providers who target and achieve industry priority R&D outcomes through an integrated multidisciplinary team approach.  
● Share R&D information between industry participants to facilitate the development of decision support tools.  
● Support education and training of industry personnel so that R&D is understood, supported, and rapidly and appropriately applied by industry. |
<table>
<thead>
<tr>
<th>To facilitate continuous improvement in OHS&amp;W.</th>
<th>• Support engineering R&amp;D and operational solutions to improve OHS&amp;W for employees of commercial SBT farming companies and research organisations, thereby reducing potential insurance liabilities.</th>
</tr>
</thead>
</table>

5. Image & Communications

| To continuously improve the industry profile and image. | • Promote the leadership role that the industry provides in sustainable aquaculture development. Use transparency to minimise risk from NGO criticism.  
• Enhance communication of R&D to highlight the direct and indirect benefits of the industry to Government and the community.  
• Communicate the outcomes of R&D on the environment to promote industry’s continuous improvement program.  
• Enhance local and international public awareness through the provision of targeted information on web sites, in newsletters and in communications with the media.  
• Ensure Industry and R&D practices meet with or exceed relevant animal welfare regulatory standards. |
Projects

The SBT Aquaculture Subprogram portfolio comprised the following Aquafin CRC projects:

Appendix 3 summarises the Outputs and Outcomes of the research projects completed by May 2008.

Production


Nutrition & Feed Technology

CRC 1A.4: FRDC 2001/249(revised) - Aquafin CRC - SBT Aquaculture Subprogram: Optimisation of farmed southern bluefin tuna (Thunnus maccoyii) nutrition to improve feed conversion efficiency and reduce production costs. Principal Investigator: Robert van Barneveld (Barneveld Nutrition). DRAFT FINAL REPORT NEAR COMPLETION.


CRC 1A.7(2): FRDC 2005/200 - Aquafin CRC - SBT Activity metabolism in live-held southern bluefin tuna (Thunnus maccoyii), Phase 2. Principal Investigator: Roger Seymour (University of Adelaide). COMPLETED.

Product Quality


CRC 2.2: FRDC 2001/248 - Aquafin CRC - SBT Aquaculture Subprogram: maximising the control of quality in farmed SBT. Principal Investigator: Philip Thomas (Flinders University). COMPLETED.
Principal Investigator: Philip Thomas (Flinders University). **DRAFT FINAL REPORT SUBMITTED.**

CRC 2.2(3): FRDC 2004/209(extension) - Baitfish extension project.
Principal Investigator: Trent D’Antignana (Flinders University). **DRAFT FINAL REPORT SUBMITTED.**

**Food Safety**

CRC 2.1: FRDC 2003/227 - Aquafin CRC - SBT Aquaculture Subprogram: development and validation of baitfish sampling methods to address international residue standards for southern bluefin tuna (*Thunnus maccoyii*).
Principal Investigator: David Padula (SARDI). **COMPLETED.**

Principal Investigator: David Padula (SARDI). **COMPLETED.**

**Environment**

Principal Investigator: Maylene Loo (previously Anthony Cheshire) (SARDI). **COMPLETED.**

Principal Investigator: Milena Fernandes (previously Anthony Cheshire) (SARDI). **COMPLETED.**

Principal Investigator: Jason Tanner (previously Anthony Cheshire) (SARDI). **COMPLETED.**

CRC 4.5: FRDC 2003/226 - Aquafin CRC - Southern Bluefin Tuna Aquaculture Subprogram: pilot study into the use and efficacy of antifoulants on the nets used for southern bluefin tuna (*Thunnus maccoyii*) culture, including residue status of tuna and the surrounding environment.
Principal Investigator: Kirsten Rough (ASBTIA). **DRAFT FINAL REPORT SUBMITTED.**


**SBT Health**


CRC 3.6: FRDC 2004/085 - Detection of SBT pathogens in environmental samples. Principal Investigator: Kathy Ophel-Keller (SARDI). **COMPLETED.**

CRC 3.7: FRDC 2006/225 - Aquafin CRC - SBT Aquaculture Subprogram: improving husbandry and performance of southern bluefin tuna through better understanding of the relationship of fish stress and health. Principal Investigator: Barbara Nowak (University of Tasmania). **ONGOING.**

**Infrastructure & Management**

CRC 1A.5: FRDC 2002/249 - Aquafin CRC – Southern Bluefin Tuna Aquaculture Subprogram: service delivery and infrastructure management for projects requiring Port Lincoln based R&D support. Principal Investigator: Jeff Buchanan (SARDI). **COMPLETED.**

CRC 1A.11: FRDC 2004/205 - Aquafin CRC - SBT Aquaculture Subprogram: provision of research platforms for projects requiring Port Lincoln based R&D support. Principal Investigator: David Ellis (ASBTIA). **DRAFT FINAL REPORT SUBMITTED.**

**OUTPUTS**

The Subprogram outputs are highlighted on a year by year basis under the headings: Steering Committee Meetings, Science Group Meetings, Industry Workshop, Other Workshops and Other Events.

**2004**

**Steering Committee Meetings**

Successful Subprogram Steering Committee meetings were held quarterly with detailed agenda and briefing papers distributed prior to meetings. Each year, two meetings were face-to-face in Port Lincoln and two by tele-conference. The format of
briefing papers was improved this year, including detailed contents pages and distribution of briefing papers via both e-mail and the SBT Aquaculture Subprogram web site. The SBT Aquaculture Subprogram web site now contains historical briefing papers and minutes back to 1997 when the Subprogram was initiated.

**Scientific Group Meetings**

Three successful scientific group meetings were held during 2004 in Port Lincoln with attendance at each by all relevant project Principal Investigators, technical representatives of about eight of the 12 commercial SBT farming companies and a number of Subprogram Steering Committee members. The first meeting focussed on final matters associated with the arrival of the new seasons research tuna and initiation of the Annual Operating Plan. The second and third meetings provided an opportunity to discuss current research projects, coordination between projects, overcome difficulties within projects and discussion of the development of new project proposals.

**Industry Workshop (25th October, 2004; Boston Bay Winery, Port Lincoln)**

The annual Subprogram Industry Workshop was successfully held on 25th October 2004 at a new location, Boston Bay Winery, which proved a better venue for the increasing number of people attending. The workshop was well attended with representatives from eight of the 12 commercial companies participating. A guest speaker, Dr Tim Ward, SARDI, was invited to present at this year’s workshop on a matter related to the SBT Industry that was of considerable interest to attendees, ‘Pelagic ecology of a northern boundary current system: effects of upwelling on the production and distribution of sardine, anchovy and SBT in the Great Australia Bight’. This year written articles were received from all presenters and collated in an improved handbook format that had a more professional appearance. The pre-workshop handbook was distributed to all members and uploaded to the SBT Aquaculture Subprogram web site. A final version of the handbook was also produced after all articles had been submitted through the SARDI internal publication review process.

**Other Workshops**

**Tagging Workshop (4th March, 2004; Lincoln Marine Science Centre, Port Lincoln)**

The SBT Aquaculture Subprogram (supported by FRDC and the Aquafin CRC) held a tagging workshop at the Lincoln Marine Science Centre on 4th March 2004. David Hall (Hallprint Pty Ltd), Kevin Williams (SBT Tagging Consultant) and John Gunn (CSIRO) were guest speakers. They presented up-to-date information based on their knowledge and experience with finfish tags, tagging and finfish behaviour during this process. The workshop included Microsoft PowerPoint presentations and practical demonstrations, specifically on dart tags and archival tags. The workshop was well attended by industry and scientists.

**SBT Health Workshop (13/14th May, 2004, Lincoln Marine Science Centre, Port Lincoln)**

The SBT Aquaculture Subprogram facilitated a two-day “SBT Health Workshop” held on May 13-14, 2004 at the Lincoln Marine Science Centre, Port Lincoln and organised by Dr Barbara Nowak and the SBT Health team as part of Aquafin CRC –
SBT Aquaculture Subprogram project 2002/225: investigation of the relationship between farming practices and SBT health. The workshop leaders included Dr Colin Johnston and Dr Marty Deveney, PIRSA Fish Health Unit and Dr Barbara Nowak, University of Tasmania. The workshop concentrated on improving communication and transfer of information between fish farm workers and diagnostic pathologists and other fish health professionals. The workshop was attended by eleven participants, who all agreed that the workshop was well prepared and interesting.

SBT Production Quality Workshop (27th May, 2004, Lincoln Marine Science Centre, Port Lincoln)
The Subprogram facilitated a “Sensory Evaluation” workshop organised by Dr Philip Thomas, Flinders University, Principal Investigator of the project on SBT product quality, and his team. The workshop had previously been held at the Aquafin CRC conference in Adelaide in 2003. Due to a very positive response from SBT industry members that attended, a repeat of this workshop was held on 27th May 2004 in Port Lincoln. The interactive, hands-on workshop was well attended by Industry members with some 50 people in total.

Tuna Quality Project Workshop (30th November, 2004, Boston Bay Wines, Port Lincoln)
The Subprogram facilitated a Tuna Quality Project workshop, organised by Dr Philip Thomas and the SBT product quality team, held on the 30th November 2004 to present the outcomes of the tuna product quality research projects and to provide researchers and the SBT aquaculture industry with an opportunity to discuss their research and research directions. Written presentations were included in both the SBT Aquaculture Subprogram Industry Workshop Handbook (2004) and the Tuna Quality Project Workshop Handbook (2004). Representatives from seven of the twelve commercial SBT farming companies attended the workshop, as did a representative (Phil Clancy) from NIR Technology Australia, who had participated through a Memorandum of Understanding associated with research into the use of NIR for SBT and baitfish.

Other Events
The Subprogram Leader has attended several meetings with two tuna companies to finalise contract agreements associated with two AusIndustry Start Graduate Employee applications and participate in the management of the Graduate Employee research projects once they commenced. He also took part as a member of an Aquafin CRC working group to review the striped trumpeter project of Stephen Battaglene, TAFI, which is within the Aquafin CRC Production program; liaised with Geoff Allan and Stewart Fielder, NSW Fisheries, to facilitate approval of their new temperate finfish Aquafin CRC project, which is within the Aquafin CRC Production Program; represented Anthony Cheshire (SARDI)/Peter Fairweather (Flinders University) at two Aquafin CRC Board meeting when they were not available; attended Aquafin CRC JMAC meetings in Hobart, Melbourne and Adelaide; attended as Aquafin CRC leader of the Production and Value Adding Programs, an Aquafin CRC Technology Transfer workshop in Hobart involving the salmon scientists and industry representatives; attended as Aquafin CRC Leader of the Production and Value Adding Programs, the annual Salmon Subprogram Conference in Hobart, Tasmania; gave a presentation to the SAFRAB (October) on the Subprogram...
activities and new projects under development, and attended a new CRC planning workshop in Melbourne in November.

The Subprogram Project Officer was involved in the SARDI/Aquafin CRC/TAFI trade booth at the recent Australasia Aquaculture Conference in Sydney, September 2004, which provided an opportunity to promote the activities of the SBT Aquaculture Subprogram and the SBT Industry in general.

2005

Steering Committee Meetings

Two face-to-face Steering Committee meetings in Port Lincoln (31st May and the 24th November) and teleconferences (14th February and the 25th August) were held. Briefing papers were prepared, the meeting conducted and minutes distributed to all members.

Science Group Meetings

Two face-to-face meetings were held (30th May and the 23rd November) in Port Lincoln.

Recent progress on a range of Subprogram projects was presented at the May meeting with considerable exchange of information between scientists and also with technical people from the SBT farming companies. A number of new PhD students participated, in particular those associated with research on residues in SBT and baitfish. The workshop finished with presentations on and consideration of new project proposals.

The November meeting addressed on-going research through a number of presentations. These talks were traditionally presented at the industry workshop, however due to the large number being presented this year the talks were split over the two days. Due to this, industry participation in the scientific group meeting was greater than at previous meetings. Extensive discussion occurred on the two new projects proposals ‘Aquafin CRC – SBT Aquaculture Subprogram: relationship between stress, SBT health and performance’, PI: Barbara Nowak, University of Tasmania and ‘Aquafin CRC – SBT Aquaculture Subprogram: longer term holding of southern bluefin tuna (Thynnus maccuyii), PI: David Ellis, TBOASA.

Industry Workshop (22nd November, 2005, Boston Bay Wines, Port Lincoln)

The Industry Workshop was held at the Boston Bay Winery again this year. The number of talks presented at the Industry Workshop had to be restricted to allow adequate discussion time, with additional talks being presented at the scientific meeting. Talks at the workshop were directed towards current industry issues, while talks presented at the scientific meeting were directed more towards on going research.

The workshop was well attended by industry. Feedback from industry was that this was one of the most successful workshops to-date. The format of grouping talks into
focus areas with discussion time at the end of each session worked well and encouraged industry to participate in discussions.

A Draft Industry Handbook was prepared, distributed to all members and uploaded to the SBT Aquaculture Subprogram website. A Final Industry Handbook was produced and included some additional articles. The Handbook was edited through the SARDI internal publication review process prior to being distributed to all members and uploaded to the SBT Aquaculture Subprogram website by the end of February 2005.

**Other Workshops**

**Fish Health Workshop (20th January, 2005; Lincoln Marine Science Centre, Port Lincoln)**
The SBT Aquaculture Subprogram facilitated a half-day training “SBT Health Workshop” organised by Dr Barbara Nowak, University of Tasmania. The workshop was attended by six industry members, two PhD students, one Aquafin CRC scientist and one SARDI scientist. Dr Mark Porter gave a presentation on stress in fish and Dr Barbara Nowak presented information on stress and health, including immune response. The workshop feedback was very positive. The workshop was interactive and included two competitions (list of factors which can induce stress in SBT and brief description of normal healthy SBT).

**Strategic R&D Planning Workshop (1 June, 2005; Hilton Motel, Port Lincoln)**
The SBT Aquaculture Subprogram ran a half-day workshop to discuss the development of the SBT Aquaculture Subprogram Strategic R&D Plan 2006-2011. The workshop was successful in highlighting the current industry drivers for SBT research and establishing the framework for the draft Strategic R&D Plan.

The workshop was attended by most SBT research scientists, some Steering Committee members and a number of industry representatives.

**Aquafin CRC Technology Transfer Workshop (1 June, 2005; Hilton Motel, Port Lincoln)**
The SBT Aquaculture Subprogram facilitated a half-day “Technology Transfer Workshop”, organised by the Aquafin CRC. The workshop discussed and identified, from a researchers, regulators and industry point of view, different methods of transferring the results from Aquafin CRC - SBT Aquaculture Subprogram projects to end users, so that strategies for technology transfer and extension could be successfully developed within projects. Attendees at the workshop included representatives from some of the Steering Committee, most SBT research scientists, FRDC (2), Aquafin CRC (2) and the SBT Industry (4).

**Risk and Response Project Meeting (21st November, 2005, SARDI Aquatic Sciences, Adelaide)**
The Subprogram facilitated a Risk and Response project meeting, organised by Dr Jason Tanner, SARDI. The full-day meeting was held at SARDI Aquatic Sciences, involving key staff from SARDI, CSIRO and Adelaide University. The meeting allowed participants to gain a much better understanding of the overall project, and to put their components into perspective. It provided a venue for information exchange.
and decision making on what the key data requirements and tasks were for the next 6 -
12 months.

New Health Proposal Workshop (16th January, 2006, SARDI Aquatic Sciences, Adelaide)
The Subprogram facilitated a workshop on the new project proposal "Relationship
between stress, SBT health and fish performance" (FRDC 2006/225) organised by Dr
Barbara Nowak, University of Tasmania.

The workshop took place at SARDI West Beach and was attended by Steve Clarke,
John Carragher, Phil Thomas, Tim Clark, Marty Deveney, David Ellis, Daryl Evans,
Emily Downes, Natalie Moltschaniwskyj, Mark Porter and Barbara Nowak.

Workshop objectives were:
• Considering the prior art on fish stress and performance, what
  measurements/observations do we want to make any other measurements than
  proposed?
• Casting a broad net, what sensors, devices and methods might be available and
  likely to give useful data?
• How do we access the technologies we want?

A summary of the proposal was presented by Daryl Evans, which was then followed
by discussion addressing the workshop objectives.

2006

Steering Committee Meetings

In 2006 two face-to-face meetings in Port Lincoln (7th June and 30th November) and
one teleconference (14th February) were held. Briefing papers were prepared, the
meeting conducted and minutes distributed to all members.

During the November meeting a new Chairperson was nominated (Richard Steven’s
resigned as of this meeting due to other commitments and Rob Lewis, SARDI was
suggested as his replacement); and FRDC funding proposals and Aquafin CRC
Technology Transfer applications for the 2007/08 round were prioritised; in addition
to the usual business of monitoring of research projects, milestone progress and
budgets etc.

Scientific Meetings

Two face-to-face meetings were held at Boston Bay Wines, Port Lincoln (8th June and
the 29th November).

A record number of industry members attended the June meeting this year. This
meeting focused on four main research areas: longer term holding of SBT; tuna
health; metabolism; and environment. A brief update on the new Japanese residue
standards and traceability requirements for farmed fish in Japan (from June 2006) was
also given and a session held to demonstrate the content of the SBT Aquaculture
Subprogram website to users and to give people an opportunity to change their password if desired. Most SBT aquaculture industry companies have representatives present.

In November, as in the previous year, a number of additional talks that could not be presented at the Industry Workshop were presented at the scientific meeting. A mini-workshop was also held to coordinate the collation of the results of the longer term holding draft final project report. Industry representatives well attended the larger morning session of the scientific meeting.

**Industry Workshop (28th November, 2006, Boston Bay Wines, Port Lincoln)**

The number of talks presented at this year’s industry workshop was again restricted to allow adequate discussion time. Talks focused on the following research areas: Longer-term holding; Environment; Nutrition; Product Quality; and Health.

The longer term holding presentations was one of the main components of the workshop, with this being the first time that these results have been presented to industry, and one of the first opportunities for researchers of the various project subcomponents to see each others results.

A guest speaker, Dr John Middleton (SARDI), was also invited to present at the workshop to provide information on the oceanography research that is currently being undertaken at SARDI. He also provided an overview of the recently approved NCRIS Integrated Marine Observing System (IMOS), including the goals, instrumentation and specific plans for the South Australian region where some $5M in infrastructure will be deployed. He outlined the relevance of the proposal to the SBT industry and instigated discussion on the future location of key equipment and the potential relevance of climate change.

Industry attendance was good, with a representative from Ridley Corporation also attending the meeting.

**Other Workshops**

**Aquafin CRC technology transfer workshop (8th June, 2006, Boston Bay Wines, Port Lincoln)**

A second Technology Transfer Workshop was held as part of the SBT scientific meeting to identify suitable technology transfer and commercialisation activities that substantially improve the value to the end-users of the current Aquafin CRC’s project results and outputs. The process of submitting and prioritising proposals as outlined at the recent Steering Committee meeting was also discussed and all current proposals and their relative cost were listed.

**2007**

**Steering Committee Meetings**

In 2007 two face-to-face meetings in Port Lincoln (20th June and 23rd November) and one teleconference (20th February) were held. The August teleconference was cancelled and urgent matters were dealt with out of session.
Briefing papers were prepared, the meeting conducted and minutes distributed to all members.

The February teleconference updated members on the status of current projects and other relevant issues (e.g. project proposals currently being considered by FRDC and the withdrawal of the TBOASA from the new Australian Seafood CRC). The status of the SBT Aquaculture Strategic R&D Plan and general communications was also provided.

The June meeting focused on project proposals with respect to optimal utilisation of the remaining Aquafin CRC funds.

The November meeting focussed on the final seven months of the Aquafin CRC: what needs to be done; what are the key dates; and who is responsible for what. Specifically the Steering Committee focussed on facilitating the development of an MOU between FRDC and the ASBTIA; considering what governance process will replace the current Subprogram at the end of the Aquafin CRC; developing a process for developing and approving projects for the 2008/09 funding cycle in the interim between the new governance process; completing the new Strategic R&D Plan; ensuring projects deliver the required outcomes and outputs; and determining what funds remain unspent and what additional project extensions should be considered.

Scientific Meeting (19th June, 2007)

One face to face scientific meeting was held at the Boston Bay Winery, Port Lincoln (19th June). The meeting was well attended by industry and presentations were informative and suitably targeted for an industry audience. A number of project outputs, including the Nutrition Manual (FRDC Project No. 2001/249; PI: Robert van Barneveld, Barneveld Nutrition), Health CD (FRDC Project No. 2003/225; PI: Barbara Nowak, University of Tasmania) and Product Quality poster (FRDC Project No. 2004/209; PI: Philip Thomas, Flinders University), were distributed to researchers and industry.

Industry Workshop (21st November, 2007, Boston Bay Wines, Port Lincoln)

This year’s Industry Workshop was once again held at the Boston Bay Winery. With the end of the Aquafin CRC less than 12 months away and the number of active projects reducing, presentations this year were focussed on Product Quality and Residues, Nutrition, Health, and Environment. Talks from active projects focussed on giving a final summary of outcomes to industry, and prioritising the research that would be done over the next seven months so as to ensure projects deliver their planned outcomes.

Bob Gibson from Adelaide University was a guest speaker at the workshop giving a presentation on the human health benefits of eating seafood. His talk focussed on the nutrients in high lipid content fish such as tuna that can be beneficial to the health of humans as well as assist in preventing and treating heart disease. He outlined a number of current studies that are aiming at providing scientific evidence for the health benefits of eating seafood, drawing public attention towards this issue. He also
outlined competitors from other food sources in the market place, such as omega 3 enriched eggs and meats, that will be vying for the same share of the market place.

The workshop was well attended by industry.

Other Workshops

Carbon Deposition Model Workshop (20th November, 2007, Lincoln Marine Science Centre, Port Lincoln)
A workshop was held to demonstrate the carbon deposition model (Farmér) developed as part of the recently completed RESA project funded by the Aquafin CRC. This model allows farm managers to examine the spatial extent of likely benthic impacts underneath an individual cage or group of cages on a single lease. Understanding this footprint allows pontoons to be located within a lease in such a way as to reduce interactions between them and their effects on the benthos.

This workshop was well attended by industry.

Mortality Sampling Workshop (20th November, 2007, Sams Seafarm, Port Lincoln)
A ‘hands-on’ mortality sampling workshop, organised by David Ellis, Dr Barbara Nowak and Dr Craig Hayward, was held to demonstrate the correct way to collect samples from moribund SBT. The workshop was aimed at people working in the SBT industry. Attendees at the workshop were provided with dissecting kits and, after a demonstration by Marty Deveney and Craig Hayward, they were provided with a SBT mort to practice collecting samples from. By training people in the correct way to collect samples the amount of information obtained from a moribund SBT increases enormously, assisting in providing the necessary information to help understand complex health issues like the ‘six week mortality syndrome’.

The workshop was well attended by industry and the feedback from industry was that this sort of ‘hands-on’ informal workshop was an ideal atmosphere for transferring technology.

2008

Steering Committee Meetings

A teleconference was held in February (20th February, 2008) focussing on finalising the remaining budget, making sure projects were on track to finish on time and the new governance structure that will replace the current SBT Aquaculture Subprogram.

The final face-to-face meeting was held in Port Lincoln (29th May, 2008) focussing on finalising outstanding matters, including due dates for final reports, delivering project outputs and budget matters. It was agreed at the meeting that the current Subprogram would continue until the end of September 2008 to finalise any Aquafin CRC matters and liaise with David Ellis to transfer the responsibility associated with new issues to the new ASBTIA – FRDC governance structure.

A final teleconference was held on 24th September 2008 and focussed on reviewing remaining project activity and ensuring all outstanding Aquafin CRC and Subprogram matters were appropriately redirected; primarily to the ASBTIA and FRDC. This was
also an opportunity to thank industry and research participants for their contributions to individual projects and the overall success of the Subprogram and Aquafin CRC.

Scientific Meeting

A half-day final scientific meeting was held in Port Lincoln (29th May, 2008) to provide an update on active projects and project outputs (Risk and response project, health and stress project, carbon deposition model, the SBT microalgal database, and the economic analysis from the longer term holding project).

A guest speaker, Sophie Bestly (CSIRO) also gave a presentation on movement patterns and feeding behaviour of juvenile SBT.

Aquafin CRC SBT Wrap-up Workshop (28th May, 2008, Port Lincoln Hotel, Port Lincoln)

A workshop was held to give a final account of the achievements of the SBT projects within the Aquafin CRC in an informal atmosphere and to provide an opportunity for industry to discuss, with researchers involved over the 7 year period, different aspects of the projects including the results, outcomes, outputs and future directions of research.

Finally, it was an opportunity to thank industry and research participants for their contributions to individual projects and the overall success of the Aquafin CRC.

The workshop was well attended by both industry and researchers. Key speakers presented excellent summaries on each research area, followed by panel discussions. Feedback from attendees was that it was a great location, good format and well organised.

Education and Training

The SBT Aquaculture Subprogram’s involvement with the Aquafin CRC and to a lesser extent AusIndustry provided opportunities for further developing the capabilities of existing researchers in the SBT industry and in associated research organisations. The Aquafin CRC also provided educational training to a wide range of university graduate students, 17 (including Aquafin CRC adopted PhD students) having been involved with PhDs focused on SBT projects (Table 2).

It has been pleasing to see that a number of the PhD graduates, have since been employed in areas directly benefiting the industry (2), or in aquaculture, aquaculture research and education in Australia (5) or overseas (2). Eleven PhD graduates are still completing their theses, two of these with existing positions in the SBT aquaculture industry.
<table>
<thead>
<tr>
<th>Name and Year of Commencement</th>
<th>University of Enrolment</th>
<th>Thesis Title</th>
<th>Proj No.</th>
<th>Supervisors</th>
<th>Industry Mentor</th>
<th>Completed?</th>
<th>First Graduate Destination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alistair Douglas (2001)</td>
<td>Flinders University</td>
<td>Maximising the control of quality of farmed SBT</td>
<td>2.2</td>
<td>Dr John Carragher Dr Philip Thomas</td>
<td>Australian and Japanese Industry Team</td>
<td>Thesis submitted</td>
<td>Managing Director, Seafood Services Japan (based in Tokyo)</td>
</tr>
<tr>
<td>Trent D’Antignana (2002)</td>
<td>Flinders University</td>
<td>Improving the flesh quality of SBT by examining their biochemistry and physiology</td>
<td>2.2</td>
<td>Dr John Carragher Dr Philip Thomas</td>
<td>Mr David Ellis (TBOASA)</td>
<td>Awarded</td>
<td>Postdoctoral Researcher, Marine Innovation SA</td>
</tr>
<tr>
<td>Peter Lauer (2002)</td>
<td>Flinders University</td>
<td>Benthic metabolism adjacent to SBT pontoons in South Australia</td>
<td>4.3.1</td>
<td>Prof Anthony Cheshire Prof Peter Fairweather Dr Jason Tanner</td>
<td>Mr Daryl Evans (Marnikol)</td>
<td>Awarded</td>
<td>Environmental Assessment Officer - PIRSA Aquaculture</td>
</tr>
<tr>
<td>Hamish Aiken (2004)</td>
<td>University of Tasmania</td>
<td>Epidemiology of the blood fluke</td>
<td>3.5</td>
<td>Assoc Prof Barbara Nowak Dr Craig Hayward</td>
<td>Ms Rebecca Paterson (Ajka Pty Ltd)</td>
<td>Writing up.</td>
<td>Aquatic Animal Health Officer - PIRSA Aquaculture</td>
</tr>
<tr>
<td>Sita Balshaw (2005)</td>
<td>Flinders University</td>
<td>Toxicological basis of mercury bio-accumulation in farmed SBT</td>
<td>2.1 (2)</td>
<td>Prof John Edwards Dr Kirstin Ross Mr Ben Daughtry</td>
<td>Mr David Warland (Sekol)</td>
<td>Writing up</td>
<td>_</td>
</tr>
<tr>
<td>Alexandra Korte (2005)</td>
<td>Flinders University</td>
<td>Dietary and cellular antioxidants and antioxidant enzymes and their role in improving product quality and shelf life in SBT</td>
<td>2.2 (2)</td>
<td>Dr Kathy Schuller Dr Philip Thomas</td>
<td>Dr Mark Crane (CSIRO)</td>
<td>Writing up</td>
<td>Women’s and Children’s Hospital, Adelaide</td>
</tr>
<tr>
<td>Samuel Phua (2005)</td>
<td>University of Adelaide</td>
<td>Global modelling methodologies for predicting dioxin and PCB levels in</td>
<td>2.1 (2)</td>
<td>Dr Ken Davey Mr Ben Daughtry</td>
<td>Mr David Warland (Sekol)</td>
<td>Thesis submitted</td>
<td>_</td>
</tr>
</tbody>
</table>
Table 3. Adopted Aquafin CRC PhD Students (extract from the Aquafin CRC 2007/08 Annual Report)

<table>
<thead>
<tr>
<th>Name and Year of Commencement</th>
<th>University of Enrolment</th>
<th>Thesis Title</th>
<th>Project No.</th>
<th>Supervisors</th>
<th>Industry Mentor</th>
<th>Completed?</th>
<th>Graduate Destinations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paul Bierman (2006)</td>
<td>University of Adelaide</td>
<td>The suitability of remote sensing of phytoplankton and water quality to monitor interactions between aquaculture and the environment in Spencer Gulf.</td>
<td>4.6</td>
<td>Dr Megan Lewis Dr Jason Tanner</td>
<td>Not assigned</td>
<td>Writing up</td>
<td></td>
</tr>
<tr>
<td>Emlyn Jones (2006)</td>
<td>Flinders University</td>
<td>Sediment resuspension and nutrient regeneration in the tuna farming zone</td>
<td>4.6</td>
<td>Dr Jochen Kaempf Dr Milena Fernandes</td>
<td>Not assigned</td>
<td>Writing up</td>
<td>CSIRO Marine &amp; Atmospheric Research, Hobart</td>
</tr>
<tr>
<td>Paul Armstrong (2002)</td>
<td>University of Tasmania</td>
<td>Phytoplankton ecology - The key issue whether aquaculture operations stimulate phytoplankton biomass</td>
<td>4.2</td>
<td>Dr Chris Bolch Dr Peter Thompson</td>
<td>Not assigned</td>
<td>Writing up</td>
<td>Monitoring Officer, Bureau of Meteorology</td>
</tr>
<tr>
<td>Dr Sapto Putro (2002)</td>
<td>Flinders University</td>
<td>Spatial and temporal structures and distribution of macrobenthic assemblages inhabiting coarse sediments at SBT farms</td>
<td>4.3.2</td>
<td>Dr Ib Svane Dr Jeremy Robertson</td>
<td>Not assigned</td>
<td>Awarded</td>
<td>University Lecturer, Indonesia</td>
</tr>
<tr>
<td>Janene Thompson (2003)</td>
<td>Flinders University</td>
<td>The interaction between enzymatic and non-enzymatic mechanisms protection against oxidative stress in farmed SBT</td>
<td>2.2</td>
<td>Dr Kathy Schuller Dr Philip Thomas</td>
<td>Rachel Lawrie (was Australian Fishing Enterprises)</td>
<td>Writing up</td>
<td></td>
</tr>
<tr>
<td>Name</td>
<td>Institution</td>
<td>Research Description</td>
<td>Code</td>
<td>Mentor(s)</td>
<td>Required</td>
<td>Work Status</td>
<td>Employment Details</td>
</tr>
<tr>
<td>-------------------------------</td>
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<td>----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>David Ellis (2004)</td>
<td>University of Tasmania</td>
<td>Thermodynamic responses of SBT to different feeding regimes.</td>
<td>1A.11</td>
<td>Dr John Purser&lt;br&gt;Prof Chris Carter</td>
<td>Not required</td>
<td>Experimental work progressing</td>
<td>Already employed as Research Manager for the ASBTIA</td>
</tr>
<tr>
<td>Dr Quinn Fitzgibbon (2004)</td>
<td>The University of Adelaide</td>
<td>Activity metabolism in live held SBT</td>
<td>1A.7</td>
<td>Assoc Prof Roger Seymour&lt;br&gt;Dr Richard Musgrove</td>
<td>Did not want a mentor</td>
<td>Awarded</td>
<td>Post Doctoral position at the Tasmanian Aquaculture and Fisheries Institute</td>
</tr>
<tr>
<td>Shelley Harrison (2004)</td>
<td>Flinders University</td>
<td>Interactions between silver gulls and tuna aquaculture in the Port Lincoln area</td>
<td>4.3.3</td>
<td>Dr Jeremy Robertson&lt;br&gt;Dr John Carragher&lt;br&gt;Dr Simon Goldsworthy</td>
<td>David Ellis (TBOASA)</td>
<td>Writing up</td>
<td>SA Department of Environment &amp; Heritage, Port Lincoln</td>
</tr>
<tr>
<td>David Padula (2004)</td>
<td>University of Tasmania</td>
<td>Through-chain investigation of residues of economic importance in Australian farmed SBT: Rationale for harmonised sampling approaches for product integrity programs</td>
<td>2.1(2)</td>
<td>A/Prof Barbara Nowak&lt;br&gt;Dr Andrew Pointon</td>
<td>Not required</td>
<td>Experimental work progressing</td>
<td>Already employed as Food Safety Researcher- SARDI Glenside</td>
</tr>
<tr>
<td>Daryl Evans (2006)</td>
<td>University of Tasmania</td>
<td>Stress indicators in farmed southern bluefin tuna, the influence of husbandry practices and the implications for fish health and performance</td>
<td>3.7</td>
<td>A/Prof Barbara Nowak</td>
<td>Already in industry</td>
<td>Experimental work progressing</td>
<td>Already employed (Marnikol Fisheries)</td>
</tr>
</tbody>
</table>

Scientific papers


Fitzgibbon, Q, Seymour, RS, Ellis, D, Buchanan, J 2007, ‘The energetic consequence of specific dynamic action in southern bluefin tuna (Thunnus maccoyii)’, *Journal of Experimental Biology*, vol. 210, pp. 290-298.

Fitzgibbon, QP, Baudinette, RV, Musgrove, RJ, Seymour, RS 2008. ‘Routine metabolic rate of southern bluefin tuna (Thunnus maccoyii)’, *Comparative Biochemistry and Physiology A-Molecular & Integrative Physiology*, vol. 150 (2), June, pp. 231-238.


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Phua, STG, Davey, KR, Daughtry, BJ 2007, ‘A new risk framework for predicting chemical residue(s) - Preliminary research for PCBs and PCDD/Fs in farmed Australian Southern Bluefin Tuna (Thunnus maccoyii)’, Chemical Engineering and Processing, vol. 46, issue 5, pp. 491-496.


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Balshaw, S 2005, ‘Mercury bioaccumulation in southern bluefin tuna (Thunnus maccoyii)’, poster presentation, 6th World Congress on Seafood Safety, Quality and Trade, Sydney, 12th - 14th September.


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D’Antignana, T, Thomas, PM and Carragher, J 2004, ‘The effect of different dietary combinations of vitamin e, vitamin c and selenium on the distribution of these anti-oxidants in the carcasses of southern bluefin tuna (Thunnus maccoyii)’, Aquaculture Europe, Biotechnologies for Quality, Barcelona, Spain. October 20-23.


Fitzgibbon, Q, Clark, T, Seymour, R, Taylor, B, Frappell, P, Ellis, D, Carragher, J and Buchanan, J 2006, ‘Cardio-metabolic physiology of southern bluefin tuna: aiming to model expenditure’,


Fitzgibbon, Q, Seymour, R, Ellis, D and Buchanan, J 2005, ‘The energetic consequences of specific dynamic action in southern bluefin tuna (Thunnus maccourii)’, 3rd Aquafin CRC Conference, Hobart, 5th - 7th July.


Hayward, C 2004, ‘Polyopisthocotyleans and their impact in marine fish culture’, As part of the PhD course, ‘Diagnosis and Control of Fish Diseases’. Royal Veterinary and Agricultural University, Copenhagen, Denmark, November.

Hayward, C 2005, ‘Tuna health’, School of Aquaculture, University of Tasmania, September.


Hayward, C, Aiken, H and Nowak, B 2007, ‘Epizootics of metazoan gill parasites did not threaten feasibility of farming southern bluefin tuna (Thunnus maccourii) in a trial extending over summer months’, 7th International Symposium of Fish Parasites, Viterbo, Italy, 24-28 September 2007.


Hayward, C, Aiken, H, Nowak, B 2005, ‘Metazoan parasites on the gills of southern bluefin tuna (Thunnus maccourii) do not rapidly proliferate after transfer to culture cages’, European Association of Fish Pathologist conference, Copenhagen, September 2005.


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Padula, D 2004, ‘Levels of dioxin (PCDD/F) and PCBs in a random sample of Australian aquaculture produced southern bluefin tuna (Thunnus maccoyii) Organohalogen Compounds’, Dioxin Symposium, Germany, 66, pp. 2097-2102.


Padula, DJ 2005, ‘Management of food safety hazards in farmed southern bluefin tuna to exploit market opportunities’, Yellow Sea Fisheries Research Institute, Qingdao, China, March.


Padula, DJ 2005, ‘Management of food safety hazards in farmed southern bluefin tuna to exploit market opportunities’, poster presentation, 6th World Congress on Seafood Safety, Quality and Trade, Sydney, 12th - 14th September.


Padula, DJ and Daughtry, BJ 2005, ‘Management of food safety hazards in farmed southern bluefin tuna to exploit market opportunities’, Southern Bluefin Tuna industry workshop, Port Lincoln, November.


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May 2006, viewed


Thomas, PM and Buchanan, J 2006, ‘The use of dietary antioxidants to extend colour shelf life in farmed juvenile southern bluefin tuna (Thunnus maccoyii), Proceedings of the Alltech's 22nd


Thompson, JL, Thomas, PM and Schuller, KA 2004, ‘The role of glutathione peroxidase in maintaining flesh quality in farmed southern bluefin tuna (Thunnus maccoyii)’, Aquaculture Europe, Biotechnologies for Quality, Barcelona Spain, October 20-23.


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**Final Reports Approved and Distributed**


**Newsletters – Tuna-Briefs**


SBT Aquaculture Subprogram Website

The SBT Aquaculture Subprogram website that was developed as part of the FRDC Project 2001/250 continued to be administered, having both historical and current outputs from the SBT Aquaculture Subprogram uploaded to the website.

The website, in addition to a Public area, continued to include two login protected areas (Tuna Industry and Steering Committee areas) allowing the web site to be used much more extensively, providing industry members with access to Commercial In Confidence reports that were secured in these areas.

As part of this project (2004/216) historical information, such as copies of all briefing papers and minutes from SBT Aquaculture Subprogram Steering Committee minutes, all SBT Aquaculture Subprogram final reports, in addition to current documents, were uploaded to the site providing an effective depository for all SBT Aquaculture Subprogram outputs.

The website was also used as a communication tool, providing information on upcoming events, as well as copies of presentations in the Tuna Industry area, following industry workshops.
The Environmental data in Port Lincoln (Real-time environmental data coming from the telemetry system located in the Boston Island SBT Farming Zone) remained available on a password protected site.

An SBT Industry Microalgal database is nearly competition that will also be available on the site.

**BENEFITS**

**Beneficiaries:**
- The SBT aquaculture industry in South Australia.
- The SBT and Australian sardine wild fishery in Australia.
- Other aquaculture industries (e.g. yellowtail kingfish).
- Suppliers and producers of services.
- The regional economy of Port Lincoln and surrounding areas.

This project implemented the Strategic R&D Plans for the SBT aquaculture industry, and the SBT aquaculture component of the Aquafin CRC Research Program, for the period 2004-2008.

**Key benefits included:**

1. Providing a framework for an orderly and structured approach to R&D, including the production of the SBT Aquaculture Strategic Plan ‘Southern Bluefin Tuna Aquaculture Strategic R&D Plan – Towards 2012: Striving for a Profitable and Sustainable Future’, involving all relevant stakeholders. The review of the Strategic R&D Plan, and the consultation that occurred as part of this, provided the opportunity for all levels of industry and relevant stakeholders to be informed of R&D progress and to participate in the future direction of R&D.

2. Improved management and review of existing projects, ensuring they are in line with the changing priorities of industry.

3. Improved communication of the Subprogram process through the timely delivery of briefing papers to the Steering Committee, the annual production of the Industry Workshop Handbook, the annual production of an AOP to FRDC, delivery of project reports to Aquafin CRC and FRDC and the successful running of scientific meetings, increasing the communication between researchers and providing the opportunity to develop and discuss the direction of new research proposals as well as develop synergies within and between project groups.

4. Improved technology transfer with research results being disseminated to all relevant stakeholders through regular Tuna-briefs, the annual Industry Workshop, meetings and smaller focussed workshops.
FURTHER DEVELOPMENT

The SBT Aquaculture Subprogram ends 30th September 2008, along with Aquafin CRC. At this time the ASBTIA Research Committee will take over management of SBT research and development. A new agreement between the ASBTIA and FRDC is expected to be finalised in November 2008 and will lead to the initiation of the SBT Research Council, which will operate under a new governance structure. David Ellis is the ASBTIA R&D Manager and is an appropriate contact at this time.

PLANNED OUTCOMES

The SBT Aquaculture Subprogram successfully achieved the planned outcomes for this project. The Subprogram has provided:

1. **An orderly and structured approach to research and development associated with SBT aquaculture so as to meet the needs of the industry and research managers/funders.**

   The Subprogram, over the period of the project, has managed 23 projects and has been involved in all aspects of the projects in consultation with the industry, and Aquafin CRC and FRDC. The Subprogram has submitted every year, in consultation with industry, an Annual Operating Plan to FRDC documenting activities that have occurred over the past 12 months and outlining future plans.

2. **An up-to-date R&D Plan meeting the needs of industry participants.**

   A new R&D plan ‘Southern Bluefin Tuna Aquaculture Strategic R&D Plan – Towards 2012: Striving for a Profitable and Sustainable Future’ was developed as part of this project in close consultation with all stakeholders. Project proposals were previously measured against the needs to the industry as outlined in the appropriate plan at the time ‘Southern Bluefin Tuna Aquaculture Strategic R&D Plan 2001-2006: Sustainability & Innovation for the Future’.

3. **Efficient management and administration of the Subprogram achieving the specified milestones, outcomes and outputs.**

   The Subprogram monitored the progress of each project, meeting with Principal Investigators at the two face-to-face Steering Committee meetings held each year, and provided updates in the briefing papers for all Steering Committee meetings. Research direction and progress was also discussed at the two scientific group meetings held annually. Throughout the year the Subprogram liaised closely with all project Principal Investigators, dealing with any issues that arose.
4. **Efficient and coordinated use of the limited resources available for SBT aquaculture related research and development (measured by the diversity, suitability and satisfaction with the research platforms in use).**

   During the period of this project most facilities for research using live SBT were located on commercial farms. However, short-term, smaller scale research requiring calmer waters did occur on a SARDI lease in Rotten Bay, south of Boston Island.

5. ** Appropriately managed communications disseminating research results (measured by the level of communication and absence of negative media issues).**

   Research results were disseminated to industry during this project through Tuna-brief newsletters, the annual workshop (including a handbook), ad-hoc workshops and the SBT Aquaculture Subprogram website.

6. **Relevant outcomes stated in the Commonwealth Agreement of the Aquafin CRC**

   **Business Planning**
   - Efficient translation of research results into industry advantage

   The SBT Aquaculture Subprogram has worked closely with the SBT aquaculture industry to identify, manage and transfer outcomes from research projects.

   **Industry-wide dissemination**
   - Improved and innovative industry practices
   - Competitive advantage to participants

   The SBT Aquaculture Subprogram has made a significant effort to ensure a detailed depository of information remains available for the SBT aquaculture industry at the end of this project. All Subprogram administrative and project technical information and outcomes have been provided on the dedicated SBT Aquaculture Subprogram web site, including final reports and newsletters. A bibliography of all publications has also been included, as has a number of outputs (databases and models) and workshop and conference presentations.

   The independent impact assessment by FERM, who consulted key industry representatives and researchers in carrying out their study, confirmed that significant impacts have already been realised.

**CONCLUSIONS**

The SBT Aquaculture Subprogram has operated efficiently and effectively over the period of this project and has facilitated the development of a new administrative structure, governance procedures, a web based information depository and personnel succession planning, as the SBT aquaculture industry moves to a more dominant role in driving and managing future research.
Strategic R&D plans have been reviewed and updated as necessary to meet with new industry priorities. In doing this the Subprogram has delivered strongly when measured against the designated strategies and objectives, as well as outcomes. An independent analysis of the impacts of a range of projects has demonstrated significant financial return.

Industry technology transfer has also been a strong outcome of this project, with industry representatives very much involved through the Subprogram in advising on preferred communication methodologies and the form for outputs. The Subprogram has delivered well attended conferences, workshops and meetings to facilitate verbal communications; and project reports, scientific publications, handbooks and manuals, interactive models, news-letters, a comprehensive web site, and posters to facilitate written communication.

REFERENCES


APPENDICIES

Appendix 1 – Intellectual Property (IP)

There was no specific IP associated with this project. IP associated with each individual project managed through this project has been addressed through the Aquafin CRC Wind-up Agreement or through FRDC.

Appendix 2 – Staff

Mr Steven Clarke (SBT Aquaculture Subprogram Leader, SARDI)
Ms Jane Ham (Project Officer, SARDI)

Temporary project staff

Ms Di Leith (Project Officer, SARDI)
Ms Alison Hughes (Project Officer, SARDI)
Ms Louise Handley (Aquaculture Administration Officer, SARDI)

Appendix 3 – Project Outcomes and Outputs

Production

<table>
<thead>
<tr>
<th>CRC Project No.</th>
<th>FRDC Project No.</th>
<th>Title: Aquafin CRC - FRDC - SBT Aquaculture Subprogram: assessment of alternative platforms for southern bluefin tuna research.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A.9</td>
<td>2004/212</td>
<td></td>
</tr>
<tr>
<td>Principal Investigator: Wayne Hutchinson - SARDI.</td>
<td></td>
<td></td>
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<tr>
<td>Outputs: Final Report.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Achievements: Developed a detailed analysis of the required system specifications, and cost benefit analysis of alternative platforms suitable for holding SBT for research, from which the best alternatives can be followed. R&amp;D platforms considered include: (1) Industry seacages, (2) On-shore system of tanks holding smaller hatchery reared fish, (3) On-shore system of tanks holding wild-caught SBT, (4) On-shore system of tanks holding smaller hatchery reared fish, (5) An existing onshore R&amp;D tank facility. The preferred platform was industry seacages; however this platform is critically dependent on contractual commitments by industry to carry out research trials, independent of commercial operational factors. Designed and tested a prototype sea-based platform for holding SBT and collecting faecal and waste feed samples required for research.</td>
<td></td>
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</tbody>
</table>
Aquafin CRC – Southern Bluefin Tuna Aquaculture

Principal Investigator: David Ellis - ASBTIA.


Achievements: Established that none of the downside risks to survival, health, flesh quality or residue status, anticipated for long-term holding, were realised.

Noted that there were indications that environmental impacts would need to be carefully monitored in full-scale trials if long-term holding was to occur.

The preliminary results of long-term holding in terms of carcase condition and growth rate were disappointing.

Feeding behaviour, assimilation and growth are greatly affected by age cohort, time in culture and carcase condition and therefore feeding strategies and farming period need to be further investigated to ensure the highest rate of return.

Expected Outcomes: Complete an economic analysis to determine the full implications of the less than expected growth rates and carcass condition.

Nutrition & Feed Technology

Nutrition & Feed Technology

CRC Project No. 1A.3
FRDC Project No. 2001/201
Title: Aquafin CRC - SBT Aquaculture Subprogram: commercialisation trials for a manufactured tuna feed.

Principal Investigators: Hagen Stehr – Stehr Group and Craig Foster - Skretting.

Outputs: Final Report.

Achievements: Achieved a world first by growing and fattening SBT fed on a pelleted feed on a commercial basis.

Demonstrated commercially pellet fed SBT attained product quality and sale prices equal to or better than baitfish fed SBT.

Developed methods for handling pellets and feeding tuna on a commercial scale: introduction of a vessel mounted feed conveyor, feed blower and underwater cameras.

Enabled tuna farmers to make a cost benefit analysis for
baitfish and pelleted feeds.

<table>
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<tr>
<th>CRC Project No.</th>
<th>1A.4</th>
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<tbody>
<tr>
<td>FRDC Project No.</td>
<td>2001/249 (revised)</td>
</tr>
<tr>
<td>Title:</td>
<td>Aquafin CRC - SBT Aquaculture Subprogram: Optimisation of farmed southern bluefin tuna (<em>Thunnus maccocyii</em>) nutrition to improve feed conversion efficiency and reduce production costs.</td>
</tr>
<tr>
<td>Principal Investigator:</td>
<td>Robert van Barneveld – Barneveld Nutrition.</td>
</tr>
<tr>
<td>Outputs:</td>
<td>An industry manual “Practical Nutrition of Farmed Southern Bluefin Tuna (<em>Thunnus maccocyii</em>)”, outlining existing knowledge on tuna nutrition and explaining the theory behind nutrition and diet formulation. A literature review on identifying a surrogate fish species for SBT nutrition research. A report on the digestive physiology and microbiology of blue mackerel (<em>Scomber australasicus</em>) and skipjack tuna (<em>Katsuwonus pelamis</em>). Developed, in conjunction with FRDC Project 2000/221, Formu-bait© software; a feed formulation software program that accepts information on potential supplies of baitfish, including their cost and nutrient composition, and relates them to a stated nutritional requirement for feeding to SBT. Using this software, farmers can quickly identify the least-cost mixture of baitfish, based on what they have available, which when combined will produce a given protein and fat level as specified by them. Semi-moist manufactured feeds and manufacturing processes with enhanced binding properties and attractiveness for farmed southern bluefin tuna. Australasian Experimental Stockfeed Extrusion Centre for production of experimental volumes of manufactured semi-moist feed for farmed southern bluefin tuna incorporating a Wenger X-85 extruder, a drying and cooling system, and a UAS vacuum infusion system.</td>
</tr>
<tr>
<td>Achievements:</td>
<td>Investigated the effects of different feeding strategies on the growth of SBT, suggesting that maintaining a constant and balanced supply of protein and fat, achieved the greatest length increase, the greatest weight gain and the lowest feed conversion ratios. Suggested that there did not appear to be any advantage in supplying either high protein/low fat or...</td>
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</table>
low protein/high fat diets at the beginning of the season to exploit higher intakes and potential growth of SBT, or later to influence fish condition prior to harvest. Identified that yellowtail kingfish, *Seriola lalandi*, was a more suitable surrogate in certain nutrition experiments than blue mackerel, *Scomber australasicus*. Made significant advances on the development of manufactured pelleted diets for SBT; improving consumption rates with moist pellets rather than dry, extruded flat pellets rather than extruded round pellets, and 30mm pellets rather than 60mm pellets. Attractants investigated had no effect on consumption by SBT. Digestibility (protein and energy) of the current manufactured diet was shown to vary throughout the tuna farming season. Commenced development of a shelf stable pellet, with preliminary results in yellowtail kingfish as a surrogate, indicating that one of the two preservatives trialled, “MycoCurb®”, showed no significant difference in apparent intake, specific growth rate or FCR. Trials still need to be undertaken with SBT.

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<tr>
<th>CRC Project No.</th>
<th>FRDC Project No.</th>
<th>Title:</th>
<th>Principal Investigator:</th>
<th>Outputs:</th>
<th>Achievements:</th>
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</table>
in-situ observations and measurements.
Recorded the metabolic cost of food ingestion for SBT –
the first for any tuna species, finding that the energetic cost
of food processing is twice that recorded for any other
species.
Showed that the lipid/energy content of the baitfish ingested
has little influence on the energetic cost of processing.
Measured the rates of nitrogen excretion and protein
synthesis of SBT, showing that ammonia excretion rates of
SBT are more than double those recorded for any other
species.
Recorded the free-swimming heart rate for SBT – a first for
any tuna species; preliminary analysis suggests that post-
feeding heart rate correlates closely with the size of the
meal ingested.
Provided data to other Aquafin CRC projects, incorporating
the data into bioenergetic and environmental models,
improving industry’s knowledge of tuna nutrition and how
tuna aquaculture interacts with the environment.

Product Quality

<table>
<thead>
<tr>
<th>CRC Project No.</th>
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<tr>
<td>FRDC Project No.</td>
<td>2000/221</td>
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<tr>
<td>Title:</td>
<td>Nutritional Profiles of Baitfish 1; Quality and nutritional evaluation of baitfish used for tuna farming.</td>
</tr>
<tr>
<td>Principal Investigator:</td>
<td>Kirsten Rough and David Ellis - ASBTIA.</td>
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<tr>
<td>FRDC Project No.</td>
<td>2000/221.20</td>
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<tr>
<td>Title:</td>
<td>Aquafin CRC - FRDC Southern Bluefin Tuna Aquaculture Subprogram: quality and nutritional evaluation of baitfish used for tuna farming project 2000/221 (extension).</td>
</tr>
<tr>
<td>Principal Investigator:</td>
<td>Jeff Buchanan - SARDI.</td>
</tr>
<tr>
<td>Outputs:</td>
<td>Final Report for FRDC Projects 2000/221 and 2000/221.20. Baitfish composition database, providing nutritional profiles (proximate analysis, amino acid and fatty acid profiles) for all types of baitfish used for feed in SBT industry.</td>
</tr>
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Achievements: Provided amino acid and fatty acid analysis for wild caught SBT.
Established the level of vitamin C and E in fresh sardines (American pilchards and Australian sardines), and
identified that the levels of these vitamins decline substantially during frozen storage, and that these lower levels could be potentially limiting to SBT growth and/or health.

Extended the work done by FRDC Project 2001/249; developed a calibration for a portable NIR (Near Infra Red) machine (Cropscan 2000B NIR unit) which was sufficiently accurate (3% across all fat levels) to rapidly identify baitfish that are outside the expected range of fat content. Provided industry with the information to objectively compare different baitfish sources on the market for their nutritional value and choosing products that most cost effectively meets their feed requirements.

CRC Project No. 1A.10
FRDC Project No. 2004/211
Title: Aquafin CRC - FRDC - SBT Aquaculture Subprogram: nutritional profiles of baitfish 3: effects of harvest and post-harvest processes on quality of local pilchards for feeding SBT.

Principal Investigator: John Carragher – SARDI.

Outputs: Final Report.
Poster for suppliers to improve post-harvest treatment of baitfish to optimise quality.

Achievements: Demonstrated the effects of harvest and post-harvest practices on the nutritional quality of locally-caught Australian sardines (*Sardinops sagax*) and of redbait (*Emmelichthys nitidus nitidus*). Identified that there were substantial losses in key elements of the nutritional profile (i.e. vitamins and nucleotides), associated with increases in rancidity and loss of freshness. Established that greater losses in vitamin E, quality and freshness occurred during post-harvest transport and freezing, and thawing of baitfish, prior to feeding SBT. It was also established that losses during extended frozen storage can be substantial.

Recommended that baitfish should be kept on ice or refrigerated when transferred from the fishing vessel’s refrigerated seawater tanks to the factory; storage time limited; and block feeding at sea is recommended over land-based thawing as rapid thawing may reduce vitamin losses.
Established a correlation between TBARS and remaining vitamin E, indicating that TBARS is a good indicator of antioxidant status and should be included as an analytical requirement for baitfish quality in Port Lincoln.

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<th>CRC Project No.</th>
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<tr>
<td>FRDC Project No.</td>
<td>2001/248</td>
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<tr>
<td>Title:</td>
<td>Aquafin CRC - SBT Aquaculture Subprogram: maximising the control of quality in farmed SBT.</td>
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<tr>
<td>Principal Investigator:</td>
<td>Philip Thomas – Flinders University.</td>
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<tr>
<td>CRC Project No.</td>
<td>2.2(2)</td>
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<tr>
<td>FRDC Project No.</td>
<td>2004/209</td>
</tr>
<tr>
<td>Title:</td>
<td>Aquafin CRC - SBT Aquaculture Subprogram: dietary supplements for reducing oxidative stress and improving flesh quality attributes in SBT.</td>
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<tr>
<td>Principal Investigator:</td>
<td>Philip Thomas – Flinders University.</td>
</tr>
<tr>
<td>CRC Project No.</td>
<td>2.2(3)</td>
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<tr>
<td>FRDC Project No.</td>
<td>2004/209 (extension).</td>
</tr>
<tr>
<td>Title:</td>
<td>Baitfish extension project.</td>
</tr>
<tr>
<td>Principal Investigator:</td>
<td>Trent D’Antignana – Flinders University.</td>
</tr>
<tr>
<td>Achievements:</td>
<td>Traced chilled SBT to the marketplace in Japan with industry responding to identified points of risk.</td>
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<tr>
<td></td>
<td>Carried out objective measures and sensory analysis of SBT quality by Japanese and Australian researchers.</td>
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<tr>
<td></td>
<td>Achieved correlations between Japanese and Australian assessments of SBT quality.</td>
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<tr>
<td></td>
<td>Observed Japanese practices, enabling sensory analysis of tuna flesh to be carried out in Port Lincoln.</td>
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<tr>
<td></td>
<td>Achieved preliminary objective colour measurement using digital camera technology, providing a good correlation with Japanese market price and quality grading.</td>
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<tr>
<td></td>
<td>Determined the levels of vitamin C and E and selenium in wild and farmed SBT.</td>
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<tr>
<td></td>
<td>Achieved increases in the levels of vitamin C in SBT flesh by sprinkling a vitamin mix onto baitfish, however did not find any increases in the level of vitamin E using the same method.</td>
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</tbody>
</table>
Achieved higher levels of vitamin C, E and selenium in the flesh of SBT fed pellets and this resulted in significantly longer shelf life for SBT flesh. Showed that increasing the level of antioxidants in the flesh of SBT did not adversely affect human sensory qualities, and did extend the colour shelf life of fresh, and frozen and thawed (75-80% of the total product exported to Japan), SBT sashimi. Found that the quality and shelf-life stability of frozen/thawed SBT product was not dissimilar to the fresh product. Cold Wave® technology was well suited to freezing SBT and maintaining its quality. Mapped the distributions of fat, glycogen and vitamins in SBT carcasses, and their changes with season, providing information useful in determining harvest strategies, particularly if the farm cycle is extended. Assessed NIR for in-line measurement of carcase fat, as a major tool in quality grading. Established that current best commercial harvest practice, along with transport practices (a) shipped on day of harvest) and (b) shipped the following day), did not have a major effect of quality characteristics of SBT.

**Food Safety**

<table>
<thead>
<tr>
<th>CRC Project No.</th>
<th>2.1</th>
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</thead>
<tbody>
<tr>
<td>FRDC Project No.</td>
<td>2003/227</td>
</tr>
<tr>
<td>Title:</td>
<td>Aquafin CRC - SBT Aquaculture Subprogram: development and validation of baitfish sampling methods to address international residue standards for southern bluefin tuna (Thunnus maccoyii).</td>
</tr>
<tr>
<td>Principal Investigator:</td>
<td>David Padula - SARDI.</td>
</tr>
<tr>
<td>CRC Project No.</td>
<td>2.1(2)</td>
</tr>
<tr>
<td>FRDC Project No.</td>
<td>2004/206</td>
</tr>
<tr>
<td>Title:</td>
<td>Aquafin CRC - SBT Aquaculture Subprogram: management of food safety hazards in farmed southern bluefin tuna to exploit market opportunities.</td>
</tr>
<tr>
<td>Principal Investigator:</td>
<td>David Padula - SARDI.</td>
</tr>
</tbody>
</table>
Achievements:

(Thunnus maccoyii) Sampling Protocols Baseline Data and Standards (Bi-lingual document).

A new sample collection method has been adopted, which provides equivalence between data reported in this study, and those officially reported in Japan.

Showed that the levels of mercury, dioxins and PCBs in wild and farmed SBT were low by international regulatory standards, regardless of the cut (akami, chu-toro, o-toro).

Identified that imported baitfish were the dominant source of regulatory significant PCBs in farmed SBT.

In relation to lead (Pb), aquaculture-produced tuna was not significantly different from wild-caught tuna.

Performed preliminary dietary modelling of PCBs indicating that adult Japanese consumers can be assured that consumption of mixed portions of whole SBT on a regular (but not daily) basis will not incur an elevated health risk.

Established that dioxins or PCB concentration of any tissue could be directly related to its fat content.

Found that farmed SBT contain different types of dioxins to wild SBT; the concentration of PCBs were higher in farmed SBT than wild SBT.

Performed preliminary dietary modelling of mercury indicating that consumers can eat twice as many servings of farmed SBT as wild SBT; mercury levels of wild-caught SBT decline during the first season of growth on-farm through growth-dilution.

Highlighted that Japanese Government (MAFF) import testing data for wild and farmed bluefin tuna entering the Japanese domestic market indicate that Australian SBT compares favourably with overseas competitors’ product.

Developed risk management (predictive) tools to assist industry in the selection of baitfish and feeding strategies that support product integrity specifications of major markets.

Achieved revision of the FSANZ and Japanese Government public mercury statement in favour of SBT.

Assurance of compliance with new Japanese Government regulatory standards and access to new markets including China, South Korea, United Arab Emirates and the European Union.
### Environment

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<tr>
<td></td>
<td></td>
<td>Principal Investigator: Maylene Loo (previously Anthony Cheshire) - SARDI.</td>
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<tr>
<td></td>
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<td>Outputs: Final Report.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Achievements: Developed and validated a DNA assay system of key benthic fauna extracted from sediment samples as indicator taxa to rapidly assess the “environmental health” of the seabed in the vicinity of the tuna cages.</td>
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<tr>
<td></td>
<td></td>
<td>Developed an Environmental Compliance Scorecard (ECS) system to provide a packaged set of statistical routines for analysing, integrating and summarising results from the DNA assay system and to support decision making for environmental compliance.</td>
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<tr>
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<td>This novel technique was adopted by the South Australian regulatory authorities for routine environmental compliance monitoring for SBT farms – a world first.</td>
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<tr>
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<td>Extending this technology to other SA finfish sectors (specifically yellowtail kingfish and mulloway).</td>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Principal Investigator: Milena Fernandes (previously Anthony Cheshire) - SARDI.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Outputs: Final Report and journal articles.</td>
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<tr>
<td></td>
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<td>Models for nutrient (phosphorus and nitrogen) inputs and outputs within tuna farms, including processes for recycling and transport.</td>
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<tr>
<td></td>
<td></td>
<td>Achievements: Characterised the natural sedimentary environment in the tuna farming region explaining much of the variability in terms of natural processes.</td>
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<tr>
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<td></td>
<td>Highlighted that, unlike in many other finfish aquaculture farms systems, seafloor scavengers (fish and invertebrates) can rapidly consume much of the baitfish wastes from tuna farms.</td>
</tr>
</tbody>
</table>
Established the patterns and rates of recovery associated with fallowing period of tuna sites. Confirmed fallowing is a useful waste mitigation strategy and that 12 months is an adequate time for most sites to return to normal. Potential polyculture techniques for tuna farmers were reviewed and potential options highlighted.

<table>
<thead>
<tr>
<th>CRC Project No.</th>
<th>4.3.3</th>
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<tbody>
<tr>
<td>FRDC Project No.</td>
<td>2001/104</td>
</tr>
<tr>
<td>Principal Investigator:</td>
<td>Jason Tanner (previously Anthony Cheshire) - SARDI.</td>
</tr>
<tr>
<td>Outputs:</td>
<td>Final report. Two preliminary models of carrying capacity for the tuna farming zone (1) Zone-based model to predict the likely increases in dissolved nutrients in the water column with a given level of aquaculture production (2) Carbon deposition model of the seafloor on a lease scale These models are now used by PIRSA Aquaculture to help set initial maximum stocking rates for aquaculture zones as they are revised. Provided a broad environmental risk analysis associated with tuna farming.</td>
</tr>
<tr>
<td>Achievements:</td>
<td>Assessed the applicability of remote sensing for environmental monitoring in the region. Constructed and assessed a telemetry based environmental monitoring system that was used regularly by industry. Generated the first quantitative data showing that an economically important fraction of feed can be consumed by birds if appropriate measures to deter them are not taken. Demonstrated, through analysis of infauna data at control and compliance sites, that SBT farming is having an undetectable impact on the benthos at compliance sites (150m from lease boundaries), although natural geographic gradients were detected. Reviewed and documented the type and location of available environmental data-sets relevant to tuna farming.</td>
</tr>
</tbody>
</table>
Title: Aquafin CRC - Southern Bluefin Tuna Aquaculture
Subprogram: pilot study into the use and efficacy of antifoulants on the nets used for southern bluefin tuna (*Thunnus maccoyii*) culture, including residue status of tuna and the surrounding environment.

Principal Investigator: Kirsten Rough - ASBTIA.

CRC Project No. 4.5
FRDC Project No. 2003/226

Title: Extension to current Aquafin CRC/FRDC SBT Projects – 2003/226.

Principal Investigator: David Ellis - ASBTIA.


OxyTuna© - a model for the oxygen dynamics of a southern bluefin tuna sea-cage system which provides a quantitative prediction of the changes in oxygen concentration through time for different sea-cage configurations (cage size, net type, stocking density) in response to changes in ambient conditions (temperature, salinity, ambient dissolved oxygen, current speed).

Achievements:
- Reviewed and documented the methods available to control biofouling on nets and associated structures (using both physical and chemical means) for various marine finfish species.
- Determined efficacy of select antifoulant products for reducing fouling growth and their impact on net integrity using net panels in the local tuna farming environment.
- Identified the pattern of development of fouling communities on commercial tuna cages under current industry practices, and related this to oxygen levels monitored on the outside and inside of these nets.
- Using a flume tank, established a relationship between the percentage cover of fouling communities with water flow, net weight and net drag.

Expected Outcomes:
- Preliminary assessment of 2nd antifouling product with view to registration for SBT farming.
<table>
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<tr>
<th>CRC Project No.</th>
<th>4.6</th>
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<tbody>
<tr>
<td>FRDC Project No.</td>
<td>2005/059</td>
</tr>
<tr>
<td>Title:</td>
<td>Aquafin CRC - SBT Aquaculture Subprogram. Risk and response - understanding the tuna farming environment.</td>
</tr>
<tr>
<td>Principal Investigator:</td>
<td>Jason Tanner – SARDI.</td>
</tr>
<tr>
<td>Outputs:</td>
<td>Final Report. A broad-scale hydrodynamic model of Spencer Gulf and a fine scale model of the tuna farming zone at Port Lincoln describing the wave environment and currents, as well as water residence times and particle transport patterns. A fine scale model of the tuna farming zone including a biogeochemical model that provides information on dissolved nitrogen, surface chlorophyll, primary production, as well as other parameters of interest. A sediment model that relates sediment resuspension to wave energy which can be used to calculate the probability of resuspended sediment concentrations at different areas within the tuna farming zone. A set of physical and biochemical data for the tuna farming zone that can be used to calibrate the various models and to establish a baseline for the ecosystem under present farming practices.</td>
</tr>
<tr>
<td>Achievements:</td>
<td>Increased understanding of nutrient cycling around tuna farms in the context of what occurs naturally without the presence of farming. An understanding of how the tuna farming region is connected to the broader Spencer Gulf, as well as shelf waters. An ability to run model scenarios to examine the consequences of altered stocking regimes, and of adverse natural events such as storms and phytoplankton blooms propagating into the area from outside.</td>
</tr>
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</table>

**SBT Health**

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<thead>
<tr>
<th>CRC Project No.</th>
<th>3.2</th>
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<tbody>
<tr>
<td>FRDC Project No.</td>
<td>2001/200</td>
</tr>
<tr>
<td>Title:</td>
<td>Aquafin CRC - FRDC Southern Bluefin Tuna Aquaculture Subprogram: tuna cell line development and their application to tuna aquaculture health surveillance.</td>
</tr>
<tr>
<td>Principal Investigator:</td>
<td>Mark Crane – CSIRO livestock industries.</td>
</tr>
<tr>
<td>Outputs:</td>
<td>Final Report.</td>
</tr>
<tr>
<td>Achievements:</td>
<td>Achieved primary (mortal) tuna cell cultures for farmed SBT. Identified the materials (e.g. culture media) and methodology (tissue explants and enzymatic dissociation) required to establish primary cell cultures; this preliminary work was instrumental in the development of the immortal cell lines achieved in FRDC Project No. 2004/209.</td>
</tr>
</tbody>
</table>

| CRC Project No. | 3.1 |
| FRDC Project No. | 2001/253 |
| Title: | Aquafin CRC - SBT Aquaculture Subprogram: a risk assessment of factors influencing the health of farmed southern bluefin tuna. |
| Principal Investigator: | Barbara Nowak – University of Tasmania. |
| CRC Project No. | 3.5 |
| FRDC Project No. | 2003/225 |
| Title: | Aquafin CRC - SBT Aquaculture Subprogram: investigation of the relationship between farming practices and southern bluefin tuna health. |
| Principal Investigator: | Barbara Nowak – University of Tasmania. |
| CRC Project No. | 3.7 |
| FRDC Project No. | 2006/225 |
| Title: | Aquafin CRC - SBT Aquaculture Subprogram: Improving husbandry and performance of southern bluefin tuna through better understanding of the relationship of fish stress and health. |
| Principal Investigator: | Barbara Nowak – University of Tasmania. |
| Achievements: | Achieved greater ability to anticipate and guard against fish health related incursions in tuna farms. Identified that the current disease threat to tuna farms is negligible to low, however noted that changes to farming practices may influence the potential threat. Parasites of SBT have been identified. |
Developed partial understanding of the epidemiology of blood fluke, *Cardicola forsteri*. Provided a baseline for SBT microbiology by identifying bacteria associated with SBT as well as investigation of the effects of post mortem on changes in microbial populations. Potential for significant gains in SBT productivity by stress reduction. Potential for development of an integrated database for SBT industry. Improved capability to determine the health status of SBT. Improved capability to predict the performance of farmed SBT. Understanding the relationship between stress, health and performance in farmed SBT. Development of nonterminal markers for prediction of performance of farmed SBT (either individual marker or a combination of markers).

<table>
<thead>
<tr>
<th>Expected Outcomes</th>
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<tbody>
<tr>
<td>Developed partial understanding of the epidemiology of blood fluke, *Cardicola</td>
</tr>
<tr>
<td>forsteri*. Provided a baseline for SBT microbiology by identifying bacteria</td>
</tr>
<tr>
<td>associated with SBT as well as investigation of the effects of post mortem on</td>
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<tr>
<td>changes in microbial populations. Potential for significant gains in SBT</td>
</tr>
<tr>
<td>productivity by stress reduction. Potential for development of an integrated</td>
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<tr>
<td>database for SBT industry. Improved capability to determine the health status of</td>
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<tr>
<td>SBT. Improved capability to predict the performance of farmed SBT. Understanding</td>
</tr>
<tr>
<td>the relationship between stress, health and performance in farmed SBT.</td>
</tr>
<tr>
<td>Development of nonterminal markers for prediction of performance of farmed SBT</td>
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<tr>
<td>(either individual marker or a combination of markers).</td>
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<tr>
<th>CRC Project No.</th>
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<tbody>
<tr>
<td>FRDC Project No.</td>
<td>2004/085</td>
</tr>
<tr>
<td>Title:</td>
<td>Detection of SBT pathogens in environmental samples.</td>
</tr>
<tr>
<td>Principal Investigator:</td>
<td>Kathy Ophel-Keller - SARDI</td>
</tr>
<tr>
<td>Outputs:</td>
<td>Final Report</td>
</tr>
<tr>
<td>Achievements:</td>
<td>DNA probes for <em>Uronema nigricans</em> (ciliate), <em>Cardicola forsteri</em> (blood fluke) and <em>Hexostoma thynni</em> (gill fluke).</td>
</tr>
<tr>
<td></td>
<td>Developed quantitative DNA tests for three key SBT parasites, <em>Uronema nigricans</em> (ciliate), <em>Cardicola forsteri</em> (blood fluke) and <em>Hexostoma thynni</em> (gill fluke), which can be used to quantify DNA of parasites from environmental samples such as sediment, water, sea-cage netting.</td>
</tr>
<tr>
<td></td>
<td>Made contributions to the understanding of the biology of <em>Uronema nigricans</em>, <em>Cardicola forsteri</em> and <em>Hexostoma thynni</em>, and the dispersal of their larvae in the farm environment.</td>
</tr>
<tr>
<td></td>
<td>Links to FRDC project 2003/225.</td>
</tr>
</tbody>
</table>

**Infrastructure & Management**

<table>
<thead>
<tr>
<th>CRC Project No.</th>
<th>1A.5, 1A.5 (2) and 1A.5 (3)</th>
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</thead>
<tbody>
<tr>
<td>FRDC Project No.</td>
<td>2000/219 &amp; 2001/252</td>
</tr>
<tr>
<td>Title:</td>
<td>Aquafin CRC – Southern Bluefin Tuna Aquaculture</td>
</tr>
<tr>
<td>Subprogram:</td>
<td>Infrastructure Management, Service Delivery</td>
</tr>
</tbody>
</table>
and Technical Support.

Principal Investigator: Jeff Buchanan - SARDI.

CRC Project No. 1A.5
FRDC Project No. 2002/249

Title: Aquafin CRC – Southern Bluefin Tuna Aquaculture Subprogram: Service delivery and infrastructure management for projects requiring Port Lincoln based R&D support.

Principal Investigator: Jeff Buchanan - SARDI.

CRC Project No. FRDC Project No.
2004/205 2004/205

Title: Aquafin CRC - SBT Aquaculture Subprogram: provision of research platforms for projects requiring Port Lincoln based R&D support.

Principal Investigator: David Ellis - ASBTIA.

A procedures manual for SBT research operations in Port Lincoln.


Achievements: Delivered experimental service to project Principal Investigators utilising live SBT in a controlled and managed experimental environment.
Developed methodology for designing tuna experiments that considered the logistics involved (handling, cost benefits etc.).
Developed methodology to release a live white shark, which was subsequently refined and adopted by industry.
Contributed to the outcomes of SBT nutrition and product quality projects by providing R&D support.

CRC Project No. 5B.1
FRDC Project No. 2001/250

Title: Aquafin CRC - Southern Bluefin Tuna Aquaculture Subprogram: implementation and coordination of research experiments conducted with caged SBT to assess manufactured diets, feeding regimes and harvesting techniques.

Principal Investigator: Steven Clarke - SARDI.

CRC Project No. 5B.1(2)
FRDC Project No. 2004/216

Title: Aquafin CRC - SBT Aquaculture Subprogram:
<table>
<thead>
<tr>
<th>Principal Investigator:</th>
<th>Steven Clarke - SARDI.</th>
</tr>
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<tbody>
<tr>
<td>Outputs:</td>
<td>Final Report (2001/250)</td>
</tr>
<tr>
<td></td>
<td>Password protected SBT Aquaculture Subprogram website (<a href="http://www.sbtuna.com">www.sbtuna.com</a>) that was regularly updated, providing all SBT Aquaculture Subprogram material (reports, tuna-briefs, Annual Operating Plan, Strategic Plans etc.) available to industry and researchers.</td>
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<tr>
<td></td>
<td>Southern Bluefin Tuna Aquaculture Strategic R&amp;D Plan - Towards 2012: Striving for a Profitable &amp; Sustainable Future (the currently document focuses only on aquaculture and will be updated to incorporate the wild sector in the near future).</td>
</tr>
<tr>
<td></td>
<td>58 Tuna-brief newsletters providing research outcomes to industry.</td>
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<td></td>
<td>A micro-algal database available on the SBT Aquaculture Subprogram website, containing historical and current micro-algal data from the tuna farming region in Port Lincoln.</td>
</tr>
<tr>
<td>Achievements:</td>
<td>Achieved an orderly and structured approach to research and development (R&amp;D) associated with SBT aquaculture, involving a high level of industry involvement.</td>
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<td></td>
<td>Provided a means to use limited resources available for SBT aquaculture related to R&amp;D in an efficient and coordinated way.</td>
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<td></td>
<td>Managed and coordinated the delivery of outcomes for all projects within the Subprogram, including milestone reports, media releases, final reports and dissemination of research results to industry through production of regular Tuna-briefs and Industry Handbooks as well as the organisation of regular meetings and workshops.</td>
</tr>
</tbody>
</table>