

Project Name	Capacity Building in Molecular Genetic Research and Education and Aquaculture and Fisheries
Code: 2.9	
Australian Personnel	Dr Chris Austin & Professor Sena De Silva
Australian Institution	Deakin University
Vietnam Institution	RIA 1
Project Duration	September 2001 - January 2005*

* Originally 31st August 2003 and extended (Contract variation – CARD2-CON 0016)

Activity Description

Genetic improvement of fish species is considered a priority area for research and development by the government of Viet Nam, particularly in the context of rural development, food security and poverty alleviation. The current proposal has been developed in consultation with Vietnamese staff of participating institutions. The project builds upon the existing collaborative links between Deakin University and the Research Institutes of Aquaculture (RIAs) in Viet Nam. The project will bring together young Vietnamese researchers and other staff from all RIAs, academic institutions and other government agencies. This project will not only capacity build within RIAs but will also engender strong and lasting networks within different government departments in Viet Nam and between Viet Nam and Australia.

The project will have two dimensions focusing on: (1) enhancing the knowledge and practical skills of young Vietnamese researchers in modern fish genetics; and (2) building specific capacity and infrastructure in fish molecular genetic research within RIA 1.

The first goal will be achieved by holding 2 work shops of 7-10 days duration in Viet Nam at RIA 1. The second goal will be achieved by assisting in the equipping of the fish genetics laboratory at RIA 1, by short and long term staff training courses both in Australia and Viet Nam and by conducting pilot scale research projects on Vietnamese commercial fish species.

Aim

To enhance capacity in research, education and training in the field of molecular genetics and biotechnology, and to increase production and enhance sustainable development of Vietnamese fisheries and aquaculture industries

Objectives

- *General capacity building in modern genetics by raising awareness and building knowledge in both the theory and practice of molecular genetics amongst young researchers and other beneficiaries and users (eg university academics, policy developers, fisheries managers, fish hatchery managers and biodiversity specialists involved in fish conservation and taxonomy) from throughout Viet Nam. This will be achieved by running 2 workshops on molecular genetics.*

Measurable Outcome: (1) Number of attendees, the diversity of organisations and institutions represented, evaluation of levels of pre- and post-workshop knowledge and abilities and (2) report describing current levels of interest and activities in genetics and identification of current needs in both research and tertiary institutions in Viet Nam.

- *To facilitate and oversee the equipping and operation of the fisheries genetics laboratory at RIA 1 to provide it with the capacity to undertake both protein and DNA-based genetic analyses.*

Measurable Outcomes: Installation and operation of equipment for genetic analyses and production of genetic data from RIA 1's Fish Genetics Laboratory leading to publication of results from pilot studies (see below)

- *To provide technical and research level training for staff of the Fish Genetics Laboratory at RIA 1 in molecular genetics and provide supporting laboratory manuals*

Measurable Outcomes: (1) increased qualifications, technical competency and research capacity of staff through short course training and a Masters program (2) production of laboratory manuals including protocols for routine molecular genetic analyses, equipment operation and maintenance and highlighting health and safety issues written and presented in Vietnamese.

- *To integrate laboratory equipping and operation with staff training activities by undertaking 2 pilot scale genetic research activities*

Measurable Outcome: Collection of molecular genetic data from RIA 1's fisheries genetics laboratory by its own staff leading to presentation and publication of molecular genetic data for Vietnamese fish species. A genetic data set demonstrating capacity of the laboratory for undertaking molecular genetic research and therefore providing a springboard for attracting research and aid funding.

Outputs and Performance indicators

Objectives	Activity outputs	Performance indicators
General capacity building in modern genetics for young researchers.	<u>Workshops on molecular genetics</u> Presentation of basic concepts in molecular genetics and biodiversity management; application of molecular genetics in aquaculture, fisheries management and biodiversity studies. Description of molecular genetic techniques. Laboratory demonstrations of basic techniques for acquiring genetic data. Exercises in the analysis and interpretation of molecular genetic data.	1) Number of participating Vietnamese institutions, (2) number of participating Vietnamese researchers and technical staff, (3) demonstrated understanding by workshop participants of genetic concepts and principles governing collection of genetic data

To oversee the equipping of the fisheries genetics laboratory at RIA1	<u>Laboratory equipping</u> Purchase installation and operation of equipment required for molecular genetic studies within the RIA 1 Fish Genetics Laboratory. The use of molecular genetic protocols by staff of the Fish Genetic Laboratory	(1) Increase in the size of the Assets Register for molecular genetics equipment within RIAs. (2) The repeatable generation of high quality protein and DNA data by staff of the Fish Genetics Laboratory using their own facilities.
Technical level training in the use of molecular genetic techniques	<u>Short-course in molecular genetics</u> Train two technicians from the Research Institute of Aquaculture in Viet Nam in the technical aspects of molecular genetics via an intensive 6 week short course at Deakin University.	(1) The award of a Certificate in molecular genetic techniques and demonstrated competency in generating molecular data (2) Production of a manual in Vietnamese
Research level training in molecular genetic techniques and analysis and interpretation of genetic data	<u>Masters program</u> Supervision of a young researcher from Viet Nam in the application of molecular genetics to a research problem in aquaculture or fisheries management in Viet Nam. Field work and sample collection to conducted in Viet Nam. Data collection and analysis at Deakin University.	(1) The award of a Masters Degree by research by Deakin University and (2) number of publications of papers and conference presentations.
Pilot scale research projects in aquaculture and fisheries genetics	<u>Pilot research projects</u> To collect samples of fish species and obtain genetic data to address 2 contrasting applied problem in aquaculture and fisheries management by staff of the Fish Genetics Laboratory at RIA 1 using their facilities.	(1) demonstrated ability by staff of the Fish Genetics Laboratory RIA 1 to analyse molecular genetic data and presentation in a form suitable for publication (2) Number of applications submitted for future research funding



PROJECT COMPLETION REPORT

Executive Summary

Excellent results have been achieved with this project. The appropriateness of the project's original design and key objectives were reaffirmed over the course of the project. All the key objectives have been met including the completion of intensive short course training by 3 Vietnamese technicians at Deakin University in molecular genetics, the completion of 2 successful workshops at the Research Institute for Aquaculture No. 1. Also, two pilot research projects were successfully completed by staff of the Fish Genetics Laboratory at the Research Institute for Aquaculture No. 1. The young Vietnamese researcher enrolled at Deakin University for a research Masters degree has made outstanding progress with his studies on genetic variation in common carp and his candidature has been upgraded by Deakin University to a PhD. This student has had one paper on carp genetics published in the journal of Animal Genetics, two other papers accepted for publication or under review and another about to be submitted.

1.0 Project Description

The government of Viet Nam has identified the genetic improvement of fish species as a priority area for research and development, particularly in the context of rural development, food security and poverty alleviation. The application of modern molecular genetics techniques can significantly enhance the rate of progress in the genetic improvement of cultured fish species in Vietnam and allows more effective management of fish biodiversity. This project has two dimensions focusing on: (1) enhancing the knowledge and practical skills of young Vietnamese researchers in modern fish genetics; and (2) building specific capacity and infrastructure for fish molecular genetic research within the Research Institute for Aquaculture No. 1.

2.0 Appropriateness of Project Design and Objectives

Background and context

The gap between the developing and developed world is increasing in relation to knowledge of, and potential for application of rapidly developing genetic technologies. The developing world is entering a genomics era due to rapid technological advancements enabling the study and manipulation of genes. The application of new genetic technologies will continue to have an increasing impact on a whole range of human affairs encompassing genetic enhancement of crop and livestock species, including fish. The wise and judicious use of genetic technologies has the potential to greatly enhance food security in developing countries while at the same time ensuring biodiversity is preserved for the benefit of future generations.

Viet Nam is confronted with the need to alleviate poverty, provide food security and at the same time maintain biodiversity within commercially important fish species to ensure there are sufficient genetic resources for the long term maintenance of genetic-based productivity and for genetic improvement programs. The achievement of these goals requires the development of both infrastructure for modern genetic-based

research and the development of human resources through appropriate training programs.

The Research Institute for Aquaculture No-1 (RIA 1) in Viet Nam, is the principal research institute responsible for aquaculture research and development in the north of Viet Nam. This institute has a long history of aquaculture research going back to the 1960s with a major emphasis on carp culture. The institute has over 200 staff, 100 research ponds, hatchery facilities and general purpose laboratories. In addition there are several affiliated research stations throughout the country with their own experimental pond facilities and hatcheries. RIA 1 also plays a significant role in education and training through partnerships with the Asian Institute of technology (AIT), the University of Fisheries (Nha Trang, Viet Nam) and the Ha Noi Agricultural University. The institute also plays the major role in aquaculture extension and technology transfer to fish farmers in the northern Vietnamese provinces.

The coordinator in Viet Nam for this project is Dr Tuan Pham, Deputy Director, RIA1, Dinh Bang, Tu Son, Bac Ninh. Dr Pham is a specialist in fish genetics. He has recently established a fish genetics laboratory at RIA 1 with basic facilities. Dr Pham is committed to the continuous upgrading of this laboratory and ensuring that it can make a significant contribution to aquaculture and fisheries research at RIA 1 over the long term.

The coordinator for this project in Australia is Dr Chris Austin who is a specialist in the use of molecular genetic information for studies focused on the genetic improvement, management and biodiversity of aquatic species. Deakin University is one of the principal providers of aquaculture education and training in Australia and has developed a very significant research program in both aquaculture generally and more recently specifically in the area of the genetics of cultured fish and crustacean species. Of special significance is the recently upgraded Molecular Ecology and Biodiversity Laboratory managed by Dr Chris Austin, that supports both PhD and staff research on a diverse range of projects involving the application of molecular genetic techniques to cultured or commercial fish and crustacean species. This laboratory has and continues to support and train Vietnamese research students undertaking both research degrees and short courses.

The general project objectives were:

- *To enhance capacity in research, education and training in the field of molecular genetics and biotechnology, and to increase production and enhance sustainable development of Vietnamese fisheries and aquaculture industries.*

The specific objectives were:

- *General capacity building in modern genetics by raising awareness and building knowledge in both the theory and practice of molecular genetics amongst young researchers and other beneficiaries and users from throughout Viet Nam.*
- *To facilitate and oversee the equipping and operation of the fisheries genetics laboratory at RIA 1 to provide it with the capacity to undertake both protein and DNA-based genetic analyses.*

- *To provide technical and research level training for staff of the Fish Genetics Laboratory at RIA 1 in molecular genetics and provide supporting laboratory manuals.*
- *To integrate laboratory equipping and operation with staff training activities by undertaking 2 pilot scale genetic research activities.*

No.	Objectives	Appropriateness rating ¹
1	General capacity building in modern molecular genetics for young Vietnamese researchers in relation to both theory and practice.	5
2	To oversee the equipping of the fisheries genetics laboratory at RIA1	5
3	Provide technical level training in the use of molecular genetic techniques	5
4	Provide research level training in molecular genetic techniques and analysis and interpretation of genetic data	5
5	To undertake pilot scale research projects in aquaculture and fisheries genetics	5

No.	Description of Design Feature	App. rating ¹
1	<u>Workshops on molecular genetics</u> Presentation of basic concepts in molecular genetics and biodiversity management; application of molecular genetics in aquaculture, fisheries management and biodiversity. Description of molecular genetic techniques. Laboratory demonstrations of basic techniques for acquiring genetic data. Exercises in the analysis and interpretation of molecular genetic data	5
2	<u>Laboratory equipping</u> Purchase installation and operation of equipment required for molecular genetic studies within the RIA 1 Fish Genetics Laboratory. The use of molecular genetic protocols by staff of the Fish Genetic Laboratory.	5
3	<u>Short-course in molecular genetics</u> Train two technicians from the Research Institute of Aquaculture in Viet Nam in the technical aspects of molecular genetics via an intensive short course at Deakin University.	5
4	<u>Masters program</u> Supervision of a young researcher from Viet Nam in the application of molecular genetics to a research problem in aquaculture or fisheries management in Viet Nam. Field work and sample collection to be conducted in Viet Nam. Data collection and analysis at Deakin University.	5
5	<u>Pilot research projects</u> To collect samples of fish species and obtain genetic data to address 2 contrasting applied problem in aquaculture and fisheries management by staff of the Fish Genetics Laboratory at RIA 1 largely using their facilities.	5

After a successful planning mission to Vietnam in November 2001, the completion of an intensive training programs in the form of 2 workshops at RIA 1, the provision of short courses at Deakin University for 3 technicians from RIA 1, the commencement

of a Master program by a young Vietnamese researcher and the completion of data collection for the pilot research project, the appropriateness of the objectives and design features were considered very high. This largely reflects that the relationship between the partners in this project was well established and functioning extremely well prior to the commencement of the project, which was facilitated by 2 visits to Viet Nam by Dr Chris Austin in early 2001. The project has also benefited by having a Vietnamese national assist with the development and implementation of this project while undertaking research in the field of aquaculture genetics for a PhD at Deakin University.

3.0 Likely Achievement of Project Objectives

No	Objectives	Ach. rating ¹
1	General capacity building in modern molecular genetics for young Vietnamese researchers in relation to both theory and practice.	5
2	To oversee the equipping of the fisheries genetics laboratory at RIA1	5
3	Provide technical level training in the use of molecular genetic techniques	5
4	Provide research level training in molecular genetic techniques and analysis and interpretation of genetic data	5
5	To undertake pilot scale research projects in aquaculture and fisheries genetics	5

Comments:

Objective 1. Two workshops for young researchers were successfully completed in July 2002 and September-October 2003. These were attended by 24 young Vietnamese technicians or researchers who use, or are likely to use molecular genetic methods in their research in the area of fisheries and aquaculture. In addition, 5 young international scientists from Thailand, Africa, Egypt, China and Indonesia also attended one of the workshops under the sponsorship of the Worldfish Centre (formerly ICLARM) facilitated by Dr M. V. Gupta (Assistant Director General – International Relations, Worldfish Centre). The second workshop was to be conducted in April-May, 2003, however this was postponed by 6 months due to the outbreak of Sever Acute Respiratory Syndrome (SARS) earlier in the year. The decision to postpone the workshop was made in consultation with ITC (email dated 2 April 2003) and was rescheduled for September – October 2003. The postponement of the workshop is covered by the contract variation (dated 28th March 2003) to extend the project to 31st January 2005 which was necessitated by the delay in recruiting a suitable Masters candidate (see below).

Objective 2. Extremely rapid progress was made in the equipping of the Fish Genetics Laboratory at RIA 1 which is a credit to the genetics staff and Dr Pham. The success of the development of the laboratory was demonstrated by the ability of the genetics staff to conduct basic genetic procedures under the supervision of Dr Austin and his support staff during the planning mission in December 2001 and during the workshops and the pilot project research work in July 2002 and October 2003. Funds to purchase equipment and chemicals for the laboratory were transferred to RIA 1 and several items of equipment and chemical consumables were brought over from

Australia for the laboratory, the workshop practical activities and for the pilot research projects.

Objective 3. A young scientist (Mr Vu Van Phu) from the Fisheries Genetics Laboratory at RIA 1 attended an intensive 4 week training course in molecular genetics at Deakin University in March, 2002. In December 2002 two additional young scientists (Ms Thi Tan Nguyen and Mr Huu Ninh Nguyen) from the Fish Genetics Laboratory at RIA 1 attended an intensive 3 week training course in molecular genetics at Deakin University. Ms Tan's and Mr Phu's training was supported by the CARD project with Mr Ninh's travel and living expenses were supported by a separate grant from the government of Vietnam.

Objective 4. The young scientist (Mrs Nguyen Thi Tan) from the Fisheries Genetics laboratory who had previously been identified as a suitable candidate to undertake a research Masters degree at Deakin University, was unable to meet the required level of English proficiency to obtain a visa and enrol in a higher degree program at Deakin University. She made 2 attempts to achieve the necessary IELTS score in March and November 2002. In consultation with the Vietnamese project manager an advertisement for the CARD sponsored Masters scholarship was circulated throughout Vietnam to appropriate institutions in order to help identify an alternative candidate. Subsequently, Mr Thai Thanh Binh, a member of RIA 1 staff made an application that was approved by the management of RIA 1 and accepted by Deakin University. Mr Thai Thanh Binh commenced his Masters program at Deakin University on 3rd March 2003. He has made excellent progress with his studies, which focus on the genetic status of Vietnamese common carp and the development of a global genealogy of common carp strains. He has analysed over 100 samples of common carp obtained from Vietnam and samples sent by researchers in China, Hungary and Israel for variation in 2 genes using DNA sequencing. He has analysed an additional 20 samples from hatcheries and the wild in more detail. Mr Thai has had one manuscript accepted for publication on common carp genetics in the international journal Animal Genetics, another accepted for publication in the Vietnamese Journal of Aquaculture, another under review and he is about to submit a fourth paper to the journal Aquaculture. Deakin University has also upgraded Mr Thai's candidature from a Master to a PhD level.

Objective 5. As a result discussions with staff of RIA 1, 2 pilot scale projects were identified:

- (1) The measurement of genetic diversity in wild and cultured populations of catfish (*Pangasius*) to construct a suitable base population for selective breeding.
- (2) Genetics of hatchery raised grass carp (*Ctenopharhyngodon idella*): Is there evidence for inbreeding and loss of genetic variation?

After each workshop 7-10 days were spent working with the staff in the Fish Genetics Laboratory at RIA 1 on the pilot projects. Molecular genetic data sets were obtained completed for both pilot projects using both DNA and allozyme techniques by RIA 1 staff using largely the resources of RIA 1's Fish Genetics Laboratory.

Implementation Performance

No.	Component Description	Performance ¹
1	Workshops on molecular genetics	5
2	Laboratory equipping	5
3	Short-courses in molecular genetics	5
4	Masters program	5
5	Pilot research projects	5
6	Planning mission	5

See comments below in regard to meeting the intended outcomes in relation to specific project objectives (1-5).

1. The two workshop conducted were very successful. There were 24 attendees in total from different institutes with a gender ratio of 10:14 (female: male) plus 5 additional international participants funded by the World fish centre. The first workshop covered mostly genetic theory and concepts and case studies together with practical demonstrations while the second workshop focussed on student participation in laboratory activities and data analysis.
2. Laboratory equipping has been completed. Especially encouraging was that the equipment and chemicals that were brought over from Australia and purchased for the project have been used successfully for generating molecular genetic data in the Fish Genetics laboratory at RIA 1.
3. Delivery of short-courses in molecular genetics to technicians from RIA 1 at Deakin University has been successfully achieved. Training was provided in a range of molecular genetic techniques including DNA extraction, PCR amplification, sequencing, genetic variant detection using the Restriction Fragment Length Polymorphism procedure and methods of data analysis.
4. Masters program upgraded to a PhD by Deakin University. Over 100 samples of common carp from Vietnam and reference material from around the world analysed by DNA sequencing. An additional 20 samples from Vietnamese hatcheries and rivers were analysed in detail. One manuscript published in a major scientific journal and one in a Vietnamese journal (see attached).
5. Pilot research scale projects successfully completed with the majority of the worked conducted by staff of the RIA 1 Fish Genetics Laboratory (data collections and analysis).

4.0 Management Performance

No major issues arose concerning the performance of the Australian agency (Deakin University) and the performance of the Vietnamese partner was considered extremely satisfactory (*Best practice - rating = 5*). The arrangements made for the attendance of the workshop by young researchers from throughout the Vietnam and the organization for visits by technicians to Deakin University were very efficient and effective.

5.0 Sustainability

There are no major issues regarding the sustainability of the project. One possible issue is the lack of “management” experience amongst the laboratory staff within the Fish Genetics Laboratory at RIA 1. Thus while the existing staff within the laboratory have and will continue to develop their technical skills and broaden their theoretical knowledge in molecular genetics they do not and will not have the experience to conduct and manage fish molecular genetic research projects from start to finish (including project identification, design, sampling strategy, choice of genetic methods, data analysis and interpretation, conclusions and significance and application of results). Thus the fish genetics laboratory at RIA 1 (and other similar laboratories in the country) will need suitably qualified personnel at the postdoctoral level or above who have the necessary technical skills and knowledge and the experience and confidence to direct and manage the day to day activities of technical level staff and ensure that significant outcomes can be generated.

Financial sustainability over the long term may also be an issue as the cost of conducting molecular genetic research is not trivial and the Fish Genetics Laboratory at RIA 1 will require significant ongoing funding from either government sources or donor agencies. If ongoing funding to undertake relevant molecular genetic research on commercially or conservationally important fish species to Viet Nam cannot be acquired the benefits of this program will not be sustained over the longer term.

Sustainability Rating – 5 (Fully Satisfactory)

Constraints, Issues and Risks

The anticipated outputs as discussed above have been achieved. Two major constraints emerged that prevented the attaining of all the project goals in a timely manner. The first of these was the difficulty encountered in recruiting a suitable candidate to undertake a Masters research program at Deakin University. The initial preferred candidate identified by RIA 1 staff did not have sufficient mastery of English to commence at Deakin University. This candidate attempted unsuccessfully on two occasions to achieve the necessary International English Language Test System (IELTS) scores. Thus the commencement of this aspect of the project was delayed by 18 months until a suitable alternative candidate could be identified and enrolled at Deakin University. When a suitable candidate was identified they could not commence their studies until 3rd March, 2003. An oversight was the absence of any provision in the budget for English language courses and English language tests, which are quite significant. The delay in the recruitment of the Masters candidate meant that the project would not be completed until this student completes his degree. As a consequence ITC and Deakin University have signed a contract variation ([CARD-CON 0016](#)) extending the project until 31st January 2005.

The second significant constraint to the completion of some of the objectives in a timely manner was caused by the outbreak of SARS early in 2003. Based on the advice issued by the Commonwealth Department of Health and Ageing at the time and in consultation with ITC (Patricia Morton), it was decided to postpone the second workshop in Viet Nam and the associated pilot project research activities. These activities were rescheduled for September-October 2003 and this extension of the project is covered by the pre-existing contract variation (see above).

6.0 Outputs achieved (See comments above under “constraints”).

Output	% Achieved - Planned	% Achieved - Actual
Two workshops on molecular genetics	100%	100%
Laboratory equipping and operation	100%	100%
Two short courses in molecular genetics @ Deakin	100%	100%
Masters program ¹	100%	100%
Pilot Research projects	100%	100%

¹ Student upgraded to a PhD, with significant outcomes (publications) deemed to be equivalent to attaining a Masters

Recommendations for Variation of Project Design

The most significant variation in the project was caused by the delay in identifying and recruiting a suitable Masters candidate. This meant that expenditure of the grant could not be fully completed until January 2005 with the last payment of the student's stipend. The only other significant variation required to the project design concerned a 6 month delay to certain activities caused by the outbreak of SARS. For the future it is recommended that postgraduate research programs are provided at the PhD level as it is much easier to recruit students at this level in Vietnam (ie a significant number of young researchers have Masters level qualifications).

Evaluation of Project Performance and Outcomes

All the project outcomes have been achieved at the completion of this project. All project outcomes have been given a rating of 5 including the Masters program. Even the latter has not been completed as such, we believe it deserves a '5' rating as the candidature of the student concerned was upgraded by Deakin University to a PhD level and there have been significant research outcomes (publications).

Especially noteworthy has been the high level of support, efficiency and co-operation from the partner organization, RIA 1 in Vietnam. This reflects the strengths of this institution and the long-term relationship between RIA 1 and Deakin University established through the work of Professor Sena De Silva and more recently the training of a PhD student from RIA 1 in fish and aquaculture genetics at Deakin University.

7. Conclusions

We consider that this project has been highly beneficial, at a number of levels, for the development of capacity in molecular genetics in relation to fisheries and aquaculture in Vietnam. At the broadest level the project has raised awareness, knowledge and laboratory skills of approximately 25 young scientists working throughout Vietnam who are or have an interest in undertaking molecular genetic research in fish genetics. At a technical level, the project has trained staff to be competent and knowledgeable in the collection of molecular genetic data and their interpretation and methods of data analysis from visit to Deakin University and the pilot projects. The most in-depth

training, specifically in relation in the design, conduct and communication of research is through training of a young Vietnamese scientist in fish molecular genetics at the post-graduate level at Deakin University.

Given the increased capacity in molecular genetic research in terms of both access to basic equipment and trained personnel, especially in relation to the Fish Genetics Laboratory at RIA 1, we believe it would now be appropriate to extend the activities of this project to the next level of technical sophistication and towards more targeted programs in fish and aquaculture genetic research and development. The specific priorities for this research would need to be identified by Vietnamese researchers and government officials in relation to the need to produce genetically improved forms of fish to help alleviate poverty and to understand and protect Vietnam's unique freshwater fish biodiversity. Such research programs should utilise wherever possible molecular genetic information and the most modern instrumentation available as it greatly reduces the time and cost of conducting routine genetic analyses, thereby increasing efficiency and the scope of outcomes. The attainment of these goal however will require funded projects to both purchase the necessary modern instruments and equipment for genetic analyses and for the training of existing staff in their use and the analysis of the data they generate.

Confirmation of the value and success of this project has been the very recent success of RIA 1 in securing funds through the new CARD-program for a project "Better Breeds of Common Carp (*Cyprinus carpio* L.) for Small-scale Fish Farmers" in association with Deakin University.