

2009

FRDC People Development Program

Award Code 2008/314.16

2009 International Travel Bursary Final Report Award Recipient: Mark Oliver



Australian Government
**Fisheries Research and
Development Corporation**

Mark Oliver
Australian Aquaculture Support Services Pty Ltd
21/01/10



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List of abbreviate terms

W.A.S – World Aquaculture Society

KL – Kuala Lumpur

NACA – Network of Aquaculture Centres of the Asia Pacific

FRDC – Fisheries Research Development Corporation

BBAP - Balai Budidaya Air Payau

AusAID - Australian Agency for International Development

AIPRD - Australia Indonesia Partnership for Reconstruction and Development

ACIAR - Australian Centre for International Agricultural Research



AWARD CODE and TITLE

2008/314.16 FRDC People Development Program: 2009 International Travel Bursary

AWARD RECIPIENT: Mark Oliver

ADDRESS: Australian Aquaculture Support Services
14 Panamuna Cres
Buderim QLD 4556

DATE: June 2010

ACTIVITY UNDERTAKEN

The recipient attended the World Aquaculture Societies (W.A.S) Asia Pacific Chapter Conference held in Kuala Lumpur (KL), Malaysia between the dates of November 3-6th 2009. In addition to the main conference, the recipient also travelled to Indonesia, Cambodia and Thailand to meet with selected key stakeholders in fisheries and aquaculture training with a view to develop professional relationships as well as gain a greater insight into the current status of training within South East Asian fisheries and aquaculture sectors.

OUTCOMES ACHIEVED TO DATE

The key outcomes for the travel bursary are listed below:

- Attend the W.A.S Asia Pacific Chapter conference;
- Chair the Education and Training session at the W.A.S Asia Pacific Chapter conference;
- Present at the W.A.S Asia Pacific Chapter conference;
- Judge and present the winners of the W.A.S Asia Pacific Chapter Conference student abstract awards;
- Effectively network with fisheries and aquaculture educators;
- Develop frameworks for galvanizing professional networks between fisheries and aquaculture education facilities;
- View firsthand the post tsunami Banda Aceh Aquaculture Rehabilitation Project;
- Liaise with key stakeholders of the Banda Aceh Aquaculture Rehabilitation Project around their fisheries and aquaculture education, training and development programs;
- Meet staff at the World Fish Centre office in Cambodia and liaise with the director around their fisheries and aquaculture education, training and development programs; and
- Meet Staff at the Network of Aquaculture Centres in Asia-Pacific (NACA) in Thailand and liaise with them around their fisheries and aquaculture education, training and development programs.

1. Acknowledgements

The recipient would like to thank the following individuals and organisations and for their assistance and support for the bursary and its related activities:

- Roy Palmer – President of the W.A.S Asia Pacific Chapter
- Dr. Fatimah Yusoff - University Putra Malaysia
- Dr Geoff Allan – NSW Primary Industries
- Dr Graham Mair – Seafood CRC
- Phillip Evans – Sunshine Coast TAFE
- Stuart Whitney – Sunshine Coast TAFE
- Dr Mike Rimmer - Banda Aceh Aquaculture Rehabilitation Project and James Cook University
- Mr Alan Brooks – World Fish Centre, Cambodia
- Simon Wilkinson - Network of Aquaculture Centres in Asia-Pacific
- Dr Sena De Silva - Network of Aquaculture Centres in Asia-Pacific
- Jo-Anne Ruscoe – FRDC
- Neil Garbutt – FRDC
- The staff and management of the Brackish Water Aquaculture Development Centre (Balai Budidaya Air Payau – BBAP) Ujung Batee, Banda Aceh.

2. Background

The recipient has had over 20 years experience in the field of aquaculture. He has worked for 10 years within the commercial finfish aquaculture sector and for the past 10 years as an aquaculture trainer at Sunshine Coast Institute of TAFE. He currently heads up the off campus training program and delivers onsite training and assessment to many staff at commercial aquaculture facilities throughout Queensland. He manages up to 50 students at a time who work in sectors as diverse as marine prawns, marine food fish, oysters, freshwater food fish and ornamentals. He has an intimate knowledge of the skills required for industry development and has written many training based documents throughout his career. The recipient also has his own aquaculture consulting company and is professionally engaged by members of the aquaculture community and new sector entrants.



The recipient was extended an invitation by Mr Roy Palmer, President of W.A.S. Asia Pacific Chapter to attend their conference held in Kula Lumpur, Malaysia between the dates of the 3rd and 6th of November. Within the format of the conference there was a session devoted to education and training which the recipient was asked to chair. From this, the recipient was asked to be a member of the conference organising committee. The conference gave the recipient the opportunity to:

- Moderate with other educators;
- Present to delegates the current trends of fisheries and aquaculture education and training within Australia;
- Gain exposure to global best practice of fisheries and aquaculture education and training;
- Develop professional relationships with other institutions and organisations;
- Seek ways to allow increased levels of communication between international institutions and organisations;
- Develop a framework in view of creating a single online community devoted to fisheries and aquaculture educators;
- View the latest trends in global aquaculture research; and
- View the latest commercial aquaculture production techniques.

3. Need

The world aquaculture society has been in operation since 1969 and is active in over 100 countries and boasts over 3000 members. It has a long history of running conferences throughout the world and they have proven to be extremely beneficial for the aquaculture community as a whole. These conferences are principally focused upon disseminating research based activities throughout the wider aquaculture community. In recent years however, there has been a shift towards allowing gazetted times events for non research based activities. The W.A.S KL conference had a *farmers* day where non researchers shared information about their commercial activities to the delegates.

Another area that is slowly being accepted as a viable conference session is training and education. Many educators, in particular from the tertiary sector attend these



conferences, however in general terms attend to view research findings instead of viewing the latest training and pedagogical techniques. Having an education and training session allows a platform for educators from all sectors to highlight their techniques, successes and failures. This inevitably leads to increased levels of inter-institutional relationships which will ultimately aid in the delivery of quality training and education in the fisheries and aquaculture sector.

The W.A.S KL conference had a specific session devoted to education and training of which the recipient was the chair. There was a vital need to have an Australian representative at this session in order to showcase the current national fisheries and aquaculture education and training environment to other international delegates. It also allowed the recipient to learn from and create more formal ties with other institutions from around the globe.

4. Objectives

Listed below were the objectives for the recipient's international bursary:

- To Gain up to date knowledge of fisheries and aquaculture education and training techniques utilised throughout the Asia Pacific region;
- To build a suite of professional relationships with other fisheries and aquaculture educators and trainers throughout the Asia Pacific region;
- To represent the fisheries and aquaculture educators and trainers of Australia in a professional manner;
- To gain up to date knowledge of various aquaculture techniques that can ultimately be disseminated to the Australian fisheries and aquaculture education and training community and;
- To liaise with key stakeholders in the fisheries and aquaculture development, education and training sectors within the Asia Pacific region.



5. Methods

The methodologies for the international bursary were broken into two distinct areas. Firstly was the W.A.S KL conference itself and secondly was the direct liaison with other organisations with the South East Asian region.

5.1 Methodologies for the W.A.S Conference

The W.A.S conference was located in a central complex in KL and all meetings and discussions were held within the conference area or adjacent venues. The recipient chose to shadow some current and past board members of W.A.S. This gave him excellent exposure to other delegates. During the conference the recipient discussed fisheries and aquaculture training either both formally or informally with individuals representing organisations from the following countries:

- Malaysia;
- Vietnam;
- Thailand;
- China;
- Indonesia;
- England;
- United States of America;
- South Korea;
- Japan and;
- Iran.

Discussions topics included:

- Training areas;
- Training techniques;
- Student participation;
- Industry training;
- Moderation;
- Education and training pathways;
- Formal versus informal training;



- Education and training systems;
- Inter institutional opportunities and communication;
- Trends;
- Successes and Failures and;
- Articulation.

7.2 Conference Sessions

The recipient attended a wide and varied range of conference sessions throughout the KL conference. The sessions are listed below in table 1.



Presenter	Title
Junaidi Che Ayob	Aquaculture trends and prospects in Malaysia
Sena DeSilva	Aquaculture in Asia: Successes, challenges and the way forward
John Sackton	Raising the positive profile of aquaculture in major markets
Andrew Ray	Microbial ecology and biofloc management of minimal exchange in super intensive shrimp <i>Litopenaeus vannamei</i> culture systems
Claude Boyd	Dissolve Oxygen dynamics in shrimp and other aquaculture ponds
Ferdinand Cruz	Production of ornamental fish in the Philippines for an export market: challenges and opportunities for South East Asia
Claudia Centurion Fernandez	Propagation of the giant anemone <i>Condilactis gigantean</i> and the corallimorpharian <i>Ricordea florida</i> : preliminary results
Michael Boddington	Chinas aquaculture industry, 2009 update
Sungchul C. Bai	Green growth aquaculture for the future
Jharendu Pant	Small scale aquaculture for combating food and nutrition insecurity in rural Cambodia: Need for judicious considerations
Michael Rimmer	Marine finfish aquaculture in the Asia-Pacific region: towards improved sustainability
Ismail Abu Hassan	Prospects for marine aquaculture in Malaysia
James Charles	Hatchery spawning of the cultured broodstock of the silver pomfret <i>Pampus argenteus</i>
Marc Le Groumellec	Biosecurity in aquaculture: from theory to practically



Misai Tsai	Modern cage culture in Indonesia: the Pompano experience
Yuan Wang	Moana Tigers: 10 years of Development in <i>Penaeus mondon</i>
Faizah Shaharom	Aquaponic systems: a community project to aide the rural poor
Adam Baker	Adapting aquaponic systems for use in the American pacific islands
Rossita Shapawi	Cost effective eco friendly pelleted feeds for the culture of humpback grouper <i>Cromileptes altivelis</i>
Mark Oliver	Progressing student outbound mobility throughout the Asia Pacific region: The results of the Micronesia 09 project
Kamaldeep Kaur	Fisheries education in Northwest India: Current status and future directions
Chris Lind (World Fish Centre)	Capacity building in the area of genetics in the Asia-Pacific region
Ram C. Bhujel	The aqua-internship: Pre job training as part of an academic degree
Azizan Amir	Human capital development in rural space: the Blue Archipelago experience

Table 1. Conference sessions attend by the recipient during the KL conference.



7.3 Methodologies for direct liaison with other organisations in the South East Asian region

The recipient visited Indonesia, Cambodia and Thailand as part of his international bursary. All of these meetings were pre arranged prior to travelling to South East Asia via introductory and subsequent emails.

The first group the recipient visited was the Brackish Water Aquaculture Development Centre (Balai Budidaya Air Payau – BBAP) Ujung Batee, Banda Aceh, Sumatra, Indonesia. The recipient viewed first hand the post tsunami rehabilitation, reconstruction and development of coastal aquaculture in Banda Aceh.

The recipient met directly with Dr Mike Rimmer who is the technical manager for the Aceh aquaculture rehabilitation project. He also met with Mr Coco Kokarkin, manager of the BBAP and many other technical and extension staff. Face to face meetings were held and the recipient was invited to give a presentation to key staff around fisheries and aquaculture training in Australia.

Staff of the BBAP also took the recipient off site to view a fisheries secondary school where he met with educators that explained how the school operates and its training techniques.

The next organisation the recipient visited was the World Fish Centres Greater Mekong office in Phnom Penh, Cambodia. He met directly with the manager Mr Allen Brooks. Discussions centred on fisheries and aquaculture training and development that had been undertaken by the World Fish Centre within Cambodia.

The recipient also met with staff members of the Network of Aquaculture Centres in Asia-Pacific (NACA). Face to face meetings were held with Simon Wilkinson, communications coordinator. Discussions centred on fisheries and aquaculture training and development that had been undertaken by NACA throughout member countries.

6. Results and Discussion



8.1 *The W.A.S Conference*

Below is a summary of relevant information and observations made by the recipient during the W.A.S conference sessions and meetings held around the conference.

- The Malaysian government strongly supports investment in aquaculture development;
- Sustainability was a common theme through most sessions;
- Asian aquaculture is becoming more sustainable;
- Despite being the largest producer of aquaculture products in the world much of the industry is still village or small farmer based;
- Some large industrialised marine fish aquaculture facilities, are emerging within the region, such as cobia in Vietnam and pompano in Indonesia ;
- Tilapia is a strong, growing sector of Asian aquaculture;
- *Litopenaeus vannamei* is the species of choice for most shrimp producing nations of the region;
- Generally, product quality is increasing and has provided greater market accessibility;
- The *Pangasius* catfish (basa) industry in Vietnam is a major global producer of white fillet fish products;
- Grouper aquaculture if undertaken correctly, is viable in countries such as Indonesia and Thailand;
- Aquaponics is becoming prevalent within Asia Pacific region;
- Education and Training within the South East Asian region is still dominated by the tertiary sector;
- Many undergraduate programs incorporate internships on government run facilities or commercial operations, with the duration up to many months;
- Vocational education and training, as defined by the model adopted within Australia, is poorly understood and rarely utilised in the region;
- Educators within the region were receptive to vocational education and training after it was fully explained to them;



- Some larger private aquaculture companies, such as Blue Archipelago, undertake quality in house training that has an internal certification process but is not formally recognised by the wider sector;
- Some European tertiary institutions are offering aquaculture internships to South East Asian facilities; and
- The use of online training platforms is becoming more widespread in Europe but the uptake is slower within the Asia-Pacific.

The W.A.S conference from the recipient's perspective was a success. Over 2000 people attended the conference which was more delegates than any was previously held in the region. Selected images from the conference can be found in Appendix 1. Most sessions were well constructed and presenters delivered quality presentations. The *farmer's day* was a very refreshing idea for a conference of this nature. The presentations within the farmer's day were of an excellent standard and the recipient was pleasantly surprised at the openness of these commercial operators to share with the delegates their culture methods. This type of openness shows a mature industry that recognises sectors should work together in order to succeed.

A collective observation from many of the delegates was that the Asian aquaculture industry is maturing into an industry that produces quality products and further to this many of them are cultured in a sustainable manner. Sustainability was a very common theme within the presentations and it was never really seen as a negative process or a *hoop* one has to jump through. Both the challenges of seafood quality and sustainability were met with enthusiasm and there was a real *can do* attitude permeating throughout the whole conference.

The education and Training session was successful, however the number of attendees was low. The people that did attend were enthusiastic and ready to contribute to any open discussion on fisheries and aquaculture education and training. There was a high degree of two way communication and open floor discussions with representatives from many institutions sharing their success and failures. Delegates learnt a great deal from this form of communication. Tools used for effective inter institution networking was discussed at great length and the recipient put forward the online communication



tool used by fisheries and aquaculture educators with Australia. This online tool has now over 80 members which includes a strong international presence. Some of these international members were from the W.A.S conference.

One of the most rewarding aspects for the recipient was being a member of the organising committee for the conference itself. Although he has assisted in organising national aquaculture training conferences and workshops in the past, this was the first international conference helped organise. The recipient also assisted in judging the student abstract and announced the winner to the entire W.A.S conference. The recipient was also asked to nominate himself for the role of student director on the board of W.A.S Asia Pacific. The successful applicants of all W.A.S board positions will be announced at the W.A.S conference in Hobart, May 2010.

8.2 Post Tsunami Rehabilitation Project, Banda Aceh, Indonesia

Prior to the tsunami that ravaged Aceh, aquaculture was an important livelihood for a great deal of Aceh coastal communities. It is estimated that around 16000 tonnes of aquacultured product was produced annually. This had an estimated value of \$57 million USD. The tsunami damaged or destroyed a large portion of the estimated 73000 hectares of aquaculture ponds and nearly all of the 300 hatcheries (Crawford fund 2009).

As a response to the devastation of the aquaculture industry in Banda Aceh, the Australian Agency for International Development (AusAID) developed a project to address this disaster through the Australia Indonesia Partnership for Reconstruction and Development (AIPRD). The project known as the Post Tsunami Rehabilitation Project was handed to the Australian Centre for International Agricultural Research (ACIAR) to manage. Some outcomes of this project are listed below.

The BBAP facilities that have rebuilt or upgraded include:

- Seawater intake and distribution system, and additional seawater storage;
- Two marine finfish hatcheries;
- Finfish broodstock tanks;



- Live food (microalgae and rotifer) production facilities;
- Effluent basin (120 m³);
- 12 unit staff accommodation building;
- Laboratory (22 m x 10 m) including:
 - PCR laboratory
 - Microbiology laboratory
 - Histopathology laboratory;
 - Environment and water quality Laboratory;
 - Wet laboratory with bioassay facility.

Training activities that have taken place include:

- Best Management Practices for shrimp farming;
- Polyculture and farm diversification;
- Onsite farm made feeds;
- Soft shell crab production;
- Soil analysis and pond construction;
- Laboratory skills in:
 - Fish disease diagnosis for finfish and shrimp;
 - PCR analysis;
 - Histology and histopathology;
 - Microbiology;
 - Epidemiology;
 - General laboratory management, sample accession and reporting;
 - Application of biosecurity in hatcheries and on farms.
- Hatchery operations in shrimp and fish;
- Live food production for shrimp and marine finfish hatcheries;
- Grouper hatchery production;
- Grouper nursery culture;
- Shrimp broodstock rearing;
- Water quality management for shrimp hatchery;
- Design and operation of recirculating filtration systems.



Also training has been given around business planning and operations. This includes:

- Computer training.
- English language training.
- Experimental design and data analysis for adaptive research
- Human Resource Management
- Experimental design and data analysis for adaptive research

An aquaculture communications centre has been built with funds from the Asian Development Bank. This centre publishes quality extension materials for the local aquaculture community. Images of the BBAP are in Appendix 2.

The BBAP is now at a point where disease screening and diagnostic services can be offered to local farmers and co-operatives.

All of the above information was given to the recipient by Mike Rimmer or by the Aceh Aquaculture Rehabilitation Project updated project profile (2009).

After witnessing first hand the aquaculture rehabilitation project it was clearly evident that a great deal of work has been done since the devastation of the tsunami. It was difficult to fathom the degree of damage to the centre and surrounding area, however after talking with staff and management who were there either on or directly after the day of the tsunami it became blatantly obvious.

All of the culture units for both the shrimp and fish areas were of an excellent standard and the supporting infrastructure such as laboratories were more than adequate. The area that impressed the recipient the most was there extension unit. It produced quality documents that dealt with a range of aquaculture related topics. The methods used within the development of the extension material had strong farmer focus. The style of the documents used many diagrams and drawings to disseminate information in an easy to understand format.



8.3 Fisheries High School: Ujung Batee

With the assistance of the staff at BBAP, the recipient visited a local fisheries high school in Ujung Batee where he met with educational staff. The high school caters specifically for students that wish to have a career in the fisheries sector. They have limited spaces for the schools program and competition is fierce. The students undertake practical learning experiences in:

- Boat building (traditional vessels);
- Vessel operations;
- Vessel maintenance;
- Marine engine servicing and repair;
- Fishing techniques;
- Net maintenance and repair and;
- Aquaculture.

Their boat building area is used for students to build traditional fishing vessels. The boats are built by groups of students as an activity and vessels are launched on their completion. Images of the Fisheries High School are in Appendix 2.

The training of vessel operations is undertaken on a high quality concrete simulator. The concrete vessel was complete with a fitted out helm and full size deck. On board the students are trained in maritime communications, navigation and because the simulator has a full size deck , practical fishing operations techniques can also be taught.

A large covered area has been devoted to net maintenance and repair and many different types of nets and equipment are available for training.

The aquaculture area has a series of glass aquaria as well as some concrete ponds. These mainly house ornamental fish and tilapia. There is another aquaculture area but was not accessible on the day the recipient visited.



The fisheries school was a very proud establishment and as the teachers eluded, was a very difficult course to enter and even more difficult to pass. Although the technology was not as prevalent as a facility within Australia, they produced quality graduates that went to work in their chosen field, study, or take over the family's fisheries or aquaculture businesses.

8.4 *The World Fish Centre, Phnom Penh, Cambodia*

The World Fish Centre is a science based non government organisation that delivers knowledge, expertise, methods, tools and technologies in both fisheries management and aquaculture through Africa, Asia and the South Pacific. The World Fish Centre has offices in Bangladesh, Cambodia, Egypt, Malaysia, Malawi, Solomon Islands, the Philippines and Zambia. The organisations goals are to help alleviate poverty, hunger and environmental degradation for the poor. The two main focal points of the World Fish Centres efforts are:

- More productive and resilient small scale fisheries and
- Expanding sustainable aquaculture

The recipient met with Mr Allan Brooks who is the World Fish Centre's portfolio Director for South Asia. Mr Brooks has had over 20 years experience in poverty sensitive fisheries and aquaculture development throughout the developing world. Much of the World Fish Centres work in Cambodia centres around the Mekong and in particular the adjacent Tonle Sap Lake, which is South East Asia's largest freshwater lake and a vitally important fishery for the country.

The most recent work by the World Fish Centre was around fisheries management of the lake and in particular developing communication tools to disseminate information about the illegal practice of catching young giant snakehead *Channa micropeltes* that school in tight balls in the shallows and fattening them up in net pens for the open market. The World Fish Centre has helped with diversification of these net pens to other species.

The main areas of training and education for the World Fish Centre in Cambodia was fisheries management, although other more specific forms of aquaculture training and



education can be undertaken when the need arises. Mr Brooks mentioned that other non World Fish Centre experts have been engaged in the past in a consultative or educational role do work under the World Fish Centres banner.

8.5 The Network of Aquaculture Centres in the Asia Pacific (NACA)

NACA is an intergovernmental organisation that promotes sustainable aquaculture throughout the Asia Pacific region. The current member countries are Australia, Bangladesh, Cambodia, China, Hong Kong SAR, India, Indonesia, I.R. Iran, Korea (DPR), Lao PDR, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Thailand and Vietnam. NACAs core activities are:

- Capacity building through education and training;
- Collaborative research and development through networking among centres and people;
- Development of information and communication networks;
- Policy guidelines and support to policies and institutional capacities;
- Aquatic animal health and disease management; and
- Genetics and biodiversity.

NACA has a multifaceted education and training program which aims to build capacity of member countries. It uses a suite of methods to deliver its goal of capacity building, but the central focus of the program is utilising and enhancing human capital within member countries. It has a strong focus on cross border communication through skills and knowledge transfer and uses a three pronged approach in its program. These are:

- Running training courses;
- Hosting and organising study visits and;
- Personnel exchange.

The key activities of NACAs Education and Training Program include:

- Identifying training needs for aquaculture development in NACA member countries;



- Identifying and organising relevant expertise and capacities to meet the training needs;
- Developing training modules and materials;
- Facilitating routine education and training activities of NACA and;
- Facilitating and coordinating exchange programmes among members and with other regions.

A long standing NACA flagship training program has been the Regional Grouper Hatchery Training Course. Over a number of years the annual course has been held at strategic mariculture centres in Thailand, Indonesia and the Philippines. The course prides itself on hands on training and because of to this, it would be defined as a true vocational training program. The duration of the courses are around a fortnight where the leaner undertakes hands on hatchery training with various grouper species. The learners are taken through all aspects of hatchery procedures including:

- Broodstock management;
- Algal and live feed cultures;
- Spawning techniques;
- Larval rearing teaching and;
- Disease control methods.

The course fees are over \$2000.00 U.S and are always oversubscribed.

7. Benefits and Adoption

The main sector of the industry that will benefit is the education and training community within the fisheries and aquaculture sector. The benefits will flow from gaining a greater understanding of how other institutions and organisations with similar goals and aspirations conduct their education and training programs.

The knowledge gained by the recipient will be disseminated to relevant stakeholders during the AquaED 2010 conference. This conference is principally focused towards around fisheries and aquaculture training and is a precursor to the W.A.S Hobart conference.



Another method of dissemination will be to post relevant information on the AquaED web site, where individuals may access this at a time of their convenience.

8. Further Development

The W.A.S conference was an excellent platform for effective communications between global fisheries and aquaculture educators. However, the recipient only scratched the surface in terms of engaging with this sector. Asia is the powerhouse of aquaculture with China alone having annual production volume of 34.5 million tonnes (2006 figures) and further to this, the next 5 largest aquaculture producing nations in the world being India, Vietnam, Thailand and Indonesia (FAO 2008).

For Australia this essentially translates to the fact that there is an enormous amount of expertise and skills in virtually every facet of fisheries and aquaculture that, although some knowledge exchange does occur, is still largely an untapped resource. Other than some of the extremely prominent institutions, there are countless other educational facilities (of which Australia is largely unaware of their existence) that deliver quality training throughout the region and from this, it would be extremely short sighted if Australia did not attempt to increase the level of inter institutional relationships for the mutual benefits of both organisations.

Many of these facilities need to be viewed first hand and a register needs to be created that highlights which Asian institutions and organisations undertake fisheries and aquaculture training. It should also highlight the specific training areas and which species or culture method they specialise in.

On another level, more ties need to be created between sector associations and their counterparts within the Asia Pacific region and this should even go down to fostering relationships between individual commercial facilities from Australia and international operations with the same goals.

Knowledge and skills exchange is a key to developing a sustainable, vibrant fisheries and aquaculture industry within Australia and the sooner a greater suite of formal ties are created with the powerhouse of global aquaculture the better. If this was not to



happen maybe the next generation of Australians seeking a career in the fisheries and aquaculture industries will bypass our system all together and prefer to attend institutions in Asia to acquire the latest knowledge and skills needed to keep them ahead of the pack.

9. References

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2. Reade, Cathay, 2009. Acehs Aquaculture Revival. Media Release. Crawford Fund, The Australian Academy of Technological Sciences and Engineering.
3. Rimmer, M, 2009. Updated Aceh aquaculture rehabilitation project profile, ACIAR



10. Appendix 1

Images of the W.A.S Conference



Top Left: Announcing student abstract winner.

Top Middle: Winning poster

Top Right: Cobia presentation

Bottom Left and Middle: Fish breeding association of Taiwan at the trade show

Bottom Right: Sustainability presentation



11. Appendix 2 Images of Banda Aceh

