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Australian Centre for International Agricultural Research

Final report

Small research and development activity

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1 Acknowledgments

We thank Fiji Fisheries, particularly Nanise Kuridrani and Garry Bingnald for strong collaboration with this project. We thank the pearl farmers and spat collecting communities of Fiji targeted by this project for their strength and cooperation under very difficult circumstances.

2 Executive summary

Commercial pearl production in Fiji relies on collection of juvenile oysters or ‘spat’ from the wild by deploying ‘spat collectors’ that provided a substrate to which pearl oyster juveniles attach and can later be harvested. This activity engages local communities that sell juvenile oysters to pearl farms. In late February 2016 Cyclone Winston caused significant damage to pearl farming infrastructure across a broad region of Fiji affecting oyster supply to the cultured pearl industry. The aim of this project was to re-establish research infrastructure at pearl farms and spat collecting communities in Fiji to help re-establish oyster supply to the industry. Continued revenue from oyster sales or from pearl production was a key component allowing farmers to rebuild their farms and to retain pre-cyclone participation levels in the industry.

Project staff worked closely with Fiji Fisheries and consulted with pearl farmers to determine the infrastructure required by them to best assist their recovery. Farmers primarily requested spat collectors and associated equipment (floats, ropes and anchors) as well as oyster culture equipment (nets). Equipment was sourced (from China) and equitable distribution among pearl farmers was agreed with Fiji Fisheries. Fisheries officers working with project staff distributed and deployed the equipment to six pearl farms in Viti Levu, Vanua Levu and Taveuni and two spat collecting communities. Deployment of this equipment was effective in improving supply of pearl oyster spat to the Fiji pearl industry and improved spat supply to a level beyond that prior to Cyclone Winston. For example, the spat collectors supplied during this project potentially support the collection of more than 850,000 oysters from one deployment, a figure that is 3-4 times the number of oyster currently under culture in Fiji. As well as addressing an immediate bottleneck to oyster supply and income generation from spat collection, this rapid and targeted response provided a basis for sustainable development of an industry that is becoming increasingly important in supporting livelihoods in rural areas of Fiji.

3 Introduction

Pearl culture offers livelihood opportunities to coastal communities in Fiji through juvenile ('spat') collection, growing of juvenile oysters, and production of half-pearls (mabè), round pearls, and handicraft items. Commercial pearl production (for export) in Fiji relies on collection of spat from the wild. This activity engages local communities that deploy 'spat collectors' (substrates to which oysters recruit) and subsequently harvest and sell juvenile oysters to pearl farms. Because of these livelihood and economic benefits, the Fijian government has worked with regional partner organisations (e.g. SPC) and ACIAR to maximise the opportunities that pearl farming offers. As a result, the number of pearl farms has increased, overall pearl production and pearl quality has increased, business skills among pearl farmers has improved, the number of communities involved in spat collection has increased, value adding has occurred through training and production of pearl and pearl-shell handicrafts, and there is strong support for the transition of spat collecting communities to pearl production. Fiji's pearl industry enjoys a significant export market and has an established international reputation.

In February 2016 Cyclone Winston caused significant destruction of infrastructure to coastal communities on the north coast of Viti Levu and in Vanua Levu and Taveuni. These areas are significant pearl farming sites and include both the largest pearl farms and the most important spat collection areas for the pearl industry. Many pearl farm/spat collection sites suffered total loss of land-based infrastructure including accommodation for workers, storage sheds, walkways and pontoons, pearl seeding houses and boats etc. There was also considerable loss of culture stock (oysters) from all levels of the production cycle and much of the ocean-based infrastructure such as ropes, floats, longlines and anchors was also lost or damaged beyond repair.

Fiji Fisheries began assisting pearl farmers rebuild land-based infrastructure, but a more immediate concern for the industry was to maintain production momentum, income and livelihood support via oyster supply. Rebuilding oyster stocks to a 'normal' level will be a key component of industry recovery and continued revenue from oyster sales or from pearl production will be vital in allowing farmers to rebuild their farms and in retaining current participation levels in the industry. Given that an oyster is 1-2 years old before pearl production can be initiated, and that a further 18-24 months is required for pearl production, immediate post-cyclone support was required to increase oyster numbers and enable a strong recovery to previous production levels by 2019.

The aim of this project was to re-establish research infrastructure at pearl farms and spat collecting communities in Fiji to help re-establish oyster supply to the industry. Continued revenue from oyster sales or from pearl production will be vital to support livelihoods and to support rebuilding of industry infrastructure. This rapid and targeted response will help minimise the impacts of under-supply of oysters to the industry and assist in restoring industry productivity to normal levels as soon as possible

4 Research activities, outputs and application

The Fiji-based Project Scientist from FIS/2014/060[1] (Dr. Pranesh Kishore) visited all pearl farms and spat collection communities in Fiji during March 2016 to assess damage from Cyclone Winston, consult with stakeholders and determine immediate farm needs. This was done in partnership with Fiji Fisheries. Re-establishing spat supply to the industry through deployment of appropriate research infrastructure was the key issue among stakeholders and an action that would maximise benefit to the broader industry. A farm-by-farm assessment was made of key research infrastructure needs as a basis for equitable distribution of infrastructure through deployment of spat-collectors, longlines, anchors, floats and ropes etc.

This project, in consultation with Fiji Fisheries, sourced and supplied the required research infrastructure (identified during the post-cyclone assessment) and coordinated its deployment at pearl farms and spat collection communities throughout Fiji. These activities were coordinated through FIS/2014/060 which maintains day-to-day contact with pearl industry stakeholders and has strong collaborative links with Fiji Fisheries. Purchase, transport, distribution and deployment of new research infrastructure was planned collaboratively with Fiji Fisheries who were responsible for deployment at each site. The Secretariat of the Pacific Community (SPC) were consulted during initial research planning allowing coordination with later donor activities targeting the pearl industry (e.g. the EU-funded Increasing Agricultural Commodity Trade (IACT) project).

Dr. Kishore works very closely with Fiji Fisheries and with pearl industry stakeholders in Fiji in planning, deployment and maintenance of pearl industry research infrastructure within FIS/2014/060. This existing arrangement provided a mechanism by which the research activities of the current project were implemented. Dr Kishore's counterpart within Fiji Fisheries for FIS/2014/060 is Garry Bingnald, a Pearl Oyster Project Officer in Fiji Fisheries. The same arrangement was employed in this project to ensure coordination of activities between projects.

No.	Activity	Comments/outputs/application
1.1	Meet with Fiji Fisheries staff to coordinate and finalise specific equipment needs	Project staff met with Fiji Fisheries staff in Lami Fisheries to coordinate equipment required following consultation with famers and spat collecting communities. Subsequent meetings finalised equipment required.
1.2	Liaise with individual farms and spat collecting communities	Liaison with individual pearl farms and spat collecting communities confirmed the equipment to be deployed and timing of deployment
1.3	Source appropriate equipment from suppliers in SE Asia	Equipment was sourced from China (Honour Stand Enterprise Limited, Zhejiang. The first order was placed in May 2016 with subsequent orders in October 2016, March and May, 2017. All equipment was stored at the Lami Fisheries Office until deployment.
1.4	Deploy equipment to pearl farms and communities	Equipment was first deployed to pearl farms and between September and November 2016. Distribution between farms and spat collecting communities is shown in Appendix 1.

[1] *FIS/2014/060: "Developing pearl industry based livelihoods in the Western Pacific"*

1.5	Monitor recruitment to newly deployed equipment	Recruitment was monitored at each site between November 2016 and the end of the project. All sites were successful in collecting spat. Some farms used the equipment to establish new spat collection sites to broaden their collection capacity (Appendix 2).
1.6	Deploy smaller equipment and 'fine-tuning'	Follow-up deployments of equipment occurred at the six sites from March 2017 and continue until the end of the project.
1.7	Final assessment of intervention impacts – industry/Fisheries/SPC consultation	Assessment of the success of spat collectors, maintenance and problem solving has occurred continuously as part of Dr. Kishore's regular visits to the target pearl farms and spat collecting communities that take place as part of FIS/2014/060. Dr. Kishore has consulted regularly with Fiji Fisheries throughout this project and has briefed SPC of project progress. Dr. Kishore also consulted with Jonathan Landrey who coordinated similar Cyclone relief activities in Fiji on behalf of the European Union (EU) via the Increasing Agricultural Commodity Trade (IACT) project. This assistance included supply of spat collectors and pearl culture equipment to the Fiji pearl industry and Dr. Kishore worked with the IACT TC Winston Recovery Action, SPC and Fiji Fisheries in coordinating the EU activity with those of this project.

5 Major Outputs

The major outputs of this project include:

- Re-establishment of research infrastructure required for collection and holding of pearl oyster juveniles at pearl farms and spat collecting communities throughout Fiji. As a result of this project there are now more spat collectors deployed in Fiji than ever before supporting improved oyster supply and industry development and resilience into the future.
- Supply of spat collectors to some farms allowed spat collection to be established in new areas and in partnership with communities not previously involved in the pearl industry (e.g. Qamea, Taveuni; Appendix 2)
- Rapid response and deployment of new spat collection infrastructure resulted in a period on only around one-year between the first consultation with farmers after TC Winston (March 2016) and the first harvest of oysters. This greatly minimised the shock to oyster supply and oyster-based livelihoods caused by TC Winston.
- Pearl farmers and community members worked with project/Fisheries staff to deploy spat collectors, monitor and maintain them and harvest resulting oysters enhancing farming/husbandry capacity within the sector.
- Large-scale deployment of new infrastructure across all major stakeholders allowed standardisation of culture practices across the industry and establishment of farming practices that will be more resilient to future cyclones (e.g. use of larger anchors, thicker ropes etc.)

6 Major Impacts

The major impacts of this project are:

- Rapid response to the loss of pearl farming infrastructure following TC Winston minimised the period where livelihoods and pearl production were affected by a halt in oyster supply.
- Greater resilience has been built into the Fiji pearl industry through increasing spat collection capacity, spread of spat collection activity over a broad geographical area of Fiji, standardisation of culture/methods, and extension of spat collection activities to new communities working collaboratively with pearl farms.
- Greater resilience has also been built into the industry through deployment of new equipment that is more robust and less likely to be damaged by future cyclones and storms.
- Improved oyster supply supports sustainable expansion of the Fijian pearl industry resulting in increased pearl production, and increased income from both export and domestic markets.
- Fiji Fisheries now have established links with an international supplier of equipment for the pearl industry. This will facilitate their capacity to support industry expansion and extension activities.
- Pearl farmers and spat collecting communities worked directly with project and Fisheries staff in planning, deployment and maintenance of research infrastructure. This provided considerable capacity building and dissemination opportunities.
- A total of 241 spat collector lines have so far been deployed during this project (Appendix 1). Each is composed of 1200 individual spat collectors and, based on prior research within FIS/2014/060, each individual spat collector would be expected to collect a minimum of four oysters per deployment period (10-12 months). On this basis, the project has so far provided the capacity for collection of ~1.16 million oysters per deployment. Oyster are currently sold by spat collecting communities to pearl farm for around F$7/kg (5-6 oysters) or F$2 each for larger oysters; the potential economic impacts of this project are therefore significant.
- While the spat collectors provided by this project target the black-lip pearl oyster (*Pinctada margaritifera*), the winged pearl oyster (*Pteria penguin*) provides valuable by-catch of this activity. A growing number of spat collecting communities in Fiji (currently four) utilise *Pt. penguin* for mabé pearl production and *Pt. penguin* shell can be used to produce mother-of-pearl handicrafts. The potential economic and livelihoods impacts of this project are not therefore limited to sales of *P. margaritifera*.
- Engagement with spat collecting communities and provision of spat collecting infrastructure and training allowed the project to engaged with women and youth and to encourage their active involvement in pearling activities.
- Broad media coverage of the project in print media and television (see Appendix 3) raised the profile of the pearl industry, Fiji Fisheries and ACIAR throughout Fiji:

http://www.fbc.com.fj/fiji/39544/pearl-industry-suffers-more-than-1m-in-damage-

http://www.fijitimes.com/story.aspx?id=350662

http://www.fijitimes.com/story.aspx?id=350649&no_redirect=true

http://fijisun.com.fj/2016/04/21/funds-received-for-pearl-farming-rehab/

7 Conclusions and recommendations

7.1 Conclusions

- This project was successful in its aim of minimising disruption caused to supply of pearl oyster juveniles to pearl farms, and associated livelihoods benefits, as a result of TC Winston. Rapid replacement of lost infrastructure resulted in restoration of juvenile oyster supply to the industry within about 12 months of the first consultation with stakeholders following the cyclone.
- This project allowed serendipitous improvements to pearl industry infrastructure and protocols to exceed those prior to TC Winston. They include deployment of new equipment that is more robust and less likely to be damaged by future cyclones and storms, increased spat collection capacity, spread of spat collection activity over a broader geographical area of Fiji, standardisation of culture/methods, extension of spat collection activities to new communities and greater involvement of women and youth in the pearl industry. All these measures will bring greater resilience to the Fiji pearl industry and support sustainable expansion of the industry into the future.

7.2 Recommendations

Pearl culture in the Pacific islands offers broad economic opportunities from community-level to export industry. The developing Fijian pearl industry is an international success story and has built steadily since 2000. ACIAR has been a key contributor to this success. There is no doubt that without the intervention of this project the level of participation in the Fiji cultured pearl industry, particularly at community level, would have declined significantly following TC Winston, and unaided recovery to pre-Winston levels would have been a very slow process. ACIAR and similar agencies need to retain the ability to react quickly and appropriately to natural disasters such as TC Winston.

8 Appendices

8.1 Appendix 1: Distribution of spat collection and pearl infrastructure during this project

Farm/community	Spat Collector Lines[2]		Floats	16 mm Rope	12 mm Rope	10 mm Rope	Spat Collectors
	Supplied	Deployed					
JH Pearls	73	38					
Civa Pearls	42	18		4			
Maivalili Pearls	38	17		4			
Malolo Desci Pearls	30	13	200	6	6	10	
Tokito Pearls	24	11	200	6	5	10	
Raviravi Ladies Pearl Group	14	8	200	5	5	10	
Namarai Spat Collection Community	10	5	200	4	4	5	
Nacobua Spat Collection Community	10	5	200	4	4	5	
Total Distributed	**241**	**115**	**1000**	**33**	**24**	**40**	
To be Distributed	**79**	**-**	**-**	**8**	**14**	**-**	
On Order	**36**	**-**	**-**	**-**	**2**	**-**	**1200**
TOTAL	**356**	**115**	**1000**	**41**	**40**	**40**	**1200**

[2] Note that each spat collector line is composed of a 200 m headline from which 1200 individual spat collectors (1.5 m long) are suspended.

8.2 Appendix 2: Spat collection established in new areas

Deal Secures Long-Term Development Of Pearl Farming In Qamea

July 20 12:43 2016

by FARZANA NISHA, Suva

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An agreement signed between Civa Fiji Pearls Limited and the Vanua Trust of Laucala sees long term development of pearl farming in Qamea Island being secured.

A memorandum of understanding has been signed between the two for the expansion of spat collecting activities for pearl farming on Qamea Island.

Spat collecting is the process of collecting natural oyster larvae and rearing them to maturity.

The spat collecting site is one of few spots in the Northern Division consistently producing good quality oysters in enough quantity.

The oysters will be used at Civa Fiji Pearls' Wailoa farm, Taveuni, with a first crop anticipated in 2019.

This is good news for Civa Fiji Pearls since Tropical Cyclone Winston caused serious damage to operations above and below the water.

The pearl farm also suffered a direct hit from Cyclone Thomas six years ago. With most infrastructure now rebuilt the increased spat collection will contribute to further recovery.

Chairman of the Vanua Trust of Laucala, Jone Fifita Rakesa, said they have been doing pearl oyster spat collecting for the last two years successfully.

"This project started very slowly with help from the fisheries department but now is growing out by itself," he said.

"Partnering with Civa Fiji Pearls who want to develop the resource in a sustainable manner with us is the way forward.

"They have good knowledge and are willing to share for the long term benefit of all. We are custodian of this resource and we must, for the sake of our children, develop it while protecting it."

Edited by: Rachna lal

http://fijisun.com.fj/tag/civa-fiji-pearls-limited/

8.3 Appendix 3: Media relating to this project

The Fiji Times ONLINE

$240k for pearl industry

Losalini Bolatagici
Friday, April 22, 2016

IT will take about two years for the pearl industry in Fiji to recover from the destruction caused by Severe Tropical Cyclone Winston.

+ Enlarge this image

Fisheries director George Madden (left) addresses the media as Paul Southgate of the University of the Sunshine Coast looks on during a press conference in Suva on Wednesday. Picture: ELIKI NUKUTABU

And for that reason, the Australian Centre for International Agricultural Research, an arm of the Australian Government that has been carrying out research in Fiji for the past 20 years, has stepped in with an assistance of $240,220 to assist with its rehabilitation.

Professor Paul Southgate of the University of the Sunshine Coast said through the Department of Fisheries, they hoped to provide the infrastructure required by the industry to maintain the supply of oysters. "We will be working really closely with the ministry to try and replace some of the vital infrastructure required which helps communities and pearl farmers collect the juvenile pearl oyster which would be used later on for pearl production," Prof Southgate said.

"The problem is when we have natural disasters like this, it takes about two years for oyster to grow to a size where it can be used for production, so the longer the period where we do not have juvenile oyster, the longer the period where there is no pearl production or reduced pearl production and that is what we are trying to minimise."

Director Fisheries George Madden said damage caused to the industry after Severe TC Winston was about $1 million.

The project was established to ensure that people in Fiji had an alternative source of living by utilising their foreshore areas to farm pearl oyster.

The project involves the collection of spats from the wild, breeding, and farming of oysters to produce black pearls for overseas markets and also the utilising of its shells to produce value-adding commodities as byproducts.

As at 2009, the ministry said, 11 pearl farms were established mainly in the Northern and Western divisions and were generating average annual revenues of about $3.4m but were now turning more than $13m in total revenue.