

SECRETARIAT OF THE PACIFIC COMMUNITY (SPC)

# AQUACULTURE



ACTION PLAN | 2007



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Original text: English

Secretariat of the Pacific Community Cataloguing-in-publication data

SPC Aquaculture action plan 2006 / [Secretariat of the Pacific Community]

1. Aquaculture — Oceania. 2. Secretariat of the Pacific Community. Coastal Fisheries Programme.

I. Secretariat of the Pacific Community

639.3

AACR2

ISBN: 978-98200-0237-1



# *SPC Aquaculture Action Plan*

2007 



# ***Foreword***

*Riding the winds of change*



## **Foreword**

*The Pacific is riding the winds of change. The world around us is presenting the people of the Pacific Islands with unprecedented challenges and opportunities – the growth of information technology and phenomena such as climate change are prime examples. SPC is dedicated to helping the countries and territories of the Pacific recognise, interpret and respond strategically to these global and regional opportunities and challenges in the best possible way.*

*One of the most profound changes occurring in the Pacific is the growth in population, which is predicted to increase by almost 50 per cent across the region by 2030. The challenges posed by this change alone are enormous. To secure a prosperous future for future generations, we must plan now. Ensuring food security for Pacific people through provision of good quality food and rewarding livelihoods is a vital part of the equation.*

*In planning ahead, we must be prepared to change the way some things have been done in the past. We need to think outside the box. Traditionally, people have looked to the sea for most of the fish they eat. While coastal communities will need to continue to do this, much of the future population growth will be in urban centres, and in inland communities in Melanesia. Supplying the fish that these communities need for good nutrition and livelihood opportunities will require a different approach. Aquaculture – the nexus between fisheries and farming – is part of the solution.*

*The Aquaculture Action Plan 2007, coordinated by SPC and developed jointly with members and partners, can help deliver the potential benefits of aquaculture to the areas of the region where they are needed most. The commodity development plan at the heart of this action plan lays the foundation for providing new livelihoods in remote coastal communities, and improved food security for inland communities and urban populations.*

*I invite all those with an interest in securing a prosperous Pacific Community to work with us to implement this plan. Together we can catalyse the development of sustainable household-level activities and larger enterprises to supply the food and products our people need for their future well-being. Together we can make a difference in the lives of Pacific Island people.*



Dr Jimmie Rodgers  
SPC Director General



# ***Our vision***

*Progressive aquaculture for a prosperous Pacific*





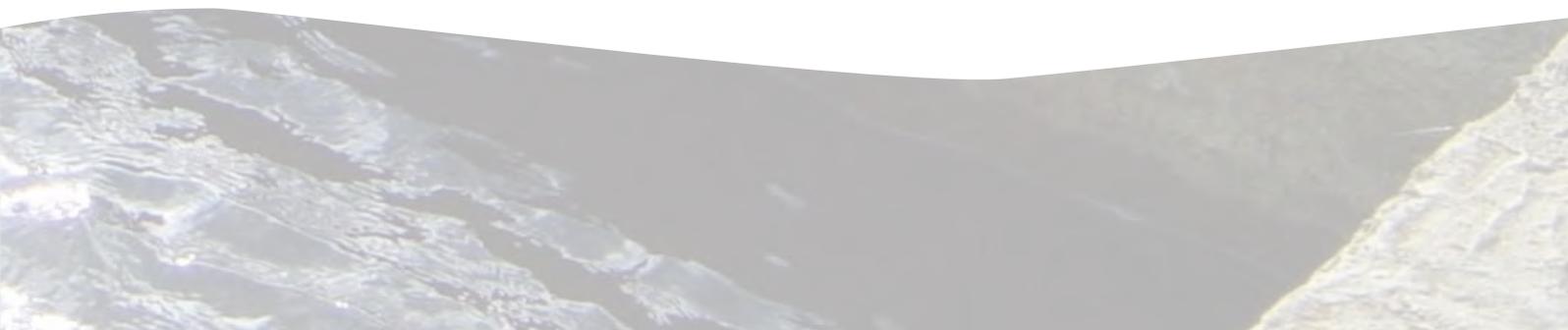
## ***The action plan***

### ***What is it?***

*The SPC Aquaculture Action Plan 2006 is a vehicle for taking SPC members and partners one step closer to fulfilling the potential of aquaculture in the region. It outlines the importance of aquaculture to the Pacific, the sector as it is today, the commodities that will carry us forward, and the actions required to get there.*

### ***How was it developed?***

*The Aquaculture Action Plan 2006 is the outcome of the 2nd SPC Aquaculture Meeting, which brought together national experts, partner organisations and the private sector at SPC, Noumea, in 2006. It builds on the achievements that resulted from an earlier milestone for aquaculture in the Pacific – the first SPC Aquaculture Action Plan in 2002.*





# Aquaculture and the Pacific

## Importance

Abundant supplies of fish and shellfish have generally supported a good way of life for generations of Pacific Island people. But it is now clear that these benefits will not continue without planning ahead. As populations grow, the amount of fish required for food security (Figure 1), and the demand for meaningful livelihoods, will increase. The task is to identify where these fish and jobs will come from, and how to deliver them to both rural and urban areas.

Part of the answer undoubtedly lies in allocating more of the region's tuna resources to meet these needs. However, this will not always be practical, particularly

for inland communities in Papua New Guinea (PNG) and other high island countries. The ability of coastal fisheries to supply future needs is limited – many of them are already fully exploited or in some places over-exploited.

Development of sustainable aquaculture can help provide more food and livelihoods in many parts of the Pacific because aquaculture systems are not constrained in the same way as capture fisheries. There is much potential for growth within the carrying capacity of suitable habitats.



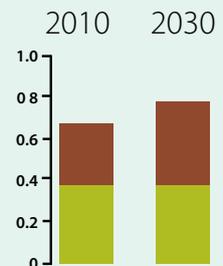
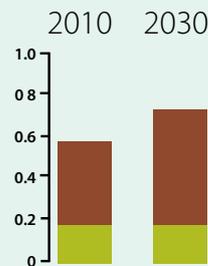
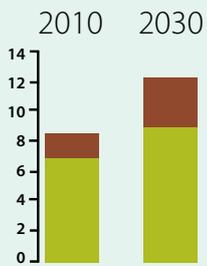


## MELANESIA

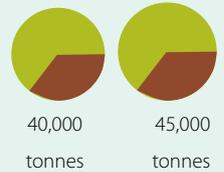
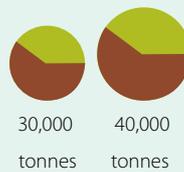
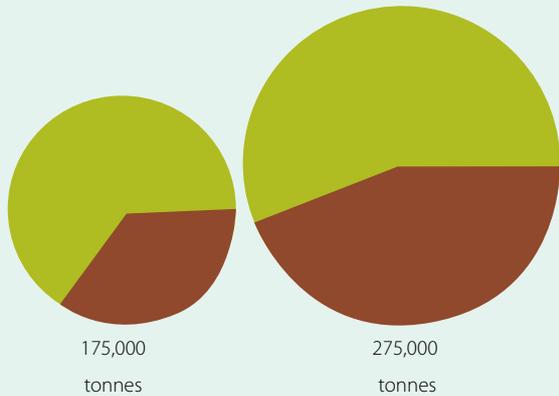
## MICRONESIA

## POLYNESIA

POPULATION



FISH NEEDED



Forecasts of population growth and quantity of fish needed for good nutrition in rural (green) and urban (brown) areas of the Pacific.



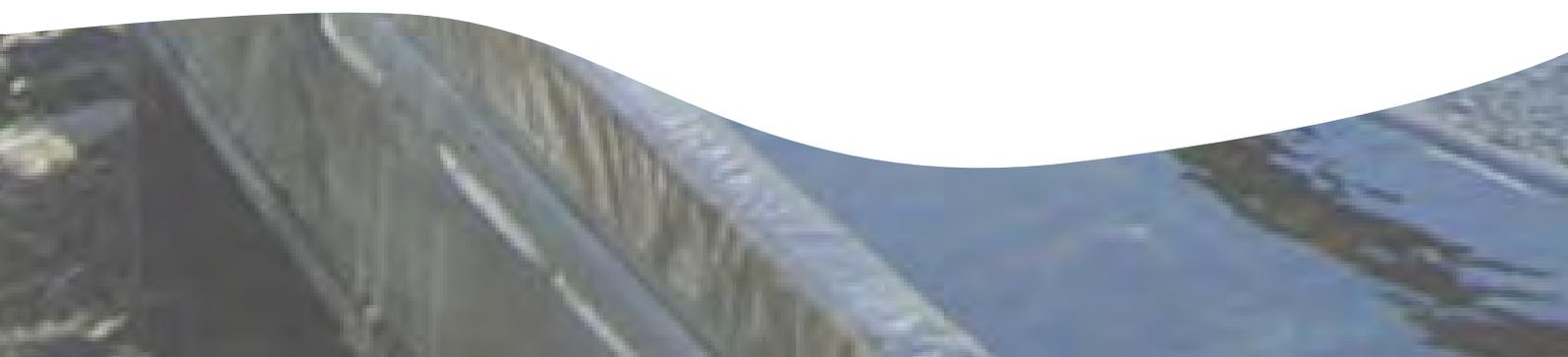


### ***Aspirations***

- Create a range of options for rural livelihoods to reduce urban drift
- Improve food security
- Improve the trade balance – more exports and less dependence on imports
- Capitalise on the region's comparative advantages – pristine environment, low incidence of fish disease and high biodiversity – to produce premium products
- Restore severely depleted fisheries

### ***Features***

- Main export commodities are pearls, shrimp, seaweed and marine ornamentals
- Total volume of production is low by world standards, but the value is relatively high US 130-180 million dollars per annum (estimated)
- Good scope for expansion (147 island biospheres)
- Growing local markets for seafood due to population growth, urbanisation and tourism
- High demand for subsistence production of tilapia in rural areas





### ***Constraints***

- Remote locations – high freight costs
- High costs of labour compared to Asia
- Few hatcheries and skilled technical staff
- Poor capacity to supply high-quality feeds based on local ingredients
- Lack of policies and processes for enabling and regulating aquaculture
- Lack of business and marketing skills
- Inadequate biosecurity and quarantine procedures
- Vulnerability to natural hazards such as cyclones and floods

### ***Challenges***

- Determine where and how aquaculture can best support food security
- Identify how comparative regional advantages can be used to create more jobs through production of competitive commodities for local and export markets
- Build national and regional capacity to reach these targets



# *Priority commodities*

*for livelihoods  
for food security*



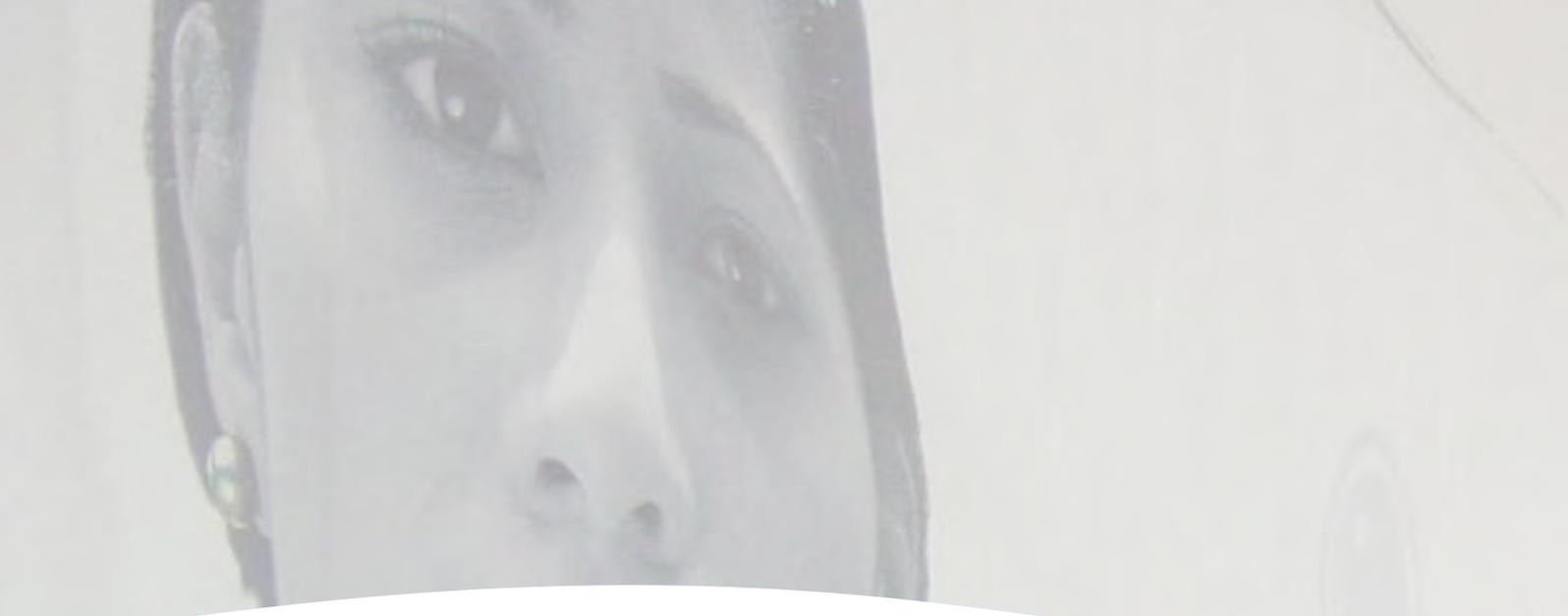
## Prioritisation process

Participants at the 2nd SPC Aquaculture Meeting and other experts from the Pacific identified our priority commodities based on:

- (1) potential impact – widespread benefit to communities and suitability to the region.
- (2) feasibility – technical capacity of regional and national agencies, the private sector and households to access, deliver, sustain and use the commodity.

## Commodity Prioritisation

FEASIBILITY	high	<b>Trochus</b>	<b>Marine Ornamentals Freshwater Prawn Milkfish</b>	<b>Pearl Oyster Seaweed Tilapia</b>
	Medium	<b>Sponge Carp Red Claw</b>	<b>Marine Fin fish Mud Crab</b>	<b>Sea Cucumber</b>
	Low	<b>Crocodile Abalone</b>	<b>Eels Rock Lobster</b>	<b>Marine Shrimp</b>
		Low	Medium	High
		POTENTIAL IMPACT		



# ***Commodities for livelihoods***

*Cultured pearl*

*Seaweed*

*Marine ornamental*

*Marine shrimp*

*Freshwater prawn*

*Sea cucumber*

*Marine Fin fish*

*Mud crab*

*Trochus*





## Cultured pearl

### Securing the future for our most valuable product

Cultured black pearls are flagship exports from eastern Polynesia. After exponential growth, annual exports peaked at US \$164 million in French Polynesia and US \$9 million in the Cook Islands. Production has now been lowered to maintain quality and address disease outbreaks. These actions are designed to maintain the Pacific's position as the world's number one producer of black pearls. There is still much potential to diversify the species of pearl oysters being farmed and the type of pearl products (such as 'mabe' half pearls), so that benefits are more widespread.

<b>Cultured pearl</b>		
<i>Objective</i>	<i>Strategies</i>	<i>Actions</i>
<b>Improve economic returns</b>	Improve the percentage of high-quality pearls produced	<ul style="list-style-type: none"> <li>• Increase skills of existing technicians</li> <li>• Improve pearl colour through selective breeding</li> </ul>
	Increase profitability	<ul style="list-style-type: none"> <li>• Reduce culture times using triploid breeding techniques</li> </ul>
	Promote export quality standards	<ul style="list-style-type: none"> <li>• Explore uniform pearl quality standards and certification</li> </ul>
<b>Maximise participation and benefits</b>	Support 'nucleus' farms as vehicles to deliver benefits	<ul style="list-style-type: none"> <li>• Attract investment for large farms</li> </ul>
	Position villagers to work on 'nucleus' farms and establish 'satellite' enterprises	<ul style="list-style-type: none"> <li>• Train small-holders in spat collection and grow-out of pearl oysters</li> <li>• Integrate small holders with larger enterprises</li> </ul>
	Add value through local sales	<ul style="list-style-type: none"> <li>• Organise handicraft workshops for artisans</li> </ul>
<b>Sustainable production</b>	Implement best management practices	<ul style="list-style-type: none"> <li>• Develop national management plans/codes of conduct</li> <li>• Train farmers in best management practices</li> </ul>
	Raise awareness of activities that affect pearl farming	<ul style="list-style-type: none"> <li>• Alert coastal managers to potential impacts on holistic farm management</li> </ul>



## Seaweed

### *A new cash crop for the Pacific?*

*Kappaphycus seaweed (trade name cottonii) produces a starchy gel called carrageenan, which is used in the food and pharmaceutical industries. Seaweed farming is simple and requires little investment. It has the potential to become an important cash crop, much like copra was in the past, providing a source of much-needed income for communities in coastal areas. Kiribati pioneered cottonii farming in the Pacific. Production is also well underway, and expanding, in Solomon Islands and Fiji.*

<b>Seaweed</b>		
<i>Objective</i>	<i>Strategies</i>	<i>Actions</i>
<b>Consolidate production and expand participation</b>	Develop economies of scale	<ul style="list-style-type: none"> <li>• Investigate potential of incentives to establish seaweed farms</li> <li>• Secure access to farm sites</li> </ul>
	Establish efficient shipping services	<ul style="list-style-type: none"> <li>• Plan regular internal shipping from farms to exporters</li> <li>• Organise roundtable discussions on prices between growers, shippers and buyers</li> </ul>
	Improve production methods	<ul style="list-style-type: none"> <li>• Improve site selection, use of varieties and farming methods</li> <li>• Raise awareness among growers of the need for high-quality product</li> <li>• Safeguard seedstock to rebuild farms following periods of low production</li> </ul>
	Diversify and add value	<ul style="list-style-type: none"> <li>• Investigate markets and production methods</li> <li>• Conduct feasibility studies</li> </ul>



## Marine ornamental

### Benefiting from our biodiversity

The demands of the marine aquarium trade – low volumes of hundreds of species – can be supplied from the great biodiversity of fish and invertebrates that inhabit the Pacific's pristine coral reefs. The challenge is to do this in a sustainable way. A growing number of enterprises in countries such as Marshall Islands are now producing cultured giant clams, corals and other ornamental species. There is also potential to supply a much greater range of products through further developing the capture and culture of a wider range of postlarvae.

<b>Tropical marine ornamental</b>		
<i>Objective</i>	<i>Strategies</i>	<i>Actions</i>
<b>Expand production of cultured giant clams, corals and wild postlarvae</b>	Promote a diverse range of cultured products	<ul style="list-style-type: none"> <li>• Determine demand for quality products</li> <li>• Share regional expertise in production and grow-out</li> <li>• Strengthen ability of hatcheries to provide juvenile giant clams</li> </ul>
	Encourage extension	<ul style="list-style-type: none"> <li>• Produce manuals on grow-out of hard and soft coral fragments, and capture and culture of postlarvae</li> <li>• Encourage exporters of ornamental products to engage in community-based farming projects</li> </ul>
	Address regulatory issues	<ul style="list-style-type: none"> <li>• Secure access to suitable farm sites</li> <li>• Develop licensing conditions</li> <li>• Apply CITES regulations</li> </ul>
	Safeguard supplies of 'seed'	<ul style="list-style-type: none"> <li>• Liaise with SPC Coastal Fisheries Programme (CFP) to maintain wild stocks</li> <li>• Implement participatory restocking programmes</li> </ul>
<b>Improve marketing and shipping</b>	Establish a regional competitive advantage	<ul style="list-style-type: none"> <li>• Evaluate/pursue ecolabelling of products</li> <li>• Encourage high-quality products</li> <li>• Establish standards to prevent sale of diseased specimens</li> </ul>
	Address restrictive shipping issues	<ul style="list-style-type: none"> <li>• Plan regular internal shipping/airfreight services</li> <li>• Negotiate appropriate freight rates</li> </ul>



## Marine shrimp

### *A reputation for quality and care*

*Within the huge and competitive global trade in farmed shrimp, the succulent blue shrimp from New Caledonia are a remarkable success, commanding top market prices in Japan and France. This success is the result of a focus on product quality and vigilance against diseases. The industry is also renowned for its high environmental standards – mangroves have not been cleared to build ponds but are instead used to absorb nutrient outflows.*

<b>Marine shrimp</b>		
<i>Objective</i>	<i>Strategy</i>	<i>Actions</i>
<b>Safeguard the potential for shrimp farming</b>	Minimise risk of introducing shrimp pathogens	<ul style="list-style-type: none"> <li>• Establish procedures for consultations with relevant authorities prior to imports of live shrimp</li> <li>• Implement protocols for safe movement of live shrimp</li> <li>• Improve measures to prevent and respond to disease outbreaks</li> <li>• Assess risks posed by imported, frozen, green shrimp</li> </ul>
	Establish best management practice for hatcheries and farms to prevent shrimp disease	<ul style="list-style-type: none"> <li>• Apply best management practices, such as the 'International Principles for Responsible Shrimp Farming'</li> </ul>





## Freshwater prawn

### A favored food

Large freshwater prawns (*Macrobrachium spp.*) command premium prices. Because they are easy to grow in ponds, these prawns can support profitable satellite farms in rural areas supplying larger nucleus operators – a model adopted successfully by the chicken industry in Fiji. Small pond culture systems for indigenous *Macrobrachium lar*, caught as wild postlarvae, also enable villagers to participate in the industry. Recent trials with monoculture in Vanuatu, and integrated culture with swamp taro farming systems in Wallis and Futuna, have attracted much interest.

Freshwater prawn		
Objective	Strategy	Actions
Develop small- and medium-scale farming systems for <i>Macrobrachium spp.</i>	Transfer technology for farming <i>M. rosenbergi</i>	<ul style="list-style-type: none"> <li>• Verify size of national markets</li> <li>• Identify appropriate genetic strains</li> <li>• Organise import risk analyses</li> <li>• Implement quarantine and disease controls</li> <li>• Provide training in basic hatchery and grow-out methods</li> <li>• Formulate cost-effective feeds</li> </ul>
	Develop farming systems for <i>M. lar</i>	<ul style="list-style-type: none"> <li>• Identify sources of wild postlarvae</li> <li>• Assess feasibility through pilot-scale grow-out trials</li> <li>• Support research on closing the life cycle of <i>Macrobrachium lar</i></li> </ul>





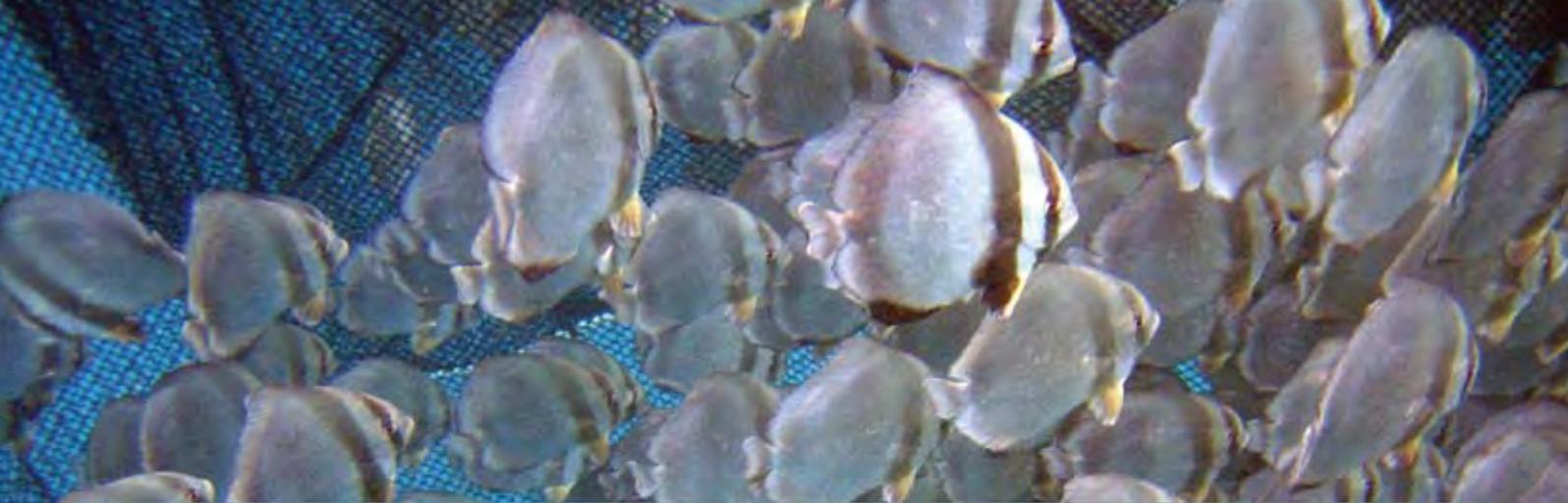
## Sea cucumber

### Restoring depleted fisheries

Sea cucumbers (known as *bêche-de-mer* or *trepang* once processed) are in trouble throughout the Pacific. Their high value and sedentary nature have made them highly vulnerable to over-fishing. Where stocks have been eliminated, or fished to such low levels that even stringent management is unlikely to rebuild the populations, restocking with hatchery-reared juveniles can be used to restore small-scale fisheries. Aquaculture technology for restocking the most valuable species of tropical sea cucumber, the sandfish, has been developed in the Pacific. The challenges are to determine (1) where restocking and sea ranching can be used to add value to other forms of management and (2) whether sea cucumber can be reared in ponds profitably.

Sea cucumber		
Objective	Strategy	Actions
Apply aquaculture technology for sea cucumber	Assess viability of restoring fisheries, sea ranching and pond farming	<ul style="list-style-type: none"> <li>• Reduce cost of hatchery-reared juveniles</li> <li>• Restock local sea cucumber fisheries</li> <li>• Develop efficient pond grow-out systems Identify optimum sites for sea ranching</li> <li>• Evaluate economic feasibility of pond farming and sea ranching</li> </ul>
	Raise awareness of measures needed to rebuild stocks	<ul style="list-style-type: none"> <li>• Assist CFP to increase community capacity to assess stocks and implement appropriate management</li> <li>• Investigate grow-out of wild sea cucumbers in sea pens to form spawning aggregations</li> <li>• Develop biosecurity measures for translocating sea cucumbers to create protected spawning aggregations</li> </ul>
	Supply 'founder' animals to establish spawning aggregations	<ul style="list-style-type: none"> <li>• Evaluate costs/benefits of using cultured sea cucumbers where wild animals are not available</li> </ul>





## Marine finfish

Objective	Strategy	Actions
Targeted development of enterprises	Assess local and export markets of interest for the region and evaluate quantities that these markets could absorb	<ul style="list-style-type: none"> <li>Identify locations with potentially viable supplies of juveniles</li> <li>Evaluate feasibility of capture and culture of postlarvae, and determine optimal collection and grow-out methods</li> <li>Evaluate cost efficiency of hatchery production of some species</li> <li>Assess availability of feeds</li> <li>Estimate economic viability</li> <li>Support feasibility trials</li> </ul>
	Advise projects and hatcheries on technical and marketing aspects	<ul style="list-style-type: none"> <li>Assess locations where availability of hatchery and grow-out technology, production costs and markets indicate that enterprises will be viable</li> <li>Support involvement of the private sector</li> <li>Maintain links to the Asia-Pacific marine finfish network</li> <li>Arrange training on marine finfish where applicable</li> <li>Support feasibility trials</li> </ul>

## Mud crab

Objective	Strategy	Actions
Evaluate potential	Assess viability of farming systems	<ul style="list-style-type: none"> <li>Survey national supplies and prices of mud crabs, and assess markets</li> <li>Determine economic feasibility and practicality of on-growing wild-caught juveniles</li> <li>Evaluate needs for hatcheries</li> <li>Identify sustainable and economic feeds</li> <li>Investigate potential links with community-based mangrove conservation efforts</li> </ul>
	Transfer technology from Asia and Australia	<ul style="list-style-type: none"> <li>Develop links with institutes involved in research and development of mud crab farming</li> </ul>

## Trochus

Objective	Strategy	Action
Restore and create local fisheries	Raise awareness of measures needed to rebuild stocks	<ul style="list-style-type: none"> <li>Assist CFP to increase community capacity to assess stocks and implement appropriate management</li> </ul>
	Supply 'founder' animals to establish spawning aggregations	<ul style="list-style-type: none"> <li>Aggregate or translocate wild trochus to form a viable spawning biomass</li> <li>Develop biosecurity measures for translocating trochus</li> <li>Support hatchery production/co-culture of trochus where wild animals are not available</li> </ul>





# *Commodities for Food Security*

*Tilapia  
Milkfish*





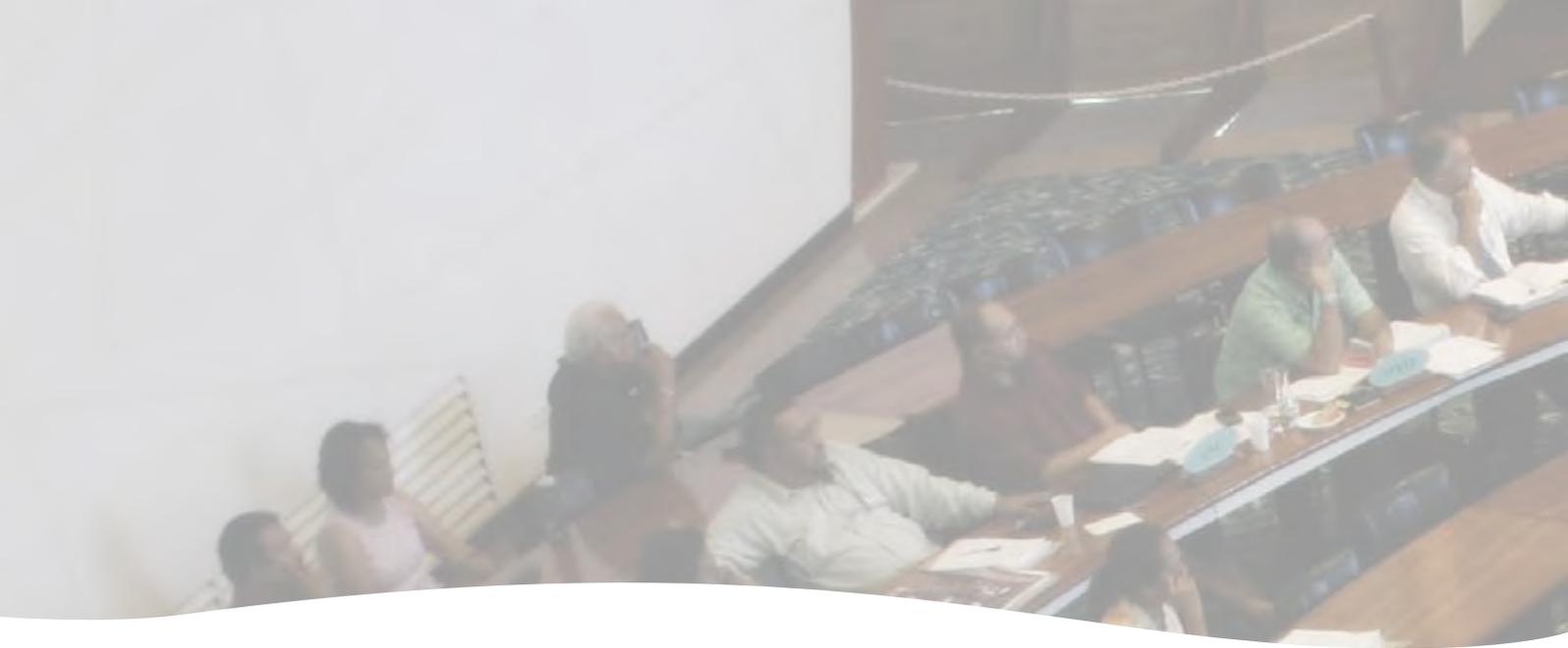
## Tilapia

### Food for our growing population and domestic markets

Commonly called 'aquatic chicken' because it is so easy to farm, Nile tilapia (not to be confused with the pest, Mozambique tilapia) has the potential to improve nutrition in both rural and urban areas of the Pacific. In particular, Nile tilapia could provide food security for the large rural communities of Melanesia. PNG and Fiji have already begun developing smallholder production. There are an estimated 10,000–15,000 small pond farms in PNG. The challenge is to scale-up production and establish farming in other countries in an environmentally responsible way. GIFT Nile tilapia, which have been bred to grow 85 per cent faster than their wild forefathers, are a particularly exciting prospect.

Tilapia		
Objective	Strategy	Actions
Develop responsible and sustainable tilapia farming	Strengthen existing production	<ul style="list-style-type: none"> <li>• Evaluate current practices</li> <li>• Acquire improved broodstock</li> <li>• Improve distribution systems for fingerlings</li> <li>• Formulate cost-effective feeds</li> <li>• Train small-holders and industry in appropriate farming systems</li> <li>• Develop 'containment' practices to limit effects on biodiversity</li> <li>• Minimise disease risk</li> <li>• Mitigate infestation of farms by Mozambique tilapia</li> </ul>
	Assess potential in other countries	<ul style="list-style-type: none"> <li>• Determine whether tilapia farming is necessary for food security</li> <li>• Organise import risk analyses for tilapia and, if favourable, assist countries to acquire quarantined broodstock</li> <li>• Establish hatcheries</li> <li>• Provide training in fingerling production and grow-out</li> </ul>

Milkfish		
Objective	Strategy	Actions
Consolidate production of milkfish	Target selected countries	<ul style="list-style-type: none"> <li>• Identify potentially profitable operations</li> <li>• Identify appropriate sources of fry</li> <li>• Support farming trials</li> <li>• Investigate opportunities for polyculture</li> </ul>



# ***Cross-cutting issues***

*SPC and partners will provide the following services to underpin development of priority commodities*





### ***Information***

- Strengthened networks for sharing practical information
- Easy access – ‘One-stop-shop’ and ‘Open forum’ on SPC’s aquaculture portal
- Study tours

### ***Training***

- Hatchery and genetics – broodstock management, genetic improvement, hatchery operation
- Farm management – culture methods, carrying capacity, pond management, monitoring, risk reduction and staff development
- Disease – identification, prevention and control
- Postharvest – food safety (HACCP), adding value

### ***Research and development***

- Teams and facilities to address bottlenecks, including feed availability
- Grant proposals for research priorities
- Peer review and publication of research results
- Supervision of postgraduate students





### ***Biosecurity***

- Safeguarding the aquaculture environment to maintain the Pacific's comparative advantage
- Raising awareness of potential effects of introductions/translocations/exports
- Impact risk analysis
- Coordinated regional disease testing and certification
- Regional guidelines and codes of conduct
- Interagency collaboration between fishery, veterinary and quarantine services

### ***Climate change***

- Identifying possible effects on aquaculture
- Developing strategies to avoid risks and make the most of opportunities





## ***Planning and policies for sustainable aquaculture***

- National aquaculture plans
- Aquaculture policy and legislation – incentives, tenure, licencing, transport, biosecurity, best management practices and quality control
- International obligations

## ***Economics and marketing***

- Economic analyses
- Small business enterprise management
- Promotion of Pacific products
- Marketing strategies – ecolabelling of products
- Advocacy for improved freight arrangements



# ***Our valued partnerships***





This action plan is the fruit of generous collaboration. The organisations that joined forces with the 26 member countries of SPC to develop this road map for the growth of aquaculture in Pacific Countries and Territories include the University of the South Pacific, WorldFish Center, Australian Centre for International Agricultural Research, IFREMER, Network of Aquaculture Centers for Asia-Pacific, James Cook University, University of Hawaii and United Nations Food and Agriculture Organization.

An even broader partnership will be needed to bridge the gap between this action plan and success. Please join us to help deliver the diversity of priority aquaculture commodities across the Pacific.





