

# Proceedings of the Sub-regional Workshop on the Marine Ornamental Trade in the Pacific



# Proceedings of the Sub-regional Workshop on the Marine Ornamental Trade in the Pacific

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Noumea  
New Caledonia

by

Jeff Kinch and Antoine Teitelbaum

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**SPC**  
Secretariat  
of the Pacific  
Community



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# TABLE OF CONTENTS

Acronyms	v
Acknowledgements	vii
Disclaimer	vii
Executive Summary	ix
Report Structure	x
Part I: Introduction	1
1.1 Sub-regional Workshop for the Marine Ornamental Trade in the Pacific	2
1.2 Marine Ornamental Trade in the Pacific	3
Part II: Country profiles by government representatives	7
2.1 Cook Islands	8
2.2 Fiji Islands	9
2.3 French Polynesia	10
2.4 Federated States of Micronesia	11
2.5 Kingdom of Tonga	12
2.6 Kiribati	13
2.7 New Caledonia	14
2.8 Papua New Guinea	15
2.9 Republic of the Marshall Islands	16
2.10 Republic of Vanuatu	17
2.11 Solomon Islands	18
Part III: Industry presentations	19
3.1 Aquarium Fish (Fiji) Ltd.	20
3.2 Hawaiian Sealife Inc.	21
3.3 Kiritimati Island Petfish Industry	23
3.4 Marine Environmental Research Institute of Pohnpei	24
3.5 Reef Life Vanuatu	25
3.6 Tonga Aquarium Industry	26
3.7 Walt Smith International	27
Part IV: Organisations	29
4.1 Coral Reef InitiativeS for the Pacific	30
4.2 Secretariat of the Pacific Community	31
4.3 Secretariat of the Pacific Regional Environment Programme	31
4.4 University of the South Pacific	32
4.5 WorldFish Center	33
Part V: Special topics	35
5.1 Convention on International Trade in Endangered Specie	36
5.2 Community approaches and sustainable livelihoods	38
5.3 Current status and prospects for cultured giant clams	39
5.4 European Union’s legislation for live aquatic ornamental imports	40
5.5 Live Reef Fish Database	41
5.6 Post-larval collection in Hawaii	42

Part VI: Management	43
6.1 Fiji's national management plan for the aquarium trade	44
6.2 Risk-based assessments for the aquarium trade	46
6.3 Tonga Marine Aquarium Fishery Management Plan	47
6.4 Vanuatu National Marine Aquarium Trade Management Plan	48
Part VII: Issues	49
7.1 Market Analysis	50
7.2 Convention on International Trade in Endangered Species	50
7.3 World Organisation for Animal Health	51
7.4 Eco-certification	51
7.5 Stock assessments and risk assessments	52
7.6 Marine ornamentals working group	52
Resource documents	53
Resource persons	55
Tables	
1: Number of companies involved in the aquarium trade in PICTs	3
2: Number of households involved in the aquarium trade in PICTs	3
3: Diversity of cultured and wild aquarium commodities exported from PICTs	4
4: Aquaculture facilities in PICTs that are producing aquarium species	5
5: PICTs that are signatory to CITES	36
6: Aquarium species listed on the CITES appendices	36
Figures	
1: Number of giant clams and corals produced by the Kosrae National Aquaculture Centre between 2005 and 2008	11
2: Number of ornamental fish exported from Kiribati between 1994 and 2007	13
3: Volume percentage of aquarium organisms exported from Marshall Islands in 2007	16
4: Volume percentage exports of aquarium organisms from Vanuatu between 1995 and 2007	17
5: Volume percentage export of aquarium organisms from the Solomon Islands in 2007	18
6: Production of giant clam per country over the last 10 years	39

## ACRONYMS

AMRC	Araura Marine Research Centre
CITES	Convention on International Trade in Endangered Species
CRIOBE	Le Centre de Recherches Insulaires et Observatoire de l'Environnement de Polynésie Française
CRISP	Coral Reef InitiativeS for the Pacific
EU	European Union
FSM	Federated States of Micronesia
HSL	Hawaiian Sealife Inc.
IEP	Island Ecosystem Programme
MERIP	Marine and Environmental Research Institute of Pohnpei
MIMF	Marshall Islands Mariculture Farm
MIMRA	Marshall Islands Marine Resources Authority
MMR	Ministry of Marine Resources
MOTA	Marine Ornamental Trade Association
MOWG	Marine Ornaments Working Group
MPA	marine protected area
NFA	National Fisheries Authority
NGO	non-governmental organisation
OIE	World Organisation for Animal Health
PCC	post-larval capture and culture
PICTs	Pacific Island countries and territories
PNG	Papua New Guinea
QPIF	Queensland Department of Primary Industries and Fisheries
RMI	Republic of the Marshall Islands
SPC	Secretariat of the Pacific Community
SPREP	Secretariat of the Pacific Regional Environment Programme
USA	United States of America
USP	University of the South Pacific



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The involvement of a wide range of interest groups involved in the marine ornamental trade, including government representatives, businesspeople and specialists, has created an invaluable and timely opportunity for the Pacific region to deliberate on the key issues for this very important industry.

### Disclaimer

The opinions expressed herein are those of the individual authors and do not necessarily reflect the views of the Secretariat of the Pacific Community, the Secretariat of the Regional Environment Programme or Coral Reef InitiativeS for the Pacific.





## EXECUTIVE SUMMARY

In December 2008, a Sub-regional Workshop for the Marine Ornamental Trade was held to identify national and regional initiatives that will ensure the long-term ecological, social and economic sustainability of this very important fishery for the Pacific.

The aquarium fishery in the Pacific has been in operation for over 30 years, exporting aquarium organisms to the United States and European markets and increasingly, these days, to Asia. Forty companies are involved in 12 Pacific Island countries and territories (PICTs), providing an estimated USD 30–40 million in revenue annually to the PICTs' economies, and employing approximately 1,470 households in supply activities or facility operations.

Cultured aquarium organisms are becoming increasingly important, with many PICTs exporting cultured giant clams and cultured corals. Experimental production of ornamental fish is also being investigated, with a major push for post-larval ornamental fish culture being considered.

Management regulations and legislation need further support. Currently, only Tonga and Vanuatu have formal aquarium fishery management plans. Fiji Islands recently conducted a series of reviews under Coral Reef InitiativeS for the Pacific (CRISP), while Papua New Guinea has developed a draft management plan.

During the course of the workshop, several specific areas of concern emerged:

- Conducting a market analysis to gain a greater understanding of the market—including the identification of new aquarium organisms and their potential for sale; commercial viability factors, such as freight costs, freight space and flight connectivity; transparency, equity sharing and pricing structures—and to assist governments and the private sector in their decision-making about management, profitability and sustainability issues.
- Assisting PICTs on compliance and capacity issues regarding the Convention on International Trade in Endangered Species (CITES), and the new regulation imposed by the World Organisation for Animal Health (OIE) (this was regarded as particularly important).
  - Currently, Fiji Islands, Palau, PNG, Samoa, Solomon Islands and Vanuatu are the only sovereign countries in the Pacific that are signatories to CITES. The Marshall Islands and Tonga are interested in joining because of the difficulties they are experiencing in exporting their cultured giant clams. Specific areas requiring clarification include CITES requirements on cultured versus wild-harvest aquarium organisms, a reform of coral listings, and an investigation of the applicability of quotas in lieu of non-detrimental findings.
  - The European Union has now stipulated that all aquarium organism exports from the Pacific should be certified by a competent authority under OIE requirements.
- Investigating the potential of a 'Pacific Eco-certification' programme as an avenue for government and industry to work together to ensure sustainability of the aquarium fishery. Any eco-certification programme should be based on best practices and not be too onerous in detail, as some PICTs had had negative experiences with the Marine Aquarium Council certification programme. Eco-certification could also assist in increasing the desirability of some aquarium organisms from the Pacific region, and ameliorating and mitigating some of the issues surrounding OIE and CITES compliance.

- Assessing the virtues of formal stock assessments and risk assessments in regard to sustainability issues surrounding the supply of aquarium organisms. Risk assessments could in some cases preclude stock assessments altogether if fisheries information was current, and could also identify and prioritise stock assessments when funding becomes available. Stock assessments (focused on a few key aquarium organisms), on the other hand, could be used to verify risks identified by risk assessments. Risk assessments were also considered to be a possible alternative to CITES requirements by some participants, and this requires further investigation.
- Establishing a Marine Ornamentals Working Group as a regional focal point for market analysis and international agreement advocacy (particularly on OIE and CITES issues), as a way to distil and discuss problems and issues, to provide an avenue for promoting Pacific aquarium organisms, and as a mechanism for coordinating technical input and research activities. Terms of reference for such a group would include the principles of networking and information sharing, and the application of industry best practices and quality control measures. ‘Pacific Regional Aquarium Council’ was proffered as a potential name for this working group.

Addressing these issues should go some way to ensuring that the continued development of the aquarium trade for PICTs is done in a sustainable manner, thus protecting the region’s coral reef biodiversity and also ensuring that stronger partnerships between the private sector, national authorities and regional/international bodies are achieved.



## Report structure

The report is divided into seven sections. Part I provides an introduction to the aquarium trade in the Pacific, while Parts II–VI are participant presentations by sector. Part VII provides a summary of issues identified by participants to consider in the further development of the aquarium trade in the Pacific.

# Part I: Introduction

- 1.1 The Sub-regional Workshop for the Marine Ornamental Trade in the Pacific**
- 1.2 The Marine Ornamental Trade in the Pacific**

## 1.1 Sub-regional Workshop for the Marine Ornamental Trade

In December 2008, the Secretariat of the Pacific Community (SPC) co-hosted with the Secretariat of the Pacific Regional Environment Programme (SPREP) and Coral Reef InitiativeS for the Pacific (CRISP) the Sub-regional Marine Ornamentals Trade Workshop. The focus of the workshop was on policy and management support for wild-capture ornamental fisheries and aquaculture of aquarium organisms for export.

The three-day workshop (2–5 December 2008) involved technical consultation between a wide range of stakeholders, including the government, private and public sectors, and specialists who are active in the marine ornamental trade in the Pacific Region. Attendance included representatives from the Cook Islands, Federated States of Micronesia (FSM), French Polynesia, Fiji Islands, Hawaii (USA), Kingdom of Tonga, Kiribati, Republic of the Marshall Islands (RMI), Republic of Vanuatu, New Caledonia, Samoa and Solomon Islands.

The workshop concept was developed by the organisers because of the pressing need to identify national and regional initiatives that will ensure the long-term ecological, social and economic sustainability of this important fishery. This is particularly important as PICTs have now been supplying the world's aquarium industry for over 30 years with an increasingly diverse range of wild and cultured commodities, such as fish, coral, live rock, giant clams and other invertebrates species, with the aquarium trade providing an estimated USD 30–40 million in revenue annually to the economies of PICTs that are involved in the trade. Due to the relatively high diversity and abundance of coral reefs in the Pacific, the region is in a strong position to supply the international market and provide much-needed revenue and livelihoods.

Nonetheless, public misconceptions and poorly informed government decisions can constrain development. Marine ornamental exporters are also facing increasingly rigid trade requirements, including recent regulations passed by the European Union (EU) for imports into Europe to be accompanied by animal health certificates, and exporting countries to be members of the World Organisation for Animal Health (OIE). Exporters must also meet strict reporting standards according to the Convention on International Trade in Endangered Species (CITES).

The workshop provided a much-needed forum for the following issues:

- assessing global and regional trends in the aquarium trade in terms of markets and production systems;
- investigating criteria for commercial viability at both community and company level;
- assessing requirements and issues related to international agreements for export;
- determining the role of 'eco-certification' programmes;
- assessing resource assessment techniques to ensure the sustainability of wild-caught fisheries;
- identifying further opportunities for aquaculture;
- determining base requirements for national management plans; and
- identifying priorities for future research, development and training.

## 1.2 Marine ornamental trade in the Pacific

The marine ornamental trade (also referred to as the aquarium trade) in the Pacific began in the 1970s. After 30 years it is now active in at least 12 Pacific Island countries and territories (PICTs) and involves 40 companies (Table 1). The annual value export by the industry is estimated to be in the range of USD 20–30 million. PICTs that are involved in the aquarium trade now account for around 10–15% of the global trade in aquarium organisms.

Table 1: Number of companies involved in the aquarium trade in PICTs

PICT*	Number of companies	Place(s) of operations
Cook Islands	1	Rarotonga
FSM	1	Kosrae
Fiji Islands	5	Lautoka (1), Pacific Harbour (1), Suva (3)
French Polynesia	3	Borabora (1) Tahiti (1), Rangiroa (1)
Kiribati	12	Kiritimati (10), Tarawa (2)
RMI	5	Majuro
New Caledonia	2	Noumea
Palau	1	Koror
PNG**	1	Port Moresby
Solomon Islands	2	Honiara
Kingdom of Tonga	4	Tongatapu
Republic of Vanuatu	3	Port Vila

\* There is also interest in developing the aquarium fishery in Nauru and re-opening the trade in Samoa.

\*\* The PNG National Fisheries Authority has contracted a private consultancy firm to develop the aquarium fishery for PNG.

The aquarium trade in PICTs currently provides income and employment for approximately 1,470 households (Table 2).

Table 2: Number of households involved in the aquarium trade in PICTs

Country	Estimated no. of households involved
Cook Islands	10
FSM	20
Fiji Islands	600
French Polynesia	10
Kiribati	200
RMI	50
New Caledonia	2
Palau	30
PNG	50
Solomon Islands	250
Kingdom of Tonga	150
Republic of Vanuatu	100
<b>Total</b>	<b>1,472</b>

The traditional markets for aquarium organisms exported from PICTs have been Europe and the USA. In recent years, a shift to supplying Asian markets has been an increasing trend, due in part to the removal of trade barriers to the People’s Republic of China in the last decade or so, and that nation’s concurrent increasing affluence.

Wild-harvested aquarium organisms have been the mainstay of the aquarium trade since its beginning. Increasingly, though, a greater diversity and volume of cultured organisms from PICTs are entering the market (Table 3). This is a global trend—for example, in Indonesia, wild-harvested organisms have decreased in number as more cultured organisms are produced, particularly cultured corals from Bali. Wild-harvested corals, however, will not disappear as they retain high demand and, subsequently, high prices. The volume of cultured clams has also increased significantly as wild harvest has been banned due to sustainability concerns and conflict with subsistence use.

Table 3: Diversity of cultured and wild aquarium commodities exported from PICTs

Country	Cultured			Wild harvest				Total
	Corals	Giant clams	Live rock	Corals	Invertebrates	Live rock	Ornamental fish	
Cook Islands		✓					✓	2
FSM	✓	✓						2
Fiji Islands	✓		✓	✓	✓	✓	✓	6
French Polynesia		✓					✓	2
Kiribati		✓					✓	2
RMI	✓	✓			✓	✓	✓	5
New Caledonia							✓	1
Palau		✓			✓		✓	3
PNG							✓	1
Solomon Islands	✓	✓		✓	✓		✓	5
Kingdom of Tonga		✓		✓	✓	✓	✓	5
Republic of Vanuatu	✓	✓		✓	✓	✓	✓	6
Total	5	9	1	4	6	4	11	

While the techniques and markets for culturing clams and corals are well known, the same assumptions for culturing of fish cannot be made. The level of technical input, costs and time required to culture ornamental fish are generally much greater. The techniques and markets are also specific to the species. Hatchery-based methods for breeding clownfish (*Amphiprion* spp.) have been successfully developed, and trials are currently under way in Vanuatu to test the viability of this application. Techniques to capture post-larval ornamental fish from the wild during the high-mortality pre-settlement phase have been developed using fine-mesh nets and light traps. This method is often referred to as post-larval fish capture and culture (PCC). The Pacific region is a leader in PCC technique, but there has been limited commercial application to date and further refinement is required to select species composition and improve commercial viability.

To encourage the expansion of the culture of aquarium species, many PICTs have invested in aquaculture facilities. Most national facilities were initially funded by aid projects and have usually been based at government fisheries agencies. Other facilities are operated by non-governmental organisations (NGOs), while in some cases the private sector has taken the initiative (Table 4).

Table 4: Aquaculture facilities in PICTs that are producing aquarium species

Country	Aquaculture facility	Facility location(s)	Commodities produced
Cook Islands	Araura Marine Research Centre	Aitutaki	Giant clams, post-larval ornamental fish (experimental), cultured corals
FSM	Marine and Environmental Research Institute of Pohnpei	Pohnpei	Giant clams, cultured corals
French Polynesia	Le Centre de Recherches Insulaires et Observatoire de l'Environnement de Polynésie Française	Moorea	Post-larval ornamental fish (experimental)
RMI	RMI government	Likiep, Arno, Woja	Giant clams
Palau	Mariculture Demonstration Center		Giant clams
Solomon Islands	WorldFish Center	Nusa Tupe, Gizo	Giant clams, cultured corals
PNG	Nago Island Mariculture Research Station	Nago Island	Facility is designated as mariculture centre but is currently under construction
Kingdom of Tonga	Fisheries Division	Sopu	Giant clams, cultured corals, live rock
Republic of Vanuatu	Fisheries Division	Port Vila	Giant clam, ornamental fish (experimental)

Technological advances over the last two decades have improved the ability of aquarists to artificially mimic 'natural' marine conditions and house a greater number of species. The aquarium has evolved from a simple standard fish tank to more complex 'reef' tanks. As the aquarist tries to achieve a compatible range of reef species, the fish may even become a secondary item. The aquarium hobbyist is becoming an increasingly 'fickle' customer, which requires that the industry be in a constant state of alert to respond as internet-driven marketing and various methods of information exchange among aquarists ensure that 'fashions' are either maintained or quickly superseded.





## **Part II: Country profiles by government representatives**

- 2.1 Cook Islands**
- 2.2 Fiji Islands**
- 2.3 French Polynesia**
- 2.4 Federated States of Micronesia**
- 2.5 Kingdom of Tonga**
- 2.6 Kiribati**
- 2.7 New Caledonia**
- 2.8 Papua New Guinea**
- 2.9 Republic of the Marshall Islands**
- 2.10 Republic of Vanuatu**
- 2.11 Solomon Islands**

## 2.1 Cook Islands

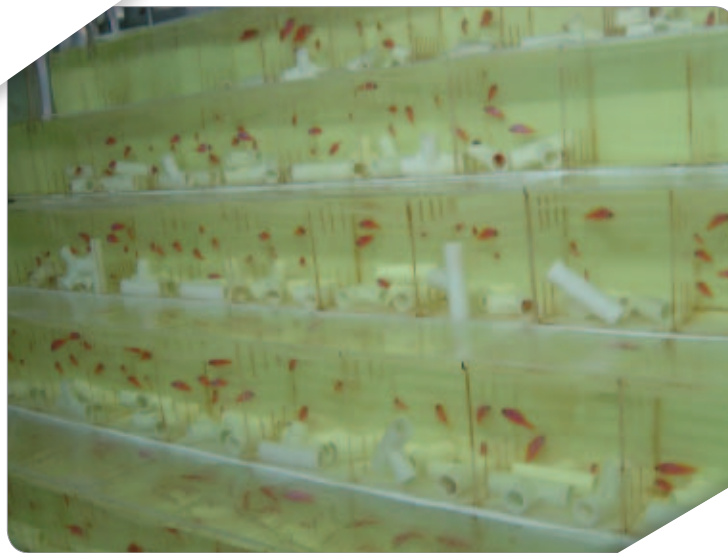
Koroa Raumea

Director of Inshore Fisheries and Aquaculture

Ministry of Marine Resources

The Ministry of Marine Resources (MMR) is the government's leading agent responsible for fishing and aquaculture activities in the Cook Islands, and has in collaboration with Island Councils established policy guidelines, regulations and by-laws for activities related to fisheries development and associated management, and aquaculture.

The *Marine Resources Act (2005)* is the major piece of legislation concerning the use of the country's marine resources. The Act distinguishes between aquaculture and marine farming from other fishing methods and describes regulations and various other provisions.



*Pseudanthias ventralis* at Cook Island's only exporting facility

Araura Marine Research Centre (AMRC), which is operated by MMR, was established in 1989 on the island of Aitutaki. Research has been conducted on culturing the two indigenous clam species, *Tridacna maxima* and *T. squamosa*, as well as three introduced species, *T. gigas*, *T. derasa* and *Hippopus hippopus*. In 2003, AMRC initiated a trial export of *T. maxima* and *T. squamosa* targeting the international aquarium industry, mostly to USA.

In 2007, MMR joined in a research partnership with SPC and CRISP to investigate the potential of PCC for the Cook Islands.

Apart from the trial exports of cultured clam for the ornamental market, wild collections of marine aquarium organisms have been exported from the Cook Islands by a private company since 1988. The target commodities are mainly ornamental fish, namely flame angels (*Centropyge loriculus*), red hawks (*Neocirrhites armatus*), anthias and wrasses, again targeted for the USA market. Areas of collection are centred on Rarotonga, with some of the outer islands also identified as potential supply areas.

Between 1988 and 1998, the annual catch for non-cultured aquarium organisms was around 18,000 pieces, with an estimated value of around NZD 200,000 annually. However, during the period from 1999 to 2008 annual production dropped to around 10,000 pieces, worth an approximate annual value of NZD 140,000. Currently, an estimated 50 divers are involved in supplying ornamental fish and other organisms for export.

Since 2003, approximately 30,000 cultured giant clams have been exported with an estimated value of over NZD 120,000. Since the beginning of 2008, exports of these cultured giant clams have been halted due to OIE requirements. MMR is currently working with SPC to develop procedures and reporting requirements to meet the new requirements so MMR can start exporting again.

## 2.2 Fiji Islands

Meli Raicebe  
Enforcement/CITES Officer  
Ministry of Fisheries and Forests



*A large export facility in Fiji Islands*

The aquarium trade in Fiji Islands provides approximately 16% of all fisheries revenue for the nation and is second to tuna. Economic values of the aquarium trade for Fiji Islands have dropped in the last two years from a general average of around USD 18 million annually to USD 14 million in 2008. This decline is due to current management policies, which have seen a reduction in live rock quotas of 50%.

There are currently five exporters involved in the trade. Three of these have been involved solely in exporting live rock but are now slowly venturing into exporting other aquarium organisms as a measure to extend their export base since live rock exports were reduced. The two main companies, Walt Smith International and Aquarium Fish (Fiji) Ltd., have ‘traditionally’ been involved in the export of ornamental fish and corals.

It is proposed that changes be made to the fisheries legislation to ensure that the interests of all stakeholders are protected, and also to allow further development of the aquarium fishery through sustainable practices while limiting the number of companies and collection areas

## 2.3 French Polynesia

Georges Remoissenet  
Program manager (Aquaculture)  
French Polynesia Fisheries



*Pseudanthias mooreanus*—an endemic fish from French Polynesia

The aquarium fishery in French Polynesia exports approximately 44,000 ornamental fish per year, mostly flame angels (*Centropyge loriculus*) and red hawks (*Neocirrhites armatus*), which have been exported each year since 2001 with an annual value of USD 230,000. Currently, there are no regulations or quotas governing the export of aquarium organisms from French Polynesia.

There are two active export facilities in French Polynesia: Te Hotu Miti is a commercial enterprise exporting aquarium organisms to USA, while Bora Eco Fish is PCC-based.

In 2003, a PCC-based aquarium trade sector development plan was drawn up. Unfortunately, due to the collection systems used (light traps, crest and 'hoa' nets), there was an insufficient volume of marine organisms being captured that were commercially viable for export. However, several endemics were identified; *Pseudanthias mooreanus*, *P. hiva*, *P. regalis*, *Chromis abrupta* and *C. flavapicis* were identified as having potential value.

Subsequently, the PCC programme in French Polynesia has been revised to incorporate the production of cultured giant clam species. These giant clams are exported, but a significant number are also used for subsistence purposes as the local market demand for giant-clam meat and muscle is estimated to be 70 tonnes annually, which accounts for approximately 1 million giant clams needed each year. In addition, the PCC programme has become further involved in public and private reseeded and lagoon development programmes.

Regulations for giant clam farming (spat collection, grow-out, transport and reseeded) were implemented in 2008. A traceability system is also being developed that will only allow exports of giant clams raised through spat collection. Since January 2008, CITES permits have been issued locally by the French High Commission for export of giant clams.

Research is continuing on improving PCC capture rates for high-value species, making farming techniques more reliable and improving health management of stocks.

## 2.4 Federated States of Micronesia

Marion Henry  
 Assistant Secretary  
 Department of Resources and Development



Coral culture at National Aquaculture Center, Kosrae, Micronesia

The Kosrae National Aquaculture Center is involved in the spawning and rearing of giant clams (*T. maxima* and *T. derasa*) and cultured corals, and experimentation with ornamental fish and artificial live rock (Figure 1).

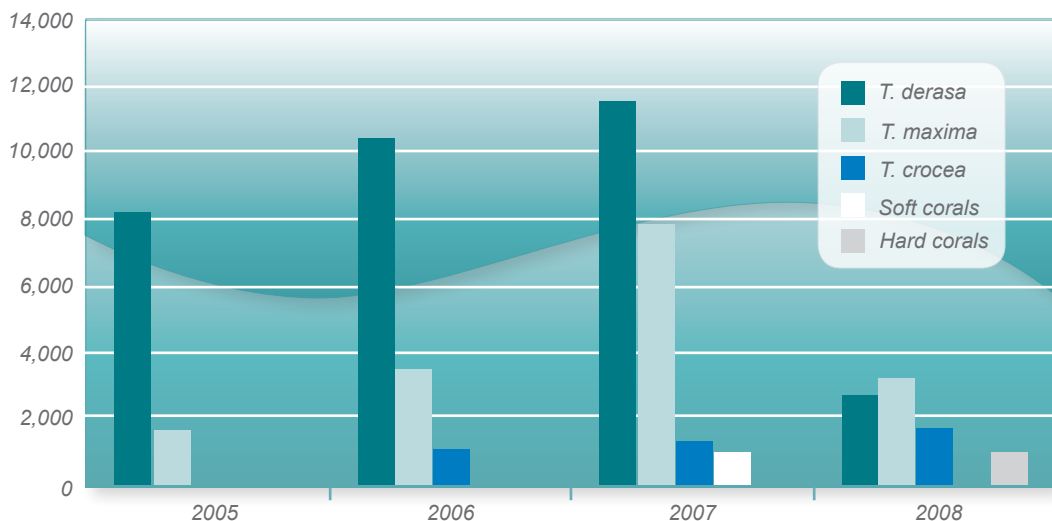


Figure 1: Number of giant clams and corals produced by the Kosrae National Aquaculture Center between 2005 and 2008

Transportation is the biggest issue for expanding the aquarium trade in FSM due to high freight costs, space availability and problems with freight forwarding. Another issue impacting on the export of some aquarium organisms is that FSM is currently not a signatory to CITES.

## 2.5 Kingdom of Tonga

Poasi Fale Ngaluafe

Program manager (Research and Aquaculture)  
Ministry of Agriculture, Food, Forests and Fisheries



Raceways set up at the Sopa Mariculture Center in Tonga

The Government of Tonga began promoting the aquarium trade to generate foreign revenue in the mid-1980s, and now supports many rural, low-income coastal communities through the export of ornamental fish, corals (soft and hard), invertebrates and live rock.

The aquarium fishery in Tonga is regulated by the Tonga Marine Aquarium Fishery Management Plan (see Part VI). Under this management plan, only five operators are approved by the government to operate, and a quota system applies on volumes of aquarium organisms that can be exported by individual companies. In September 2008, a precautionary approach was issued that set a ban on the harvesting of live rock based on sustainability concerns from supplying communities.

Due to the recent ban of live rock and the quota system on other aquarium organisms, exporting companies have taken an increasing interest in the culture of certain aquarium organisms, in collaboration with SPC and the Australian Centre for International Agricultural Research.

## 2.6 Kiribati

Karibanang Aram  
Senior Fisheries Officer

Ministry of Fisheries and Marine Resources

Kiribati entered the aquarium trade in the 1970s. Today, the aquarium trade in Kiribati involves 14 companies and forms a source of income generation for more than 40 households, with Kiritimati Island in the Line group being the main producing area. The flame angel (*Centropyge loricula*) is the dominant species exported from Kiribati and accounts for more than 80% of all annual exports (see Figure 2 for the number of ornamental fish exported). The other main commodity exported is cultured giant clam species. In 2007 the total revenue collected from the trade reached its peak: just over USD 1 million.



Flame angels (*Centropyge loricula*), the most exported species from Kiritimati, that has created controversy

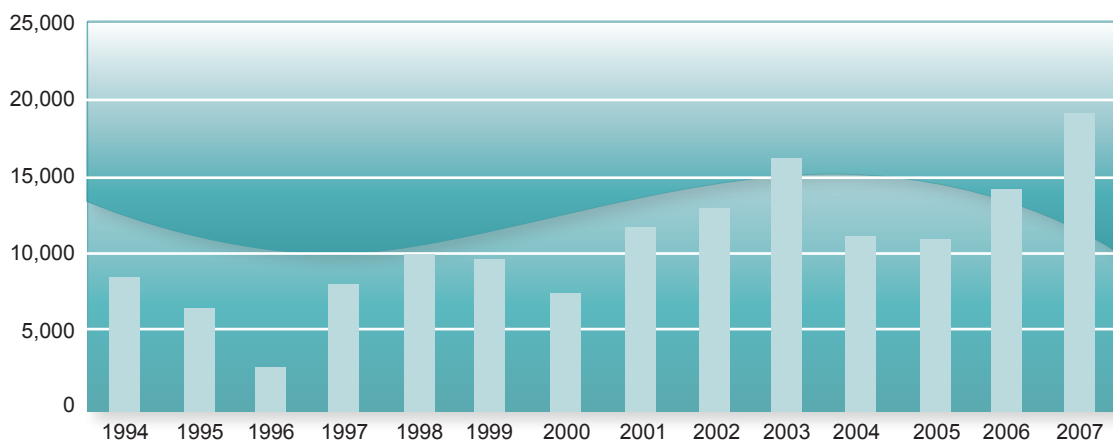


Figure 2: Number of ornamental fish exported from Kiribati between 1994 and 2007

Even though the aquarium trade has potential for further expansion in Kiribati, the management of aquarium organisms is still very weak and needs to be strengthened as past management attempts were not very successful. Management regulations that are to be implemented soon target the collection and export of flame angels only, as it is the main species exported from Kiribati. The new regulation includes an export quota of 9,000 flame angels per month and an export size limit of 60–70 mm. Licensing and permitting are also to be reviewed and improved, as well as the development of area management plans.

The major issues currently faced by exporters involved in the aquarium trade in Kiribati include the undervaluing of exported aquarium organisms; high transportation costs, particularly air freight, due to Kiritimati Island's remoteness; and perceived trade barriers associated with CITES and OIE.

Kiribati lacks the capacity to carry out CITES and OIE requirements and is therefore seeking regional assistance, especially from SPC, to enable Kiribati to become a full member of these two international bodies.



## 2.7 New Caledonia

Yves-Marie Anne  
Rural Development Officer (Aquaculture and Fisheries)  
South Province Fisheries Department



Handling rare angel fish in New Caledonia

There are currently two collectors based in the Southern Province area in New Caledonia who export ornamental fish. Approximately 300–600 conspicuous angelfish (*Chaetodontoplus conspicillatus*) are exported annually, while around 50–100 emperor angelfish (*Pomacanthus imperator*) are exported annually. Domestic sales within New Caledonia account for another 4,000 fish annually; these sales include multiple ornamental fish species.

Management of the aquarium fishery in the Southern Province area includes the need for a special fishing licence and a range of documentation and inspection requirements, plus gear and fishing area restrictions. Fines are imposed for any infringement.

## 2.8 Papua New Guinea

Jeff Kinch

Coastal Management Advisor

SPREP, Samoa

Leban Gisawa

Inshore Fisheries Manager

National Fisheries Authority, PNG



*Fisherman's island shores where communities are involved into collecting aquarium fish*

Despite PNG's extensive reef systems, there has been little attempt to develop the aquarium fishery in the past. This has been due to high costs of transport, complex tenureship systems, and law and order issues.

In 2007, the National Fisheries Authority (NFA) entered into a contract arrangement with a private USA-based consultancy firm, EcoEZ, which is made up of ex-Marine Aquarium Council staff from the Philippines and the Pacific, to develop the aquarium fishery for PNG. NFA has given EcoEZ over USD 3 million to do this. The development of the aquarium fishery in PNG is currently focused around Port Moresby, though resource assessments have been conducted in Oro, Milne Bay, East New Britain, East Sepik, Manus and Bougainville provinces.

A National Marine Aquarium Management Plan was developed by NFA in 2004, and is still in draft form.

Flight connectivity is not considered optimal for direct exporting from the provinces via Port Moresby, particularly when the size of aircraft and originating destinations (with higher freight costs) are taken into consideration.

The growth of an independent aquarium fishery in the provinces will remain doubtful in the short term unless scheduled domestic and international flight services can provide sufficient freight capacity (i.e. adequate aircraft size and runway length), flight regularity (i.e. limited delays or cancellations) and, most importantly, flight connectivity; and acceptable freight rates to shippers.

Under the current situation, the most viable option for the development of the aquarium fishery in PNG will be for the construction of a high-standard land-based holding facility in Port Moresby, which would allow aquarium organisms to be shipped in from provincially based companies for holding, collation and consolidation, and then final export.

The development of a central facility in Port Moresby supplied by provincially based companies raises several questions for the future development of the aquarium fishery outside of the National Capital District (NCD), particularly for companies that wish to be independent operators (i.e. exporting under their own licence and label). There are also questions about the associated added costs and quality control of having another facility package for companies, and equity sharing.

EcoEZ is now exporting from Port Moresby, and has incorporated villages around Port Moresby.

Two companies in the Milne Bay Province are waiting for licences to commence in 2009: SmartFish and Dive Milne Bay.

## 2.9 Republic of the Marshall Islands

Florence Edwards  
 Chief of Coastal and Community Affairs  
 Marshall Islands Marine Resources Authority

Interest in expanding the aquarium trade in RMI has increased over the past few years, with a push for reforms to be made in government policies to allow for this expansion and development along with appropriate monitoring mechanisms and dialogue among stakeholders.

The *Marshall Islands Marine Resources Authority (MIMRA)* is mandated by the *Marshall Islands Marine Resources Act 1997* to regulate the processing, marketing and export of fish and fish products. In addition to the Act, under the National Fisheries Development Plan and the National Fisheries Development Policy MIMRA is required to prepare fishery plans to ensure responsible fishery management practices are followed for any commercial fishery. Subsequently, MIMRA has drafted the Aquarium Trade Policy, Mariculture Development Plan and Marketing, Processing and Export Regulations.



Packing fish in RMI

MIMRA has also taken the proactive role of assisting communities to develop local fisheries management plans and to link these communities with exporters as a means to increase their benefits from participating in the fishery without jeopardising long-term subsistence requirements.

Aquarium organisms exported from RMI include ornamental fish, cultured giant clam species (*Tridacna maxima*, *T. squamosa*, *T. derasa* and *Hippopus hippopus*), cultured hard and soft corals, and other marine invertebrates (Figure 3). The export of live rock ceased in 2007 due to enforcement by RMI's Environmental Protection Agency.

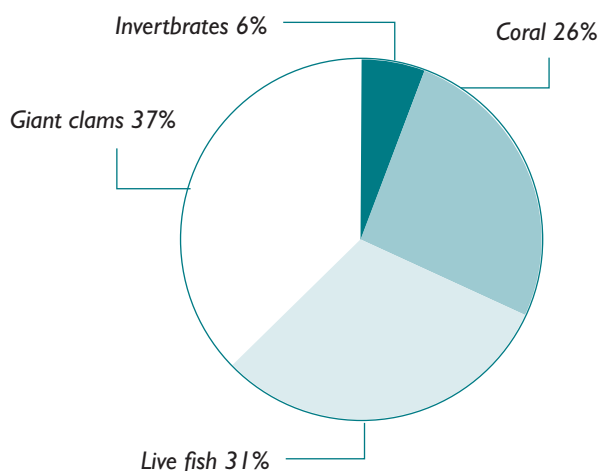


Figure 3: Volume percentage of aquarium organisms exported from Marshall Islands in 2007.

## 2.10 Republic of Vanuatu

Jason Raubani

Acting Principal Fisheries Resource Officer

Department of Fisheries

The aquarium trade in Vanuatu started in 1993. Currently, three companies are actively operating: Sustainable Reef Suppliers (SRS) Ltd, Reef Solutions (Vanuatu) Ltd (RSV) and Reef Life (Vanuatu) Ltd (RLV). These companies export ornamental fish, giant clams, live rock, invertebrates and live sand (Figure 4). The marine aquarium trade in Vanuatu is now the major fisheries export commodity, with an estimated value of around USD 2 million annually.

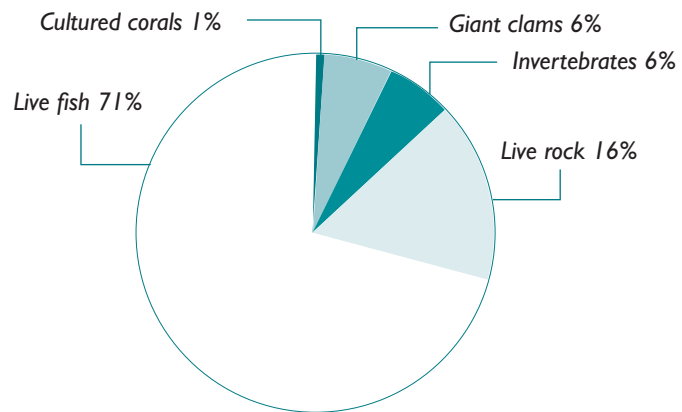


Figure 4: Volume percentage exports of aquarium organisms from Vanuatu between 1995 and 2007.



A day's catch for aquarium fish divers of Vanuatu

The aquarium fishery in Vanuatu is managed by the 2008 Vanuatu National Marine Aquarium Trade Management Plan (see Section VI). The plan recognises the importance of research in culturing of aquarium organisms for export. Currently, a collaborative research project between the Vanuatu Fisheries Department, SPC and the Japanese International Cooperation Agency's Grace of the Sea project is focusing on the production of the highly sought-after and valuable clownfish (*Amphiprion* spp.).

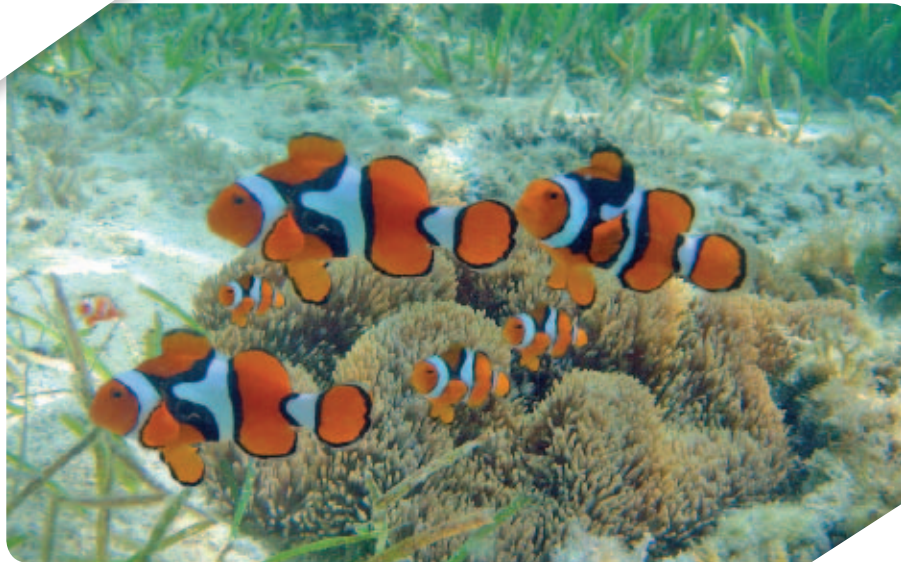
There is already significant progress on the culturing and rearing of giant clams targeted for the export market. At the moment, one of the three exporters is exporting significant quantities of giant clams from its own hatchery. In addition, other companies can purchase giant clams for export from the Vanuatu Fisheries Department's own hatchery.

Furthermore, since the 2008 Vanuatu National Marine Aquarium Trade Management Plan prohibits the export of wild-harvested corals, exporters are now growing their own corals for export. There is significant effort by the Vanuatu Fisheries Department and NGOs to educate people about growing coral for sale to the exporters of aquarium organisms.

## 2.11 Solomon Islands

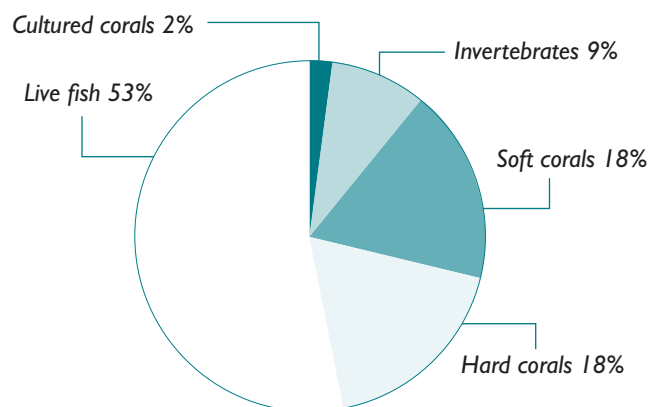
Patrick Mesia  
 Marine Aquaculture Officer  
 Ministry of Fisheries and Marine resources

Jeff Kinch  
 Coastal Management Advisor  
 SPREP



Nemops (*Amphiprion percula*) a popular export from Solomon Islands

The aquarium trade started in Solomon Islands in 1995. Currently, there are two companies involved in the export of live aquarium organisms from Solomon Islands. Both are situated in the Ranadi industrial area of Honiara. Solomon Islands Marine Export (SIME) is involved in coral exports, while Aquarium Arts (Solomon Islands) exports mostly ornamental fish, some corals and invertebrates (Figure 5).



**Figure 5: Volume percentage export of aquarium organisms from the Solomon Islands in 2007.**

Coral exports from Solomon Islands are dominated by *zoanthids* and *Euphyllia* spp. Cultured *Sinularia* and *Acropora* spp. are also popular. In 2007, the top five fish species exported in order of volume were the maroon clownfish (*Premnas biaculeatus*), Clarkii clownfish (*Amphiprion clarkia*), green chromis (*Chromis viridis*), orange clownfish (*A. percula*) and blue tang (*Paracanthurus hepatus*). Invertebrates are dominated by the common sea star (*Archaster typicus*).

There is no specific management legislation on marine ornamental trade that is covered under the current *Fisheries Act 1998*, which is under review, though the *Wildlife Protection and Management Act 1998* regulates export permits of live animals, including aquarium organisms. Solomon Islands joined CITES in 2008.

## **Part III: Industry presentations**

- 3.1 Aquarium Fish (Fiji) Ltd.**
- 3.2 Hawaiian Sealife Inc.**
- 3.3 Kiribati Island Petfish Industry**
- 3.4 Marine Environmental Research Institute of Pohnpei**
- 3.5 Reef Life Vanuatu Ltd.**
- 3.6 Tonga Aquarium Industry**
- 3.7 Walt Smith International**

### 3.1 Aquarium Fish (Fiji) Ltd.

Tony Nahacky  
Director  
Aquarium Fish (Fiji) Ltd.



Sorting catches in the fish room at Aquarium Fish (Fiji)

Aquarium Fish (Fiji) Ltd. provides considerable benefits to communities that have few prospects for income opportunities. At present, the wild harvest of aquarium organisms is the mainstay of the aquarium fishery, simply because not all collecting areas, for a variety of reasons, are suitable for culturing aquarium organisms. In addition, a range of aquarium organisms are not currently commercially viable to culture.

An increasing trend in Fiji Islands that is diverting more and more resources of time and money from the aquarium trade is compliance issues with elements of Fiji Islands legislation and NGO goals. While regulations are important, the issues for compliance are usually not regulations that improve sustainable collection or diver safety. Aquarium Fish (Fiji) Ltd. considers sustainable collection and diver safety to be of the utmost importance, but ironically, some compliance regulations frequently jeopardise both. The problem revolves around regulations that do not consider the needs of the trade, resulting in the aquarium trade being affected by those regulations and, subsequently, their benefits and revenues being affected. Conservation NGOs often add another layer of regulations directly through government lobbying or through requirements for a community to receive NGO benefits.

These problems would be minimised by:

- NGOs and governments identifying and consulting all stakeholders that will be affected;
- governments avoiding a 'one-shoe-fits-all' management style or regulations—for example, having the same SCUBA requirements for a tourist who only occasionally dives and relies on a charter boat as opposed to an experienced collector who is working day in and day out;
- NGOs having a better understanding of aquarium resource management and not applying food fish management to aquarium resource management; and
- NGOs carefully considering their goals and the effects of their goals on a community. Frequently we run

into NGOs that have the goal of alleviating poverty. This is admirable, except that we often find they are replacing substantial income in the community derived from the aquarium trade with an untested business model that at best fails when the NGO no longer funds it or at worst is never commercially viable.

Aquarium Fish (Fiji) Ltd. is one of the few companies that is Marine Aquarium Council certified; this was quite an arduous, time-consuming and costly task that has provided very limited benefits or financial returns for exporting certified aquarium organisms. From Aquarium Fish (Fiji) Ltd's experience, any eco-certification programme, to be successful, needs to be market-based to provide greater market share and price to exporters and collectors. In return for paying a higher price, the end consumer would receive the following assurances:

- their purchase of aquarium organisms did not recklessly endanger collectors;
- their purchase of aquarium organisms did not endanger reefs;
- child labour was not used; and
- a higher standard was used for handling the aquarium organisms.

Eco-certification that results in a higher price to the collector or exporter provides:

- additional income to the collector and exporter to handle the aquarium organisms properly to ensure their health;
- additional income to the collector and exporter to collect or purchase aquarium organisms that have been collected in a sustainable manner; and
- income for increased safety.

Simple forms or guidelines can provide effective collection management. If sustainable collection is considered when ordering or buying specimens, rotation of collecting areas along with low impact on collecting areas can be achieved. For example, the choice of equipment used in collection, such as mesh size, can greatly minimise disruption to non-target species.



## 3.2 Hawaiian Sealife Inc.

Richard Xie  
President  
Hawaiian Sealife Inc.



The yellow tang is an emblematic species from Hawaii and a flagship species for HSL

© Jeremy Claisse

Hawaiian Sealife Inc. (HSL) is one of Hawaii's largest marine ornamental companies. It has been in business for over a decade and has trade relationships in 27 countries around the globe.

HSL is currently expanding its market options through the export of post-larval ornamental fish and the development of collaborative arrangements with the University of Hawaii at Manoa. A school programme whereby students can observe fish growing from the larval stage, an aquarium rental programme and the revitalisation of a local park are several other areas in which HSL is currently involved. Research partnerships around the world have also been formed, including projects with the Oceanic Institute in Hawaii and several institutions in the People's Republic of China.

Even though HSL is expanding its operations in many different arenas, the wholesale business still sits at its core. Most of HSL's sales go to Asia (50%), followed by the North American market (25%), with the remaining 25% marketed to other global destinations. Approximately 300–500 boxes of ornamental fish are shipped out in an average week, with an increasing number of post-larval ornamental fish making up these exports.

Hawaii's aquarium fishery collection laws are becoming more stringent. For example, a recent Bill was presented to the Hawaiian State Legislature that would have effectively shut down Hawaii's aquarium fishery for good, as well as impacting on trans-shipping. Even though the Bill was not accepted by the legislature, Hawaii's Department of Land and Natural Resources will be implementing new restrictions on the collection of ornamental fish. Subsequently, HSL is looking towards developing further market opportunities for post-larval fish collection to promote the Hawaiian marine aquarium trade as an environmentally sustainable fishery.

Best practices for ornamental fish collection practised by HSL include using only experienced divers and using barrier nets. Ornamental fish are held for about a week to insure that they are healthy before shipping.

### 3.3 Kiribati Island Petfish Industry

Tekinaiti Kaiteie  
 Manager/Owner  
 Moving Colours



Loading of aquarium fish onto an air freighter for export on Kiritimati Island, Kiribati

The aquarium trade is one of the main economic activities in Kiribati, with 12 marine aquarium exporters (all locally owned) exporting mostly ornamental fish to Hawaii, which is the main market, but also to Japan and Hong Kong. The main ornamental fish species exported are the flame angel (*Centropyge loricula*), lemonpeel angel (*C. flavissimus*), black tang (*Zebrasoma rostratum*), blue tang (*Paracanthurus hepatus*), goldflake angel (*Apolemichthys xanthopunctatus*), emperor angelfish (*Pomacanthus imperator*), Griffis' angelfish (*Apolemichthys griffisi*) and Marquesas butterflyfish (*Chaetodon declivis*). Ornamental fish are held in open-sea holding facilities.

Issues affecting the aquarium trade in Kiribati include limited flights (one per month), limited flight connectivity that is often complicated by unexpected or unannounced delays and cancellations, and the high costs involved in importing packaging and oxygen cylinders.

## 3.4 Marine Environmental Research Institute of Pohnpei

Simon Ellis

Director

*Marine Environmental Research Institute of Pohnpei*

The Marine Environmental Research Institute of Pohnpei (MERIP) is a not-for-profit corporation registered in FSM. MERIP's mission statement is to promote sustainable development and livelihoods for Micronesians through natural resource conservation, and to research, teach, demonstrate and transfer technologies that allow Micronesians to improve their lives while maintaining core traditional values and minimising impact on the environment. The primary activity at MERIP is culturing corals, using simple fragmentation techniques, for the aquarium trade. Currently, 12 provincial farmers work in partnership with MERIP to grow three species of soft corals (*Sarcophyton* spp. and *Sinularia* spp.) and two species of hard corals (*Acropora* spp.). Another three species of soft coral and four species of hard coral are under development. MERIP maintains a central farm for research purposes and for growing broodstock to distribute to farmers. The central farm also ensures throughput of product to buyers as the local farmers become more proficient in farming techniques.



*Planting coral at one of the MERIPs farm site in Pohnpei*

Corals were selected as an ideal product for culturing at the community level because they have high value, have few predators, are easy and cheap to culture, have very low environmental impact, and are sustainable. Substantial time and effort is spent training farmers in proper culturing techniques so as to improve economic and environmental viability of the farms, as well as improving quality and colour.

Farmers are generally chosen from communities that are supporting one of the 11 marine protected area (MPA) developments in Pohnpei. Interested farmers receive all the necessary equipment and training to begin farming. MERIP then purchases the corals back from the farmers and handles all marketing aspects. Cultured corals are sold primarily to established, regionally based wholesalers in Kosrae, FSM and the Marshall Islands Mariculture Farm (MIMF) based in Majuro, RMI (the major buyer). MIMF is owned by the 'aquaculture only' Florida, USA-based company Ocean, Reefs and Aquariums, which has substantial marketing power. Constraints to the further development of coral culturing are primarily the perennial shortage of cargo space with the single commercial air carrier in the region, Continental Airlines.

MERIP will soon be experimenting with light traps for the capture of post-larval ornamental fish.

### 3.5 Reef Life (Vanuatu) Ltd.

Kaltabang Kalmet  
Manager  
Reef Life (Vanuatu) Ltd.



Reef Life (Vanuatu) Ltd. set up in Vanuatu

Reef Life (Vanuatu) Ltd. has been in operation since 2000, and has a sister company in Tonga, Dateline Aquarium Fish. Reef Life (Vanuatu) Ltd. currently operates in four different locations around Efate Island. Royalty fees are given to the ‘traditional’ owners of the area of collection. Reef Life (Vanuatu) Ltd. employs two expatriate divers from the Philippines to train ni-Vanuatu divers. Aquarium organisms exported include ornamental fish, giant clams (*Tridacna squamosa* and *T. maxima*), coral (*Acropora* spp.) and live rock.

## 3.6 Tonga Aquarium Industry

Koli Moa Kakala  
*Island Marine Tropical Export*



*Holding fish prior to export in one of Tonga's operators facilities*

The aquarium trade in Tonga mainly exports to the USA market, though one company has recently begun exporting to Japan and Hong Kong. Cultured giant clams and corals are also inconsistently exported to Europe.

Harvesting and collecting zones for aquarium companies are allocated by the Tonga Fisheries Division, with each exporter having specific quotas for individual aquarium products (ornamental fish: 100,000 pieces annually/exporter; live rock: 100 tonnes (recently banned); hard corals: 150 pieces per week; unlimited quotas for soft corals, invertebrates and cultured organisms). On each export, 10% is paid as resources rent to communities.

Factors affecting the aquarium trade in Tonga include limited flights to USA (one direct flight per week), while commercial ability has been affected by the Tongan government's ban on the export of live rock. The alternative route via Auckland will add extra costs and time in transit.

### 3.7 Walt Smith International

Walt Smith  
Owner/Director  
Fiji/Tonga



*Cultured rocks drying tables at WSI set up in Fiji Islands*

Walt Smith International (WSI) has been operating in the region for the past 20 years. It has a company in Tonga exporting mostly wild-caught fish, corals and invertebrates; live rock exports were banned from Tonga in September 2008. The main parent company is based in Fiji Islands and handles mostly live rock, as well as live corals, fish and invertebrates.

Due to concerns by environmentalists, but also to broaden its product line, WSI has expanded into culturing corals and making artificial live rock (made from cement, sand and volcanic pumice) in the ocean. Artificial live rock, once cured, is left in the ocean for 18–24 months. Cultured corals are fragged on site and placed on racks to grow for 6–12 months, depending on the species.

Recently and as a result of the ban on live rock and the drop of the coral quota in Tonga to 150 pieces a week (per exporter), WSI, the Tonga Fisheries Division and SPC's Aquaculture Section have started working on an aquaculture project targeting both of these commodities, hoping that some of the live rock quota can be reinstated for companies that venture into aquaculture activities.



## **Part IV: Organisations**

- 4.1 Coral Reef Initiatives for the Pacific**
- 4.2 Secretariat of the Pacific Community**
- 4.3 Secretariat of the Pacific Regional Environment Programme**
- 4.4 University of the South Pacific**
- 4.5 The WorldFish Center**



## 4.1 Coral Reef Initiatives for the Pacific

Eric Clua  
 Managing Director  
 CRISP, New Caledonia



Example of relevant literature being produced by the CRISP project

CRISP started in 2006 and is dedicated to supporting the sustainable development of coral-reef-related activities in the Pacific through collaborative arrangements with SPC and SPREP, and actions implemented by different technical partners, such as universities, research centres, NGOs, consulting agencies and private companies. Among all the actions developed by CRISP the economic development of reef resources has been a priority, and the focus has been on on bio-prospecting and the creation of sustainable fisheries markets, in particular PCC.

CRISP actions dedicated to developing PCC have been implemented following the leadership of Ecole Pratique des Hautes Etudes—Centre National de la Recherche Scientifique in French Polynesia and Wallis and Futuna, and the University of the South Pacific (USP) in Fiji Islands.

At USP, a French postgraduate student has been conducting research on post-larval re-seeding techniques as a spin-off from capturing post-larval fish for grow-out for the aquarium trade, while a Fijian student provided a description of the zooplankton from which the larvae originated, thus providing useful information for better understanding larval growth prior to capture. An aqua-farm has been established at USP, along with various fish-larvae identification tools and a post-larvae rearing manual.

Following on from the PCC work with fish larvae, research and development work has expanded to encompass studies on crustacean larvae capture and grow-out potential in term of marketing, particularly regarding the mantis shrimp (Squillidae), a high-value crustacean. Other research activities under CRISP have focused on examining the relationship between successful larvae colonisation and the degree of coral habitat damage.

CRISP has also been involved in conducting reviews and assessments of the economic and legal issues surrounding the aquarium trade and its further commercial development. A French Polynesia study focused on the overall strategy to be adopted to ensure that the French territory plays a major role in the development of PCC regionally, while reviews in Fiji Islands suggested recommendations for adjusting current management legislation in the aquarium trade there, as current legislation restricts the export of post-larval organisms.

The main objective of CRISP now is to support the further development and commercial viability of post-larvae markets regionally. The focus is on conducting further applied research to improve the capture of high-value species, and the development of a post-larvae export pilot operation in Kiribati based on a joint venture between the French and American companies Ecocean and Hawaiian Sea Life respectively. Further research is also being conducted on implementing an eco-certification programme for post-larval organisms. In the long run, the trade of PCC organisms for the aquarium trade will need to be linked to a regional approach, ensuring that demand and supply are viable.

## 4.2 Secretariat of the Pacific Community

Being Yeeting  
Senior Fisheries Scientist

Ben Ponia  
Aquaculture Advisor

SPC, New Caledonia

SPC's goal in this area is to 'provide technical assistance and support to SPC member countries and territories in developing and managing sustainable marine aquarium trade operations'. To achieve this goal, a range of activities are undertaken, including:

- developing and implementing marine aquarium trade management plans and monitoring programmes where needed in PICTs;
- building local technical capacity in resource assessment and data collection protocols;
- assisting PICTs to set up and implement local research projects to collect the biological information needed for management, including resource surveys;
- developing a suitable data repository system to support the monitoring and management of the industry;
- providing training on best trade practices in collection, handling and packing of fish to improve and maintain quality of fish; and
- improving availability of information and awareness about the trade to local communities.

## 4.3 Secretariat of the Pacific Regional Environment Programme

Jeff Kinch  
Coastal Management Advisor  
SPREP, Samoa

SPREP's core business under the Island Ecosystem Programme (IEP) is to address the issues of ecosystem conservation, sustainable management of natural resources, and protection of priority threatened species from the threats of human-induced impacts, invasive species and living modified organisms. These issues require action at the local, national, regional and international levels. IEP subsequently focuses on developing the capacities of the peoples of PICTs to equip them to sustainably manage and conserve their terrestrial, coastal and marine ecosystems and associated natural resources, including aquarium organisms. This reflects a fundamental commitment by SPREP to sustaining the livelihoods of the peoples in PICTs today and tomorrow by supporting ecosystem management and species conservation.

SPREP has previously been involved in management of the aquarium trade through support from the Canada-South Pacific Oceanic Development Program, International Coral Reef Action Network, European Union and MacArthur Foundation. Activities have focused on financial assessments of the coral trade in Fiji Islands and Solomon Islands, as well as general management and best practices arrangements.

## 4.4 University of the South Pacific

Edward Lovell

Lecturer

Division of Marine Studies;

School of Islands & Oceans Faculty of Science, Technology and Environment

USP, Fiji Islands

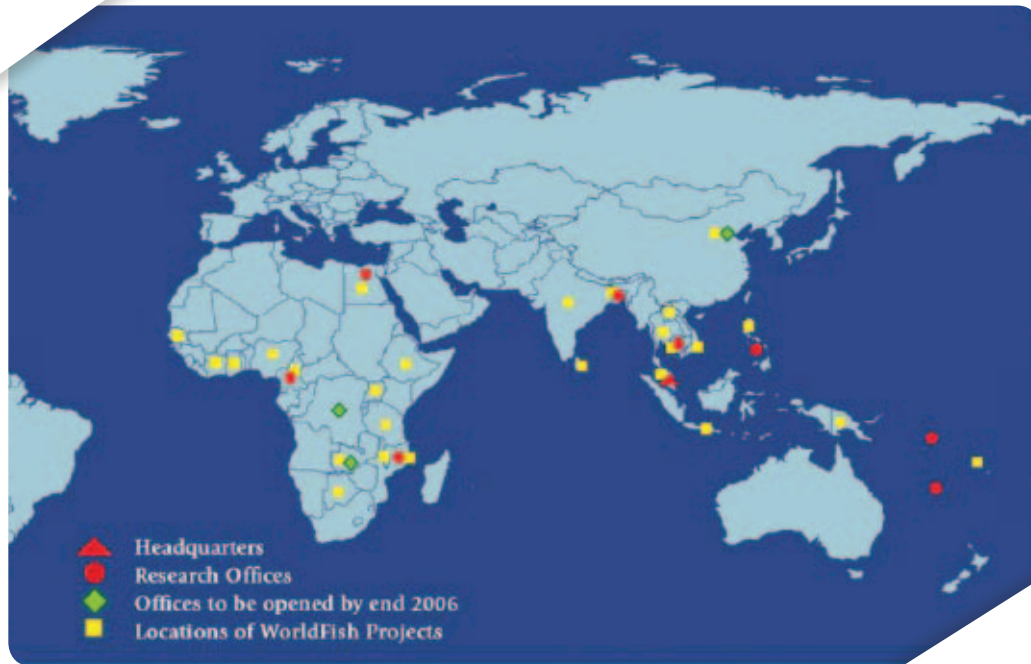
The aquarium fishery is important to the livelihoods of coastal people. As such, USP's School of Marine Studies and Institute of Marine Resources have been involved in resource, environmental impact and CITES non-detriment finding assessments for both the coral fishery and live rock collection. The Institute of Applied Science has been actively supporting the Fiji locally managed marine areas (FLMMA), which promote the culturing of live rock in several communities.

Specific research programmes conducted at USP include post-larval fish capture and culture with potential for aquarium trade items and re-stocking food fish. Another project comprises the assessment of Fiji Islands' legislative framework for the trade in aquarium fish. Currently, this information is central to the Forum Fisheries Agency review of the *Fiji Fisheries Act*. In the classroom, various facets of the fishery and issues, particularly with regard to CITES legislation, are presented. Postgraduate research in aquarium fisheries topics is encouraged.

Linkages exist with participation with the Department of Environment CITES secretariat. USP has published a number of reports on the fishery, including the Marine Aquarium Council's certification requirements and an overview assessment by the World Wide Fund for Nature. It provides awareness regarding the fishery, CITES, and the taxonomy of coral, other benthos and fish as part of curriculum course work.

## 4.5 The WorldFish Center

Warwick Nash  
Pacific Regional Director  
WorldFish Center  
New Caledonia  
(now with Queensland Primary Industries and Fisheries)



The WorldFish Center in the world

The mission of the WorldFish Center is ‘to reduce poverty and hunger by improving fisheries and aquaculture’. To maximise development impact, the Center focuses on addressing two ‘development challenges’. The first is Developing Resilient Small-Scale Fisheries, and the other is Sustainable Aquaculture. The WorldFish Center believes that focusing on these activities provides the best opportunities for investments in fisheries and aquaculture to contribute to wider global development agendas and goals. Activities within the Sustainable Aquaculture development challenge include:

- improving market environments to support and foster aquaculture investment that benefits the poor;
- identifying and addressing barriers to entry by the poor in value-added market chains; and
- strengthening the role of public–private partnerships in addressing key market constraints to aquaculture development.

Livelihoods projects in Solomon Islands implemented by the WorldFish Center aim to provide income and livelihood opportunities in a socially and ecologically appropriate way through the culturing of giant clams (*Tridacna* spp.), soft and hard corals, invertebrates (particularly blue-banded coral shrimp, *Stenopus hispidus*; and lobsters, *Panulirus* spp.) and sponges; and black-lip pearl (*Pinctada margaritifera*) farming.



## **Part V: Special topics**

- 5.1 Convention on international trade in endangered species**
- 5.2 Community approaches and sustain livelihoods**
- 5.3 Current status and prospects for cultured giant clams**
- 5.4 European Union's legislation for live aquatic ornamental imports**
- 5.5 Live Reef Fish Database**
- 5.6 Post-larval collection in Hawaii**

## 5.1 Convention on international trade in endangered species

Jeff Kinch  
Coastal Management Advisor  
SPREP, Samoa

Complementing subsistence and artisanal resource utilisation, the harvesting of aquarium organisms has provided and can provide economic opportunities to improve the lives of peoples residing in PICTs, and can also under the right circumstances provide long-term incentives to conserve reef ecosystems, which are typically very high in biodiversity.

At present, several PICTs are members of the Convention on International Trade in Endangered Species (CITES) (Table 5).

Table 5: PICTs that are signatory to CITES

Country	Signatory Year
Australia	1976
Fiji Islands	1997
France (including its Pacific dependents)	1978
New Zealand (including its Pacific dependents)	1989
Palau	2004
Papua New Guinea	1976
Samoa	2004
Solomon Islands	2007
Vanuatu	1989
USA (including its Pacific dependents)	1975

CITES has three appendices that list species of wildlife. Each appendix has different requirements and levels of protection. All aquarium species exported from the Pacific are listed in Appendix II (Table 6).

Table 6: Aquarium species listed on the CITES appendices

	Fish				Invertebrates	
Organism	Labridae		Syngnathidae		Tridacnidae	
Common name	Maori Wrasse		Pipefishes, seahorses		Giant clams	
Scientific name	<i>Cheilinus undulatus</i>		<i>Hippocampus</i> spp.		<i>Tridacnidae</i> spp.	
	Corals*					
Organism	Scleractinia	Antipatharia	Helioporidae	Tubiporidae	Milleporidae	Stylasteridae
Common name	Stony corals	Black corals	Blue corals	Organ-pipe corals	Fire corals	Lace corals
Scientific name	<i>Scleractinia</i> spp.	<i>Antipatharia</i> spp.	<i>Heliopora coerulea</i>	<i>Tubiporidae</i> spp.	<i>Milleporidae</i> spp.	<i>Stylasteridae</i> spp.

\* 880 species in 120 taxa

An Appendix I listing offers the highest protection for any species under CITES and includes species that are threatened with extinction and potentially at risk from international trade. Trade in wild-collected specimens of these species is subject to particularly strict regulation and only authorised in exceptional circumstances.

An Appendix II listing of a species does not necessarily mean that it is currently threatened with extinction, nor that trade in that species will be limited; however, any such trade must be determined not to be detrimental to the survival of the species in the wild, and should only involve specimens that were obtained in compliance with national laws for the protection of fauna and flora. Appendix II includes species that may become threatened if their trade is not effectively regulated. All hard-coral taxa are listed in CITES Appendix II.

To ensure that trade in an Appendix II-listed species is non-detrimental, a number of steps must be completed prior to export. First, the scientific authority of the state must advise that the export would not be detrimental to the survival of the species. Second, the management authority of the state must be satisfied that the specimens were not illegally obtained. The scientific authority may also determine that limits should be placed on the export of a species in order to maintain it throughout its range at a level consistent with its role in the ecosystems in which it occurs. Annual quotas are one example of such limits. The management authority is ultimately responsible for the issuing of permits.

In relation to importation of Appendix II-listed species, the importing state must require the prior presentation of the export permit or re-export certificate. Some importing states, most notably the members of the European Union, have taken stricter measures and require the prior issuance of an import permit before Appendix II specimens can be imported. If a species is re-exported, the re-exporting state's management authority must be satisfied that the species was imported in accordance with CITES provisions.

The main purpose of Appendix III is to provide assistance to a party in the enforcement of its national regulations for a species subject to exploitation for international trade. In practice this circumstance usually arises when there is a significant level of illegal trade that the party needs the cooperation of other parties to address. The listing in Appendix III therefore provides for this cooperation through enabling CITES parties to apply their domestic laws to ensure that trade in the listed species occurs in a manner consistent with the laws of the state of origin for that species.

Unlike with species listed in Appendix II, parties issuing export permits for Appendix III specimens are not required to ensure that exports are within sustainable levels, i.e. to make a 'non-detriment' finding. Exports from parties that are range states for the species that are not listed in Appendix III must be accompanied by a certificate of origin.

For continued development of the aquarium fishery in PICTs, several issues with CITES need to be addressed:

- the need to strengthen capacity of designated authorities in PICTs to make non-detrimental findings;
- the need to ameliorate responsibilities between these authorities (i.e. Environment and Fisheries departments);
- the need for training in taxonomic identification of individual species in trade (particularly for customs officers);
- improvement of export data collection;
- enhancement of administrative capacity in PICTs that will ensure adequate financing and regulatory ability for the issuance of CITES permits; and
- continued investigation and better marketing of cultured organisms/products and their amelioration with CITES' position on sea-ranching and propagation.



## 5.2 Community approaches and sustainable livelihoods

Cletus Pita Oengpepa

Manager

WorldFish Western Pacific Research Center

Solomon Islands

In recent years, the WorldFish Center has conducted a number of scientific research projects investigating the life cycle of marine organisms used by the coastal inhabitants of the Pacific Islands, and their suitability for aquaculture. They include giant clams and corals and, more recently, post-larval fish species, as well as black-lip pearl oyster. The results of this research have been embedded in a community-based approach to support resilient small-scale fisheries management in Solomon Islands through partnerships with community-based organisations, NGOs and national and provincial fisheries departments. Such collaborations have paved the way for the WorldFish Center to gain a better understanding of community governance and to be better acquainted with socio-economic status, cultural norms, social structure and stratification, resource utilisation, conflict resolution and community leadership and governance.



Community members installing a crest net for capturing post larval shrimps in Solomon islands

Training workshops in the technical aspects of culturing aquarium organisms have been held to impart concepts and skills and to transfer technology to community members, with the goal being to build capacity and increase community confidence for participation in such activities. This type of participatory approach is also fundamental to building esteem for successful implementation and continuation of the aquarium trade into the future. Through these training workshops, a broad spectrum of knowledge has been able to be imparted to the communities, and in turn, trainers have been able to gain a better understanding of community responses and behaviour towards cash income-generating opportunities, the community's patience in adopting new concepts, and the degree of continued support required in terms of supervision and monitoring.

Given the significant impact of high fuel prices on the return to village farmers in getting aquarium organisms to market, positive economic gains for communities participating in the aquarium trade are more likely for villages near airstrips and urban centres or with regular shipping access. The model that the WorldFish Center is currently working with involves a central (provincial) depot to operate as a holding facility to consolidate and move aquarium organisms to the exporter on demand. Future work will focus on investigating new opportunities in the overseas market and to better understand the opportunities and constraints for aquarium trade intermediaries. Equally important to the study is accessibility to infrastructure for reliable communication.

National fisheries and aquaculture regulations are currently being reviewed and the results should provide an opportunity to comprehensively integrate laws regulating the aquarium trade in order to sustain the growth of the fishery. Relevant authorities, such as the Ministry of Fisheries and Marine Resources and the Ministry of Environment, Conservation and Meteorology, NGOs and research institutions like the WorldFish Center are working together to identify and remove barriers influencing the economical, legal, social and political factors of the aquarium trade for Solomon Islands.

## 5.3 Current status and prospects for cultured giant clams

Antoine Teitelbaum  
Aquaculture Officer

Kim Friedman  
Senior Reef fisheries Scientist

(now with Western Australia's Department of Environment and Conservation)

SPC, New Caledonia

Studies into giant clam aquaculture initiated in the early 1980s developed the tools to mass-produce and culture all eight established species of giant clams. Altogether, 17 countries and territories of the Indo-Pacific region artificially propagated and cultured giant clams as a method for creating an export market for clam meat.

Over the past decade, the decline in production recorded after the initial phase of research is being reversed. There is now a resurgence of interest as government projects make way for private investment. Today there are more than 10 private ventures and 15 government-linked operations raising clams for the lucrative and well-established global aquarium market (Figure 6).



Cultured giant clams at harvestable size for the aquarium market.

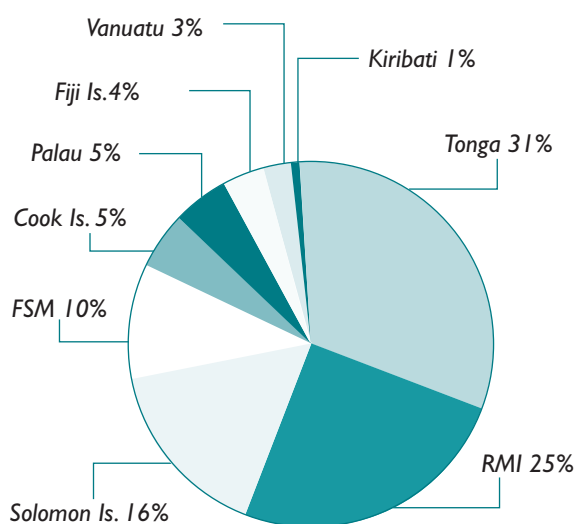


Figure 6: Production of giant clams per country over the last 10 years

The current global production of wild and cultured giant clams is estimated at not more than 200,000 pieces per year. Traditional supply of wild live clams practised by Vietnam, Vanuatu, Solomon Islands and Fiji Islands has decreased, with major cultured clam suppliers emerging in Tonga, Marshall Islands and Solomon Islands. Recently, French Polynesia has developed a new aquaculture model that could see it dominate one sector of the giant clam aquarium market.

Profitable export of live products from the Pacific needs to overcome relatively high production and transport costs in an area where infrastructure is often limited. However, most Southeast Asian countries don't allow the trade of Tridacnid species, which has left small island nations in the Pacific with an excellent marketing opportunity. Furthermore, the ease of access to natural resources (broodstock), the pristine water quality at farming sites, and the ingenuity of private enterprise make giant clam farming a suitable activity for Pacific Island nations

## 5.4 European Union's legislation for live aquatic ornamental imports

Dale Hamilton

Bio-security and Trade Consultant, Vanuatu

EU has previously considered live ornamental aquatic species a relatively low-risk commodity for imports. However, beginning in 2006, increased concerns over possible disease risks resulted in the introduction of new legislation regulating imports of these species (*Decision 2006/656, Directive 2006/88 and Regulation 1140/2008*, which is currently in draft). This legislation includes:

- the ability of the EU to assess the capacity of exporting countries and their 'competent authorities';
- specific diseases of concern and those species considered susceptible;
- specifically approved exporting countries, using OIE membership as a minimum requirement; and
- new certification requirements regarding diseases of concern.



Every shipment sent out of the Pacific region must match international export regulations.

As of April 2007, the new legislation had been applied only to live aquatic ornamental fish imports and not to live ornamental molluscs and invertebrates. However, by July 2009 the legislation will apply to all ornamental species. Exporters also need to be aware that individual EU member countries have the ability to choose to implement the legislation prior to the final implementation date of 30 June 2009.

Currently only four PICTs are OIE members and the new legislative requirement for OIE membership is a direct threat to the ability of many PICTs to trade in live aquarium organisms. As a result SPC has begun negotiations with EU with a view to seeking an exemption from the OIE membership requirement for PICTs, proposing to EU that the imposition of OIE membership represents a non-technical barrier to trade and that the diseases and species listed as of concern are not relevant to the Pacific. It is important to note that the exemption being sought is only for exports of live ornamental species that are not listed as being susceptible to the diseases of concern in the EU legislation, and that are destined for import only into a closed ornamental facility. With the exception of some crustacean species and their susceptibility to white spot disease (*Ichthyophthirius multifiliis*), all of the species listed are either freshwater species or marine species that do not occur in the Pacific or are not exported by SPC member countries.

In response to SPC's proposal, EU has expressed a willingness to consider granting this exemption. Although an encouraging development, the final outcome is uncertain and will depend heavily upon the effective establishment of a regional animal health reporting system for SPC member countries, and upon their ability to participate in the reporting system. This system will mean that non-OIE member countries will be able to report regularly on their aquatic animal health status. The lack of this sort of disease-reporting capacity is

one of the major concerns of EU and part of the reason they imposed OIE membership as a requirement for exporting countries.

Implementation of the proposed regional animal health reporting system is planned to begin in 2009, and SPC will keep member countries informed of its progress.

## 5.5 Live Reef Fish Database

Being Yeeting  
Senior Fisheries Scientist (Live Reef Fisheries)  
SPC, New Caledonia

The purpose of the Live Reef Fish Database is to store and provide research, catch and export data.

The collection of fisheries-dependent data will include:

- catch—by species/area: numbers, length frequency;
- effort—by area/method: number of collectors, collecting time;
- Fisheries-independent Data;
- resource survey data—species, sizes, densities, stock; and
- status reef habitat and coverage—coral types, live rock

Industry and export data will involve the collection of information on:

- operator's monthly records—species/size: numbers collected, exported, mortalities—biological samples; and
- customs shipment/packing lists—export volume, value

Other Information that will be collected and collated includes:

- trade information—prices, market buyers, supplies; and
- technical information—research studies, reports, best handling practices

Data collected within PICTs will be entered on a stand-alone country database that is 'mirrored' to the regional database. Visual presentation of results will include:

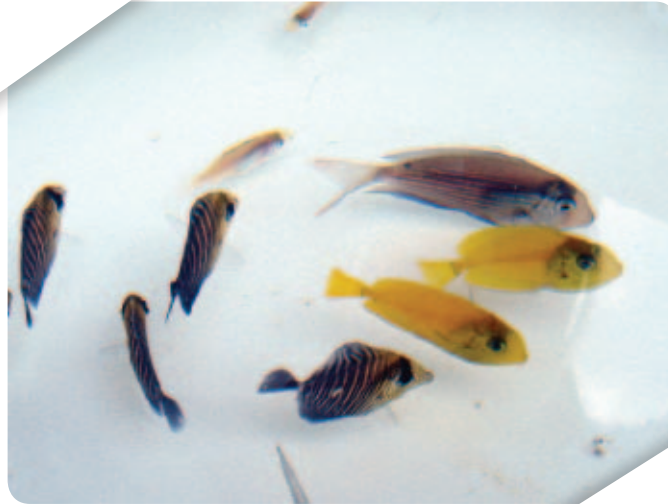
- monthly exports by species and company for quota tracking;
- catch-per-unit-effort trends to monitor health of the resource;
- mortality rates per company as a check to best practices; and
- annual or bi-annual resource surveys to check status of stocks

## 5.6 Post-larval collection in Hawaii

Richard Xie

President

Hawaiian Sealife Inc., Hawaii, USA



*Surgeon fish post-larvae collected with light traps*

Post-larval fish collection involves the collection of fish that have completed their larval pelagic stage but have yet to settle on a reef. HSL began using floating light traps in September 2008 to collect these fish during the night. The post-larval fish are then held for several weeks in a grow-out facility and trained to eat dry food before they are sold in the aquarium market, mostly in Asia.

Post-larval fish collection has taken place in many different PICTs but none of these operations has proven commercially viable, with the rate of failure mainly due to the small size of the collections and the fact that the aquarium trade is accustomed to trading in adult and sub-adult ornamental fish.

By creating a 'hub and spoke' model of business, HSL is attempting to promote more post-larval fish into the aquarium trade by acting as a wholesaler for all PICTs that are collecting post-larval fish. By increasing the number of nets being used at each location, it is considered by HSL that post-larval fish collection can become profitable for collectors. HSL is a well-established wholesaler with approximately 400 customers in 27 countries and can therefore use its established trade connections to promote post-larval fish in the aquarium market much more efficiently and effectively than any one collector could on their own.

In order for HSL to be able to promote post-larval fish collection as a sustainable form of harvest for the aquarium trade, it will need significant infrastructure improvements in both PICTs and at its base of operations in Honolulu, Hawaii, USA. Collectors in PICTs will also need to be taught how to capture post-larval fish and maintain them for a few days or weeks before they can be exported to Hawaii. Finally, international collaborations such as this need individuals who are able to foster partnerships and work in an independent fashion. Once all of these factors are accounted for, HSL feels it can be the catalyst for a more sustainable and therefore more environmentally friendly aquarium trade.

## **Part VI: Management**

- 6.1 Fiji's National Management Plan for the Aquarium Trade**
- 6.2 Risk Based Assessments for the Aquarium Trade**
- 6.3 Tonga Marine Aquarium Fishery Management Plan**
- 6.4 Vanuatu Marine Aquarium Trade Management Plan**

## 6.1 Fiji's National Management Plan for the aquarium trade

Edward Lovell

Lecturer

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Faculty of Science, Technology and Environment

USP, Fiji Islands

In Fiji Islands, the aquarium fishery is co-managed by the departments of Fisheries and Environment. The latter is responsible for compliance with CITES, which applies to hard corals and live rock. The Fisheries Department is responsible for licensing, collection and export permits. Regarding the latter, the department has a dedicated database for compiling export data for CITES purposes. This ensures quota compliance and is used in determining sustainability and advising the CITES Non-Detriment Findings Committee. The Fiji Islands Fisheries Department is also the secretariat for the Fiji Marine Aquarium Council (FMAC), which is made up of all parties (e.g. traders, government and NGOs) interested in the management of the aquarium fishery. Fiji aquarium exporters are members of the Marine Ornamental Trade Association (MOTA), which allows policy discussion and takes a proactive approach to the management of the aquarium fishery from the trade point of view. The Fiji Department of Environment is responsible for the CITES secretariat, which includes the Scientific Council and Management Authority. Fiji Animal Health and Quarantine is responsible for issuing OIE permits for live fish for export to Europe. The aquarium trade must comply with the *Endangered and Protected Species Act (2002)*, which forms the basis of CITES wildlife protection and allows for aquarium fishery regulation.

Currently, there is an absence of a detailed legislative base within the Fiji Fisheries Department for managing the aquarium fishery, though two legislative reviews were recently conducted with support from CRISP. Up until now, management of the aquarium trade has evolved through setting of policy and guidelines within the broader *Fisheries Act*.

Under this ad hoc management arrangement, there is a moratorium on the number of companies, which is limited to five at present (two export live fish and coral, and three ship live rock). There is also a 'One Area—One Operator' rule, as the presence of multiple users competing for the same resource is considered detrimental to the intensity of removal and management of collection areas. Aquarium traders are also required to develop collection area management plans.

Aquarium organism collectors are not allowed to collect in:

- tourism areas near a resort or hotel;
- an area closer than 100 meters to any dive mooring;
- recognised subsistence fisheries areas; and
- designated MPAs

### Live coral

Collection practices for corals include:

- collecting approved species and quantities as listed in the national quota;

- limiting collateral damage to corals or other invertebrates in proximity of targeted coral;
- minimising mortality through best-practice collection techniques; and
- collecting only where there is dense coral growth.

Coral export quotas have been self-imposed in lieu of CITES non-detriment findings. These quotas are based on previous exports. There are 55 CITES-designated taxa, which comprise both generic and species categories. Twenty-seven of these are genera, with 28 at the species level. Non-scleractinian coral comprises three genera and two species. Eleven generic categories have a zero quota so no species are allowed for export. Thirty-six genera containing 81 species are not contained in the quota and are likewise not allowed for export. Quotas have remained unchanged for the last six years despite applications for a reallocation of taxa and quantities. An arbitrarily mandated 25% reduction by government prompted action for detailed resource assessments, which have been conducted by USP and the Fiji Fisheries Department. The resource assessments in the Aquarium Fish (Fiji) Ltd and Walt Smith International collecting areas will form the basis for quota setting and be central to the non-detriment findings. Cultured corals are also increasingly propagated.

## Live rock

Live Rock collection best practices include:

- not compromising the basic habitat structure of the reef;
- focusing collection on the outer flat reef crest zone, where regeneration is rapid; and
- ensuring that the elevated ‘algal rim’ structure of the crest zone is not altered

The production of artificial live rock will progressively minimise wild collection and thus ensure the sustainability of this all-important commodity in the aquarium trade.

## Ornamental fish

Ornamental fish collection involves the prohibition of:

- breaking of coral colonies to get at fish; and
- use of chemicals such as cyanide and ‘traditional’ root poisons (*Derris* spp. or Duva)

Management for the aquarium fishery has evolved over time, benefiting through experience in understanding the needs of the aquarium fishery while having the flexibility to adapt to changing conditions of the trade in both Fiji Islands and foreign markets. Now, with the recent legislative reviews supported by CRISP, the adaptability that has underpinned the current success in management must be maintained.



## 6.2 Risk based assessments for the aquarium trade

Anthony Roelofs

Senior Fisheries Biologist

Queensland Department of Primary Industries and Fisheries, Australia

Queensland's Department of Primary Industries and Fisheries (QPIF) is utilising a risk-based approach to sustainably manage the aquarium fishery in Queensland. The risk-based approach is developed from the Australian Ecological Sustainable Development Framework, which is based on best-practice methodology outlined in the Australian and New Zealand Standard Risk Analysis.

The aquarium fishery in Queensland is small relative to the global aquarium trade; however, it operates within an extensive area along the Queensland east coast (approximately 2,300 km in length) and includes the Great Barrier Reef Marine Park, which has several spatial closures ('green zones').

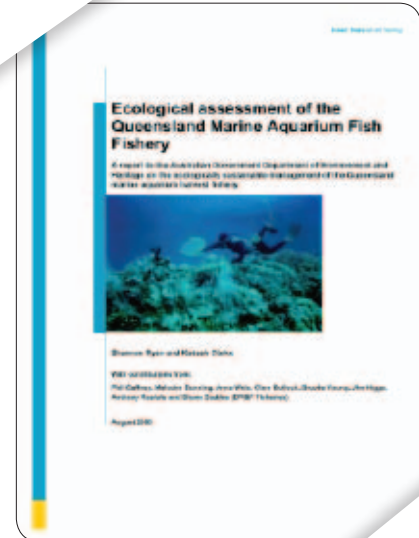
Management of the aquarium fishery is via input (e.g. limited entry, limited diver numbers, gear restrictions and spatial closures) and output (e.g. in-possession and size limits, and quotas) controls.

The QPIF risk-based framework uses a five-stage process, comprising a staged approach to the risk identification phase, incorporating comprehensive pre-assessments of the vulnerability and sustainability risks to species collected in the aquarium fishery, and formally implementing performance measurements based on the outcomes of the risk assessments in the monitor and review phase.

Risk-based management has several key advantages over traditional stock-assessment-based fishery management. A major benefit, and one that has been key to its acceptance by QPIF, is that it is both cost and time effective and helps prioritise future management and resource needs.

The risk-based approach is also supporting QPIF's efforts in moving towards an ecosystem-based management approach to fisheries by being based on a comprehensive assessment of risks to the sustainability of other species that may be indirectly impacted by the aquarium fishery. Vulnerability, sustainability and ecological risk assessments are important first steps in this process and provide a subset of priority species from each fishery requiring specific management measures to ensure sustainability.

This framework provides Queensland and the Australian Commonwealth with an alternative method to meeting non-detriment use requirements for CITES. QPIF's risk-based assessment offers an accepted approach to determining and managing the risks to the sustainability of species and ecosystem components on which the aquarium fishery is based. A risk-based approach can also be used in lieu of quantitative resource assessments for aquarium organisms where these are not feasible or achievable, by comprehensively assessing the risk to each species using the most up-to-date qualitative and quantitative information available on life history strategies and ecosystem requirements. It is a transparent and participatory process that achieves good stakeholder support and importantly can also effectively incorporate local knowledge into the management decision process (i.e. it is supportive of co-management approaches).



Example of material being produced by QPIF to better manage the aquarium trade in Queensland.

Regular reviews of the risk framework are critical to the management effectiveness of a risk-based approach to the aquarium fishery and ensure that QPIF can quickly respond to new information that may change the risks to sustainability. Subsequently, the system is flexible and remains responsive to political issues and emergency fishery needs should they arise. Underpinning the risk-based approach and performance measurements is the use of comprehensive and detailed compulsory daily commercial logbooks that provide the essential information required for effective fishery performance monitoring. The logbooks can be readily adapted to suit changing information needs arising from the review process.

Risk-based assessments, performance monitoring and status reporting, when combined, form the basis for the sustainable management of the aquarium fishery in Queensland. The key to its success are the feedback loops placed throughout the risk-based assessment, monitoring and management processes, including the ability to incorporate ad hoc issues as they arise. This ensures the system remains responsive and adaptive to change as, when and if required.

### 6.3 Tonga Marine Aquarium Fishery Management Plan

Poasi Fale Ngaluafe

*Program manager (Research and Aquaculture)*

*Ministry of Agriculture, Food, Forests and Fisheries, Tonga*

The Government of Tonga recently passed the Tonga Marine Aquarium Fishery Management Plan. Preparation of the plan was in part instigated by the ban on the export of live rocks and corals resulting from previous cabinet decisions of 1993, 1994 and 1997 that clearly stated the need for a management plan to guide and provide control measures for this fishery.

The plan has several management strategies and measures in place, including:

- restrictions on the number of licences;
- restrictions on who may engage in fishing for the collection of aquarium organisms;
- quotas on the amounts of ornamental fish, corals and live rock that can be exported per company;
- authorisation to hold fish;
- area restrictions;
- gear and method restrictions;
- inspection and observation requirements;
- reporting requirements; and
- training requirements.

A Marine Aquarium Management Committee provides oversight and allows for review of the plan as and when required. Membership of this committee consists of:

- the Head of Tonga Fisheries;
- the Tonga Fisheries Legal Adviser;

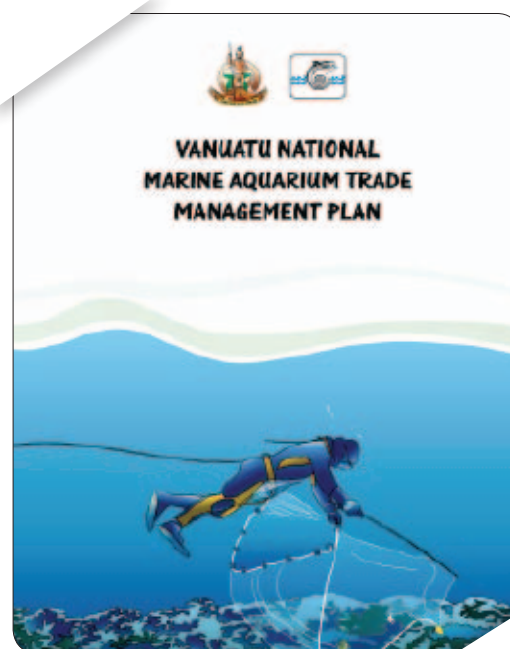
- representatives from the Environment and Customs ministries;
- resource owners' representatives;
- district officers from coastal communities;
- private sector representatives; and
- representatives from the Tonga Export Fisheries Association.

## 6.4 Vanuatu National Marine Aquarium Trade Management Plan

Jason Raubani  
Acting Principal Fisheries Resource Officer  
Department of Fisheries, Vanuatu

The Vanuatu National Marine Aquarium Trade Management Plan 2008 was made in accordance with Part 2, Section 3 of the *Fisheries Act, No. 55 of 2005*. The fundamental part of the management plan is Section 7, which deals with management arrangements. It provides guidelines for the operation and development of the aquarium trade in Vanuatu. Specific management measures include regulations that govern the:

- number and type of licences required by collectors and exporters;
- implementation of a Total Allowable Catch (TAC) for the flame angel (*Centropyge loriculus*);
- types of fishing methods and collection practices allowed;
- requirements for holding facilities;
- engagement of foreign collectors;
- use of underwater breathing apparatus;
- access agreements for collections under local tenure;
- conservation of aquarium organisms;
- reporting requirements; and
- observer programme.



Vanuatu National Marine Aquarium Trade Management Plan

# Part VII: Issues

## 7.1 Market analysis

## 7.2 Convention on the trade in endangered species

## 7.3 World organisation for animal health

## 7.4 Eco-certification

## 7.5 Stock assessment and risk assessments

## 7.6 Marine ornamentals working group

Outcomes of the workshop highlighted several pressing issues that were identified by participants, and these are detailed in the following sections.

Addressing these issues should go some way to ensuring that the continued development of the aquarium trade for PICTs is done in a sustainable manner, thus protecting the region's coral reef biodiversity and also ensuring that stronger partnerships between the private sector, national authorities and regional/international bodies are achieved.

## 7.1 Market analysis

During the course of the meeting, several issues related to financial viability and market access were raised by government and private sector participants. In general, most agreed that a market analysis would be beneficial for PICTs as it would ease some of the problems with suppliers in regard to transparency (e.g. knowledge of benefits accruing to local suppliers and national economies), equity sharing and pricing structures (e.g. knowledge that pricing is affected by a variety of variables, including demand, species, volume and freight costs) and alleviate competitive price-slashing or pricing wars.

An aspect of market analysis that was called for was the conducting of a detailed analysis of freight costs, freight space and flight connectivity to assist in determining the commercial viability of an aquarium export operation in a given location. This was highlighted in the PNG presentation. Subsequently, a market analysis could assist in lobbying government and airlines to guarantee or improve flight capacity so as to ensure adequate market opportunities.

A market analysis could further assist governments and the private sector in their decision-making about management, profitability and sustainability issues, particularly as a majority of PICT fisheries departments are mandated to foster fisheries growth in conjunction with sustainable management.

Finally, several participants thought that a market analysis could assist in identifying new aquarium organisms and their potential for sale. This would also include a consumer ‘willingness to pay’ study to determine market competition between wild-harvested and cultured aquarium organisms. Overall, a market analysis would be beneficial in identifying drivers and impediments to facilitate expansion (i.e. issues that influence the market chain).

As an adjunct to the need for a market analysis, it was suggested by participants that specific information related to pricing would be beneficial in understanding pricing trends and the identification of new market opportunities. In the majority of responses, this involved the potential of developing a fair pricing structure (e.g. stop the undercutting of prices along the market chain), but it was also recognised that this would only work if everyone ‘played fair’.

It was suggested that a regular trade brief or bulletin could be produced by SPC focusing on a few aquarium organisms that were industry staples, and solely based on landed costs from only reputable retail outlets. This would avoid generating confusion (and unrealistic expectations, particularly among suppliers), as different freight costs and economies of scale exist along the market chain. The market information generation would also provide useful comparison costs of exporting to different destinations, which could be fed into SPC’s regional fisheries database.

## 7.2 Convention on international trade in endangered species

There was consensus among participants that all exporting PICTs should be members of CITES. Currently, RMI and Tonga are interested in joining because of the difficulties they are experiencing in exporting their cultured giant clams. It was suggested that SPC and SPREP should assist in developing procedures for reporting and also provide technical support to PICTs for determining non-detrimental findings, particularly as the vast majority of PICTs face capacity issues with appropriate staff and financing.

There was also an expressed need for PICTs to band together for regional advocacy, particularly as there is a need for information flow on CITES decisions. Advocacy was seen as important by PICTs because it was felt by some participants that a CITES listing did not reflect, in some cases, the true status of species in a

given area. It was also raised that aquarium organisms were often generalised as endangered or potentially endangered because they appeared in large volumes (e.g. green chromis, *Chromis viridis*) when in fact they were actually prolific species on coral reefs. Further clarification on CITES requirements regarding cultured versus wild-harvest aquarium organisms was also called for, as well as a need to reform coral listings and an investigation of the applicability of quotas in lieu of non-detrimental findings.

### 7.3 World organisation for animal health

Most participants considered that the issues surrounding OIE were more to do with accessing the EU markets, as the EU has now stipulated that all aquarium organism exports from the Pacific be certified by a competent authority under OIE requirements. Similar issues surround CITES and capacity by governments to participate was highlighted. Some participants argued that OIE should not be necessary for PICTs because the Pacific is free of disease, while other thought that the aquarium industry could use meeting OIE regulations as a marketing tool.

At present, there is a considerable amount of misconception and confusion surrounding OIE among participants and further clarification is required. Participants suggested that SPC continue to take the lead in responding to OIE on behalf of PICTs, and that SPC provide training for appropriate government agencies.

### 7.4 Eco-certification

Eco-certification was advocated by most participants as a way for government and industry to work together to ensure sustainability of the aquarium fishery, though participants were divided on who should take responsibility for it. Some suggested it should be driven by government, while others felt it should be promoted by an independent body made up of fisheries departments, NGOs and industry. A few participants suggested that standards be developed by SPC and SPREP, with a 'Pacific Eco-certification' overseen by SPC and supporting fisheries departments to conduct the certification process.

All participants were, however, in agreement that eco-certification should be based around best practices and not be too onerous in detail. Some had had negative experiences with the Marine Aquarium Council (MAC) certification programme, which was considered to be too complex, time-consuming and costly to implement, and it was suggested that lessons be learnt from the MAC model and a completely fresh approach be taken that was PICT driven, though still based on accreditation. There was some discussion on investigation of other certification programmes such as ISO or similar auditing systems (e.g. organic produce).

It was also thought that eco-certification could assist in increasing desirability of aquarium organisms from the Pacific region, and ameliorating and mitigating some of the issues surrounding OIE and CITES compliance. Eco-certification was seen as a way to promote both cultured and wild-harvest aquarium organisms. The majority of participants were in agreement that any eco-certification programme would need to balance industry confidentiality, not be too costly to implement, have as its main focus quality aspects, and be linked to marketing first and foremost.

## 7.5 Stock assessments and risk assessments

Due to the remoteness of PICTs and the associated collection areas within them, it was considered by many participants that risk assessments may be easier to implement than stock assessments, as the logistical needs and time required make stock assessments expensive in most instances. With the inadequate support given to government fisheries departments, this is a valid concern.

Some participants thought that risk assessments could preclude stock assessments altogether if fisheries information was current, and could also identify and prioritise stock assessments when funding became available. It was advocated by a few participants, however, that where possible stock assessments should be conducted, as there may be some data gaps in running a full risk assessment (e.g. fisher inputs and historical catch data), and risk assessments could be done annually after that. Stock assessments (focused on a few key aquarium organisms) could also then be used to verify risks identified by risk assessments. Risk assessments were considered to be a possible alternative to CITES requirements by some participants, and this requires further investigation.

For both types of assessment, it was suggested by participants that they be standardised and the results fed into a regional or global database. The Queensland risk-based approach that was presented by QPIF could be reviewed by PICTs as a model to apply a standard methodology. Training on assessment protocols was requested of SPC, as intensive capacity building would be required for appropriate agencies to implement either type of assessment.

## 7.6 Marine ornamentals working group

There was consensus that a marine ornamentals working group (MOWG) would be beneficial for providing a regional focal point for market analysis and international agreement advocacy (particularly on OIE and CITES issues), and a way to distil and discuss problems and issues, provide an avenue for promoting Pacific aquarium organisms, and act as a mechanism for coordinating technical inputs and research activities. It was suggested that terms of reference be developed that would include the principles of networking and information sharing, and the application of industry best practices and quality control measures.

Participants suggested that SPC take the role of coordinating the MOWG, and once it was established, countries take responsibility for hosting and chairing on a two-year rotational basis. The 'Pacific Regional Aquarium Council' was proffered as a name for the MOWG by one participant.

It was suggested that the establishment of a MOWG could set a great example to the Philippines and Indonesia, though in reality, the establishment of a MOWG may be difficult because of issues over who would fund it and also because, in general, members of the aquarium industry compete against each other for market share. Currently Fiji Islands has the Marine Ornamental Trade Association (MOTA) and a fisheries advisory council for the aquarium trade, both of which are made up of government, industry and other agencies and appear to be working relatively effectively as useful forums for resolving issues among Fiji aquarium exporters. MOTA could be used as a working model for a more regional MOWG. RMI is trying to establish an association at present to advise on management measures.

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