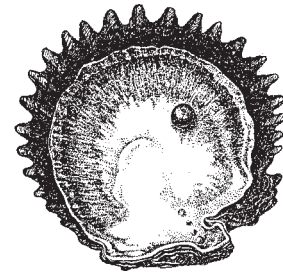




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PEARL OYSTER

INFORMATION BULLETIN

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NOTE FROM THE EDITOR

Pearl culture developments in the Pacific continue at a rapid pace. We are happy to hear of these successes and pleased that the Pearl Oyster Information Bulletin can help by keeping you informed of the latest advances.

In the last issue we noted the Indian hatchery successes with *Pinctada margaritifera*. In this issue, we have news of the significant steps made by the French Polynesian hatchery programme, where commercial-scale production is well established. Pearl oyster hatchery research is also planned for the ICLARM Coastal Aquaculture Centre, in Solomon Islands.

POIB #1 described the inaugural pearl harvest from Manihiki, Cook Islands. This issue includes details of the first auction of Cook Islands pearls (worth over US\$ 800,000).

Further marketing advances have been made in French Polynesia. The Tahitian black pearl has received formal recognition by international jewellery authorities, and the most recent auction in Tahiti returned 620.4 million CFP (US\$ 5.640 million).

Information on pearl oysters is becoming increasingly accessible. The range of PIMRIS services available to Special Interest Group members are detailed below. A select bibliography on pearl oysters has recently been circulated, and a comprehensive bibliography is being compiled by Mark Gervis of ICLARM. (cont. page 2)

Inside this issue

Pearl Production in French Polynesia,
by *M. Coeroli* Page 2

Pearl oysters in Abaiang and Butaritari atolls, Republic of Kiribati,
by *B.M. Yeeting* Page 3

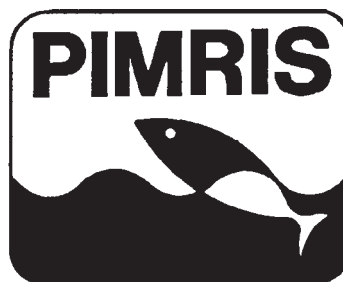
Progress in Penrhyn,
by *Arake Tonitara* Page 5

Pearl Oyster introduction to Tokelau atolls: real potential or a long shot?
by *R.D. Braley* Page 9

ICLARM's Coastal Aquaculture Centre explores pearl oyster research needs,
by *M. Gervis* Page 12

Welcome to new members,
by *J.P. Gaudechoux* Page 14

PIMRIS is a joint project of 4 international organisations concerned with fisheries and marine resource development in the Pacific Islands region. The project is executed by the South Pacific Commission (SPC), the South Pacific Forum Fisheries Agency (FFA), the University of the South Pacific's Pacific Information Centre (USP-PIC), and the South Pacific Applied Geoscience Commission (SOPAC). Funding is provided by the International Centre for Ocean Development (ICOD) and the Government of France. This bulletin is produced by SPC as part of its



Pacific Islands Marine Resources Information System

commitment to PIMRIS. The aim of PIMRIS is to improve the availability of information on marine resources to users in the region, so as to support their rational development and management. PIMRIS activities include: the active collection, cataloguing and archiving of technical documents, especially ephemera ("grey literature"); evaluation, repackaging and dissemination of information; provision of literature searches, question-and-answer services and bibliographic support; and assistance with the development of in-country reference collections and databases on marine resources.

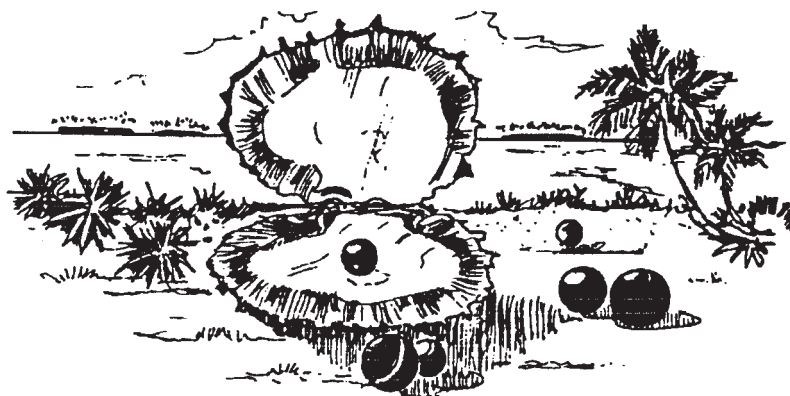
This increased momentum to Pacific pearl culture developments is exciting. As farmers, managers, development workers and scientists, however, we need to maintain a focus on the long term viability of the industry. Realistic projections are needed to keep everyone's expectations in perspective. Guidelines for controlled development, including management and marketing options, need to be openly evaluated.

The promise of pearl oyster hatcheries throughout the Pacific gives rise to a plethora of questions. What level of technology is required? What is the most appropriate size, number, and location of hatcher-

ies? Is protection of broodstock numbers or genetic identity a problem? What can selective breeding programmes achieve, and how soon? What protocols are needed to regulate pearl oyster shipments? Assuming unlimited supplies of spats, what are the limits to growth geographically, ecologically, and economically? What further impetus is required: expanded links between public and private research? greater co-ordination of marketing? training of seeding technicians?

These issues can best be resolved through improved communication. We hope the POIB can continue to foster closer links between us all.

PEARL OYSTER NEWS



Pearl production and marketing in French Polynesia

by Martin Coeroli
EVAAM, French Polynesia

Introduction

Marketing of the French Polynesian black pearl started around 1880 with the few natural pearls occasionally found in oysters fished for mother-of-pearl shells. The rareness of the black pearl produced by the black-lip pearl oyster, *Pinctada margaritifera*, caused it to be called the 'Queen of Pearls' from the start. After successful pearl culture trials in 1965, pearl farming quickly got off the ground.

Pearl production

Pearl production in French Polynesia is now carried out by 105 co-operatives, 180 family businesses and 23 private companies, totalling 2,367 people on 308 pearl farms. Only 149 of these farms were actually producing pearls in 1990. The others are expected to be ready to market their production in 1991 and 1992.

An estimated of 400,000 pearls were produced in 1989, 360,000 of which were exported.

Co-operative marketing

The French Polynesian Government has for the past ten years been providing technical assistance through EVAAM to the co-operatives and family businesses which have combined to form the joint venture 'Poe Rava Nui'. At the 13th pearl auction organised by this consortium, 41,130 pearls were sold for 620.4 million CFP francs. (\approx US\$ 5,640,000)

Pearl exports

Pearl exports have been increasing steadily year by year, in quantity, value and average price. From 1987 to 1989 they rose in quantity from 407.6 kg to 622.4 kg and in value from 2.25 billion Pacific francs (\approx US\$ 20.4 million) to 3.79 billion CFP francs (US\$ 34.4 million).

The average price per gram of pearls rose from 5,523.6 CFP francs (US\$ 50.2) to 6,090 CFP francs (US\$ 55.3) over the same period.

The main export markets are:

Japan:	67.7%
USA:	17.0%
Switzerland:	9.6%
Hong Kong:	3.2%

The Japanese market

French Polynesia ranks second, behind Australia, among pearl exporters to Japan. In 1988 Japan imported 596.7 kg of raw cultured pearls from Australia compared with 182.9 kg from French Polynesia, for 3 billion CFP francs (US\$ 27.2 million) and 1.5 billion CFP francs (US\$ 13.6 million) respectively. The average price works out at 6,933 CFP francs/g (US\$ 63.0) of South Sea pearls (Australia) and 8,676 CFP/g (US\$ 78.8) of Tahiti pearls (French Polynesia).

Development prospects

Since 1984 French Polynesia has been implementing a vigorous pearl farming development programme in which only a dozen atolls are involved at present but which will be shortly be extended to 30 more atolls and about 10 high islands. Increased production will go hand in hand with improved pearl quality. Better spat collection and rearing techniques will be supplemented by hatchery spat production.

First pearl auction in Rarotonga

The first auction of cultured black pearls in Rarotonga last October fetched a total of US\$803,567 for 24 pearl farmers from Manihiki. Two Asian companies, No-Ah and M.S. Orient Ltd, bought the entire offering of 6,302 pearls at an average of \$128 each, with the largest single pearl going for \$9,000.

Meanwhile, the Ministry of Marine Resources has completed a national pearl industry plan, making the Cook Islands eligible for US\$2.4 million over five years to establish a pearl research and train-

ing facility on government-owned Suwarrow atoll, south-west of Manihiki. The results are intended to be fully transferrable to the other lagoons of the Northern Group, with the caveat that each Island Council agree to the national plan. So far, the Penrhyn islanders, with a lagoon five times the size of Manihiki's, have been reluctant participants, preferring to wait and observe the pioneering efforts of their neighbours. Perhaps the success of the first sale will accelerate the Penrhyn Island Council's decision to proceed.

Advertising

Advertising campaigns carried out by EVAAM in several countries since 1987 have led to the present boom in the black pearl market.

Sustained efforts have resulted in approval by international jewellery trade bodies of the trade name 'Tahiti cultured pearl' for every black pearl cultured from *Pinctada margaritifera*. This trade name will be guaranteed by a certifying laboratory set up in Papeete (Tahiti).

Conclusion

The marketing strategy adopted by French Polynesia for this product is to increase production while keeping the value high. This rules out mass production, even though potential pearl farming sites in French Polynesia would enable production to be raised to over 7 tonnes.

Source: Islands Magazine: "Inaugural black pearl sale nets 803,567 for islanders", by Tap Pryor

Pearl oysters in Abaiang and Butaritari atolls, Republic of Kiribati

*by Being M. Yeeting,
Fisheries Division, Republic of Kiribati*

Introduction

A questionnaire survey was conducted at Abaiang and Butaritari atolls of the Republic of Kiribati in May 1991, mainly to confirm rumours of the presence of the black-lipped pearl oysters (*Pinctada margaritifera*) in the lagoons of these two atolls, and

try and gather baseline information that would indicate the present status of the stocks. An attempt was also made to map the location of the stocks on each island. This should be very useful in the planning of future field surveys.

Abaiang Atoll

On Abaiang Atoll, 16 local residents from 4 villages were interviewed. All reported the presence of pearl oysters. Half of the responses indicated current exploitation while half denied any exploitation. It is suspected that this reflects feelings of reservations to tell the truth in relation to the recent Island Council regulation which prohibits any exploitation of the resource.

The results of the survey however showed that on average for a 3-4 hour trip, 14 pearl oysters are usually collected. These are all obtained from the western reef passages. Most are sold at a price ranging from AUD\$10.00 to UAD\$20.00 per half shell. Also quite a large number are given away to friends and only some are being used for fish lures.

It is suspected that although there is a current regulation prohibiting the collection of the resource, there is very little enforcement. A meeting with the Island Council would be appropriate to encourage enforcement and discuss the potential for pearl oyster farming and pearl culture.

Butaritari Atoll

On Butaritari Atoll, a total of 14 local residents from 5 villages was interviewed and all reported the presence of pearl oysters on the island.

Results seemed to indicate a more limited pearl oyster stock for Butaritari than for Abaiang. An average catch of only 4 pearl oysters per 2-3 hour trip was reported. These are all obtained from the western reef passages. Most of the pearl oysters are given away as gifts with some being sold. Those sold are priced from AUD\$10.00 to AUD\$50.00 per half shell and therefore are more expensive than the Abaiang oysters.

There is no current existing Island Council regulation and therefore the stocks are likely to be totally depleted if exploitation is continued. Butaritari Atoll would also be considered for future pearl oyster research work and therefore an immediate moratorium on further harvesting is to be recommended by the Fisheries Division to the Island Council.

Shell prices (black-lip, trochus and green snail)

Source: FFA Export Market Report, Third Quarter 1990

A. April 1990					
	(All prices in US\$/kg)				
	Solomon Islands (FOB prices)	Solomon Islands (Prices to producers)	Vanuatu to producers	Fiji	Australia (FOB prices)
Trochus	8.60	4.00	3.00	4.67 - 5.67	4.00
Black-lip	8.00	4.00	5.00 - 6.00	5.00 - 5.67	4.00
Green snail	15.00 - 32.00	3.20 - 7.20	4.00		
B. August 1990					
	Papua New Guinea (Export)	Solomon Islands (Export)	Vanuatu (Export)	Vanuatu (Producer)	
Trochus	6.40 - 7.00	8.60	*	1.77	
Black lip	5.00 - 6.00	8.00	13.25	3.35	
Green snail	15.00 - 20.00	15.00 - 32.00	55.00**	7.07	
C. December 1990 — January 1991					
	Papua New Guinea (FOB prices)	Solomon Islands (Prices to producers)	Vanuatu to producers	Fiji	Australia (FOB prices)
Trochus	6.00 - 8.00	4.80	2.00	4.70 - 5.30	4.70
Black-lip	7.00 - 9.00	4.40	5.00 - 6.00		4.70
Green snail	25.00 - 30.00	3.50 - 8.00	4.00		

* Trochus button blanks sell for US\$ 26.50 per thousand

** Price for processed (i.e. cut) green snail shell in Korea

Prospectus for Cook Islands black pearls

Source: *Islands Business*

Manihiki has struck it rich with cultured black pearls. The Cook Islands Ministry of Marine Resources is predicting that the pearl trade will soon be worth more than NZ\$ 20 million (US\$ 11.5 million) a year — from two to four times the value of all other exports of fruit and vegetables, clothing, copra, pearl shell, and handicrafts. Manihiki's leading individual pearl farmer is said to already have made a million dollars (US\$ 575,000).

Prime Minister Geoff Henry has little doubt about what the culture pearl business could mean. 'I see it as one of the more exciting things taking place — happening here in the Cook Islands. It has been just one island up till now but we want to expand the industry to the whole of the northern group. I hope to see legislation for a Pearl Board which would be responsible for selling or auctioning pearls and responsible for quality.'

In Rarotonga, sources said the volume and quality of pearls harvested had not quite reached expectations, but overall results were good. Most pearls are being bought by Japanese. 'The most important thing is developing an awareness of the Cook Islands as a producer of black pearls', said Ruben Tylor, of Cook Islands Pearls, Ltd.'. The industry is still in its infancy.' He described the market for pearls as being 'infinite'. Cook Islands Pearls is also manufacturing pearl jewellery, a sideline the government wants to see developed.

Joan Rolls, whose company Beachcomber Ltd is one of Rarotonga's pearl dealers, said a top quality pearl might fetch up to NZ\$ 3,000 (US\$ 1,700). Her shop has in its stock a strand priced at NZ\$ 29,000 (US\$ 16,700). 'It surprises me the number of people who are interested in individual pearls', she said.

Progress in Penrhyn

by Arake Tonitara,
Penrhyn, Cook Islands

Fisheries Officers from the Cook Islands Ministry of Marine Resources were in Penrhyn in July last year to deploy experimental spat collectors. Results so far suggest that the best spatfall has been on the collector line close to Taruia Passage.

Farmers also began to drill and hang *kasi* (young pearl oysters) in July last year in preparation for future seedings. Currently there are an estimated 20 farmers, each with two to three thousand *kasi* on lines.

An overview of nacre-producing molluscs, pearl production, and the use of pearls in crown jewels

A recent Dutch monograph provides two interesting perspectives on pearls. The first section, by Dr H.E. Coomans, is a useful review of all the nacre-producing molluscs, including gastropods and cephalopods, as well as both freshwater and marine bivalves. The second section, by Rene Brus, focuses on the high profile of pearls in the crown jewels of various countries (China, Iran, Spain, France, India and the Netherlands).

The publication is entirely in Dutch, but also includes some excellent colour photographs. One particularly

noteworthy photograph is of Buddha figurines cultured in *Cristaria plicata*. These freshwater half-pearls, the legendary precursor of all cultured pearls, were reputedly first grown in China in the twelfth century.

The full reference is:

Coomans, H.E., and Brus, R. 1989. Parel en Parelmoer. Uitgave: Stichting Zeebiologisch Museum, Scheveningen, Netherlands. 64 p.

Gold-lip survey around Isabel, Solomon Islands

Source: *SPC Fisheries Newsletter*

Solomon Taiyo Ltd, the largest tuna fishing company in Solomon Islands, undertook a survey of gold-lip (*Pinctada maxima*) shell resources around the island of Isabel (in the north of the Solomons group), in collaboration with the Fisheries Division, Ministry

of Natural Resources. The survey, conducted between 18 November and 23 December 1988, was carried out in order to assess the possibility of developing gold-lip pearl culture in the country.

The survey was conducted around the areas of Kia (north-west), Buala (central) and Tatamba (south-east Isabel); these areas were commercially exploited during the 1960s, with an estimated annual production of 18 tonnes. This fishery declined, however, due to dwindling stocks and a decrease in market prices for the shell.

Diving in selected areas was carried out by a team of three divers: two commercial contract divers from Japan, who used hookah (surface air-feed) equipment, plus Senior Fisheries Officer Paul Nichols of the Ministry of Natural Resources, who dived using SCUBA. Diving was carried out from

a 7-metre Yamaha workboat, to a maximum depth of 40 metres in most places.

Results from the survey were not encouraging for the sites visited by the team; the coverage rate of shells was very low (on average, less than 1 shell/1,000 sq.metres). However, due to reef ownership problems, some areas which are reported to hold substantial goldlip stocks were not dived; thus a follow-up survey may be planned. Should sufficient stocks of gold-lip shells be located to supply adequate numbers of shells to a culture industry, the production of cultured blister and round pearls in Solomon Islands could become an important new development in the country's fisheries sector.



Members of the goldlip survey team holding specimens of *Pinctada maxima* aboard the survey vessel.

Further gold-lip survey in Wagina Region, Solomon Islands

Kathy Colgan, of the Australian Bureau of Rural Resources, led a team on a survey of gold-lip stocks in the Wagina Region of Solomon Islands (between Santa Isabel and Choiseul), in November — December 1990. The survey team included Nelson Kile and Gideon Tiroba of the Solomon Islands

Fisheries Department, as well as Richard Storey of the Cook Islands Ministry of Marine Resources, and Samson Piniata of Cook Islands Pearls Ltd. We hope to be able to publish a summary of the findings in Pearl Oyster Information Bulletin #4.

The Australian pearling industry will be worth an estimated A\$ 80 million in 1991. One of the main aims of two recent surveys of pearling beds in the north was to try to fill in some of the information gaps in the industry.

The major problem facing the pearling industry is the shortage of shell. Pearl fishermen have to collect shell from the wild to take back to their farms, where they insert the nucleus. It is a very high risk industry — the animals can, and often do, die at any stage of the process. Despite a small measure of success in producing hatchery shell, industry members still rely heavily on the wild stocks.

Carried out by the Fisheries Resources Branch of the Bureau of Rural Resources (BRR), the pearl bed surveys were designed to provide detailed information about the pearling grounds in Torres Strait and the Northern Territory. Data were collected using divers, underwater video cameras, and sediment and benthic samples. Kathy Colgan, from BRR, headed up the project. Before she even ventured out near pearling beds, Kathy had to spend a number of months researching possible sites, talking to members of the pearling industry, and organising a diving team and boat.

But Kathy believes the end result will prove very worthwhile to the pearling industry. 'I think we have got some tremendous results', she said. 'We hope the survey will answer a number of questions about pearling and the pearl resource.' 'We need much more information — you can't make informed decisions about the fishery unless you have the basic biological knowledge about the species.'

Kathy's project was broken into two parts: a survey of Torres Strait pearling beds, carried out between March and June 1989, and a survey of the Northern Territory pearling beds, carried out between October and December 1989.

Torres Strait

Funded by the Government, the Torres Strait survey was designed to find out whether there was still shell on old pearling grounds. These grounds were listed in historical records as being very productive for shell. 'We weren't sure whether the people involved in looking for shell in Torres Strait weren't finding it because they weren't going out and looking for it, or because it just wasn't there. I targeted areas which in the past had been productive for shell, visiting and filming the area, and collecting samples', Kathy said.

Before going out to survey the beds, Kathy talked to as many people as she could, including islanders who had been involved in the pearling industry in the past. One valuable source of information proved to be Vern Wells, master of the *Paxie*, the ship that surveyed the pearl beds during the 1950s and 1960s.

Kathy also visited the CSIRO archives in Canberra to gain access to a large amount of previously unpublished information from the now deceased scientist Stan Hyde, who had been based at the CSIRO pearling research station on Thursday Island for 12 years, from 1949 to 1961. A major part of her survey work included organising the gear she would use in the surveys. This involved buying and learning how to use a video camera, organising a diving team and a vessel, and arranging the construction of a sled and housing for the camera, based on a CSIRO design.

The underwater equipment Kathy used in the surveys included a remotely operated video camera, and a grab and dredge to collect sediment and ocean bottom organisms. The camera ran along the bottom of the ocean on a sled and was connected to an on-board monitor via a video cable. According to Kathy, one of the major advantages of video is that it can be used to correlate the information received by divers.

'The advantage of video is that you can use it to compare what the diver sees and what is actually there', she said. 'Divers' estimations of what is on the bottom are very subjective, and depend on the experience of the diver. By enlarging the frames on the video we can get a correlation between the two sets of information.'

Kathy and her team successfully visited and filmed a number of different sites during the three months they spent in the area. When the results are analysed, the survey will provide valuable current information about the status of the stocks on the 'old grounds'—an area to the west of Badu.

Northern Territory

The Northern Territory bed survey was jointly funded by industry and Government, following a decision in 1986 by the Northern Territory and Commonwealth Governments to establish and develop a farm-based Northern Territory pearling industry.

With the benefit of a bigger boat, an 'A' frame to swing the equipment out over the side, and two cameras—a forward-pointing one and a downward-

pointing one—Kathy hopes she will have some interesting results from her field trip in this area.

The survey focused on two main areas, the eastern fishing grounds centred around the Crocodile Islands, and the western fishing grounds west of Bathurst Island. These areas were assessed as being the most likely to contain shell, particularly the gold- and silver-lipped pearl shell *Pinctada maxima*. The aim of the survey was primarily to determine the geographical extent of the beds.

'I think I've done that, in part', Kathy said. 'Although I'm sure there will be room for argument'.

The survey results will be used in management decisions, including the assessment of current quota levels. The results will also help pearling industry members target shell collection. 'The question that really interests me is the type of bottom where shell is found, and whether we can speed up the fishing process and be of assistance to the fishing industry', said Kathy. 'For example, we could say that if you

get certain conditions, you're likely to get shell, or you're not likely to get shell. The commercial side of it really is the ultimate aim.

'I think this research is a starting point for the pearl fishermen. I'd like to see further research where science and industry get together to determine what questions need to be answered.'

Survey results

Kathy returned to Canberra with an enormous amount of data from the two surveys, including a large quantity of sediment and benthic samples, which are currently being analysed by various organisations, and 300 hours of video film.

The results of the surveys will be released in the form of two preliminary reports. The reports will contain preliminary data, some mapping, and initial thoughts based on the results. Kathy will present the reports to pearling members at workshops to be held during May 1990.

Training pearl seeding technicians in Australia

Source: Western Fisheries

Pearl producers, in Western Australia, have undertaken to train local people in the industry under a recent agreement with the Federal Government.

The pearling industry has signed a negotiated agreement with the Federal the Department of Immigration, Local Government and Ethnic Affairs and the Department of Employment, Education and Training.

Commenting on the agreement, Western Australian Fisheries Minister Gordon Hill said he was pleased that negotiations had been brought to a successful conclusion. 'The agreement provides for a number of pearl culture technicians being permitted entry into Australia, but at the same time setting out an education and training commitment by Australian companies to enhance the skills base within the Australian pearling industry', he said.



'I understand there has been a high degree of co-operation between the three parties which allowed the arrangement to be brought into effect in late June of 1991.'

In the first year of the arrangement, the pearling industry will be required to start an on-the-job training programme for up to six trainees with a view to eventually having eight trainees in the programme at any one time.

Some trainees will join a pearl farm after first completing a tertiary education in a related field in aquaculture studies. Depending upon individual

academic records, the training periods may range from five to eight years.

Mr Hill said the process of developing a number of skilled Australian pearl culture technicians would take time. 'The training programmes will be monitored on an ongoing basis by representatives of the industry and Government', he said.

'Training will cover many aspects of the pearling industry, such as pearl oyster seeding, pearl oyster cleaning, pearl harvesting and general farm maintenance.'

Pearl oyster introduction to Tokelau atolls: real potential or a long shot?

by Dr. R. D. Braley
James Cook University, Australia

To tiny atoll nations, potential sources of export may look better than the truth of the matter. A case in point may be whether the introduction of broodstock pearl shell to the atoll lagoons of the Tokelau Islands will pay off within the next decade. Although *Pinctada margaritifera* is found in high densities in the Northern Cook Islands and the Tuamotus, French Polynesia, there are many other atolls such as the Tokelaus and Tuvalu which harbour sparse populations of this pearl oyster. Traditional tuna fishing in Tokelau utilised *P. margaritifera* shell (Gillett, 1985), but they are now rare.

Several consultants since 1958 have made brief visits to Tokelau to assess the stocks of pearl oysters and/or the feasibility of introducing black-lipped pearl oysters to the lagoons (Van Pel, 1958; Hinds, 1971; Laboute, 1987; Braley, 1989). Both Van Pel and Laboute believed Faka'ofu lagoon would be very good for the culture of *P. margaritifera* and similarities between Faka'ofu and French Polynesian lagoons were noted. Hinds noted that transfers of oysters to Tokelau may not be a straight forward affair but suggested that a trial shipment of 5,000 shells from Tonga or Northern Cook Islands be attempted in a suitable vessel with tanks and circulating seawater.

Recommendations from the pearl oyster and giant clam survey I conducted in 1989 were that if the government attempts an introduction of pearl oysters, that it be carried out in Faka'ofu and/or Atafu lagoon rather than Nukunonu. The coral reefs in the lagoons of Faka'ofu and Atafu are still considerable, while there is a larger but more sandy bottom in Nukunonu lagoon.

A biological consideration may be the presence of large numbers of spondylid oysters (spiny or thorny

oysters) in the lagoon at Faka'ofu. I am suggesting that high densities of spondylids along the slopes of patch reefs in Faka'ofu lagoon may represent a potentially unbeatable competitor for establishing natural populations of introduced pearl oysters. The microalgae filtered from the water by the spondylids is likely to be the same food source required by pearl oysters; the filtration by the spondylids and the numerous solitary tunicates may also pick up competent larvae ready to settle and kill them in the process. The available settlement space is also a consideration when the numbers of the giant clam, *Tridacna maxima*, in shallow water are taken into account. Although not quantified, Van Pel noted the abundant spondylids in Faka'ofu as did Laboute, who suggested the name *Spondylus* (*aff. varius*). The survey I conducted in 1989 found spondylid densities in Faka'ofu lagoon as follows:

Depth	Densities
36 m	32-34 spondylids/m ²
30 m	3-39 spondylids/m ²
24 m	3-56 spondylids/m ²

Spondylid densities in Nukunonu and Atafu were generally <1/m². No black-lipped pearl oysters were found to live in any of the 3 lagoons but *P. maculata* was found on shallow patch reef edges and surfaces within Atafu lagoon.

Another biological consideration is where the broodstock pearl shell will originate from. Okinawa had been suggested since spat of *P. margaritifera* were purportedly being produced there in a hatchery. It is advisable to try to get broodstock from the northern Cook Islands; perhaps Penrhyn Island, because it has a good airstrip and wharf with deep passes into the lagoon. The Cook Islands are closer

to Tokelau and there should be less chance of new parasites or viruses coming to Tokelau than if the oysters were to come from as far west as Okinawa. Diseases of pearl oysters have been transferred even between atolls in the Tuamotu group and these diseases have even affected other bivalve molluscs.

Some economic considerations involve the initial cost of collection of at least 5,000 live pearl shells as broodstock from the northern Cook Islands, the transport by suitable ship to Tokelau and the cost of setting up local spat collection sites, and maintaining these and a responsible government employee(s) to work on the project. Even if recruitment of juvenile *P. margaritifera* were successful in the first year of the operation, it would require many more years to establish a large viable population of pearl oysters from which annual recruitment in commercial quantities could be assured. Unless there was a long-term commitment to follow through with a spat collection programme the result may be an expensive waste of funds and effort.

I believe a well thought-out plan and long-term commitment may make a pearl oyster introduction project a very good experiment, but only time will tell whether the results will be positive or negative.

Report on Fisheries Development in Oceania to Japan International Co-operation Agency

A report by Masashi Yamaguchi to Japan International Co-operation Agency (JICA) has recently been translated into English and printed as a revised offprint for personal circulation. The report provides a detailed review of the literature on a country-by-country basis. Pearl oysters feature in the sections on French Polynesia, Cook Islands and Tonga.

An analysis of the development potential for individual resources is provided, with avenues highlighted for Japanese involvement in development aid or co-operation. The section on pearl oyster concludes:

'Artificial spat production of pearl oysters has already been established by private farms in the Ryukyus, for all of the three species considered here (*Pinctada margaritifera*, *P. maxima* and *Pteria penguin*). One of the farms, Tasaki Pearls Co., tried to extend

References

- Braley, R.D. 1989. A giant clam stock survey and preliminary investigation of pearl oyster resources in the Tokelau Islands. A report prepared for Dept. of Agric. and Fish., c/o Tokelau Affairs, Apia, Western Samoa and the FAO South Pacific Aquaculture Development Project, Suva, Fiji. 51 p. + figures, tables and appendices.
- Gillett, R. 1985. Traditional tuna fishing in Tokelau. *Topic Review #27*, SPREP. South Pacific Commission, Noumea, New Caledonia. 47p.
- Hinds, V.T. 1971. A rapid fisheries reconnaissance in the Tokelau Islands (August 18-25, 1971). South Pacific Commission, Noumea, New Caledonia. 8p. + appendix.
- Laboute, P. 1987. Mission to the Tokelau Islands to evaluate cyclone damage to Coral Reefs. ORSTOM Centre, Noumea. 11p. + figures.
- Van Pel, H. 1958. A survey of fisheries in the Tokelau Islands. South Pacific Commission. 16 p.

their expertise in Tonga but a joint venture project with the Government did not develop after feasibility studies and successful trial cultivations of imported spat of three species by the company in Vava'u for several years.

Although assisting in development of pearl and pearl shell production in Oceania would bring up conflict of interest for the Japanese industry, there are great opportunities for this international co-operation.'

Source: Report on baseline study for fisheries development in Oceania, with special reference to sedentary organisms on coral reefs and lagoons, by Masashi Yamaguchi, Department of Marine Sciences, University of the Ryukyus, Okinawa. Revised offprint of report for JICA. August 1989. 48 p.

Commercial village shell industries in Papua New Guinea

Joseph Glucksman formerly worked with the PNG Fisheries Division, and has provided a copy of a 1982 paper :

Glucksman, J., and Lindholm, R. 1982. A study of the commercial shell industry in Papua New Guinea since World War Two, with particular

reference to village production of trochus (*Trochus niloticus*) and green snail (*Turbo marmoratus*). Science in New Guinea, 9 (1) : 1-10.

An excerpt from the introduction was of interest. It reads :

'...later the colonial government of Papua New Guinea reinforced the traditional internal trade (in shells) by adopting the **kina** (gold-lipped shell, *P.maxima*) and the **tambu** (*Nassarius camelis*) as forms of currency (Gwyther et al.,1980).'

'During this period the most important commercial shells were the gold-lipped (or mother-of-pearl) shell, and to a much lesser extent the black-lipped pearl shell *Pinctada margaritifera*. Probably because of this early fishing pressure, *P.maxima* is now rarely found within the limits of free diving. These shells are now harvested from greater depths with the aid of expensive and sophisticated equipment like SCUBA and Hooka gear... this is beyond the capabilities of village industries (and) the gold-lipped shell falls somewhat outside the scope of this

paper. Statistics on (gold-lip) production and price are shown on Table 1.'

A further brief note (no source given) on pearl shell fisheries in PNG also reads :

'A brief on the pearl fishery in Daru, Western Province of Papua New Guinea'.

People (men) along the coastline areas to the western side of Daru from such villages as Tureture, Mabaduwan and Sigabaduru have been involved in the past but have not had a fishery of their own. They were employed as pearl divers on the foreign-owned pearl boats.

There is no pearl fishery existing within the western province at the present time although on the Australian side of the Torres Strait Protected Zone a fishery does exist. An Australian pearl fishing boat (Thursday Island owned) has been approved to fish within the PNG side of the protected zone but has not done that yet. It is anticipated that the boat would fish in 1991.

New removable float-fixing system in Australia

Source: Professional Fisherman

A new system of attaching flotation buoys to the lines which keep pearl-bearing oyster panels suspended in coastal waters has been developed in Perth by Bullivants' sales representative, Athol Lucas.

It replaces the traditional method in which ropes ran through the centre of buoys and became encrusted with weeds and other marine life.

This caused problems when the time came to lift the panels for seeding, checking or cleaning, because the headline ran through the centre of the floats.

Athol's answer employs a specially designed nylon peg which firmly locks into one side of the flotation buoy. Nylon webbing attached to the end of the peg passes through the centre of the float and is spliced to the polyethylene head rope. The ingenious arrangement keeps the floats off to one side of the head rope, simplifying the task of winching pearling panels on board.

'The float is good for 12 kg flotation in salt water, and we did ten times that before it pulled the peg', Athol said. 'It didn't damage it, just pulled the peg out. The webbing is not affected by sunlight so it is not going to rot, it lies lower than the rope so it is not going to get chafed, and it's easily worked'. Athol's innovative design offers a further benefit

during the cyclone season. In a cyclone the pearler normally has to go out and cut ropes to lower the pearl-carrying panels out of harm's way. The new method is much simpler. The pins are easily pulled and the necessary number of floats removed to be ferried ashore once the panels reach a safe depth.

Cleaning is equally easy, as Athol explained. 'The floats get very dirty with marine growth, but they can be removed, cleaned and replaced without any need for ropes to be cut.'

The system uses 100 metres of rope, 55 floats and 100 panels for the pearl shells.

'Everyone asks for 100 panels', Athol explained. 'They are a wire frame covered with fishing net on both sides to make pockets in which they put six or eight pearl shells.'

Pearlers already using the new system include the Paspalis group in Darwin, Blue Seas Pearls and Pearls Pty Ltd, both of Broome, Darella Holdings in Cairns, Arrow Pearls Pty Ltd of Darwin and Willy Creek (WA), Cygnet Bay Pearls and Clipper Pearls (WA).

Bibliography published

A select pearl oyster bibliography has been printed and distributed through the Pearl Oyster Information Bulletin mailing lists. The bibliography covers 134 references, selected as those most useful to pearl farmers, managers and other industry workers in the South Pacific. References are listed alphabetically by author, and in groups for specific subjects, and for species. The introduction and section headings are in both French and English.

As a supplement to the bibliographies of Intes and Coeroli (1985) and Mahedevan (1987), this provides a useful starting point. A more comprehensive work is in preparation by Mark Gervis of ICLARM CAC.

Pearl Oyster Information Bulletin readers are encouraged to inform us of any corrections or omissions to this or earlier bibliographies. Reference

listings (and reprints or photocopies) of new publications are also sought.

Requests for further copies of the bibliography should be forwarded to Jean-Paul Gaudechoux, Fisheries Information Officer, SPC, Noumea.

The full reference is:

Sims, N.A. 1990. A select bibliography on the biology, ecology and culture of pearl oysters. Fisheries Information Project, South Pacific Commission, Noumea, New Caledonia. 24 p.

One correction is required: Intes, A. (in press) was not published through the VIth Coral Reef Congress, but remains an unpublished manuscript.

ICLARM's Coastal Aquaculture Centre explores pearl oyster research needs

Source: Mark Gervis, ICLARM, Solomon Islands

Mark Gervis of the ICLARM Coastal Aquaculture Centre, under funding from the British Overseas Development Administration, has spent the past five months working on pearl oysters.

His terms of reference were to compile a bibliography on pearl oysters (Bivalvia, Pteriidae), write a review of the biology and culture of pearl oysters, and identify pearl oyster research needs of the region, submitting a proposal that would aim to fulfil some of those needs.

After receiving a copy of Neil Sims' Masters project literature review on *P. margaritifera*, it was decided that a joint authorship was appropriate for the review, and they are now working on this together. Both the review and bibliography should be available through ICLARM within the next six months.

Preliminary small-scale trials for spat collection of *P. margaritifera* have started in two areas of the Solomon Islands, and are hoped to continue throughout the year. Initial results should be available by May.

Museums offer assistance

Do you have a problem knowing what to call that odd-looking pearl oyster you found on the beach (or in the back of your socks drawer)? Ever wondered about the extent of the geographical distribution of the species you work with? Does that paper on *Pinctada obscura* actually refer to your species? Now, we can suggest two sources of excellent advice on such ruminations.

Prof. Kenneth Boss, Professor of Biology and Curator in Malacology at the Museum of Comparative Zoology, Harvard University, writes:

'...we try to maintain as complete a collection as possible of research articles concerning malacology. Our library and collection of molluscs is open for consultation by researchers and students. Our collection comprises many million of shells; about 400,000 units of which have been catalogued and another 300,000 or so awaiting processing. We have a good representation of marine molluscs from the Indo-Pacific region and many of these have been utilised in taxonomic and systematic studies of commercially important species (e.g. Ranson on *Pinctada* and Rosewater on *Tridacna*).'

Dr Philip Colman, of the Australian Museum, Sydney, writes:

'The Australian Museum has a very extensive pearl oyster collection, and a fairly exhaustive library. This also applies to other molluscs of commercial interest

such as trochus, green snail etc. So hopefully (we) can be of mutual benefit.'

The complete mailing addresses for Prof. Boss and Dr Colman are included in the 'Welcome to new members' section on next page.

Abstracts

Rose, R.A., Dybdahl, R.E., and Harders, S. 1990. Reproductive cycle of the Western Australian silverlip pearl oyster, *P. maxima* (Jameson) (Mollusca: Pteriidae). *J. Shellfish Res.* 9(2): 261-272. (in press — due out December 1990).

The seasonal gonad development of the commercially important Indo-Pacific, silverlip pearl oyster, *Pinctada maxima*, was investigated as part of a mariculture programme. Histological preparations from 1,328 adults from populations off the northwest coast of Western Australia were collected approximately twice monthly over a six year period (1982-1988) to examine the pattern of gametogenesis. Histological findings were further supported by visually scoring the gonads of 2,588 broodstock and by observing hatchery and field spawnings of approximately 10,000 oysters. Possible exogenous reproductive stimuli were also investigated.

P. maxima was confirmed to be a protandrous hermaphrodite which matured as a male during year one at a shell height greater than 110 mm. Bisexuality was uncommon. The pattern of gametogenesis was shown to be similar in both sexes with the mean percentage of mature gametes being highest during the warmer austral months. Maturity indices also showed that both sexes followed a similar annual cyclical pattern in which maturity index was highest during months of warmer seawater temperatures and least during the cooler months.

The breeding season extended from September/October to March/April with a primary spawning peak at the beginning of the season and a secondary one at the end. Both sexes were multiple spawners and females during hatchery spawnings released between 0.5×10^6 and 12×10^6 ova per spawning. Except for water temperature and possibly chlorophyll-a, the exogenous factors measured during this study did not provide any practical indication for predicting the onset or duration of the reproductive cycle in *P. maxima*.

Newnham, R.B.T. 1989. Pearl and Politics - The impact of the development of the cultured pearl industry on Manihiki. M.A. thesis, University of Canterbury. 119p.

This study attempts to discern the effects of a new industry on a small, isolated coral atoll in the central Pacific: pearl farming in the lagoon of Manihiki, in the Northern Group of the Cook Islands.

Through a combination of archival research, interviews and participant observation, the historical development of the cultured-pearl industry is discussed as a precursor to analysing the contemporary situation. The research design utilised in the study reflects the position of the researcher as a member of the researched community.

A rudimentary theoretical framework is proposed, based on the need for a multi-disciplinary approach to studying the Pacific, by combining Development Theory with other relevant approaches, e.g. Mirab, Smallness.

Political control of the industry lies with the Manihiki Island Council, whose view of development has conflicted with that of central government and has disturbed the relationship between Manihiki and Rarotonga. As the industry continues to develop, Manihiki will become more dependent on Rarotonga, and control of the industry will probably return to central government.

Socially, the industry has caused an occupational change from gathering wild shell to farming. Families remain the main economic unit of production, but alterations to their income structure and labour allocation result from their level of involvement with farming.

A reversal of migration and remittance patterns appears to be occurring, as migrants are attracted to Manihiki by the development of farming and more money flows out of Manihiki than in. These results suggest that some ideas on Pacific Island dependence need to be reconsidered.

Welcome to new members

by J.P. Gaudechoux
South Pacific Commission, New Caledonia

The Pearl Oyster Special Interest Group is growing. We had received additional completed questionnaires from the individuals listed below. The previous lists of members are available in the two first issues of SPC Pearl Oyster Bulletin.

If you are on the list and your name and address is wrong, please send us a correction. If you are not on the list and want to be, fill in the form enclosed with the bulletin or write to us for a new one.

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