

# PEARL OYSTER

INFORMATION BULLETIN

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## NOTE FROM THE EDITOR

### *'The gathering together of Pacific pearl culture'*

The last issue, as I pointed out in the Editorial at the time, was filled with conflicting points of view, contrasting trends, and contradictory assessments and predictions. It seemed as if we were all looking at the issues from different angles. As with sunlight through a gemstone, the different perspectives were refracting the light differently through the various facets.

Rather than the brilliant scintillations and sparkles of a gemstone, however, this issue has more of the deep, soft, even lustre of (what else?) a pearl. In the articles, excerpts and opinions expressed on the pages following, I am struck by a sense of the rounding out of Pacific pearl culture into a fuller, more whole, more perfect entity. To be true, there is still a lot of nacre that needs to be laid down before this baby will roll eight-ways, but look at the Great Leaps Forward reported in the pages below:

- the Pearls '94 conference scheduled for May will provide the first international forum for discussion of pearl oyster biology and pearl culture science, pearl marketing and jewellery;
- the International Pearl Association has recently been formed, to foster a more co-ordinated approach to marketing and promotion, information exchange and public education;

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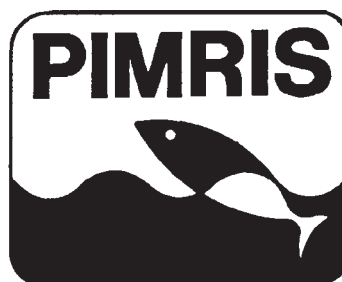
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PIMRIS is a joint project of 4 international organisations concerned with fisheries and marine resource development in the Pacific Islands region. The project is executed by the South Pacific Commission (SPC), the South Pacific Forum Fisheries Agency (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.

- the French Polynesian Government has expressed a renewed commitment to work with other South Pacific countries in sharing information and expertise in pearl culture development;
- the South Pacific Commission maintains its views that a regional pearl culture collaborative agreement would benefit both new and established industries in the region; and
- the industry in French Polynesia has been reorganised in a number of areas, with a new pearl producers association, and a new government-industry agency to promote Tahitian black pearls on the international market and to provide better grading standards.

To add a further glow to the news herein, prices at the annual Tahiti pearl auction in October increased by almost 19 per cent over last year's prices with an average value per pearl of 10,595 CFP (US\$ 105).

There is also news of progress with several promising projects – successful culture of mabe pearls in Tonga, hatchery culture of Marshall Islands pearl oysters, spat-collector trials planned for Solomon Islands, commercial farm developments in India and training programmes in the Philippines.

The research abstracts included in this issue cover topics as diverse as *Pinctada maxima* genetic pat-

terns in Australia, biofouling of *P. margaritifera* in French Polynesia and the sociological significance of pearl shell to highland people in Papua New Guinea. Mark Gervis has been kind enough to provide a string of further additions to the pearl oyster bibliography. We have also taken advantage of an offer from the publishers of *Pearl World* to reprint some excerpts of a few recent articles of particular interest to the South Pacific (including the October auction report).

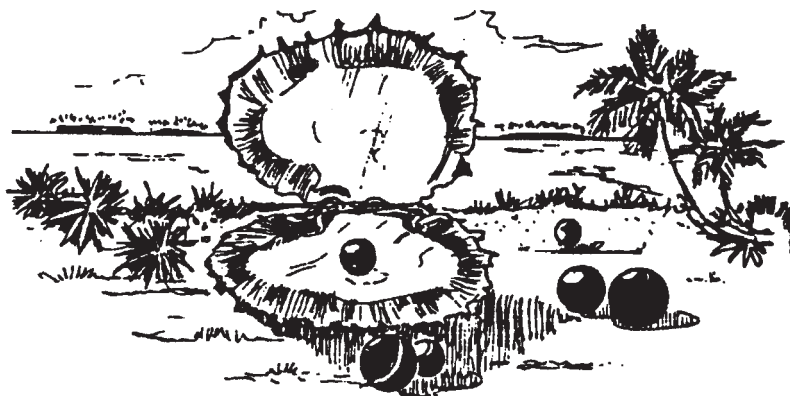
All of these spreading, strengthening branches should eventually bear fruit. The ferocious 'fratricide', as Gaston Flosse so aptly described it (see article on p.12), will hopefully become part of the past. While there may not be a cornucopia of cooperative camaraderie, there will eventually develop some greater sense of shared goals. As we meet together, and share a common association, the potential mutual benefits will become increasingly apparent.

The Pearls '94 conference will hopefully mark a real milestone in development of this industry, and in increasing the focus on developments in the South Pacific. We look forward to seeing you all there. Aloha!

Neil Anthony Sims



# NEWS FROM MEMBERS



## Moves in French Polynesia to improve standards and marketing

by *Philippe Cabral*,  
EVAAM  
Rangiroa, French Polynesia

A new association of independent producers has recently been created, called the SPPTI (*Syndicat professionnel des perliculteurs de Tahiti et de ses îles*, or the Consortium of Pearl Producers of Tahiti and its Islands). Its objectives are to standardise a professional and technical approach to pearl classification based on physical criteria of quality and to regroup production to ensure better and more efficient national and international marketing of pearls – basically, the exportation of a higher quality

product. The association brings together approximately 60 independent farmers in the Tuamotu Islands.

A new government agency, the *Groupement d'intérêt économique (GIE) Perles de Tahiti*, has also just been created. Made up of members of the government and professionals, it is responsible for developing a better promotion strategy for our cultured pearls on the world scene.

*Editor's note: also see the article on page 12: The Papeete plan to keep pearls in black*

## Solomon Islands pearl oyster project initiates blacklip spat collector trials

by *Johann Bell*,  
ICLARM Coastal Aquaculture Centre  
Honiara, Solomon Islands

The Australian Centre for International Agricultural Research (ACIAR) has provided ICLARM's Coastal Aquaculture Centre with funding for two years to assess the feasibility of farming pearl oysters in Solomon Islands.

The project stems from the observation that reasonable quantities of both blacklip and goldlip pearl oysters have been harvested from many areas within Solomon Islands on a regular basis. In view of the success of the blacklip pearl industry in Tahiti and Cook Islands, ACIAR, ICLARM and the Solomon Islands Fisheries Division are collaborating to determine whether it is possible to establish blacklip pearl oyster farms in other types of coral reef habitats in the Pacific, e.g. the more open lagoon complexes of Solomon Islands. The most important question in this regard is, 'Are there sufficient wild spat of the blacklip pearl oyster in Solomon Islands to set up a viable industry?' To answer this question, Johann Bell and Mark Gervis, from the Coastal Aquaculture Centre, have designed a sampling programme to measure spatial and temporal varia-

tion in abundance of blacklip spat over a wide area of Solomon Islands.

Spat of blacklip pearl oysters will be collected from three sites in each of five main areas (i.e. a total of 15 sites). At each site, a 100m longline will be set up. Spat collecting bags will be suspended from the longline 2–3 m below the surface. Fifty spat bags will be added to each longline every three months.

Each group of 50 spat bags will be removed after they have soaked for six months. This procedure is designed to provide a reasonable 'window' to catch any spat present during a given three-month period, and then allow enough time for the spat to grow to a size where they can be identified easily. Two types of spat collecting material will be used for the spat collecting bags: shade cloth and black plastic sheet.

The five areas to be sampled will be chosen from the following regional centres: Marau, Tulagi, Auki Yandina, Seghe, Munda and Gizo. All these areas

provide access to a range of sheltered reef habitats. The final selection of the five areas will be based on site inspections (November 1993) and historical levels of blacklip harvests.

Blacklip spat collected at each site will be grown out to market size in lantern cages in nearby coastal villages. This is an important part of the project: one of ICLARM's goals is to develop ways of increasing income from coral reef habitats to benefit coastal villagers in developing countries. The hope is that the sampling programme will identify areas where villagers can reliably catch and grow enough spat to attract an overseas pearl farming company. The villages would then sell their live mature shells to the industry.

The ACIAR funds will also be used to provide an estimate of the distribution and abundance of wild

adult goldlip oysters in Solomon Islands. There are also plans to collaborate with Professor John Lucas and his team from James Cook University in Townsville, Australia, to investigate low-cost methods of rearing blacklip or goldlip oysters in hatcheries.

In addition to the part-time involvement of Johann Bell and Mark Gervis, the following staff will be employed on the project full time: a Research Associate (Mr Kim Friedman), two full-time technical aides (to be appointed), an officer from Solomon Islands Fisheries Division (Mr Gideon Tiroba), and Mr Robert Jimmy, a recent graduate from the University of Tasmania in Australia. Robert, who is from Vanuatu, has volunteered to work on the project during the first year, with a view to assessing the feasibility of a similar development in his country.

### **First successful larval rearing of Marshall Islands blacklip pearl oysters**

*by Dale Sarver,  
Black Pearls, Inc.  
Kona, Hawaii*

Black Pearls, Inc. operates a blacklip pearl oyster hatchery and experimental growout facility in Kailua-Kona, Hawaii. In September 1993, the company was awarded a U.S. National Marine Fisheries Service grant to develop black pearl farming in the Marshall Islands. The initial phase of the project will focus on the lagoon of Namdrik atoll, and will last 18 months.

Pearl oysters are naturally scarce in the Marshall Islands, as in many of the other island groups in the South Pacific. This scarcity is due to either earlier overfishing, heavy predation by fish and octopii, or a natural flushing of the larvae out of the lagoons. In most cases, there are not enough oysters to develop commercial pearl farms, even though the oysters may grow well and may be capable of producing excellent pearls.

Black Pearls, Inc., in conjunction with the Marshall Islands Marine Resources Authority, is building on earlier work carried out by the South Pacific Commission and Forum Fisheries Agency. A pilot pearl farm is being developed in the Namdrik lagoon, with about 3,000 wild-collected adult oysters currently hung on longlines. Some of these will be seeded for pearls in the next few months. Artificial spat collectors and remote quarantine hatchery technology will also be evaluated as sources of supply of further oysters for farming. Several thousand spat collectors are currently deployed throughout the lagoon, and more will be set over the next year.

Hatchery production of spat is an integral aspect of this project. In October, 30 broodstock were transported to Hawaii and held in the Government-approved quarantine facility at the Natural Energy Laboratory of Hawaii in Kona. This hatchery has the unique capacity of using fossil seawater drawn from over 700 metres deep. This water has its origins in the Antarctic, and is essentially sterile. By using this water to hold broodstock and rear the larvae, the facility ensures that the Marshall Islands oysters never come into contact with the Hawaiian surface water. In addition, all effluent from the hatchery is disposed into an approved deep injection well. This prevents any possibility of disease transfer or genetic exchange between the Hawaiian and the Marshall Islands stocks. The spat can therefore be safely transferred back to the Marshall Islands once they have been reared to a suitable size.

All the broodstock shipped in October survived the trip and two successful spawns have been induced since their arrival. Spat from the first larval cycle are settling now, while the second cycle is currently in progress. Over the next year spat of various ages will be sent back to Namdrik for further grow-out.

This remote quarantine hatchery technology has exciting potential for many of the other island groups throughout the South Pacific.



## Pearl culture training courses offered in the Philippines

by Daisy F. Ladra,  
Bureau of Fisheries and Aquatic Resources,  
Quezon City, Philippines

In an effort to develop the pearl resources of the Philippines, pearl production training programmes have been initiated by the Bureau of Fisheries and Aquatic Resources this year. Pearl is the eighth highest dollar earner of the Philippines. As of 1991 the industry is worth US\$36,000,000, from the export of raw and polished pearl oyster shells, shell buttons and pearls. The training is a basic course designed to develop technical know-how in pearl oyster/freshwater mussel farming and pearl production. It runs for a week and covers both theoretical and practical aspects of farm set-up, basic surgical techniques for pearl production, oyster/mussel anatomy and biology, farm operation and maintenance and spat collection. A field trip to a pearl farm is the culminating activity. The training is intended to provide the participants with skills which they can immediately apply in their work.

Two courses have been conducted this year, one in marine pearls and the other in freshwater pearls. The first course was held in Zamboanga City under the auspices of the Land Bank and the Agricultural Training Institute. The second course, which centred on freshwater pearl production, was held at the Regional Fisherman's Training Center in Tabacco, Albay. Both courses were attended by around 20 participants from the banking sector, private investors and extension workers from the government.

Anyone interested in these courses should contact: Daisy F. Ladra or Virginia Luyun, Bureau of Fisheries and Aquatic Resources, 860 Arcadia Bldg, Quezon Ave, Quezon City Philippines.

## Pearl culture project in India

by Daniel S. Dev,  
Tamilnadu Fisheries Development Corporation,  
Tamilnadu, India

### Introduction

The natural pearl fishery in the Gulf of Mannar (opposite the north Sri Lankan coast along the Indian mainland) dates back to the 16th century, however, between 1663 and 1961 only 38 natural pearl fisheries were established there.

### Indian pearl oyster resources

Pearl oysters are found in India in the Gulf of Mannar along the Tamilnadu State coast and Gujarat State coast in the Gulf of Kutch. Of the above, only the Gulf of Mannar has abundant oyster resources. Pearl oyster species include *Pinctada fucata* (= *P. martensii*/*P. radiata*). Other species such as *P. margaritifera*, *P. bugillata*, *P. anomoides*, *P. chemnitzii* and *P. atropurorea* are also found.

### Indian cultured pearls

Research on cultured pearls started in India in the 1970s, with the first cultured pearl produced in 1973. This continued on a research scale till 1983. One commercial venture was started, but suspended its activities in 1987 due to the paucity of oysters. Once the hatchery production of pearl oyster spats was perfected, the pearl culture project of the Tamilnadu Fisheries Development Corporation was started in 1991. This project is the first of its kind and the only farm producing cultured pearls on a

commercial scale in the whole of India. The Government of India has given funds as aid for a functional hatchery.

### Pearl oyster collection

For this project we collect oysters from the natural pearl oyster beds off Tuticorin. There are about 85 natural charted pearl oyster beds, lying about 10–15 km away from shore with depths ranging between 10 and 25 m. We have a team of seven SCUBA divers (whose equipment is all imported). Oyster collection is done on nearly all favourable days. The favourable north-east monsoon period starts in September and continues till the following May.

### Farming

Pearl oysters collected at Tuticorin are transported to our farm site near the shores of Krusadai island. We have devised a technology for shallow-water sea farming and the oysters in cages are farmed at a depth of 3 to 5m. The cages are suspended from permanent wooden platforms erected in the sea by diving wooden poles.

### Implantation seeding operation

Oysters of about 50mm and above are selected and subject to seeding operation. The oysters are



**The pearl farm near Krusadai Island**



**Indian women perform pearl seeding operations.**



**A pearl in an Indian pearl oyster, *P. fucata***

narcotised with powdered menthol. Shell bead nuclei of 2 to 7mm are used in seeding. Multiple implantation is also done by our team of 18 technicians. At harvest time, in addition to their regular salary, the technicians are paid bonuses based on their performance.

### **Post-operation culture**

The seeded oysters are normally cultured for pearl formation here for 18 months. For the very small nuclei introduced we allow only 12 months for pearl formation. In our waters, the temperature does not usually go below 26°C and will go up to a maximum of about 31°C. The salinity ranges between 30ppt. and 38ppt. Our farm is located in a sheltered area, with a mild water current; the growth rate of oysters is good. Periodical cleaning eliminates the bio-foulers, predators and other enemies of oysters.

### **Harvest**

Harvesting is done manually and pearls are extracted. The pearl production at present averages 40 per cent. However, the production efficiency of certain skilled technicians is up to 75 per cent.

### **Processing**

After grading and sieving, the pearls to be drilled (using imported Japanese machines) are segregated. We then carry out the pearl cleaning process as per requirements, treating the pearls in mild cleaning/bleaching solutions.

### **Marketing**

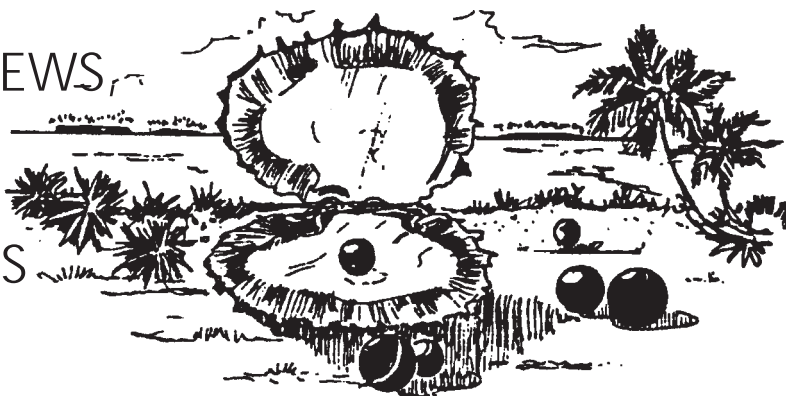
So far we market for retail only. In fact we are experiencing difficulty in marketing locally, and if the project is to be viable, a regular marketing channel will have to be identified.

At present we are importing shell bead nuclei from Japan, but recently we have produced and are trying bead made out of sacred Indian conch, *Xancus pyrium* var. *acuta*.

[Editor's note : Daniel also informs us that his project has about 30,000 carats of cultured pearls from the first harvest up for sale. These range in size from 3 mm to 7 mm. Interested parties may contact the Tamilnadu Fisheries Development Corporation Ltd, at phone no.s 8277012, 8277114 or 8277305, or by telex at 7178 Fish In.]

# PEARL OYSTER NEWS

## RECENT ARTICLES, AND REVIEWS



### International Pearl Association formed

The first International Pearl Association (IPA) Board Meeting was held in November 1993 in San Francisco.

The following officers were elected: John Larendresse (President), Flora Lu (Vice-President), Eve Alfille (Treasurer), Alex Edwards (Secretary).

The mission of the IPA is to provide a forum for sharing materials and experiences, acquiring information, and discussing common needs or problems relating to the pearl industry.

The association will enable members to:

- ☞ add significantly to the success of their respective organisations by exchanging the knowledge that enhances their ability to respond to their particular needs and expectations;
- ☞ contribute to the advancement of the pearl industry; and
- ☞ serve as a leader in this rapidly growing and dynamic industry.

The IPA will promote the continued development of resources, education and public awareness and add significantly to the information and support that enhances global participation and the conservation of resources.

The IPA will be establishing a number of committees, covering:

- Membership,
- Education,
- Evaluation/Accreditation,
- Employment,

- Executive,
- Public relations,
- Scientific advisory,
- Funding,
- Publication,
- International government relations,
- Awards,
- Professional standards,
- Marketing, and
- Chapter relations.

In addition to the Committees there will also be an IPA directory and quarterly newsletter, both dedicated to the global pearl industry.

Some of the board members' comments on the newly formed International Pearl Association:

☞ *What visions do you have for the Association?*

- To be the world data-bank concerning pearls and the pearl industry.
- An organisation dedicated to furthering the pearl market worldwide.
- A self-sustaining international body, which will moderate disputes, encourage stabilised markets, where possible, promote all types of pearls, cultured and natural, and create new markets by reaching a wider public.

☞ *What specific role in the pearl industry do you hope to see IPA play?*

- To develop/exchange knowledge concerning pearls through publishing, teaching, contests, exhibitions and seminars;

- To educate the retailers and help them to promote pearls.
- ☞ *How would you prioritise the IPA's agenda?*
- 1 To draw members from all over the world;
  - 2 To serve as a clearing-house within the industry for jobs, investment, trading;
  - 3 To offer high profile educational awareness of all types of pearls to the public.
  - 4 To organise pearl course and educational programmes for retailers and designers.
- As the sponsoring society of the Pearls '94 Conference and Exposition (14–19 May 1994 at the Sheraton Waikiki Hotel), the Board reviewed and approved its programme format.
- For further information, contact:
- Robin Crest or Bobbi Bradley  
Crest International  
940 Emmett Avenue, Suite #14  
Belmont, CA 94002  
USA
- Fax: (1-45) 595 3379.

### Collaboration in Pacific Island pearl oyster resource development

**Source: South Pacific Commission,  
24th Regional Technical Meeting on Fisheries,  
Working Paper #8**

*Excerpts from Working Paper #8, prepared by the South Pacific Commission Secretariat for consideration at the 24th Regional Technical Meeting on Fisheries, held in Noumea from 3 to 7 August 1992*

#### Background

The development of aquaculture activities based on the blacklip (*Pinctada margaritifera*) and goldlip (*P. maxima*) pearl oysters has been identified as a potential income-earning activity for outer islands and rural areas in Pacific Island countries. In some locations, initial economic analysis suggests that culture for the shell alone could be feasible, but in all cases the ultimate goal would be the production of gem-quality pearls.

Interest in this area by Pacific Island countries follows the successful development of a low-technology, outer-islands based pearl culture industry in French Polynesia and, more recently, the establishment of a fledgling industry in the Cook Islands. The South Pacific Commission has for some years been assisting its member countries explore the potential for pearl oyster culture in their own lagoons, and promoting the concept of a regional approach to the development of this industry.

Following an exposé on the black pearl culture industry at the 23rd RTMF by the representative of French Polynesia, the meeting made the following recommendation:

*'That the South Pacific Commission follow up French Polynesia's offer to contribute to developing a policy and a regional programme for cooperation in the field of pearl shell resource enhancement'.*

This paper provides a summary of present considerations related to pearl oyster and pearl farming in the region, and details the action taken by the Secretariat in promoting the collaborative development of pearl oyster farming on a regional basis, through co-operation with both French Polynesia, and with other interested parties.

#### National and international bodies involved in pearl oyster resource development

##### *South Pacific Commission*

During the development of the Cook Islands pearl culture industry, SPC provided support under its 'inter-country study visit' and 'expert assistance' schemes. Staff of the Ministry of Marine Resources were sponsored to visit pearl culture establishments in Takapoto, French Polynesia. The visit of the first seeding technician to carry out pearl nucleus implantations on Manihiki, Cook Islands was partly sponsored by the Commission. In addition, support was given to the Federated States of Micronesia when one of its Marine Resource Department staff undertook a training attachment on Manihiki at SPC expense.

Since the establishment of the British Government-sponsored Inshore Fisheries Research Project, the Commission has also carried out surveys of natural blacklip pearl oyster resources in selected lagoons in Kiribati, Tuvalu and the Marshall Islands. Further survey work of this type is planned for these countries, plus the Federated States of Micronesia and possibly elsewhere.



In most of the locations (all of which are atolls) where SPC surveys have taken place, local pearl oyster stocks are reduced, sometimes seriously so. Anecdotal information suggests that this is the case in most atolls in the region, as well as in many coastal lagoons around high-island countries. Sometimes the low shell populations can be attributed to intensive over-harvesting (usually for mother-of-pearl export) in the past. In other cases the reasons are unclear, and could be due either to fishing activity, or non-ideal environmental conditions, or a combination of factors.

Irrespective of the causes, pearl oyster population sizes in many locations appear to have been reduced below the minimum level required for successful mass spawning to occur. Recruitment is therefore thought to be low, and inadequate to allow the population to build up to high levels. Low populations are also maintained by incidental or subsistence harvesting, which continues uncontrolled in most cases. In some locations, harvesting is increasing and there is a danger that local pearl oyster populations could be eliminated altogether.

In these cases the establishment of pearl oyster farming activities is not feasible, and will not become so until the depauperate wild stocks recover. A more appropriate approach to pearl oyster resource development in such situations would be to take steps to protect the resource and, if possible, to artificially enhance its recovery. Such enhancement could take advantage of methods that are traditionally used in pearl farming e.g. the collection of juveniles using spat collectors, and the aggregation of sexually mature animals into spawning colonies. It would also benefit from research and dissemination of information on hatcheries or other systems to increase reproductive success and the level of juvenile production from reduced numbers of adult pearl oysters.

Only one of the locations surveyed (Namdrik atoll in the Marshall Islands) has so far been found to have pearl oyster stocks adequate to support a farming venture. Further assistance has been provided to the Marshall Islands government in establishing a pilot farming project. Juvenile pearl oyster shell has been taken from artificial spat collectors, placed in nursery baskets, or drilled and hung directly on subsurface longlines and will ultimately be seeded with pearl nuclei. Practical training on a working pearl farm in the Cook Islands is also being organised for the local manager of this project.

#### ***Forum Fisheries Agency***

The work on Namdrik has benefited from financial support from US treaty funds administered through

FFA, which organisation has also been active in promoting pearl oyster resource development. Surveys of wild pearl oyster stocks have been sponsored in Solomon Islands (goldlip) and Fiji (blacklip), as has the attachment of a Solomon Islands fisheries officer to a Cook Islands pearl farm.

#### ***French Polynesia***

The French Polynesian pearl culture industry has been successful in establishing a prestige, high-quality, high-price and relatively low-volume market for its pearls, a process which has taken many years to achieve. For obvious reasons, the industry is keen to ensure its own protection from competition, and there is serious concern among industry members about the dangers of encouraging other countries to commence pearl production. The industry view is that there is a limit to the number of pearls the world market can absorb, and that if other countries begin farming pearls over-production will occur, driving pearl prices down and making French Polynesian production uneconomic.

The French Polynesian Government goes to considerable lengths to ensure that only the best quality pearls are sold, and that inferior pearls remain un-marketed, or are even destroyed. It is feared that production in countries where pearl quality is not subject to strict regulation will result in inferior quality pearls being sold, leading to a decline in market acceptability of black pearls, and a consequent reduction both in average product value and in the size of the world market. Inferior quality pearls include those which are misshapen, poorly coloured or textured, or on which the nacreous layer is patchy or spotty. They also include those which have too thin a nacreous layer because they have been harvested too soon after seeding. This problem has occurred in both French Polynesia and the Cook Islands, and is particularly common to newly established farms where it is necessary to realise a cash return on initial investment as early as possible.

For these reasons, as well as a simple reluctance to encourage competition, pearl culture interests in French Polynesia have assumed a conservative position regarding the provision of assistance to other countries of the region. Being economically important in the Territory, the industry has a great deal of influence in French Polynesia and it will be difficult for the government to enter into any form of agreement that promotes pearl culture in other countries of the region without industry support. This support is not likely to be forthcoming unless industry members can be convinced that they will benefit from such an arrangement.

French Polynesian authorities continue to express their willingness in principle to collaborate with other Pacific Island countries in developing a regional approach to pearl oyster culture, but the terms and conditions under which this could take place have yet to be elaborated. It is therefore necessary to identify specific, concrete actions that can be taken by the various interested parties to encourage greater collaboration.

### **Australia**

The production of pearls from goldlip pearl oysters in Western Australia and the Northern Territory is Australia's most valuable aquaculture industry. Although golden pearls ('South Sea Pearls' or 'Broome Pearls') occupy a different market niche from black pearls, and do not compete directly with them, the industry view on marketing is similar to that in French Polynesia. There is a widespread apprehension concerning over-production, and existing industry interests are keen to prevent increases in production either within Australia or overseas.

As in French Polynesia, the industry is influential in Western Australia, and has been instrumental in convincing the state government to introduce regulations essentially preventing the use of hatchery-produced *Pinctada maxima* spat for pearl farming, despite the fact that the necessary hatchery technology has been developed in the state. The result has been that the hatchery developers have now moved offshore, and Australian-run *P. maxima* hatcheries are now operational in Indonesia, and perhaps elsewhere, but still forbidden in Australia. The logical outcome of such a situation will be that overseas production, with its implicitly poorer quality control standards, will increase, while Australian production remains static. Such a situation would appear detrimental to Australian interests and could perhaps have been avoided if a more co-operative stance had been adopted by industry.

There is a growing interest in Queensland and the Northern Territory in farming *Pinctada margaritifera*, but at present there are no commercial blacklip pearl producers in operation. Stocks of blacklip appear less robust than those of goldlip in Western Australia, and there is considerable interest in research into hatchery and resource enhancement techniques and technology, an area that is of mutual interest to Australia and Pacific Island countries.

As a result, a joint programme of research is being developed through the Australian Centre for International Agricultural Research (ACIAR), in partnership with Kiribati, the Cook Islands, and per-

haps other Pacific Island countries, as well as SPC. The principal foci of the project, which concerns only *Pinctada margaritifera*, are: simple methods to improve reproductive success by spawning small numbers of shell in floating enclosures; land-based low-technology hatchery techniques, especially through the use of micro-encapsulated feeds as a substitute for algal diets; identification of potential parasites and pathogens, and the identification of key environmental factors influencing their presence and distribution; and description of genetic variation among regional populations, and within populations (especially those subject to enhancement programmes) over time.

### **Areas for co-operation**

The view of the SPC Secretariat is that a regional approach to developing pearl culture, if governed by a properly structured and legally binding agreement, would benefit established industries in the region as well as other countries wishing to gain an entry into the business. An important feature of such an agreement is that it would reduce the likelihood of a competitive and confrontational situation arising between pearl-producing countries. The agreement, while providing for technical co-operation between signatory countries, should also focus on marketing arrangements, with a clear understanding that all countries would adhere to agreed criteria and controls regarding the marketing of inferior quality pearls.

Within the scope of such an agreement, there are four principal areas in which co-operation could take place: resource enhancement of depleted or naturally depauperate stocks; promotion of environmentally sound pearl oyster and pearl culture techniques; a collaborative approach to pearl marketing which would maintain product quality and maximise returns to industry; and applied research to improve the productivity of, and economic returns from, pearl farming.

#### **Resource enhancement**

Where wild stocks are reduced, the aim would be to rebuild them by protecting adults from fishing, taking steps to improve the reproductive success (i.e. increased fertilisation rates) of spawning adults, and husbanding juveniles to reduce early-life mortality rates.

These aims might be partly achieved by concentrating adults and through spat collection programmes. There are also more technically advanced approaches to resource enhancement that could be investigated. These might include the spawning of shell within floating enclosures, or the develop-

ment of simple land-based hatcheries, if an alternative to live algal diets for larval pearl oysters could be developed. Hatchery techniques for *Pinctada* species have already been developed in Japan, Australia and French Polynesia, but information on these techniques is commercially secret and is not in the public domain. Juvenile production, and especially hatchery technology, for resource enhancement purposes is clearly an area that would benefit from improved collaboration between commercial and non-commercial institutions if a mechanism can be found through which information could be shared without damaging the interests of one or other party.

### ***Pearl farming***

Experience both in French Polynesia and the Cook Islands has demonstrated that the following of basic rules regarding stocking densities, material construction and deployment methods, and animal husbandry techniques makes the difference between a successful pearl farm and a failure. Poor farming practice can lead to serious environmental problems such as disease and reduced spatfall within a lagoon, thus affecting all farmers, not just those whose practices are poor.

There is thus a need for co-operation in all fields of pearl farming development, from stock surveys, through the establishment of pilot ventures, to the training of individual farmers in correct farming methods. Those countries with established industries can play a major role in ensuring that other countries do not repeat the same errors and face the same problems that they have in establishing pearl oyster farming enterprises.

### ***Marketing***

It is the Secretariat's view that the black pearl market has not been studied well enough for a realistic assessment to be made of the likely impact of increased production from the Pacific Islands. Black pearls occupy a specialised market niche and, rather than cause saturation, it has been speculated by some economists that increased production beyond a certain critical level would lead to increased demand for the product. Given the value of the existing and potential industries in the region, this issue merits a much more detailed examination, and would be an appropriate study to be undertaken by a regional agency.

### ***Applied research***

A number of institutions are involved in, or planning, applied research into various aspects of pearl

oyster farming that has the direct aim of conferring benefits to the industry by improving some aspect of farming productivity. A major programme involving several metropolitan and territorial agencies is under way in French Polynesia, spurred on by problems with disease outbreaks in some lagoons during the late 1980s. Some Australian institutes are also involved in production-oriented research, in fields which variously include the study of parasites and pathogenic agents, improvements in hatchery technology, the environmental implications of pearl oyster farming development, and research into improved methods of pearl seeding that will yield higher numbers of higher quality pearls. Aspects of all these topics could be carried out more efficiently and cost-effectively as collaborative research activities.

### **Conclusion**

There is considerable scope for the development of pearl oyster and pearl culture as an economic activity in countries of the South Pacific region. There is also considerable scope for technical and economic collaboration among countries of the region to ensure that development occurs in a harmonious and mutually beneficial manner.

If those countries that already have established industries withhold their co-operation from those countries wishing to develop new industries, then the latter will seek technical assistance from outside the region. This will lead to a situation of competition and confrontation among countries of the region, and will also make it easier for disreputable operators to establish themselves. An agreement which not only provided for technical co-operation but also promoted collaborative business ventures and regionally accepted marketing controls would have the potential to overcome many of these problems.

The Secretariat's view is that, irrespective of where the initial technical assistance comes from, new pearl culture industries will ultimately develop in several countries of the region. To avoid conflict which would be damaging to both new and established industries, it is preferable that this should happen in an atmosphere of solidarity, co-operation and mutual support rather than of competition, conflict and mistrust. For these reasons the Secretariat is eager to support any steps that can be taken towards the establishment of a regional agreement under which technical and economic co-operation can take place.

## Restructuring opens up opportunities in French Polynesian cultured pearl industry

*Excerpts from an article by Ulafala Aiavao, entitled 'The Papeete plan to keep pearls in black', published in Islands Business Pacific, September 1993, p. 48.*

If a unique technology-sharing plan by the Tahitians goes smoothly, there may be pearl farm possibilities for other Pacific Island countries, particularly atoll states which typically have few development options.

Cultivated black pearls return more than US\$ 40 million a year to the French Territory, while the gross economic value from support services is about US\$200 million. Tourism receipts are only slightly higher than pearl revenues. Tahiti, producing more than 95 per cent of stock on the market, is the world capital for the annual sales meetings with wholesalers. Papeete alone has 67 retail outlets for this prized jewel of the sea.

Territorial officials are therefore concerned at anything that undermines the exclusive image (and price) of black pearl farms based in the outer islands of the Tuamotu and Gambier archipelagoes. In recent years, that concern has included the activities of the newer and much smaller pearl farming industry in neighbouring Cook Islands, which got its start from its bigger brother.

### Convention

Last June, the President of French Polynesia, Gaston Flosse, used an international convention to call for 'a permanent commitment to ensure quality. There must be a panoply of measures to prevent unfair and hostile competition'. Flosse, speaking in French, used the word *fratricide* (killing your brother). Interpreters diplomatically used the word hostile, explaining later that it suited the context of his French.

Competition in this case came from the temptation to export low-grade pearls to wholesalers, instead of keeping them off the market. Although this generally lowers prices and gets more sales, it can backfire.

Pearl farmers are always at the mercy of their oysters which innocently produce both high- and low-value stock in man-made oyster beds. Some years ago, Tahitian authorities used a steamroller to crush low-grade pearls into useless grains. The flamboyant event was stopped after a public uproar but producers got the message.

Not surprisingly, there has been some hesitancy by Tuamotu and Gambier veterans in sharing trade secrets with potential rivals across the region. 'It took five years of talks before local producers agreed to do so. (Now) they want an agreement on quality standards and marketing', says Alexandre Moeava Ata, Special Advisor for Foreign Affairs in the territorial government. The June agreement on technology transfer to other Pacific Islands naturally means that Papeete, with vastly more experience, would be the leader.

The growing industry in the Cook Islands has generated interest in other states. Papeete can let newcomers develop in fits and starts (with the possibility of an unstable market in future). Or it can act as a guiding light, winning friends along the way and protecting its financial stake.

'We see huge possibilities for the Pacific Islands', says Ata, who has received recent enquiries from Kiribati and Palau. A large initial investment is needed, but the returns from black pearl farming have greatly benefited the sites where they are currently based – two low-lying atolls in the Cook Islands and dozens of atolls in French Polynesia.

There is keen interest in a new site set up in the lagoon at Tahaa in the Society group, the first time a 'high' island has been used. Success there may have implications for Pacific states lacking atolls. 'The basic problem for new producers is the biological balance of the lagoon and overcrowding. We can help with knowledge as we have a research programme involving eleven universities around the world studying the mother-of-pearl functions', says Ata.

'The added value is important. European jewellers tend to use black pearl as an addition to others. We still need to discover new ways of presentation. My feeling is that it will come from South America because they are very good at design.'

### Difference

Pearl farming will not work everywhere. When it does, the success rate from grafting or seeding of the oyster is typically only one-third of the number of attempts made. All the same, the returns can



make a difference to the standard of living on an outer island, not to mention a national economy.

Under the Papeete plan, a central pearl stock exchange will be based in Tahiti. It may help to prevent wholesalers from playing suppliers against each other in order to reduce the prices. (The October auction in Papeete comes before the one in Rarotonga.)

A joint marketing system would look at a standard classification system, and de facto price range, so that incentives could be biased towards high value products. Retail prices are typically hundreds of dollars for single, prime specimens while pearl strands run to five figures.

There are also challenges (and jobs) opening up in jewellery design. The standard black pearl is round, but there is a surprising variety of shapes including disks, ovals, teardrops, furrowed circles, fingers and baroque or irregular patterns. Exchange of knowledge would also hammer home the need to maintain the exclusive image of black pearls as an alluring product.

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*Excerpts from an article by Fran Dieudonné, entitled Co-operation asked for black pearl industry, published in Pacific Magazine, August 1993, p. 17.*

At the opening of the fourth Pacific Islands Conference of Leaders in Papeete, Tahiti, in June, Gaston Flosse, Territorial President, asked for co-operation among South Pacific countries in the production and marketing of black pearls.

Flosse emphasised that it was important to ensure high standards of quality and stability of prices. He

## Partnerships

New sites showing potential will probably involve partnerships with established producers in French Polynesia or the Cook Islands as the fast-track method to learning the ropes. It holds promise at the community level, but one lesson the industry has learnt is that black pearl farming works best when it is driven by the private sector. State support has generally been restricted to economic incentives.

Black pearls of the deepest hues are the most valuable, but the term also covers hues of green, gray, gold, blue, purple and pink. Some nations, notably Japan and Taiwan, offer so-called 'black' pearls which are regular ones artificially dyed black. So far, that method remains sacrilegious to purists working with the Polynesian stock. Wholesalers and retail clients seem to agree as they willingly pay a higher premium for naturally coloured pearls.

praised the whole industry, saying that it had more than 20 years of commercial experience behind it. He expressed his appreciation for what the black pearl industry had developed, especially the people of Rangiroa in the Tuamotu Island group for their pearl centre and their work.

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*Excerpts from an article published in Les Nouvelles Calédoniennes*

For the past two years, pearl farming in French Polynesia has been struggling to cope with the recession; the added impact of a collapse in prices has brought the Territory and the industry together in an attempt to respond more effectively. The inception of a GIE (Economic Interest Group) *Perles de Tahiti* (Pearls of Tahiti) marked the culmination of this process and the first step in a thorough restructuring of the cultured pearl sector.

At the end of the eighties, the Tahitian pearl industry was booming, but the good times were not to last. Since 1991, the market has been depressed and prices have been falling considerably and without respite.

Many factors seem to have contributed to the industry's 'growing pains', including an over-rapid

increase in production coinciding with the world economic recession, excessive trade dependency on Japan and competition from new producing countries.

## Coping with the crisis

In April 1992, with the agreement of the responsible authorities, the professionals within the Poe Rava Nui Group and the SPPP (Professional Association of Pearl Producers) decided to join forces to promote and develop the cultured pearl market in Tahiti. In July 1992, the Tahiti Chamber of Pearl Jewellery and Marketing Trades was set up, along with various promotional activities in 1992 and 1993. These consolidation endeavours led to the establishment of a consortium of producers and the establishment of the Pearls of Tahiti Economic In-

terest Group, which has set itself the aim of upgrading the Tahitian pearl industry over a three-year period and achieving a turnover of 6 billion CFP francs (US\$ 60 million) [as compared to 4.2 billion in 1992].

To achieve this goal, Pearls of Tahiti is proposing to:

- perform market research and seek out new purchasers,
- design and conduct promotional campaigns,
- propose and implement a process of product standardisation,
- support research on product development and on improving pearl farm profitability,
- set up a pearl advice bureau, and
- make proposals designed to structure and better regulate the pearl market.

### Three founder members

Pearls of Tahiti is composed of three founder members: the Territory, which will have four votes on the Board of Directors (3 appointed by the Council of Ministers and 1 by the Territorial Assembly);

SPPP, with 4 votes; the Poe Rava Nui Group, with 3 votes.

One vote was also given to the recently established Consortium of Pearl Producers of Tahiti and its Islands (SPPTI) which was not, however, invited to be a founder member. Answering questions on this topic, the Minister of the Sea expressed sympathy for this new consortium. The creation of the Group allows for the possibility of including any group of professionals, providing that it is representative of the pearl-farming industry.

Funding for the operation of the Group will come from members' contributions, its own revenue, public subsidies and also the reallocation of part of the 2 per cent tax on pearl exports.

At the signature of the agreement ratifying the establishment of the Pearls of Tahiti Group, the President of the Government referred to the need to introduce sounder organisation and stricter regulations to govern this sector and the desirability of environmental, technical and economic co-ordination for the purpose of upgrading the product and gaining a firm foothold on the market.

### Review of French Polynesian pearl culture (1987 – 1991)

*Source: South Pacific Commission, 24th Regional Technical Meeting on Fisheries, Information Paper #12*

*Excerpts from Information Paper #12, entitled Country Statement – French Polynesia, prepared for information at the 24th Regional Technical Meeting on Fisheries, held in Noumea from 3 to 7 August 1992)*

#### Pearl exports: 1987 to 1991

| Year | Weight<br>(in grams) | Value<br>('000,000 CFP francs) |
|------|----------------------|--------------------------------|
| 1987 | 407,620              | 2,251                          |
| 1988 | 446,827              | 2,513                          |
| 1989 | 622,433              | 3,790                          |
| 1990 | 599,482              | 3,758                          |
| 1991 | 833,504              | 4,425                          |

#### Development of pearl culture in French Polynesia

Although the pearl industry continued to expand in 1991, the first alarm signal came in October that year with the relative failure of the Poe Rava Nui Group's pearl auction, when a number of lots went unsold and those that did find buyers yielded on average about 25 per cent less per pearl than in the previous year.

This decline continued in 1992 with many of the pearls reaching the retail market not being bought.

There are two main reasons for this:

- stockpiling by Japanese operators (who buy 70 per cent of production) of large quantities of pearls in recent years; and
- over-production, with supplies arriving from the many pearl ventures set up between 1988 and 1990, which had begun large-scale production.

Since all the experts agree that the quality of pearls produced in French Polynesia is improving, this downward trend in prices is alarming and many observers are already warning of a possible crisis in the immediate years to come, if new markets are not found.

#### General Pearl Oyster Research Programme

This programme, commenced in 1988, is continuing its work. After being mostly funded from territorial sources, substantial programme support will soon be forthcoming under a development agree-

ment with the French Government and from the European Economic Community.

Work on pathology has revealed an intra-cellular parasite in the intestine of two *Pinctada* species of the region. This protozoan of genus Gregarina is in the process of being described and its life cycle studied; a crustacean may well prove to be the principal host.

Studies by IFREMER on physiology are into their final phase. Similarly, EVAAM's research on the reproductive biology, spat collection seasons and hatching techniques will soon be in print.

Natural stocks of *Pinctada margaritifera* in many lagoons have come under scrutiny and were the subject of a doctoral thesis in 1993.

Work on autofouling (publication late 1992) is in progress as is an investigation of shell borers and their impact on the nacre and on oyster health (results expected to become available in 1994).

Some socio-economic research work is also under way to improve knowledge about the impact of development of this activity on the populations of remote Tuamotu atolls.

Further work (on genetics and on the environmental impact of intensive culture) began in 1992.

Most of this research takes place within a programme known as the General Pearl Oyster Research Programme (PGRN) co-ordinated by EVAAM and involving various territorial and metropolitan French laboratories.

### **Pearl World provides industry overviews**

**The worldwide South Sea pearl market** — Excerpts from an article by Salvador J. Assael, published in Pearl World – The International Pearling Journal, Vol. 1, No. 2, pp. 1–5.

Exactly thirty years ago at this time I had the privilege of attending the very first Burma Auction in Rangoon. At the time of that first auction there were only 19 lots shown, but they were extremely big in quantities of goods: each lot was anywhere from a minimum of 200 momme to 1,500 momme. I was the only American present. There were no Japanese at all (due to the fact that the Burmese Government had actually taken over and nationalised the pearl farms that had been created by Mr Kichiro Takashima and, therefore, a tremendous friction at the time existed between the two countries). The rest of the buyers were mainly Europeans.

The goods were extraordinary in quality. They were, without a doubt, the finest goods that had ever been produced anywhere in the world, and even today the finest of Australian or Indonesian goods cannot compare with what was shown in 1963. These Burmese pearls were the result of the incredible knowledge of South Sea pearl production provided by the Takashima technicians, and by the fact that the oysters living in these fabulous waters could create such marvels. Furthermore, the Government, having nationalised the farms two years prior to the first harvest, allowed the pearls to grow to incredible sizes. The colour was the finest pink: the cultivation was incredible. The quality of the baroque pearls was beyond imagination. In other words, '...those were the days'. What incredible changes have taken place in the past 30 years!

Burma continued on its own to make white South Sea pearls but, as the years went by (as we all know), the quality has declined.

From that point on, Australia began to produce South Sea pearls in the Arafura Sea. New people and new companies emerged in Australia and we can definitely say that Australians now produce a magnificent South Sea pearl.

However, the colour is not pink enough yet, except for a minimal percentage. There is still no mastery of colour in the sense that the *Pinctada maxima* that produced a fabulous pink pearl in Burma cannot produce a strong pink colour in Australia. The crops generally run on the greyish side (very light grey to actual grey). The proof that gem-quality Australian pearls can be produced and can bring in very high prices is that Australian necklaces have been sold in auctions at world-record prices! For instance, in April 1988, a 25-pearl necklace sold for US\$ 1,265,000; in April 1989, a 35-pearl necklace sold for US\$1,045,000; and in April 1990, a 45-pearl necklace sold for US\$2,420,000.

And in particular, even with the recession as it exists today worldwide, last October a 23-pearl necklace was sold for US\$ 2.31 million, meaning that each pearl was sold for over US\$100,000. Size, of course, is essential. Just this April a smaller necklace of 25 pearls sold for US\$1,100,000, meaning that the price for each pearl was US\$44,000.

This proves that very fine goods in very large sizes are still extremely rare and, when available, are snapped up by private customers... whether Americans, Europeans or Asians. We as a company (*Salvador J. Assael is president of Assael International Inc.*) feel that demand is very strong in the cheaper goods, and in the very high-priced goods. The middle range tends to be a little weaker, and this is certainly due to world conditions today. We predict that when world conditions change, the demand for these goods, which was extremely strong up to 1991, will also increase tremendously.

The fact that Australian producers are limiting themselves due to the conditions in the market seems to point to very steady prices – not only steady but, in our opinion, ever-higher prices than those which existed in 1992. We feel that 1992 was the bottom of the market, and that market prices are beginning to rise.

The proof of this is that at the last two auctions in Kobe (October 1992 and March 1993), all goods put up at auction were sold at a higher price than reserve. In dollar equivalent, they averaged about US\$450 per momme. However, the March goods were easily 25 to 30 per cent lower in quality than the October goods. Yet they were all snapped up at the same per-momme price.

Fifteen years ago many Japanese companies were dyeing their poor yellow pearls black, and the world market was flooded with what was then black-treated South Sea and akoya cultured pearls. That market is, nowadays, almost non-existent thanks to the Tahitian pearl, which has been accepted worldwide to the point that we find as great a demand for black Tahitian pearls as we have for white South Sea pearls.

Many of the pearl farming operations in Tahiti are able to produce 9–12mm pearls of mostly poor quality. This affects the market because there is a feeling of over-production.

South Sea pearl cultivation and production is not an easy thing. So many factors affect it, be they pollution, sickness, lack of food in the lagoons or natural disasters, that no producer can be 100 per cent sure of what will happen to his farm. The market, therefore, cannot be free of price fluctuations.

Whereas there is perhaps an over-production of sizes 0–12mm in poor quality black Tahitian pearls, there is a tremendous scarcity of black Tahitian pearls 12mm and above because it is very difficult to produce them. The demand for large sizes, par-

ticularly in good quality, is so great because only one or, at the maximum, two producers in Tahiti can produce these big sizes. And, thus, at this particular time they cannot cope with the demand.

Confirming this fact, gem-quality black Tahitian pearls have fetched incredible prices at auctions. For instance, in October 1989 a three-strand necklace of 37, 39 and 43 pearls, respectively, sold for US\$ 880,000; in April 1990 a 27-pearl necklace sold for US\$ 792,500; and in October 1992 a relatively small necklace sold for US\$ 275,000, which is a record price at auction for a small-sized necklace.

At the moment, on the market there are no known big black natural colour Tahitian pearl necklaces available anywhere in the world.

We forecast that the moment we move out of the recession, worldwide demand for these pearls will be even greater. Production will definitely not increase because it is impossible to do so, but prices of fine large necklaces and fine large black pearls will certainly rise.

An attempt has been made in the past few years to start producing 'natural black pearls' in the Cook Islands and the Marshall Islands. We have followed this phase very carefully and have travelled to both places. Two years ago, we even attended an auction that took place in the Cook Islands of the goods produced there by a group of cultivators. The merchandise was extremely poor, very high-priced and monumentally uninteresting. We are following this attempt, but we are aware that it is a futile effort which is being given up, and it has already become a zero factor in the industry. [*Editor's note: Note the rebuttal in the subsequent Pearl World issue, reprinted below.*]

Overall, we can safely say that production is being contained, that quality is being worked upon constantly in order to be improved, and that prices will certainly remain steady – and, unquestionably, rise – within the next two or three years.

We can also categorically state that the South Sea pearl business has become tremendously important within the entire pearl industry. For example, 30 years ago South Sea pearls made up only 1 per cent of Japan's total pearl exports; today they are approximately 42 per cent. When you consider that what is being shipped out of Japan is only part of the South Sea production, and then add the direct exports out of Australia, Hong Kong, Indonesia and Tahiti, we can estimate that easily an additional US\$ 100 million can be added to the Japanese figures. If we add the export figures of South Sea



pearls out of Japan, approximately US\$ 118 million, and the US\$ 100 million of direct exports, we arrive at a figure of approximately US\$ 220 million in export prices of South Sea pearls, white and black. This accounts for 55 per cent of all the pearl business in the world, excluding (of course) freshwater pearls and Chinese pearls.

In a way, the most desirable thing that could happen to the South Sea pearl industry is something very basic. Improve the quality of crops to the point that, instead of having prices increase, we can have much more steady crops, so that goods can be sold at cheaper prices. The aim really would be not to

sell occasional necklaces of pearls at the highest possible prices, but to sell all crops at commercial-level prices. If we can achieve that, consumption would become even greater than it is today, because more and more people could afford to buy South Sea pearls.

Therefore, a production increase is not a fearsome thing if the producer can get a fair price for his crops due to improved quality. Then the producer could definitely afford to lower his cost, and also lower the price of South Sea pearls. This is not an undesirable thing, because consumption and demand would be even greater than they are today.

**Cook Islands' pearl quality defended** — *Excerpts from a letter to the Editor, published in Pearl World – The International Pearling Journal, Vol. 1, No.3, p. 6.*

*Dear Sirs*

*I read your June/July issue with interest, particularly the portion of the article on the Cook Islands where attempts at developing a black pearl industry were described as 'a futile effort which has been given up'. If this information is based on a visit two years ago, I would suggest the writer return and see what real progress has been made.*

*During my last visit a few months ago, it was apparent that the industry was just beginning to obtain results that (with continued effort) may well challenge the output of Tahiti. This is not surprising, since pearling has long been an established part of the Cook Islands economy too.*

*Although Tahiti has had a head start on culturing – and therefore still has a commanding edge on product quality, presentation and marketing – the technicians of Manihiki are coming of age, be it the small independents, such as Dr Robert Woonton, or the two major producers.*

*One of the latter, Peter Williams, maintains that – very recently – each new harvest has been exceeding the results of those prior. The Cook Island pearlery already have a large trade with Japan, and have also cultivated a pearl in excess of 20 mm... and, thus, are not at all 'a zero factor in the industry'.*

*In my opinion, competition is healthy. With it, we will see progress and choice... and that is something we should all support and encourage. Without such competition, the black SSP industry will remain confined to Tahiti, and could slip into decline if events turn against that locale. I, for one, am relieved that there is at least one other location where *Pinctada margaritifera* is comfortable. And although I have bought almost exclusively in Tahiti, and praise their pioneering efforts in the field, I am saddened to hear any negatives about the progress taking place in the Cook Islands.*

*Robert Murray, FGA  
Essex, England*

**The view from Tahiti** — *Excerpts from an article by Martin Coeroli, published in Pearl World – The International Pearling Journal, Vol. 1, No. 3, pp.1–3.*

Tahiti's naturally coloured pearls, black or grey, are cultivated in approximately 90 per cent of the lagoons scattered throughout French Polynesia.

The first attempts at cultivation took place in the Bora Bora lagoon in 1961, and continuing success in this enterprise can be measured in the total export of approximately one ton of product in 1992. The Tahitian pearl industry is divided between 15 large pearling companies which collectively form the Professional Syndicate of Private Pearlery, which accounts for approximately 75 per cent of each year's total production of Tahitian pearls; 350 members of a group called the Poe Rava Nui Group, an association of co-operatives and family-run micro-

companies which produces 17 per cent of the annual crop and which has, since 1972, organised the annual Tahiti International Auction during which, in 1992, approximately 50,000 pearls were sold; and small- and medium-sized independent pearling companies, not organised into a group, which account for 8 per cent of production.

The total output of product in French Polynesia is estimated to be around 500,000 cultured pearls per year. In 1992, exports totalled more than 1,069 kg in weight, with a pre-processed market value of some US\$40 million. Half-pearl exports totalled 66,13 kg, or about US\$173,000, and keshi pearl exports came to 2.7 kg, approximately US\$96,000.

### 1992 Tahitian pearl export distribution

|               |        |
|---------------|--------|
| Japan         | 82.60% |
| USA           | 12.00% |
| Hong Kong     | 1.00%  |
| France        | 0.90%  |
| Switzerland   | 0.55%  |
| New Caledonia | 0.46%  |
| Germany       | 0.40%  |
| Others        | 2.09%  |

An emerging trend of late is the growing interest of Taiwan and South Korea, in particular. Analysis of recent Tahitian pearl sales indicates a high demand for well-harvested, select pearls in rounds, drops, baroques and specially circled shapes; black, with green, purple or blue overtones; sizes up to 10.5mm in diameter, and especially those 12mm to 14mm in size.

Concerning overall Tahitian pearl production: a notable feature has been the strong period of growth between 1989 and 1991. But since then, we have seen a drop in demand due to a variety of factors which include: saturation of available space in most of the lagoons suitable for pearl production; heightened risks from natural disasters and recent climatic changes (early this year, nearly 85 per cent of the pearl farms located in the archipelago north of Tuamotu were destroyed by typhoon winds and subsequent high tides); diseases which cause high mortality during the cultivation periods. (Despite much scientific research being carried out since the

first appearance of mass pearl shell mortality in 1985 – with a 50 to 80 per cent mortality rate – little is yet known about its origins.)

Abnormal mortality rates of 30 to 50 per cent are still occurring in most of the lagoons, with subsequent negative effects upon pearl success rates, particularly upon the quality of the harvested product; a drop in prices for the smaller-sized and lower-quality pearls, affecting the viability of a certain sector of pearl farming operations; and a need for qualified implant technicians. (Recent pearling developments, combined with ecological restraints, have caused pearl producers to look for skilled pearl grafters, experienced with blacklip oysters. Unfortunately, very few technicians of this calibre are available. Recruiting and training new technicians will add to the overall high risks of production, at least for the next two years, as it takes that long to become skilled at this exacting task.) Overall, though, Tahitian producers are optimistic.

The 16th Annual Tahitian Auction, held under the auspices of the Poe Rava Nui Group, is scheduled for October 1993. Approximately 70,000 pearls will be on sale [*Editor's note: Figures from the October auction are presented below*]. Most of the major Japanese wholesalers have confirmed their attendance at this event, underscoring the fact that in recent months there has been a heightened interest in Tahitian South Sea pearls among Japanese buyers, and the number of visits to French Polynesia for pearling purposes has increased tremendously.

**The October auction in Tahiti** — *Excerpts from an article published in Pearl World – The International Pearling Journal, Vol. 1, No. 4, p 7.*

The 16th Annual Tahiti Pearl Auction in October 1993 was lauded by the local press in terms such as 'The pearl takes off', 'Tahiti is coming up', and 'A superb success' (among other superlatives).

With some modesty the president of the organising association for the event, the Poe Rava Nui Group, was quoted as calling it 'a ray of light' in the otherwise rather dark pearl sky, worldwide, at present. The auction was supposed to last two days, but by the end of the very first morning 46 of the 108 offered lots had been snapped up by anxious buyers; the remaining lots were sold by that evening. In total CFP 492,646,608 (US\$ 4,691,872) was taken in for the 46,494 pearls on sale (which totalled 99,307.1 grams or 26,482 momme) – an amount some 93 per cent higher than the minimum price set by the organisers.

Sixty-five wholesalers from Korea, Taiwan, Hong Kong, New Zealand, Australia, Germany, Hawaii and Japan came to the auction, with 34 buyers succeeding (31 buying one or more lots; 3 companies buying 10 or more). The vast majority in attendance were Japanese.

The success of the event seems to be due to the large increase in strength of the yen versus the French franc (a 20 per cent gain over a one-year period); smaller production than expected; and approximately 30,000 pieces being rejected prior to the auction, resulting in an increase in the quality of the offerings.

Congratulations are due the Poe Rava Nui Group, who prepared and put on the best auction in recent memory.

**Annual Tahitian pearl auction results (1989 through 1993)**

| Year | Number of pearls sold | % change from previous year | Total sales (CFP) | % change from previous year | Average price (CFP) | % change from previous year |
|------|-----------------------|-----------------------------|-------------------|-----------------------------|---------------------|-----------------------------|
| 1989 | 36,618                | —                           | 557,000,000       | —                           | 15,211              | —                           |
| 1990 | 41,130                | + 12.3%                     | 600,000,000       | - 7.7%                      | 14,587              | - 4.1%                      |
| 1991 | 48,771                | +18.6%                      | 497,000,000       | - 17.1%                     | 10,190              | - 30.1%                     |
| 1992 | 49,525                | + 1.5%                      | 441,000,000       | - 11.3%                     | 8,916               | - 12.5%                     |
| 1993 | 46,494                | - 6.1%                      | 492,000,000       | + 11.6%                     | 10,595              | +18.8%                      |

[Editor's note: for further information on Pearl World, contact: the Editor, 1822 West Glendale Ave., Suite 401, Phoenix, Arizona 85021-8543, USA (Fax: 1-602-246-1688)]

### Culture trials in Vava'u produce marketable half-pearls

Excerpts from an article published in *Matangi Tonga*, May-June 1993, p. 42.

The culture of half-pearls is now being carried out on an experimental basis in Tonga. Work being done in Vava'u by the Ministry of Fisheries is showing that this may be an important export in the future.

The species of pearl oyster which can produce half-pearls, the giant winged oyster (*Pteria penguin*), is not native to Tonga. They were brought from Japan in the 1970s by a Japanese pearl company interested in setting up a venture in Vava'u. The company suffered some setbacks in their operations, they ceased operating in Tonga, and their oysters were all but forgotten.

In the late 1980s in Neiafu Harbour a Peace Corps volunteer noticed considerable quantities of young oysters which seem different from the native species. After they were positively identified as Japanese giant winged oysters, the Ministry of Fisheries carried out a survey and discovered numerous large individual oysters on anchor ropes. Juvenile oyster collectors, which are pieces of rope hanging from floats, were set and substantial numbers of small oysters settled. With these indications that the introduced oyster species was abundant in Vava'u, the Ministry of Fisheries launched a major half-pearl culture project.

The first step in culturing half-pearl is to collect the juveniles, or 'spat'. In Neiafu Harbour between the Paradise Hotel and 'Utulei, rafts are floating from which polypropylene ropes are suspended. The larvae of the winged oyster are free-swimming, but

eventually settle, some on the hanging ropes. After the ropes have been hanging two to three months, the spat are collected and transferred to net cages where they remain for three to four months, until the oysters are 30 mm to 40 mm in size. A hole is drilled near the hinge and the oysters are suspended on lines from floats. After hanging for two years, the oysters are recovered, and a half sphere between 10 and 20 mm in size is fastened by superglue to the inside of the shell. The shells are returned to the water for another 7 to 18 months before harvesting.

About 65 per cent of the implanted shells produce marketable half-pearls. The area on the shell where the half-pearl is formed is cut away and sent to Japan for final processing into jewellery.

The experimental pearls from Vava'u have been sold for an average of US\$ 37 each, but there is considerable potential for increasing the financial yield. A very high quality half-pearl can be worth almost US\$500. Additional experimentation needs to be done in manipulating various environmental factors. By doing this it may be possible to obtain the high-quality greenish-blue or medium-value silver and gold colours, rather than the yellow tones presently being produced in Vava'u. It is thought that in the future the high-quality half-pearls will be exported and the ordinary ones used for local handicraft manufacture.

The culture of half-pearls is considered more appropriate for Tonga than the conventional round

pearls for several reasons. The type of oyster that produces round pearls, the blacklip pearl oyster, is not common in Tonga and the spat would be very difficult to collect. Also gluing a nucleus into a

gonad for round pearl production is extremely complicated (another factor which makes the success rate of half implantation much higher than for round pearl implantation).

## Pearl oyster fisheries guidelines announced

*Excerpts from an article published in Western Fisheries, Summer 1993, p.6.*

A blueprint for the future of Western Australia's \$125m a year pearling industry was announced recently by the State Government.

The blueprint has been developed as guidelines under the Pearling Act, and will provide a clear direction to pearl farmers and the Fisheries Department for development in the industry.

Pearl farming licences, the production of pearl oysters in hatcheries, foreign investment in the industry, the control of fishing on wild stocks of oysters, and the siting of pearl farms are all covered under the new guidelines.

The farming of South Sea pearls is WA's most successful aquaculture venture, and it is crucial that WA retain its position on the world market as a leading producer of high-quality pearls.

To do this successfully, and keep production costs down, the pearling industry needs to develop its expertise in hatchery and pearl oyster grow-out technology.

One of the foreseeable threats to WA's market position is the growth of new pearl farming technology offshore.

The new guidelines are designed to strike a balance between the further development of expertise in pearl oyster culture and husbandry, and the control

of excessive pearl production which could adversely affect market prices.

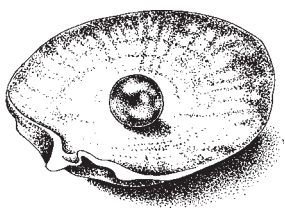
These measures are designed to ensure that Western Australia not only remains competitive on the world market in the current economic climate, but also has the capacity to maximise production if market circumstances change.

The new guidelines have been developed under the direction of the Pearling Industry Advisory Committee, and will ensure that ownership and control of the industry remain in Western Australia.

Future entrants to the pearling industry will be limited to 49 per cent foreign share-holding. In addition all principal office-holders and directors will have to be Australian residents.

The guidelines have been agreed to by the Western Australian Fisheries Joint Authority, which comprises the Federal Minister for Primary Industries and Energy, and the State Minister for Fisheries. Copies of the report are available from the Fisheries Department of Western Australia.

## Japan - Myanmar joint venture set up



An article in *The New Light of Myanmar* (15 August 1993, p.8) announced the setting up of a joint venture between Myanmar Pearl Enterprise and Niino International Corporation. The Myanmar-Niino Joint Venture Company Ltd was formed 'for the purpose of culturing and marketing high quality pearls, shell and shell products'.



## Australian pearl research in progress

The Australian Fisheries Research and Development Corporation has provided the following descriptions of pearl oyster research in progress:

**Project no.:** 93/194

**Title:** Cultured pearl classification equipment development

**Researcher:** Mr P. Hawkins

**Tel:** 03-850-7622

**Objectives:** To develop and build for the Australian industry a flexible, conveniently operable and consistent, pearl quality classifying instrument.

**Project no.:** WADFW-017

**Title:** Stock evaluation and recruitment measurement in the WA pearl oyster fishery

**Researcher:** Dr L. Joll

**Tel:** 09-447-3062

**Objectives:** To develop techniques for the assessment of pearl diver efficiency and selectivity in taking pearl oysters.

To consider the impact of fishing on the reproductive potential of wild stock pearl oysters.

To develop a database on recruitment to commercially fished grounds.

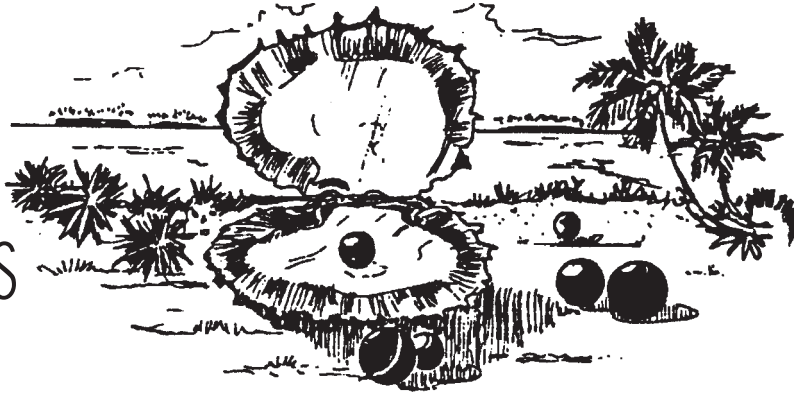
To examine geographic variability in pearl oyster growth rates and age at recruitment to the fishery.

To examine the degree of genetic difference between populations of *Pinctada albina*.

To examine the disease status of Broome and Shark Bay stocks of *P. albina*.



# ABSTRACTS and PUBLICATIONS



## ICLARM publishes a review of pearl oysters and pearl culture

by R.A. Rose  
Pearl Oyster Propagators  
Darwin, Australia

The 1992 publication *The biology and culture of pearl oysters (Bivalvia: Pteriidae)* by M.H. Gervis and N. A. Sims is a well-presented and informative review of four commercially important Indo-Pacific pearl oysters. The text on the commercial significance, taxonomy, zoogeography, biology, and ecology of each of these species is well referenced. Descriptions of the various mariculture and pearl culture techniques commonly used for each species are adequately described, giving the reader a good idea of the state of the technology. This is an admirable achievement, considering there is little published or anecdotal information available and that much of it is private and largely confidential.

The authors do not merely review the biology and pearl cultivation techniques of each species, but

also discuss important topics of research, economics and marketing of these species. Special attention is given to the comparatively young black pearl culture industry of the Pacific region.

The text is easily understood and succinct. Photos, illustrations and tables are simple and clear. One minor complaint, however, is the lack of photos or illustrations showing the developmental stages of the larvae and newly settled spat of each species.

Whether you are a malacologist, hatchery technician, seeding technician, farmer, dealer, jeweller or marine biologist, this publication is an informative piece of work which has neatly documented the present state of the Indo-Pacific pearling industry.

## The economics of pearl production - Where is the data?

by Gary Newkirk

Review by Gary Newkirk (1993), in *Out of the Shell*, Vol. 3, No. 2, p. 18.

ICLARM has recently published a review of pearl oysters in its valuable series of studies and reviews, *The biology and culture of pearl oysters (Bivalvia: Pteriidae)* by M. H. Gervis and N. A. Sims. Like others in the series this review briefly covers the taxonomy, biology, ecology, marketing and economics. Though no topic receives extensive discussion in the approximately 40 pages of text and figures, the important issues are raised and the list of more than 250 references make the work worthwhile in itself.

The weakest area is in the economics of production. However, this must be a reflection of the stage of

development of the culture industry. Until recently production has been controlled by Japanese interests with tight control of information. With the expansion of commercial culture in the South Pacific more information should be forthcoming.

*Out of the Shell* readers may remember an IDRC-supported project in Sudan where pearl oysters are grown for the shell, not the pearls. Even in Sudan the published economics information is out of date as culture methods are changing (Farah, O. (1991). Activities of the Sudan-IDRC Oyster Culture Research Project, *Out of the Shell*, Vol. 1 No. 4, February 1991, pp. 5-12).

Gervis and Sims give a good capsule summary of the status and prospects of the market for pearls. This seems to bode well for the emerging independent producers but they point out the need for co-operation in marketing. This must be a concern because the pearl market is 'big business' and small producers will have to be wary! We look forward to

seeing how pearl oyster culture will develop and benefit small coastal communities.

Gervis, M.H. and Sims, N.A., 1992. *The biology and culture of pearl oysters (Bivalvia: Pteriidae)*. ICLARM Studies and Reviews 21, 49 pp.

### Abstract

*Pearl oysters are farmed throughout the Indo-Pacific region, including the Red Sea. The biology and ecology of four pearl oyster species from the family Pteriidae, Pinctada fucata, P. maxima, P. margaritifera and Pteria penguin, are reviewed here. The culture techniques used for each of these species are described and the research needs, economics and marketing aspects are discussed. P. margaritifera and P. maxima culture is likely to proliferate throughout the Indo-Pacific region in the next decade and there is also good potential for developing P. fucata culture in India and Sri Lanka. The culture of P. fucata martensii in Japan faces stagnation or reduced profitability unless remedial measures are taken to improve the culture environment and the quality standards imposed on exported pearls.*

### The supply of pearl oysters: a key to the success of pearl culturing in French Polynesia

*Abstract of a paper presented by P. Cabral and T. Seaman at the World Aquaculture '93 Conference, Torremolinos, Spain, 26-28 May, 1993. European Aquaculture Society, Special Publication No. 19, p. 35.*

Over the past few years, pearl culturing has become a primordial activity in French Polynesia, being the result of a number of favourable factors, some of which are:

- the multitude of locations able to support this activity, namely atolls;
- the relative simplicity of the techniques used, compatible with the lifestyle of the Islanders;
- the extreme beauty, size and colour of the produced pearls ranging from tints of silver-grey to the brightest blue greens; and
- the availability of the oysters.

However great the evident overexploitation of the blacklip pearl oyster *Pinctada margaritifera* (L.) var. *cumingii* in the region during the early part of this century for the mother-of-pearl shells and in the first years of pearl culturing, the availability of oysters is still significant due to the success of spat collection. After the use of this technique on the atoll of Takapoto by the local Fishery Service, other atolls began little by little to develop this activity, according to economic and practical criteria, resulting in its undeniable success.

Adapted from the scallop spat collecting techniques, the larvae are trapped on polypropylene mesh

ribbons 5 to 10 cm wide which are folded like an accordion from a whole 60 cm to 1 m in length, and attached onto lines 100 to 200 m long.

For many reasons, namely difficulties in identifying the larvae, the distance and isolation of the atolls, there is no monitoring of the quantity of larvae in the lagoons and thus the setting of collectors occurs throughout most of the year. Unlike scallops which are rapidly removed, the pearl oysters spat are grown and remain firmly fixed on the collectors until they are able to be grafted (about 8 to 9 cm height), giving maximum yields of approximately 300 oysters per square metre.

Unfortunately, many atolls where pearl culturing takes place have a relatively poor oyster stock from which to obtain yields with collectors. Additionally, on some atolls, it is forbidden to receive oysters from another island due to recent occurrences of pathological problems in certain lagoons. The solution proposed to farmers for establishing themselves with the primary product is to use hatchery and endemic broodstock to supply the farms directly or to repopulate the lagoons either with young spat or larvae.

These techniques are actually tested on the atoll of Rangiroa. The technique of spat production has been mastered and the first results of larval repopulation will soon be available.

## Biofouling of *Pinctada margaritifera* in French Polynesia

*Abstract from a 1992 thesis by L. Leca submitted to the Université française du Pacifique. The thesis was entitled 'Study on the biofouling of Pinctada margaritifera (L.) var. cumingii (Jameson) blacklip pearl oyster in two atolls of French Polynesia'.*

In French Polynesia, an increasing rate of biofouling affecting pearl oysters was observed on several atolls after the cyclones that hit Polynesia in 1983 and the massive mortalities of 1985.

The research on biofouling affecting *Pinctada margaritifera* (L.) var. *cumingii* (Jameson) described in this study were carried out in the lagoon of Takapoto and Takaroa atolls, from March 1990 to March 1991.

Settlement and growth of biofouling on both artificial substrates and wild or bred living black pearl oysters were compared. Biofouling nature, rate of colonisation at different depths in the same environment and in two nearby but dissimilar lagoons, time of emergence and abundance periods were also studied.

Some 67 algae species including 21 Cyanophyta, 25 Rhodophyta, 14 Chlorophyta and 7 Pheophyta were recorded. Cyanophyta and two Rhodophyta, Polysiphonia and Tiffaniella were the most frequent ones.

Forty-six animal species were recorded. The most frequently occurring groups were molluscs, lophophorians and tunicates.

In 1989 the results showed that the natural environment was more favourable for the generic richness

of the biofouling algal flora than the breeding farm environment. Since 1990, the difference between the two environments seems to have decreased, because of the great retrogression of Rhodophyta on wild mothers-of-pearl.

It also seemed that in the natural environment, as well as on farms, the vegetal biofouling was more diversified in Takaroa than in Takapoto in 1990.

A qualitative gradient of biofouling with bathymetry was observed. Tunicates are abundant in shallow water (1–4 m), molluscs and Spongia at medium levels (5–6m) and Bryozoans around 9–10m.

In ecological succession, the sponges are associated with microphytes from the beginning of colonisation. Tunicates and molluscs come later.

About two months later, the three groups are living together, then decrease spontaneously after five months.

Studies on alive and inert substrates show that algae and animal frequencies are more important over oysters than over ceramic tiles.

Nevertheless, the differences are slight enough to permit the use of artificial substrates for further research and save living material.

## Gametogenesis in *Pinctada margaritifera* in French Polynesia

*Abstract from a thesis by Maryse Thielley of the Laboratoire d'Ecologie Marine Tropicale, Université française du Pacifique. The thesis is entitled 'Histological and cytochemical study of the gametogenesis in the pearl oyster, Pinctada margaritifera (L.) var. cumingii (Jameson)'.*

The blacklip pearl oyster, *Pinctada margaritifera*, is a protandric hermaphroditic species, capable of occasional sexual reversal, particularly, when under stress, from the female to the male condition. The great economic importance of this species for French Polynesia has led to the introduction of a programme covering stock management, spat production improvement and the analysis of causes of mortality.

Under a collaborative arrangement between EVAAM, IFREMER and the French University of the Pacific, the author undertook a histological and cytochemical study of gametogenesis in the pearl oyster.



The author's observations revealed the usual characteristics of this process of gametogenesis in lamelibranch molluscs, the subdivision of the gonad into follicles and the centripetal development of the germinal cells within the follicles. The state of maturation of the sexual cells and the relative proportions of their various component groups made it possible to define seven stages of development for the genital gland in the male condition and five for the gonad in the female state.

Further research, particularly at the ultrastructural scale, would be required in order to clarify a number of as yet unelucidated aspects, such as the nature of the poly-nuclear elements encountered at the perimeter of the male gonad at the beginning of maturation or the type of relationship between the oocyte and the follicular wall.

This initial study can already be used to determine the annual reproductive cycle and the factors affecting sexual maturation in the pearl oyster.

### Ultrastructural study of gametogenesis in the French Polynesian black pearl oyster *Pinctada margaritifera* (Mollusca, Bivalvia). I – Spermatogenesis

Abstract of an article by M. Thielley, M. Weppe, and C. Herbaut (1993) in *Journal of Shellfish Research*, Vol. 12, No.1: 41-47.

Ultrastructure of the germinal cells is described throughout the spermatogenesis, in the French Polynesian blacklip pearl oyster, *Pinctada margaritifera* (L.) var. *cumingii* (Jameson).

Special emphasis is given to the spermatozoan structure description. Abnormal spermatogenesis and processes of degeneration and resorption of residual germinal cells are also reported. Male germinal cells present a centripetal evolution in the

acini. Germinal cells deriving from a same germinal lineage are connected among themselves and among one auxiliary cell by cytoplasmic bridges.

The mature sperm of this species is of the primitive type, with a short acrosome and without an axial rod. The spermatozoa are 45–50  $\mu$ m long. The midpiece contains two centrioles along with satellite bodies and four or five mitochondria.

### Genetic subdivision of the pearl oyster *Pinctada maxima* (Jameson) (Mollusca: Pteriidae) in Northern Australia

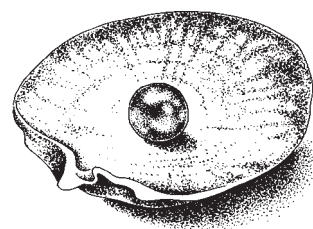
Abstract of an article by M.S. Johnson and L.M. Joll in *Australian Journal of Marine and Freshwater Research*, 1993, 44, 519-26.

The genetic structure of the pearl oyster *Pinctada maxima* in northern Australia was investigated by starch-gel electrophoresis. Six polymorphic enzymes were examined in 220 individuals from five areas which span a distance of 3,400km. Across this range, the average  $F_{ST}$  is 0.104, with three of the loci showing highly significant variation in allelic frequencies.

Most of the geographic variation is clinal between western and eastern populations. Particularly striking is the near substitution of alternate alleles for *GOT* between Western Australia and north-eastern Queensland.

Comparisons between adjacent pairs of samples usually revealed significant genetic differences, including differences between samples found in two areas in the Northern Territory separated by

320km. In contrast, two samples from Western Australia showed little evidence of genetic subdivision over a distance of more than 800km. These genetic comparisons indicate that stocks of *P. maxima* are highly subdivided in northern Australia, but they also favour the view that there are substantial connections of Western Australian populations over large distances.



### Growth of the pearl oyster *Pteria sterna* under different thermic and feeding conditions

*Abstract of an article by M.A. del Rio-Portilla, A.D. Re-Araujo, and D. Voltolina (1992) in Marine Ecology Progress Series, Vol. 89: 221-227.*

The combined influence of temperature and food concentration on *Pteria sterna* growth was determined, using three temperatures and three food concentrations.

For 15 weeks, the shell was measured weekly along the axis of maximum growth. The two higher growth rates (4.8 and 4.2 mm per month) were obtained

with the highest ration, at 30° and 25°C, while the lowest food concentration growth was not temperature-dependent. By the response surface analysis, a synergistic effect of temperature and food concentration on growth was found. Food concentration, but not temperature, had an important influence on condition index (ash free meat dry weight/shell dry weight x 100).

### Observations on the pearl oyster fishery of Kuwait

*Abstract of an article by S. M. Alamatar, K.E. Carpenter, R. Jackson, S.H. Alhazeem, A.H. Al-Saffar, A.R. Abdul Gaffar and C. Carpenter (1993) in Journal of Shellfish Research, Vol. 12, No. 1: 35-40.*

The pearl oyster fishery of Kuwait was monitored daily from January 1989 to May 1990. Landings of pearl oysters in 1989 totalled 287 tons with a market value of US\$1.0 million. Commercial pearls (>3 mm) were estimated to be present in one of every 4,200 oysters. Most of the pearl oysters landed were new recruits with hinge lengths between 40 and 56mm.

There was a curvilinear relationship between total weight and size of oysters (length) and the sex ratio approached 1:1. Spawning occurs throughout the year, with a spat settlement peak in early fall. Over the size range examined there was no relationship between the size of oysters and the size of pearls and subsequent resource management strategies are discussed.

### Experimental spat collection of blacklip pearl oysters in the Seychelles

*Abstract from B. Bautil and D. Boule (1992). Results of preliminary experiments by the SFA on artificial spat collection of the black pearl oyster, Pinctada margaritifera. Seychelles Fishing Authority Technical Report, SFA/R&D/020. 17 pp., & appendices.*

Forty oyster spat collector bags were submerged at two different sites near Mahé Island for a period between 3.2 and 11 months. Strong currents in the south-east monsoon period resulted in a few bags lying in the sand, which was detrimental to spat settlement. The mean settlement rate was calculated at 15.6 oysters per bag, however 71 per cent of the bags had more than 10 oysters per bag. Considering only those bags, the settlement averaged 27 oysters per bag.

The sizes of oyster in collector bags after different soaking times indicate that growth rate in the first few months is higher than in French Polynesia. Growth rates of oysters maintained in a cage indicated an average increase of 21.7mm in five months,

between the size of 25.9mm and 47.76 mm. The observed mortality over the same period was 29.2 per cent.

Oyster spat settlement did occur all year around, indicating that spawning also occurs all through the year.

Pearl culture in the Seychelles is technically feasible and pearl farms will depend, for their regular supply of oysters, on collecting oyster spat produced by natural stocks. The number of natural oyster beds is reported to be limited in Seychelles and these beds are presently exploited for the supply of the artisanal craft industry and the jewellery industry. Suitable sites for farming operations, on the

granitic and on the outer coralline islands, are limited. In view of these limitations, priority has to be given to assessing the actual status of oyster beds and then implementing protection measures where needed. The continuation of the Seychelles Fishing Authority training and research programme regarding optimum sites, settlement rates, growth rates and other biological information will be crucial for the future development of the industry.

The successful development of the pearl oyster industry in Seychelles will largely depend on the choice of adequate management options, concerning the resource as well as potential commercial ventures. A guideline on pearl culture development has been produced in this field (Bautil et Chaudron 1991).

### **Abundance and distribution of the blacklip pearl oyster *Pinctada margaritifera* (L.) in the Cook Islands, South Pacific**

*Abstract of an article by N.A. Sims in Australian Journal of Marine and Freshwater Research, 1992, 43, 1409-21.*

Stocks of *Pinctada margaritifera* were surveyed in three atoll lagoons in the Cook Islands to assess abundance, describe distribution patterns, and evaluate the method for ongoing monitoring. Belt transects were laid at randomly selected sites across the lagoons. Densities over depth gradients were extrapolated to give a stock estimate for Manihiki lagoon of 2.0 million  $\pm$  3.2 million pearl oysters. Stocks in Penrhyn lagoon (5.0 million  $\pm$  4.1 million) and Suwarrow lagoon (around 400,000) were estimated from average densities. The wide confidence limits mean that other methods are needed to monitor changes in abundance over time.

Penrhyn and Suwarrow lagoons have not recovered from earlier overfishing. No pearl oysters occurred below 36 m. Density and shell size increased with depth; this was most notable in Manihiki, where fishing was heaviest. Sizes and densities were influenced by bottom type in Manihiki. Density was greatest in the north of Penrhyn, and decreased southwards; Manihiki had no density gradient across the lagoon.

### **Population dynamics and stock management of the blacklip pearl oyster, *Pinctada margaritifera* (L.), in the Cook Islands, South Pacific**

*Abstract of an article by N.A. Sims in Australian Journal of Marine and Freshwater Research, 1992, 43, 1423-35.*

Permanent transects were used to measure changes in abundance of *Pinctada margaritifera* in Manihiki lagoon, Cook Islands. Growth *in situ*, mortality and recruitment were also studied. A correction factor for searcher efficiency was also determined, allowing earlier estimates of standing stocks to be adjusted.

Overall abundance in Manihiki decreased by 18 per cent in one year. Most losses were attributable to fishing ( $F = 0.19$ ;  $M = 0.11$ ). Mortality (27%) and recruitment (9%) were presumably underestimated because of heavy fishing of juveniles. Total mortality, estimated by Wetherall plots, decreased from 0.48 to 0.35 over the year owing to a decline in fishing for larger oysters.

The average shell diameter of recruits was 110 mm. This was also an approximation of  $L_{\infty}$ . Von Bertalanffy growth parameters of  $K = 0.26$  and  $L_{\infty} = 183$  mm were estimated from shell size increments.

Yield per recruit calculations indicate that minimum size limits are not effective. Reserve areas, quotas, and other restrictions on effort should instead be used to protect broodstocks.

## Corrections and additions for the ICLARM pearl oyster bibliography

Mark Gervis of the ICLARM Coastal Aquaculture Centre in Solomon Islands has kindly provided an update on his earlier bibliography. The following listing covers references listed in Current Contents from August 1990 to July 1993.

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- Beaumont, A.R. and S.A.A. Khamdan (1991). Electrophoretic and Morphometric Characters in Population Differentiation of the Pearl Oyster, *Pinctada radiata* (Leach), from Around Bahrain, *J. Mollus. Stud.*, 57, Nov., 433-441.
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- Shen, Y.P., X.Y. Zang, H.P. He, L.J. Ma (1993). Triploidy Induction by Hydrostatic Pressure in the Pearl Oyster, *Pinctada martensii* Dunker, *Aquaculture*, 110, 3-4, 221-227.

Mr Tint Tun has kindly provided a list of corrections for Mark Gervis' bibliography.

- Page 15** Dix, T.G. 1972a. Mesenchymal tumors... should read: Dix, T.G. 1972a. Two Mesenchymal tumors.
- Page 35** Mizumoto, S. 1976. Pearl farming in Japan. A review. In: FAO Technical Conference on Aquaculture. Kyoto. Japan. 26 May 1976. FAO-FIR: AQ/Conf. 76.R.13, Ed. T.V.R. Pillay, p.381-385. should read: Mizumoto, S. 1976. Pearl farming in Japan. In: Advances in Aquaculture. Eds. T.V.R. Pillay and W.A. Dill. Fishing News Books Ltd. Farnham, Surrey, England. pp. 381-385.
- Page 37** Nasr, D.H. 1984. ... 110 (0): 241-246 should read: Nasr, D.H. 1984. ... 110(0): 241-245.
- Page 37** Nicholls, A.G. 1931. ... 3: 26-31 should read: Nicholls, A.G. 1931. ... 2: 26-31.
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## Abstracts of six unpublished papers from Burma

*Mr Tint Tun has provided abstracts for six of his unpublished papers on pearl culture in the Union of Myanmar (Burma). Mr Tun can now be contacted at his new address: 267 Bargay Road, Myenigone, Yangon, Union of Myanmar (Burma).*

### Review of South Seas pearl culture

The Union of Myanmar is a nation which produced precious South Sea pearls. In accordance with its market economy and in an effort to promote its pearl culture industry, Myanmar established a joint venture with a Japanese company in November 1992. In recent years, South Sea pearls have become

very popular on the world market in general and Japan in particular. Kuichi Iakashi, a vice-president of the Mikimoto Company, has said that 'South Sea pearls are very valuable'. This paper provides some information excerpted from pearl information bulletins.

### Pearl oysters (Genus: *Pinctada*) of Pearl Island

Seven species belonging to the Genus *Pinctada* were identified. Their systematic positions, synonyms and distributions have been described.

pearl oysters in their papers and they provide the classification, identification and distribution of Burmese marine molluscs.

Pearl Island is an island of the Mergui archipelago and is situated in Boke-Pyinn Township, Tenasserim Division. As regards the pearl oysters of Burma waters, Soe Thu (1970, 1971 & 1979), Kyaw Myint (1971) and Marlar Myo Sein (1982) described the

Since the Genus *Pinctada* consists of some economically important species for the pearl culture industry, this study has attempted to identify pearl oysters which were collected from Pearl Island.

### On the growth of pearl oyster *Pinctada fucata* (Gould)

During the twelve-month study on the growth of *Pinctada fucata* at Pearl Island, the oysters grew from 0.66 cm to 2.38 cm in mean width. Growth rate was rapid in early stages but later declined gradu-

ally. The Myanmar species is thicker than Korean species at the same length, Japanese species at the same height or Indian species at the same age.

### A study on sex ratio and sex change of the pearl oyster *Pinctada fucata* (Gould) in Pearl Island

This study was conducted at Pearl Island on sex ratio and sex change of the pearl oyster *Pinctada fucata* from October 1981 to December 1982. *P. fucata* is a potandric hermaphrodite. Sex ratio is not

differed significantly from balance 1 ratio in older oysters. Sex change, from one sexual phase to another, occurred in *P. fucata*.

### Natural spat collection of the pearl oyster *Pinctada fucata* (Gould) in Pearl Island

Settlement of *Pinctada fucata* spat was observed throughout the year. The spat prefers to settle at darker places. Type B spat collectors, vinyl-coated

wire cages (45 x 18 x 15 cm) wrapped with polyethylene tape, were the most effective in natural spat collection.

### *Pinctada fucata* (Gould): a promising mother-of-pearl oyster for Myanmar Pearl Enterprise

Systematic position of *Pinctada fucata*, synonyms, common names, distribution and pearl culture techniques have been described. Due to the advantages

of geographical situation and the skill of Myanmar pearl culturists, *Pinctada fucata* can become a promising species for Myanmar Pearl Enterprise.

### Freshwater mussel newsletter and research reports now available

A Triannual Unionid Report is being compiled by Richard G. Biggins, of the U.S. Fish and Wildlife Service, 330 Ridgefield Court, Asheville, North Carolina 28806, U.S.A. [Telephone (1-704) 665-1195 Ext. 228]. The Report is described as 'A forum for the informal exchange of information on the status

of North American unionid research, management and conservation.' Report No. 1, published in May 1993, includes paper abstracts and Research in Progress updates, focusing mainly on resource surveys, larval and juvenile culture, and the impacts of run-off pollutants.

### Pearl shell symbolism in Highlands Papua New Guinea, with particular reference to the Wiru people of the Southern Highlands Province

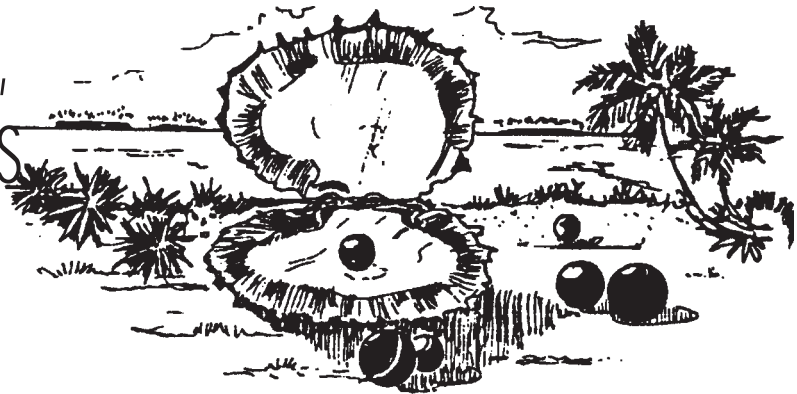
*Abstract of an article by Jeffrey Clark in Oceania, 61, 309-339.*

Pearl shells, in their use in exchange in the Papua New Guinea Highlands, have usually been analysed as 'power tokens' in a political context dominated by big men. This article attempts to account for the historically recent acceptance and use of pearl shells in terms of symbolic and aesthetic, rather than political and economic, values.

The symbolism of two types of pearl shell found among the Wiru people is considered, and an overview of available material on pearl shells in the Highlands is presented. A comparative perspective using historical ethnographic and linguistic evidence supports the claim that pearl shells were incorporated into ceremonial exchange because of their symbolic and aesthetic connections with the natural world and a cycle of death and regeneration.



# CONGRESSES, CONFERENCES and WORKSHOPS



## An international pearl conference

*Article by C. Richard Fassler entitled 'Pearl culture taking off: International conference set for Hawaii' published in the November/December issue of Aquaculture Magazine, pp.89-91.*

The world pearl industry is going through a period of tremendous flux. What better time to hold a conference to assemble the various players to discuss the challenges and opportunities?

The State of Hawaii Aquaculture Development Program and the Hawaii Jewellers Association are sponsoring Pearls '94, which will be held at the Sheraton Waikiki Hotel in Honolulu from 14 to 19 May 1994. The goal is to increase pearl production and sales throughout the world.

Pearls '94 will feature an exposition, a technical forum, a jewellers' forum, a silent auction, an exhibition at the Bishop Museum, and presentations by many industry leaders.

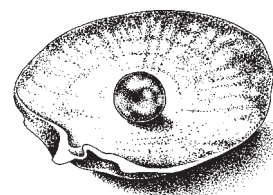
One of the more interesting and important symposia will explore the status of American mussels. A recent article in *Fisheries* pointed out that of the 297 native freshwater mussels, 213 (71.7%) are considered endangered, threatened or of special concern. Federal officials and environmental groups, awakened to the problem by the recent Mississippi River flooding and the zebra mussel threat, are discussing methods of conserving the mussel resource. Any restrictions could have a severe impact on the pearl industry.

Other symposia will concentrate on biology, ecology and stock management; improving pearl quality through biotechnology; advances in production; government and international institutional support; socio-economic and political implications of development; investment considerations; and abalone and conch pearls.

Among the many social events planned will be a traditional Hawaiian beachside luau and a Tahitian feast. Governor John Waihee has emphasised the importance of the conference to Hawaii's pearl aquaculture and jewellery businesses by declaring the third week in May 'Pearl Week' in Hawaii.

The event has caused something of a sensation. Originally planned to focus on pearl production in the South Pacific, Pearls '94 has received an avalanche of interest from around the world and is now truly international. Attendance predictions have expanded from 250 delegates to more than 1,000. Farmers, scientists, government officials, jewellers and equipment suppliers will come together at what should be the largest and most diverse gathering ever held in the 3,500-year history of the gem. It is likely that more than 50,000 pearls – black, white, golden, freshwater, saltwater, cultured and natural, round and baroque – will be traded.

Predictably, the nations that are new to farming cultured pearls (but who often possess centuries-old traditions of harvesting the natural product) have welcomed the opportunity to 'jump start' their technology. Nations with an existing industry, such as French Polynesia, Australia and the Cook Islands, are looking to Pearls '94 to stimulate the market.



### The Japanese response

The response from Japan, however, has been less than enthusiastic, despite repeated attempts to enlist their strong participation. Among those efforts was a letter from Governor Waihee to Japan's leading pearl trade association, inviting their members' assistance. According to a correspondent for *Pearl World*, an international trade publication: *The Japanese we talked with were shocked that the Hawaiians were stealing their show... It had obviously never entered the Japanese mind that some 'outsiders' would ever dare to encroach upon 'their' industry by being the first to hold an inaugural, truly international pearl conference.*

The Japanese are now planning an international conference of their own, to be held sometime in 1994. The organisers of *Pearls '94* are confident that the Japanese will put aside national pride and join the conference for the good of the industry. After all, they are still the undisputed leaders in pearl technology, and numerous opportunities now await the application of that technology outside Japanese waters.

Persons wishing to submit technical papers, purchase booth space, or attend the conference should contact the Conference Organiser, Crest International.

### Pearls '94 update

A 'Call for Presentations' has been issued by the Program Committee for the Pearls '94 International Pearl Conference, Exposition and Auction, to be held at the Sheraton Waikiki, Honolulu, Hawaii, 14 to 19 May 1994. A copy of the 'Call for Presentations' is attached to the back of this issue.

The deadline for abstracts is 1 March 1994. A 30–50 word summary was requested by the Program Committee, and should have been received by 10 December 1993. However, the schedule for return of these forms has been moved back to accommodate later submissions, and this form can still be submitted along with the abstract up until 1 March 1994.

The conference will be divided into a Technical Forum and a Jewellers' Forum.

#### The Technical Forum will address:

- Ecology;
- Improving pearl quality through biotechnology;
- Freshwater mussels, pearls and nuclei;
- Government and international institutional support;

*Further information is available from Pearls '94, 940 Emmet Ave, Suite 14, Belmont, CA 94002, USA. Phone : (1-415) 595-2682, Fax :(1-415) 595-3379.*

### Tahiti pearl festival postponed to prevent clash with Pearls '94

*Article in the December/January issue of Pearl World - The International Pearling Journal, Vol. 1, No. 4 p7.*

The Tahiti Pearl Jewellers' Association has very generously agreed to postpone its First International Tahiti Pearl Festival until June 1994, in order to encourage participation at Pearls '94, the event being billed as *the world's first international pearl*

*conference* scheduled for 14 to 19 May in Hawaii. The Tahiti festival events remains the same as *Pearl World* reported in the August/September issue, but with the dates changing from 18 to 21 May to 15 to 18 June.

- Socio-economic and political implications of pearl industry development; and
- Abalone pearls, natural pearls, investment consideration etc.

#### The Jeweller's Forum will include:

- Country overviews (Tahiti, Japan, China, Australia, Indonesia, USA, Cook Islands and others);
- Successful designs with pearls;
- Enhancement;
- Simulated pearls;
- Price setting and quality control;
- Pearl stringing;
- Educating the public;
- Natural versus cultured pearls;
- Pearl peeling; and
- General pearl grading.