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# PEARL OYSTER

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## NOTE FROM THE EDITOR

This issue is fairly hefty. The greater size reflects the further expansion of the Pearl Oyster Special Interest Group (SIG), and a concomitant broadening of our perspectives. The greater depth and diversity of content is largely due to more input from you, the members. Thanks on behalf of all the SIG members to those who have contributed articles, letters, newspaper clippings and comments to this issue.

The geographic horizons of the SIG now range from Harvard to Hikueru, Kiribati to Kuwait. The SIG also encompasses an increasingly diverse range of disciplines. This issue includes articles on computer programmes and satellite mapping, conflict resolution and traditional fisheries management, oil pollution and pathology testing, pearl farmer training workshops and auction updates. Our member list includes professions from pearl farmers to politicians, aid agency workers to taxonomists.

Similarly, our biological boundaries are expanding. This issue contains a number of articles on *Pinctada fucata*, and an aside note on *Pteria brunnea*. There is also a contribution underlining the concerns we should all share in the status of Unionid mussels of the North American river systems. The obvious pun emphasises the point best -Mississippi mussels are the nucleus of the industry.

The growing diversity of the Bulletin is to be encouraged. It provides us all with a wider network of contacts, and a broader resource base for us to draw on (cont. page 2).

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It challenges us to keep growing and learning, to look beyond our own lagoon, to rethink the way we have always done things, and to picture pearls as part of a planet-wide industry. It also keeps the dust from settling on the atlas.

The Bulletin still retains its focus on the South Pacific. The underlying rationale for the Bulletin was to promote information-sharing between Pacific Island pearl oyster workers, who often feel isolated. Pearl culture developments, however, don't happen in a vacuum. Technological developments elsewhere, be they hatcheries or hanging methods, might be applicable to the Pacific.

Market trends in Tokyo or New York reach right back to the hip pockets of the farmers in Takapoto and Broome.

What happens in the Pacific is also important to pearl oyster workers outside the region. It may affect them directly, or there may just be lessons to be learned and ideas to try. We all have an interest in pearls, be it academic or financial/and the Pacific will be an important focus for pearl culture and pearl oyster research in the years to come.

Neil A. Sims

## NEWS FROM MEMBERS

It was interesting to read the lists of publications on pearl oysters and pearl culture sent in by some members. Other members are encouraged to do likewise.

Please ensure that you list those articles and reports which may not have been formally published. This 'grey' literature is usually not accessible through bibliographies and literature searches, and it would be helpful to cite it here. If possible, please also send a

copy of the more obscure or poorly circulated papers and reports to the SPC library, the FFA library in Honiara or the USP Library in Suva. By placing it in these repositories, your work becomes part of the PIMRIS Archives, where it is accessible to other SIG members, and is safely preserved for posterity .

Neil A. Sims

### Problems with pearl mussels: regulating the harvest

Source: Amie Brautigam  
IUCN Bulletin, Vol.21 (4), pp. 5-6

In the late 19th and early 20th centuries, the freshwater bivalves of the family Unionidae, commonly referred to as naiads, were heavily harvested in North America for pearls and for manufacture into pearl buttons. Since the 1940s, a small number of these species has been virtually the sole source of the shell beads made by Japanese technicians for implanting into pearl oysters (*Pinctada* spp.) as the nuclei around which cultured pearls grow.

The cultured pearl industry is worth billions of dollars worldwide. It extends from Japan to Australia, taking in numerous countries in between. It offers considerable opportunity for economic development. As an example, cultured black pearls have been French Polynesia's leading export commodity since 1983.

According to the Tahitian Ministère de la Mer, roughly 500 kg of cultured black pearls were exported in 1988, with an estimated value of US\$ 23 million.

Japan alone declared export values for cultured pearls in 1987 totalling US\$ 378 million.

Research carried out under the auspices of the IUCN/SSC Trade Specialist Group suggests that the volume of commercial exploitation may now be threatening freshwater pearl mussels in the United States. Preliminary results of a review of trade data by the US Fish and Wildlife Service suggest that exports of raw mussel shell from the United States have averaged a minimum of 5,000 to 6,000 tonnes per year since 1985. This was a dramatic increase over export levels from the late 1960s, when overharvesting forced a drop in exports to as low as 600 tonnes in 1971.

Of the 297 Unionid taxa native to North America, 13 are believed to be extinct, 35 are listed as endangered, and a further 55 are or have been candidates for listing under the Endangered Species Act. These 90 -or 103 -species must be considered an absolute minimum list of threatened naiad species.

For many species, changes in hydrology and water quality due to impoundments and channelisation, siltation, and pollution, have been the major factors threatening their survival. Loss of fish hosts necessary for reproduction has been a problem. Acid rain and the introduced zebra clam are additional potential threats. The level of exploitation for the cultured pearl industry is now adding a further pressure on the species.

Al though export documents might suggest that the naiad harvest is limited to only a few, generally common, species, the nature of the harvest virtually ensures that threatened or protected species are taken incidentally wherever their ranges overlap with commercial harvesting. Murky water and nonselective gear are mainly responsible for this incidental take, which not only threatens the

survival of a number of threatened species but also involves a substantial volume of specimens of no commercial value. Steve Ahlstedt of the Tennessee Valley Authority, one of the world's experts on these animals, believes that as many as 15 tonnes of mussels may be harvested to yield one tonne of commercial export value.

The incidental take of threatened or protected species in the commercial harvest is obviously cause for concern. The sheer volume of the harvest, particularly in light of Ahlstedt's assertion and the past history of over-exploitation of these complex and environmentally sensitive animals, also raises questions about the sustainability of the harvest.

Malacologists and fisheries biologists most familiar with these species seem to agree that naiad populations are being over-harvested, but this consensus has yet to be translated into effective management at the state or federal level, due to lack of financial and staff resources for research necessary for assessing sustainable levels of harvest and for implementation and enforcement of management regimes and harvest restrictions.

To guarantee that the naiad supply continues as a viable long-term resource for the expanding cultured pearl industry, research and population monitoring programmes must be implemented immediately.

Harvest and trade controls must be tied to a broad assessment of the status of the principally traded species and take into consideration the biological and ecological requirements that will affect populations' long-term viability. Additional research and investment into culturing the mussels themselves for use in the cultured pearl industry may also be necessary. If the industry is to remain sustainable, it must make this investment now.

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Amie included more details in the following letter to the editor. Although emphasising that her research is ongoing, and her findings to date are only preliminary:

*'...I can say at this stage that its findings thus far have quite clear implications for the cultured pearl industry.*

*The world's cultured pearl industry is virtually entirely dependent on North American Unionid fauna for use as a seed material. Preliminary findings point to an annual harvest of at least 8,000 tonnes and an export volume of approximately 6,000 tonnes of these mussels, with Japan importing over 90 per cent of the shell but other countries, including the Republic of Korea and Taiwan, importing*

*shipments that appear to be destined for pearl culturing operations.*

*While incidental take of threatened Unionid species is one problem associated with this harvest, malacologists and fisheries biologists contacted in the course of my research appeared in agreement that even the most common species are being over-exploited and the entire resource may be at risk if commercial harvest is not controlled.*

Already, commercial musselmen are moving into smaller rivers to harvest shell now absent from larger rivers. In addition, the price spread per tonne is expanding, suggesting that poor quality shell being harvested at the same time as top quality shell is demanding an increasingly higher price. The increase in price paid for shell is bringing more people into the business of collecting shell, which in turn is placing more pressure on the diminishing resource. An all-too-familiar scenario.

My research has led me to recommend already that the United States propose the inclusion of the entire family Unionidae on Appendix II of CITES (many Unionids are already on Appendix 1), which would provide for greater monitoring of the trade and vest authority with

the Fish and Wildlife Service to require institution of enhanced management regimes in the states that allow commercial harvest. I am uncertain as to the impact this would have on the cultured pearl industry.

While on the one hand I would suspect it to be negligible, it is also possible that those already reaping a considerable profit from this industry would increase the prices even further, leading to the snowball effect (increased price to increased effort to increased over-exploitation) referred to above and to increased costs for the end users, the cultured pearl operations that are already paying top dollar for the Japanese-made blanks and Japanese technicians to surgically implant them'.

## On the varieties of *P. margaritifera*

By Tint Tun  
University of Mawlamyine, Union of Myanmar

Mr Tint Tun, of the Department of Marine Science at the University of Mawlamyine, Mawlamyine, Union of Myanmar (formerly Burma), writes:

'... I notice the species which is dominant in the Bulletin is *Pinctada margaritifera* and it was not described to variety level. According to the literature, this species has six varieties. I believe that the Indian *P. margaritifera* (POIB #2, p. 2) is not the same as the Tahitian black-lip pearl oyster, *P. margaritifera* var. *cumingi*. It is probable that the Indian species is the *typica* variety.

From my point of view as a pearl culturist, *typica* has much less potential than *cumingi* for use as mother shell in pearl culture. I sincerely think that it will be more appropriate and more informative to describe, if possible, to variety level for black-lip pearl oyster.'

Tint also enclosed a listing of his research paper titles. Those that concern pearl oysters are:

- Pearl oysters of Pearl Island (Genus *Pinctada*);
- Natural spat collection of the pearl oyster, *Pinctada fucata* (Gould), at Pearl Island.
- A study on sex ratio and sex change of the pearl oyster, *Pinctada fucata*, at Pearl Island.
- On the growth of pearl oyster *Pinctada fucata* (Gould);
- A study on spat settlement on asbestos collectors at Setse;
- *Pinctada fucata* (Gould, 1850), a promising mother-pearl oyster for Myanmar Pearl Enterprise;

## Training courses and publications from Tuticorin

By A. Chellam  
Tuticorin, India

Mr A. Chellam, of Tuticorin, writes:

'...I have been a scientist for the last fifteen Years, doing research on pearl oyster survey, pearl oyster farming, pearl production, pearl oyster seed production and extension by conducting training programmes. Our work is mostly on *Pinctada fucata*. *Pinctada margaritifera* is rare in our area. With a few specimens of *P. margaritifera* collected from this part of India, we

successfully bred them and produced seed. Because of the unfavourable ecological conditions of the inshore waters, they could not survive long.

We have been conducting training courses on pearl culture and pearl oyster seed production to cater to the needs of the local State Fisheries Departments. Our

*Institute (CMFRI) along with the Regional Seafarming Development and Demonstration Project of the Network of Aquaculture Centres of Asia (NACA), Bangkok conducted a training programme at Tuticorin on pearl oyster farming and pearl culture in which 26 candidates from 10 South-East Asian countries participated. This was in February 1991.*

*Below are some of the important publications based on the work of this Centre.*

- Larval rearing and production of spat of pearl oyster *Pinctada fucata* (Gould). *Aquaculture*, 34:287-301 (1983);
- Pearl culture (K. Alagarwami Ed.) *Bull. Cent. Mar. Fish. Res. Inst.* 39, 142 pp (1987);
- Larval and juvenile rearing of black-lip pearl oyster *Pinctada margaritifera* (Linnaeus). *Aquaculture*, 76:43-56 (1987);

– Hatchery production of pearl oyster spat: *Pinctada fucata*. CMFRI Special Publication No. 49. 36 pp (1991);

– Pearl oyster farming and pearl culture. Training Manual No.8. February 1991. FAO/UNDP Regional Sea farming Development and Demonstration Project. RAS/90/002. Bangkok 10200 Thailand. 104 pp, 7 Fig., VIII Plates.

– Production of Cultured pearls(K. Alagarwami). 1991. Indian Council of Agricultural Research, New Delhi. 112 pp.

*At present I am on study leave and I am working on the reproductive bionomics of the wedge clam Mesodesma glabratum along the coasts of Tuticorin for my Ph.D. Any information on the above species in particular and other related bivalves in general will be of much help to me.*

## Historical perspective on pearl oyster diseases

Source: C. Denis George  
Cairns, Australia

C. Denis George, of Cairns, Australia, provided a copy of a letter he wrote on 17 January 1979, to the then Director of the Fisheries and Fauna Department of Western Australia, K.B. Bowen.

Some excerpts on pearl oyster diseases were of special interest:

*'...The subject of the pearl shell mortalities attributed to mysterious diseases has received special attention in studies and personal observations were carried out since 1960 in Exmouth Gulf, Thursday Island, Cygnet Bay, Burma, Philippines, Hong Kong, Japan, Mexico, Papua New Guinea and Polynesia. Additional personal communications were received from Sudan, Fiji, Thailand and the Japanese pearl farms in Kuri Bay, Port Essington, Thursday Island and Port Moresby.*

*The phenomenon in all these areas indicates the existence of a definable pattern affecting the health of the pearl oysters. The decline of the physiological conditions are indicated by many forms: visceral mass becoming soft, glassy and watery, reproductive function discontinued or greatly reduced, crystalline-style feeding mechanism and the amount of faeces reduced, function of the pearl formation mechanism changed to effect deposition of calcium carbonate in the form of calcite instead of aragonite, heavy amorphous organic matter secreted mainly in the nacreous periphery of the valves, the growth processes disappear or discontinue, the oyster stops to grow all together and finally in most of the cases ends in death. Occasionally a recovery follows and this is indicated by a strong demarcation zone on the valves.*

*From the point of view of pearl-making the above stated symptoms result in: increased rate of nuclei rejection; rejection of inserted mantlepiece or their mummification; increased percentage of seed pearl formation; reduced nacre deposition or deposition of calcite or organic matter resulting to the drop of the quality of the pearl.*

*The observed fact in your (Australian) grounds that from two pearl oysters lying close by only one was affected, clearly indicates that this particular oyster was subjected to some form of third influence which is unrelated to a contagious malady, as otherwise it would have killed the second oyster as well.*

*The unidentified micro-organism discovered by Mr Peter Woolf of Sydney is of great interest. However, the question remains if it is the cause or the effect of the so-called disease.*

*During the 1969-70 peak of the heavy mortalities in the pearl farms from Port Moresby to Kuri Bay and Smith's Harbour, the rate on many occasions had reached 100 per cent. Many times, out of one cage containing ten oysters, only one had survived. Discounting the hypothesis that this particular oyster may have developed a condition of immunity, it is a further verification of the non-existence of malady.*

*In our pearl making experience over the many years, the normal post-operation death rate is 3 per cent. Every other abnormal mortality was traced to certain explainable causes.*

*From all the instances of pearl shell mortalities observed or studied by the writer, the only one which so far has not been understood is the one that occurred at Baja California of Mexico during 1938. However, investigations in the locality carried out by the writer during 1969 produced evidence indicating that the pearl oysters were affected while in their natural environment but the cause could not be identified. This is not the case with the Australian oysters where the mortality occurs in the pearl farms.*

Denis also provided a list of publications, submissions, and a partial record from the media.

*'...I started my pearl farm in 1949. By 1956 I developed techniques and first pearls. Over the years I became involved in all phases-levels-activities of the industry including the science of the pearl and of pearl oysters. Since 1960 I have been promoting the pearl for others (gratis) and I feel to have effectively contributed to current participation of Indo-Pacific people in the industry.*

*My first paper was in 1957. Besides early TV demonstrations and press articles, two of my papers are in bibliography of POIB issue #1. I am specialising in four species of pearl oysters and production of all types*

*In our opinion, there is nothing wrong with the Australian pearl oysters neither with the ecological environment. The mortality has become an endemic condition of the pearl farms and indicates the existence of other causes. It is related to the overall management of the pearl industry and the applied techniques and methods.*

*It must be remembered that the pearl shell mortalities is a permanent condition in the Japanese home industry since 1960 and as well in all the pearl farms of the South Seas established with their cooperation.*

*of pearls, techniques/applications, processing-handling-marketing including biology, physiology, environment, quality decline, cause of mortalities, etc.. I have a historical/ technical/scientific/trade library with extensive detailed documentation and files (including a 1932 film of Japanese producing black pearls in Palau).*

*I am concerned with the massive problems in all pearl grounds of the Indo-Pacific and particularly in the Tuamotus, as I had developed black pearls in 1968. The cause of mortality problems and quality decline is understandable and it can be rectified.'*

### **Papers, Submissions and a Partial Record from the Media**

- Development of Pearl Culture: The AHEP AN, July-Sept. 1957 (a prognosis on Australia's potential pearl development)
- Experiment in Packe Island: The AHEP AN, April-June, 1958 (first post-war Australian pearl farm, Torres Strait)
- The Oyster is his World: Bob Johnson, Sun Herald, February 2, 1959
- Pearl Industry for Australian Nationals: Submission to the Government of Queensland, November 25, 1960
- Pearl Man with a Problem: The Bulletin, January 18, 1961
- Development of the Pearl Industry in W.A. by Australians: Submission to the Government of W. Australia, March 1961
- Demonstration of Pearl Techniques: ABC-1V Documentary Broadcast nationwide on 21-23 April, 1961
- Nota single mod con: Larry Folley, The Australian Women's Weekly, February 27, 1963 (The Packe Island pearl farm)(Extensive media record on development activity and controversy with Japanese Pearl Policy is omitted)
- Pearl Expert Sees Rich Future for Pacific's White Gold: Pacific Islands Monthly, September 1965
- Pearls, Pearls, Pearls!: Pacific Islands Monthly, February 1966
- Australia Processes half pearls: Australian Fisheries Newsletter, June 1966 (first pearl process facility)
- The Cultured Pearl- Its history and development to the present day: The Australian Gemologist, issues June 1966 to January 1967 (fundamental paper, standing to this day. See pp.11 and 12 for Japanese

- problems/decline as was detected in 1960, and on Pearl Industry's trends.)
- Pearl cultivation in the South Seas: South Pacific Bulletin Fourth Quarter, 1968 (in French edition also).
  - Techniques of Pearl Cultivation: South Pacific Bulletin, Fourth Quarter, 1969 (in French edition also).
  - The Black pearls -History and Development: Lapidary Journal of America, April 1971.
  - There is Gold for Islanders in a Neglected Industry: Pacific Islands Monthly, September 1971
  - The Birth of a Pearl: Lapidary Journal of America, June 1972 (an original study with colour photography of surgical technique and colour microphotography on stages of pearl formation was made in Exmouth Gulf of W.A in 1961).
  - The Pearl: A report to the Government of Papua New Guinea, The FAO of United Nations and Asian Development Bank -On the background and history of the early and present day developments of the cultivation of pearl-shells and pearls in the Indo-Pacific region, January 1978 (Re-published by Lapidary Journal of America in six issues)
  - Comments on 1978 Shell mortalities: Personal communication to fisheries director of W. Australia, January 17th, 1979 (excerpts provided above: Ed.)
  - Australian Pearl Shell Resources -Pearling and Pearl Industries: Submission to the Senate Standing Committee on Science and the Environment, September 20,1979 (34 pages and 21 Appendices)
- from which 11 are Japanese intimate documents on pearl policy and control of South Seas pearl).
- The Torres Strait Pearl Conspiracy: Pacific Islands Monthly, August 1962 (cause for the pearling industry's bankruptcy)
  - Application of Japanese Overseas Pearl Culture Policy in Australia: Submission to the Japanese Government, His Excellency the Ambassador of Japan in Australia, August 14/1985, 13 pp (on destructive effects and exploitation).
  - Development of Pearl Cultivation in Australia, Part 1- Historical Aspects on the Early Discovery of the Pearl Cultivation Technique: The Historical Society, Cairns, North Queensland, Bulletins 322-324, March to May 1987 (discovery of pearl technique and its 'acquisition' by a Japanese Fisheries Mission, in 1902).
  - Historical Review of the Post-War Pearling Industry and Development of Pearl Cultivation in Australia to December 1987 (limited publication for information of Government and for developmental purposes)
- '... These cover my papers and press items of significance in a chronological progress. There are volumes of glossy publications, TV documentaries, media articles, more reports/submissions to Government and documentation of developments which are omitted.'*

## Kuwaiti pearl research resumes

By Sulaiman Almatar  
Kuwait Institute for Scientific Research, Kuwait

Sulaiman Almatar, of the Mariculture and Fisheries Department, Kuwait Institute for Scientific Research, writes:

*'... Before the Iraqi aggression on Kuwait, I was involved in a project to study the fishery on the pearl oyster P. radiata in Kuwaiti waters. I have completed a full year of data collection, including catch, size composition, and efforts. I also made many surveys using SCUBA diving*

*to locate oyster beds and to estimate density. I have managed to save most of the raw data from destruction by the Iraqis, and I am currently in the process of analysing the data to prepare a report.*

## Introduction

Following serious pathology problems between 1984 and 1987 on pearl oyster farms in several lagoons of the Tuamotu Islands, the Territory of French Polynesia, through the Institute for the Development of Aquaculture and Marine Activities (EVAAM), launched a comprehensive programme to investigate potential pathogens, improve our knowledge of pearl oyster biology and gain a better understanding of the reef and lagoon ecosystems in which pearl farming is carried on.

This research programme will cost an estimated 210 million CFP francs, of which 80 million CFP francs will be provided by the Territory, 80 million CFP francs by the French Government and 50 million CFP francs by the European Development Fund.

## Progress to date

In the past three years, work has begun:

- on Takapoto Atoll, with research on pathogenic organisms, biochemistry, reef and lagoon ecology, assessment of natural stocks and improvement of oyster collection and breeding methods;

- on Rangiroa atoll, with highly successful research on the biology of pearl oyster reproduction.

The programme also covers other aspects of pearl farming such as oyster rearing, management of the resource and the lagoon environment, socioeconomic impact, etc...

In January 1992, a scientific group of experts, including a pearl farmer reviewed and reactivated this multi-disciplinary programme coordinated by EVAAM and conducted in cooperation with a number of research institutions operating in French Polynesia (ORSTOM, IFREMER, French University of the Pacific, Practical Advanced Training School) as well as with specialised laboratories in France.

The first results of the research under way, including an anatomical and histological atlas of the pearl oyster, will be published in 1992, while the results of the research undertaken recently, principally a very thorough study of the rearing environment, investigation of a recently detected parasite, soiling problems, pearl oyster physiology (nutrition, breathing, etc...) are expected to be partly available from 1993.

## The *Pinctada margaritifera* hatchery in French Polynesia

By Philippe Cabral  
EVAAM, French Polynesia

In view of the rapid development of pearl farming in the Tuamotu island group and the foreseeing difficulties in obtaining sufficient supplies of oyster spat to meet future requirements, EVAAM, in 1984, decided to launch a hatchery spat production programme, while the Territory concurrently introduced measures to promote recently developed techniques for spat collection in the natural environment.

Once a suitable site had been selected and the first stage of building and training completed, a pilot hatchery in Rangiroa began trial operations in 1987. The results proved very encouraging, since rearing of larvae -which had been the downfall of the trials previously conducted by IFREMER (ex-CNEXO) was comparatively successful and spat was produced after our fourth trial (about 3,000 spat). These results did not therefore bear out CNEXO's assumption that genetic problems had been responsible for the failures recorded over 4 years of trials.

After further production of about 10,000 spat in 1988, a second hatchery was built, again in Rangiroa, for real-size assessment of the hatchery production potential of this pearl oyster species.

The year 1990 was devoted primarily to refining operations in the new hatchery and large-scale trialling of various techniques for settlement of larvae and growth of spat. About 50,000 spat were produced that year. In 1991, continued work on settlement and growth enabled results to be further improved (more than 150,000 spat were produced) and a fairly precise production plan to be drawn up for this type of hatchery.

Depending on the techniques used, the hatchery parameters are now as follows:



- rate of survival of larvae ready for metamorphosis: >30 per cent;
- rate of metamorphosis of the above larvae: approx. 17 per cent;
- rate of survival during growth in hatchery: >80 per cent;
- rate of survival in the lagoon to 1 year: from 20 to 40 per cent.

Further work is needed on larvae settlement and spat growth in the lagoon, in particular for the first 6 months.

This work will be conducted throughout 1992 in conjunction with genetic research. The techniques developed are now sufficiently reliable and the results consistent enough for investigations to be undertaken on other aspects of larvae or spat biology, irrespective of the techniques used.

In addition, trial seeding of oysters from the hatchery was performed for the first time in December 1990. The first pearls will be harvested in the first half of 1992.

## Status of the Tahiti cultured pearl market

By Martin Coeroli  
EVAAM, French Polynesia

The price per gramme of Tahiti cultured pearls exported from French Polynesia dropped by 15.7 per cent in 1991. The pearls fetched an average of 5,471 CFP/gr, against 6,490 CFP/gr the previous year (see graph below).

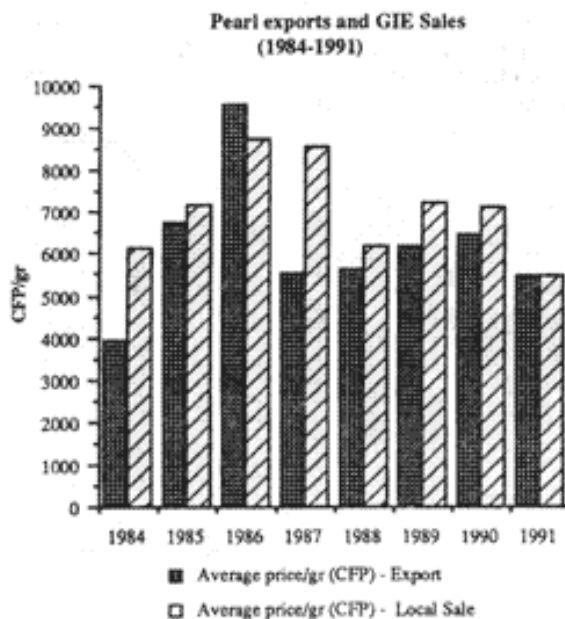
A similar slump was observed in the average price per gramme of the pearls sold at the annual pearl cooperatives (GIE) sale in October 1991: 5,442 CFP / gr against 7,143 CFP/gr in October 1990.

The downward trend seems to be becoming more marked, since the average price per gramme of pearl exports in December 1991 was only 4,438 CFP (see graph below).

The main reasons for this fall in value appear to lie in the considerable increase in the total weight of pearl exports (+ 36.7 per cent) and the sluggish demand on our major markets (Japan, USA, Switzerland).

It is therefore urgent to take measures to slowdown production, or even freeze it at its present level, in order to prevent prices from dropping further, otherwise the profitability of pearl farms, whose production costs cannot be cut down, will be seriously jeopardised.

Only a concerted regional trade policy can prevent price competition nipping this activity in the bud, before it has even had a chance to become established in other Pacific Island countries.



## Namdrik (Marshall Islands) black pearl project summary report: encouraging progress

by Virgil Ron Alfred  
MIMRA, Marshall Islands

### Namdrik black pearl project

Preliminary survey work by the Marshall Islands Marine Resource Authority (MIMRA) in this atoll suggested stocks of pearl oysters adequate to envisage their culture as an economic activity. The Commission was requested to provide a specialist to work with the Island Council in setting up a demonstration farm and to make recommendations to the government on a suitable institutional framework within which such an industry might be developed in the Marshalls.

Consultant Mr Julian Dashwood, of the Cook Islands Ministry of Marine Resources, spent three weeks on Namdrik during which time he was able to deploy spat collectors, establish a sub-surface pilot farm, and discuss with the people of the islands a pearl oyster management plan for the lagoon. The presence of good stocks of pearl oysters was confirmed, although not in the quantities initially estimated by MIMRA. Specific plans were laid down for the continuation of the programme and for building up the number of spat collectors over the next 12 months.

This project was funded jointly with FFA and USAID, who provided substantial quantities of equipment for the establishment of the farm, and logistical support.

The initial deployment of spat-collectors in the Namdrik lagoon took place in November 1990. About 3,250 spat bags were deployed at that time. At the same time about 150 juvenile black-lip oysters (*Pinctada margaritifera*) were collected from the wild stock. An underwater platform was also constructed.

In April 1991 another 750 spat collectors of the imported type were deployed. Another 300 spat collectors were constructed from local materials (*Pemphis acidula*) and were put out for trial. Settlements were found on these, but not as much as the imported materials.

With the average of 10 young oysters in a sack it would be safe to conclude that the spat collection programme in Namdrik is a success. It is also suspected that the deployment in

November 1990 was in the midst of a peak spawning period because of large settlements found in the sacks three months later. Due to fear of overcrowding and feeding competition, some young oysters were taken out of the sacks and put in lantern-type baskets (35 cm x 35 cm, polyethylene). There are now 100 baskets hanging with 20 young oysters in each basket.

Greater settlements were found in collectors using the Christmas tree mussel rope. Old mooring ropes were also collected and tried as spat collectors but were not as effective as the mussel rope. It was also observed that at least one other species of oyster is settling in these spat bags.

Collecting of young oysters from the wild stock continues. Today, over 3,000 oysters have been collected from wild stock population in the Namdrik lagoon. Collection of wild stock will continue until November 1991 or until 10,000 young oysters have been collected from the wild population, beginning the nucleus of a pearl farm project. These collected oysters are drilled and tied to a branch line which is then hung on a sub-surface main line or an underwater platform already in place.

At the moment the project is in need of additional materials. Orders have been placed for more ropes, spat bags and spat-collectors, and baskets. The major activities right now, while awaiting more materials, are cleaning the shells, keeping a close watch on the spat lines, and collecting young wild oysters. It is the plan of the MIMRA staff to go and spend up to three months deploying more spat collectors and to have a closer observation of progress on the project site.

# PEARL OYSTER NEWS RECENT ARTICLES AND REVIEWS

## NEWS FROM THE COOK ISLANDS

### Auction of Manihiki pearls in Rarotonga

Source Cook Islands news and Pacific Islands Monthly  
(June 1991 – August 1991)

Almost two thirds of Manihiki's 39,000 pearls were sold when the Cook Islands pearl auction closed after almost five hours of bidding. Fifty-four lots of pearls on auction had a total reserve price of about NZ\$ 4.8 million (US\$ 2.8 million) and the pearls were expected to fetch about NZ\$ 8 million.

The remaining third were sold during a private session with buyers during which the media and others were excluded and the price of the pearls was renegotiated.

General comments from some of the buyers were that in light of the Cook Islands still being in the early stages of developing its pearl industry, the quality of pearls was overall noted high as expected although there were some excellent quality lots.

The Manihiki black pearl industry, which made NZ\$ 3.2 million at its June 1991 auction, has many problems to resolve before the industry can reach its full potential. The industry's main problems centre around management, marketing and the local people taking control of their industry.

The recent auction highlighted the changes and expectations. It was set up to market the pearls at international level. It was not altogether successful. The average price per pearl was down 40 per cent from NZ\$ 230 to NZ\$ 140 compared to last year's auction, which was the first in the Cook Islands. Twenty of the 54 lots didn't sell. This meant that some Manihikian farmers returned to their farms with no fresh capital, while others received only

One buyer from the Orient suggested that given time the Cook Islands will be able to achieve high quality among all its pearl farmers and not just some.

He added that the country should entice more buyers from Europe and the United States.

A Manihikian felt that while there were good sales, it was a disappointment for those whose lots were withdrawn as they required good financial returns to help cover the costs involved in establishing and developing their farms.

It was also expressed that through the concerted efforts of the farmers, the private sector, the national and local governments the quality of pearls could be raised overall.

NZ\$ 8,000 to NZ\$ 10,000 for two years work -an amount obviously down on 1990. It costs about NZ\$ 5,000 to set up a small farm, and it takes up to five years to get a return.

The 50 buyers at the auction came from six countries including Japan and French Polynesia. While some saw some 'excellent' pearls, many felt that the overall quality of the 39,000 pearls on sale was not as high as they had expected it would be. This, they said, is because the industry is new in the Cook Islands. Given time the industry will develop and achieve consistently high standards of harvest. Some buyers were disappointed they were not told that the pearls came from two harvests.

The auction was run by Cook Island Pearl Ltd. (CIPL) with the help of the Ministry of Marine Resources. CIPL is owned by Chinese Tahitian Yves Tchen Pan. He was the assessor at the auction and had the most pearls on sale there. His farm on Manihiki is the only foreign-owned one and is the biggest with 250,000 shells. He farmed for some years in French Polynesia before moving to Manihiki. Most of the 24 farmers in the June auction run farms in joint ventures with him.

Farmers who will harvest later this year said not all Manihiki pearls are of poor quality. Manihiki has about 50 pearl farms. The smallest has 200 shells. Tekake Williams, a native of Manihiki, has the second largest farm with 50,000 shells. William's farm was the first in Manihiki and it remains successful.

CIPL secretary Reubin Tylor, a lawyer, said the unstable temperature of the lagoon affects the quality of the pearls. Temperature readings have only been taken in the past seven months by CIPL.

The readings show temperatures rising over a degree during April but falling back at the end of May. Some farmers are questioning the validity of the temperature theory. The Ministry of Marine Resources says when temperatures rise above 29 degrees Celsius the plankton flow into the lagoon slows down and the oysters have insufficient food. Oysters filter through 220 cubic yards of waste a day looking for plankton. If the pearl has not been well fed in the final six to twelve months of its life, it doesn't grow a good lustre.

In Manihiki, Tylor said CIPL is not overstocked and has no disease.

EVAAM (French Polynesia) was asked by the Cook Islands' Ministry of Marine Resources to inspect the farms after a Manihiki farmer told Marine Resources he was worried about a number of dead oysters on the CIPL farm. Marine Resources Secretary Julian Dashwood said the oysters could either have been killed by disease or by the stress of implantation.

EVAAM did not find any of the usual physical signs of disease but to double check they are doing

an analysis report on Manihiki lagoon tissue samples.

Local discontent with CIPL came to a head shortly after that auction when the Island Council granted an extra 25 hectares of lagoon to CIPL - a decision later revoked when the locals protested the area offered was a traditional fishing ground and a bird sanctuary. Manihikians returning home from abroad to live are also wanting pearl farms. CIPL said they need a bigger farm to space out the shells because the lagoon was getting hotter. The CIPL farm covers 16.4 hectares of the 48 square kilometre lagoon.

Julian Dashwood feels the Island Council, which has the ultimate control of the lagoon, has to start viewing the industry in the longer term rather than making ad hoc decisions as obstacles arise.

The Island Council made a positive move two months ago when it closed the lagoon to divers of wild oysters, fearing the natural stocks were being depleted. Marine Resources is surveying wild stocks, the first in a long time. Said Dashwood 'The success of any pearl culture is based on the ability to collect spats rather than harvesting of wild stocks.

Spat collectors become fertile areas in the lagoon that don't take from the natural stocks because they provide a home for larvae that would not otherwise survive. Collected spats are good for the industry because they offer an alternative to diving for wild oysters and are better shell to implant because they are more resistant.'

An ecological report done in February for Marine Resources said the lagoon can sustain a maximum of one million oysters, only if the ratio of Wild to cultured shells is 2:1, and if the farmed shells are well spaced, and cleaned regularly. The Minister of Agriculture, Vaine Tairea, sees the Manihiki industry as pioneering the way for other Cook Islands lagoons with potential for pearls. Said he: 'Manihiki is a learning process. Pearl farming is not an easy job and must be done properly. We are starting small, then if a mistake is made it can be corrected.'

## Lagoon closure brings financial difficulties for Manihiki pearl farmers

Source: Evening Post, New Zealand, October 1991

The following article highlights some of the difficulties in obtaining start-up capital for pearl farming in remote atoll islands. The farmers' cash-flow crisis was precipitated by the Manihiki Island Council's decision to close the lagoon to all diving, to protect the remaining brood stocks in the wild.

A critical shortage of finance in Manihiki, added to the domination by a single operator of the only black pearl oyster industry outside French Polynesia, has pushed farmers to the brink of collapse.

The largest farming interest in the atoll, which is home to about 100 subsistence farmers, is held by Cook Islands Pearls Ltd. The company, owned by Chinese Tahitian Yves Tchen Pen, farms about half the local industry's 500,000 shells.

Pen has attracted resentment from local farmers jealous of his success and the economic clout wielded by his large operation in the undercapitalised industry. The biggest dispute between Pen and other farmers is over his plan to expand his 16 ha farm by a further 25 ha.

The Manihiki Island Council has granted permission for the expansion, but petitions from farmers working about 50 smaller operations have blocked the move.

Manihiki councillor Tai Manuela has sought a full environmental investigation into the proposal and warned: There will be war if the decision is not reversed.'

One leading pearl farmer, Sir Tangaroa Tangaroa, said the lagoon was already overcrowded with

farms and there was a risk of disease wiping out the whole pearl industry. Preliminary results of marine studies on the lagoon, however, have shown no sign of disease among the shells.

But concern about over-exploitation of the lagoon has prompted the Island Council to put the issue of farming permits on hold while the studies are carried out.

Marine research officer Kelvin Passfield said the current level of 500,000 shells may be the sustainable limit for the lagoon. Manihiki Mayor Solomona William blamed the present crisis on the local council's failure to prepare the atoll for the rapid expansion of the pearling industry after a farming deal with Pen in 1986. The island council hadn't the faintest idea what to expect,' he said.

A recent government report on a development plan for the atoll pinpointed shortage of funds as the biggest obstacle facing small farmers.

The farmers complain of this lack of finance, with banks unwilling to lend money without security. The situation has left them struggling against the well-established and profitable Cook Islands Pearls, they say.'

## Pearl oysters tested for disease overseas

Source: Cook Islands News – August 1991

The Ministry of Marine Resources has sent tissue samples from pearl oysters on farms in Manihiki to laboratories in New Zealand and Australia to be tested for disease.

The samples were taken by Fisheries Research Officer Kelvin Passfield and consultant Neil Sims in a survey of a cross-section of small and large Manihiki farms. No disease has yet been officially identified on pearl oysters in Manihiki's lagoon, however rumours have abounded to the contrary in recent months.

Mr Passfield told the *Cook Islands News* that he could not say at this early stage whether or not disease was present in the oysters. He reserved any statement on that for when the scientific results are back from Australia and New Zealand. The research officer said 51 oysters from various farms were tested and two tissue samples from each oyster were taken.

A sample of each oyster was air-freighted to the New Zealand Ministry of Agriculture and Fisheries laboratory at Greta Point in Wellington and to the Oonoonba Veterinary Laboratory at Townsville, Queensland. Marine Resources will compare the findings of both laboratories to see how they match up. By sending the samples to two independent laboratories for testing, the department should have a better picture of the situation.

Mr Passfield acknowledged the co-operation of the pearl farmers, including Cook Islands Pearls who helped supply the necessary chemicals and equipment required for the tests to be carried out. A spokesman for Cook Islands Pearls, Man (Tou) Unuia, said that they were hopeful that the outcome of the tests would clear the air of speculation concerning disease in the lagoon. He added that for the sake of the black-lip pearl oyster industry in Manihiki and the northern group islands, it was hoped that the test result will show no disease in the lagoon.

## Manihiki diving courses and farm survey

Source: Cook Islands News – August 1991

Marine Resources has recently completed diving courses for Manihiki pearl farmers and carried out a survey of pearl shell population numbers on farms.

A National Association Underwater Instructors (NAUI) scuba diving instructor from the Ministry of Marine Resources in Rarotonga has just completed an intensive training course with the Manihikians. Manihiki's Marine Resources Administration Officer, Tere Kauraka Dan, reports that diving instructor Richard Story provided diving instruction to Manihikian pearl farmers. Arriving on Manihiki on 2 July 1991, a series of intensive courses was organised, with the help of the local marine officers, with over 60 students enrolled.

There was a pass rate of about 90 per cent after four weeks of four-day courses with the numbers of students being as high as 18 in some weeks.

Each day began with a theoretical session followed by practical lessons in open water.

Also in Manihiki was Patricia Tuara (a Masters graduate in Marine Environmental Studies), in response to a request from the Manihiki Island Council, to carry out a survey of the pearl farms. Working with a team of eight other fisheries officers, Ms Tuara carried out a shell count of well over 100 pearl farms.

The survey entailed spending an average of five hours each day free and scuba diving, noting the number of shells in various categories, as well as taking measurements of the spacing (horizontally and vertically) between pearl shells.

The survey, which began with the larger pearl farmers and then moved on to the smaller farms, was completed in two weeks.

## Cook Islands pearl farmers could train in Japan

Source: Cook Islands News – October 1991

A consortium of Isei Province pearl farmers are looking at setting up a training scheme in Japan for Cook Island pearl farmers.

The Minister of Agriculture, Vaine Tairea, who has just returned from an 11-day (September 1991) visit to Japan, says that the pearl farming industry in Isei are keen to have Cook Islanders train with them for a three-to six-month period.

To ensure that the training is effective, they are suggesting that they incorporate learning Japanese in the programme. Members of the consortium are coming to Rarotonga next month to confirm details.

During a tour of the Isei consortium's farm, Mr Tairea says he was particularly impressed with the innovative raft farming methods they were using to prevent pollution in the water. By using rafts, which were 24 by 16 feet (1 foot = 0.30 m) and carried 150 lines of 20 shells, they never cleaned shells in the lagoon. Instead the rafts were anchored in the lagoon but were towed by boat to land for shell cleaning and seeding.

This ease of movement of shells was particularly effective during hurricane season because the shells could be quickly towed to the safety of land once a hurricane warning was announced.

Minister Tairea felt that the raft concept was one that could offer a solution to the potential pollution problem in Manihiki's lagoon.

## OTHER NEWS

### Pearl oysters – Australia's most valuable aquaculture industry

Source: Austasia Aquaculture – January 1990

The culture of pearls is by far Australia's most valuable aquaculture industry. The last official figures for production were from Western Australia in 1988 -valued at an estimated A\$ 63 million, although the actual figure may be higher. According to the Chairman of the Licenced Pearl Producers Association (LPPA), Mr Bruce Brown, the 1989 production season may be worth in excess of A\$ 80 million.

The following article has been prepared using information provided by members of the LPPA and other pearl farmers. Extracts have also been taken from a number of other sources, mostly Taylor (1985), Maloneetal. (1988), and Scoones (1988) – see 'References and further reading'.

#### Many changes

Since the time the pearling industry was established in Western Australia in 1850, it has gone through many changes -from the original hand gathering of shell for pearls at low tide to the present day sophisticated culturing of pearls.

Several species are cultured -the majority of the production is from the silver-lip pearl oyster (*Pinctada maxima*) mostly for cultured pearl, although the shells have been used for mother-of-pearl and some oyster meat has been produced. In the past there has also been some limited production of the Shark Bay pearl oyster (*P. albidus albidus*) for small pearls, as well as interest in *P. margaritifera* and the winged oyster (*pteria penguin*).

The majority of production comes from Western Australia, although recently there has been some renewed activity in the Northern Territory and Queensland (see next article).

#### Shell collection

Collection of shell takes place by divers, mostly along the Eighty Mile Beach area, in the north-west of Western Australia. Since 1969, pearl diving techniques have been transformed with rubber suits, flippers and hooker breathing apparatus giving divers greater mobility in the water, an increased catch rate and a decreased risk factor.

Each lugger is given a quota of shells to fish for the season, which runs between March and September.

A diver is paid on the number of shells he picks up, thus competition of the bottom is fierce. Here the divers work in close proximity, often racing towards the same shell.

Once collected, the shells are cleaned, sized and placed in baskets for storage until they are transferred to the carrier vessel for shipment to the pearl culture farm.

#### Raft and bottom culture

The traditional Japanese method of pearl culture is practised by some companies, and involves holding pearl oysters after operation in wire cages or baskets suspended in the surface waters from an extensive system of rafts.

However, there have been considerable changes in the technique in recent years. The major departure is the holding of pearl oysters on the seabed, both at the collecting grounds and at the leases, where they are less vulnerable to cyclonic conditions than when held on rafts. This bottom farming technique requires divers to carry out routine work.

Many companies now operate on the pearl oysters at the collecting grounds before transporting them to leases. In the last year or so more companies have favoured holding the operated oysters in net bags suspended on longlines.

#### Pearls and pearl products

While the best known pearl is spherical in shape, the majority of cultured pearls are not round. The basic classes of shapes produced are round, semi-round, baroque and semi-baroque; these are often sub-divided into more precise shape classes. The value of the pearl is determined by its size, shape, colour, lustre and skin quality, with the highest valued pearls being large, round, white and smooth skinned.

Half pearls are marketed independently of the round pearls and may fetch between A\$ 5 and A\$50 per piece. Small numbers of half pearls are retained for jewellery manufacture in Australia.

Mother-of-pearl-shell (MOP) which has not produced half pearls is sold on a weight basis. It is a highly sought after commodity, particularly by Asian and

European countries, fetching up to A\$ 10,000 per tonne in 1988. A small industry in Australia manufactures jewellery and ornaments from the shell. Some shells are re-imported after processing by relatively inexpensive labour in Asian countries.

The meat of the adductor muscle is considered as a delicacy and sold for up to A\$ 300 per kilogram (dry weight) in 1988. However the main market in Hong Kong has dropped somewhat and 1989 prices were around A\$ 150/kg.

### Difficulties

The industry is undergoing a number of difficulties including widely varying spatfalls, resulting in a quota system for shell collection, problems with deaths of pearl oysters during transport to the culture farms, outdated technology and lack of co-operation between growers. The establishment of the LPPA is expected to overcome some of these difficulties.

The industry is regulated jointly through the Federal Department of Primary Industries and Energy and the Western Australian Fisheries Department. A further positive step was the establishment of a Pearling Industry Review Committee (see Malone et al., 1988) which gave a number of recommendations for future development.

Work has been undertaken by the Western Australian Fisheries Department into hatchery production of pearl oyster spat. While there has been limited success, problems have occurred with the collection and conditioning of broodstock, especially with nutrition. A number of research projects are underway.

Despite these problems, the outlook is bright. Implementation of the Review Committee's recommendations, the LPPA and the co-operative research projects all will enable the industry to further develop, and continue to provide an extremely valuable export product.

### References and further reading

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Taylor, M., 1985. The pearling industry of Western Australia 1850-1985. *Fisheries Education Publication no 3*, Fisheries Department of Western Australia, 30 p.

(Licenced Pearl Producers Association, PO Box 321, Broome, Western Australia, Australia (Membership consists mostly of the *P. maxima* producers).

## Pearl culture in Queensland

Source: Austasia Aquaculture – March 1991

Three species of pearl oysters are cultured in Queensland, namely gold-lip (*Pinctada maxima*), black-lip (*P. margaritifera*) and the penguin oyster (*Pteria penguin*). Gold lip oysters produce the best quality pearls.

There are 11 operations in the Torres Strait and on the east coast, covering 1,650 ha in 14 farms. Most of the Torres Strait and far northern operations have been in existence since the 1950s. However, the 5 East coast operations, located between Cairns and Cooktown, have been in existence for less than

5 years, with 30 of these started in 1990. The farms vary in size from 20 ha to several hundred hectares, with 60 ha being the average size for the new farms on the east coast.

Production figures supplied to the Queensland Department of Primary Industries are incomplete and require further corroboration. However, it is evident that approximately 50,000 shells were held by the operations in 1988, and 37,000 shells were held in 1989 and 1990.



## The black pearl connection

Source: Connoisseur Magazine – April 1991

*This article, published in Connoisseur magazine, focussed on the expanding market for black pearls. It also included a discussion of the methods used and problems faced by Salvador Assael and Robert Wan's farm in Marutea, French Polynesia.*

'...Black pearls, which until ten years ago were regarded as an oddity, have become such a rage on the American and international markets that the demand for them has begun to outpace the supply. Wholesale prices for individual pearls have gone up about 50 per cent in the past three years. In October of 1989, Christie's (New York) auctioned off a triple strand containing 119 black pearls for US\$ 880,000. A half year later, in April 1990, Sotheby's got virtually the same price for a single strand of only 27 black pearls, with a 17.9 millimeter whopper at the centre. It was bought by the jeweller Harry Winston, who promptly put it back up for sale, in Japan, for a reported US\$ 1.5 million, or more than US\$ 55,000 for each pearl.

For one reason or another, 30 per cent of the oysters die shortly after implantation; 40 per cent more reject the implanted bead by spitting it out. Only 30 per cent produce any kind of pearl at all, and, of these, nearly all exhibit some flaw that decreases their value: they are covered with little pits; one side has no nacre on it; their colour is splotched; they are oddly misshapen, or 'baroque' in the trade. Of the total batch, only 2 to 3 per cent, even under the best conditions, deserve being rated as gems, one whose shape is perfectly round – 'eight-way rollers' they are called – and whose colour is deep and luminescent.

The reason for the low production rate is that, for all their tough appearance, oysters are supersensitive to the way they are handled, and what the Japanese know better than anyone else is how to treat them right. Just before the implantation, in the stage called **shitake**, they must be weakened so that the shell opens without too serious prying and the muscle around the pearl sack will not resist insertion of the bead. But how to weaken them sufficiently, without debilitating them fatally? Some say they should be brought to the surface of the lagoon and warmed by the sun, but not too much; others, that they should be deprived of food, but for how long?

Robert Wan's own theory is that oysters loosen up best when they are around their own kind; and so before implantation he puts them in close proximity to one another. Then there is the **yo yo**, or period right after the operation, which the oysters spend in a *sort* of intensive-care unit, where they are catered to

like anyone else who has just gone through a stressful experience. One thing they need is peace and quiet. A great deal of unhappiness can be created by the heavy wave action of a storm, which discombobulates the rafts in the lagoon and causes a jerking up and down on the nylon ropes from which the oysters are suspended. They also need a lot of oxygen and a lot of food. In one day, an oyster filters an amazing 220 cubic yards of water looking for good stuff to eat, so lagoons with a low plankton count will never produce very big or very good pearls.

Salvador Assael and Robert Wan's farm suffered severe ecological problems this past year for reasons nobody yet knows, water temperatures in the lagoon at Marutea rose on the average a full degree. The result, through death or through rejection of the beads, was an abrupt 40 per cent drop in pearl production, from 50,000 pieces to 30,000 last year. There was also a sharp reduction in the size and quality of the pearls. In 1989, the lagoon produced enough pearls of gem quality for 30 single-strand necklaces running from 13 to 18 millimeters. In 1990, there were enough for only 6 strands, with none of the pearls running over 15 millimeters.

Economically, the consequences were not quite so dire. Having a virtual monopoly on the market, Assael simply raised his prices accordingly and sold out the crop at a greater profit than ever before. But what the development bodes for the future could be serious indeed. Since the level of water temperature also affects the oxygen supply, as well as the concentration and variation of nutrients, a rise of a single degree, if allowed to continue, could produce less healthy oysters, which would not only yield fewer pearls but be more susceptible to disease. In the mid-1980s, a virus that invaded the digestive cells of oysters on a pearl atoll in the north-east section of the Tuamotu archipelago ended up killing off a whole lagoon.

Whether the warming at Marutea is another bit of fallout from the notorious greenhouse effect no one is sure. The temperature change last year does seem to have ranged across the whole South Seas pearl region. Yet, curiously enough, on Marutea only the oysters suspended toward the centre of the lagoon were seriously affected; those hanging off the floats along the

shore produced a richer crop than ever before. Whatever the cause, Mr Wan is taking no chances. For one thing, he flew in a marine engineer all the way from Iceland to devise a method of easily raising and lowering the oysters so that he can respond more quickly to temperature changes. For another, he is investigating the idea of running a long pipe out into the ocean beyond the reef and pumping in fresh seawater from 100 feet down, a stratum particularly rich in oxygen and plankton. To hedge all his bets, last fall he bought another atoll 400 miles away, laid down a landing strip, and is setting up an oyster farm to provide the pearls in the event that disaster strikes at Marutea.

Then again, it has occurred to Assael that the real culprit may be much easier to deal with. It is called greed. After his early successes, in the late 1970s and early 1980s, he began increasing rapidly the number of seed oysters in the lagoon, trying to get more and larger pearls to satisfy the growing demand, from around 25,000 in the late 1970s, to more than 150,000 by 1990; and it may just be that there are more oysters on Marutea than its ecology will support. The plan, therefore, is to scale back on the oysters in the lagoon and see if the production rate next year will rebound accordingly. 'We thought we could produce enough pearls to supply the whole world', he says, 'and I think what happened is we got a little piggish'.

## Biotechnology: a new dawn for pearl farming

Source: Modern jeweller

*It is interesting to hear a representative of the jewellery industry state that 'demand for quality pearls is worryingly (I) greater than supply', The article also discusses the development of the Japanese cultured pearl industry, from Mikimoto's beginnings to the post-WWII boom, and the disastrous crash of the mid-1960s. The industry now is relatively stable, but suffers from poor enforcement of the management regulations the government has established to prevent over-production, The article highlights the Japanese Government's active role in fostering the recent biotechnological advances in pearl culture in Japan,*

Among the many converts to the cause of biotechnology are Japan's 2,000 or so pearl farmers, whose harvests are plagued by pollution and overcrowding of waters. For at least the past 15 years, ever since nature could no longer be counted on to produce enough oysters for pearl cultivation in Japan, almost all of the molluscs used for growing there have been bred in tanks rather than gathered from the sea floor,

Unfortunately, oysters bred in captivity lack the endurance of those found in nature. So now Japanese researchers are trying to selectively breed oysters in the lab that are as hardy as those once found abundantly in the deeps.

Japanese biotechnology labs are breeding pearl-growing oysters that are designed for crowded conditions and shorter growing times. The same labs also produce oysters whose mantle tissue secretes nacre free of value-robbing yellow when used for nucleation,

What's more, research at biotechnology labs has helped farmers grow better pearls by finding new mantle and nucleus incision points within the oyster where nacre growth is faster. To meet the demand for larger pearls, researchers are developing new methods that permit insertion of larger nuclei. It all adds up to lab-enhanced pearl culturing of fin-quality akoya pearls. (Akoya is Japanese for the

*Pinctada martensii* oysters used to grow that country's saltwater pearls),

This revolution is 24 years old, launched in 1966 by Dr Koji Wada at the National Research Institute of Aquaculture in Mie, one of Japan's three pearl farming areas. Wada, a staff member of what was then called the National Pearl Research Laboratory (the facility, now also devoted to fish breeding, was renamed the National Research Institute of Aquaculture in 1981), reasoned it was the colour of the inserted mantle slice that decides the basic body colour of a cultured pearl.

To prove his premise, Wada devised the following experiment: he grafted yellow and white mantle tissue, plus the customary clam-shell bead-nucleus, into oysters whose mantles were both yellow and white, then let them grow pearls for three years. Sure enough, the oysters into which yellow mantle tissue had been transplanted grew cream-coloured pearls while the oysters into which white mantle tissue had been transplanted grew white pearls. Neither the mantle nor the shell-lining colour of the host oyster made a difference in the colour of the pearls produced.

Today, for the first time in years, demand for quality pearls is worryingly greater than supply. In an attempt to ease the shortage of fine goods, Japan's pearl farmers once again worsen their woes by overcrowding waters with oysters. Pearl

production soared from 15.3 million momme (1 momme = 3.75 gr) in 1983 to 18.7 million momme in 1988. 'You can't put so many more oysters into the same area of water without disastrous results', says Latendresse, the single largest supplier of the dozen or so varieties of Mississippi water system mussel shell used to make Akoya pearl nuclei. 'Quantity is as much an enemy to quality as pollution', he says.

This is where biotechnology comes in. First, it can decrease oyster mortality rates by breeding animals

with better endurance. Second, it can increase pearl quality by breeding oysters whose mantle tissue will secrete nacre with good colour, thickness and lustre and in less time than naturally bred oysters. When asked about the main contribution of research to pearl farming, Wada answers, 'A lot of our findings confirm what was already known. But science can teach the pearl industry a more systematic approach to using that knowledge'.

## Pollution imperils Persian Gulf pearls

Source: Jewellers' Circular-Keystone – April 1991

Oil, the economic mainstay of the Persian Gulf region for half a century, now threatens the production of pearls, once the area's main cash crop. The late January 1991 spill of Kuwaiti oil, called the world's worst ever, was the most recent disaster to befall a product that provided a living for many as far back as Biblical times.

Persian Gulf pearls, mentioned in both the New and Old Testaments, were well-known to both ancient Greeks and Romans. Known eventually as Oriental pearls, they formed naturally in the shallow, balmy salt waters of the Gulf. *National Geographic* notes that Bahrein once was credited as having the highest per capita wealth on earth, all due to income derived from pearl fishing. Says Karin Hurwit, supervisor of Master Stones and Pearl Identification at GIA's Gem Trade Lab; 'History always points to that area over time it became the prime source of pearls for traders'. But the popularity of natural Persian Gulf pearls began waning in the 1920s.

Persian Gulf pollution and heavy sea traffic have made it increasingly difficult for the *Pinctada margaritifera* and *Pinctada vulgaris* to survive.

Recent reports suggested a revival of freelance diving in the Gulf but pollution caused by the spill of 11 million gallons of crude oil may doom that trend. Dr Robin Love, marine biologist at the University of California at Santa Barbara, says that 'certain factors will determine the molluscs' survival'. The length of time and the way the oil degrades is very important. 'If it releases a large amount of aromatics, such as benzene, the resulting toxins could be lethal to the molluscs.' He also notes that bivalves tend to close up if they sense anything wrong with their environment. 'If the oil coating remains there for too long, the mollusc will inevitably starve to death.' Finally, he explains that clean-up methods could endanger the life of the molluscs. 'Skimming the oil is the best way. But if the clean-up crews use surfactants to break up and sink the oil before it hits the beach, the combination of chemicals and sinking oil could be very toxic to the molluscs.'

Thus the future appears uncertain for the Persian Gulf pearl. Just as the pearl had poised itself for re-entry into gem markets, it has been toppled again, and possibly annihilated, by that cash crop of today, oil.

## South Sea (Gold-lip) pearls increase in price and production: 1990

Source: Jewellery News Asia – May 1990

Production of South Sea pearls has increased but a steadily rising demand pushed up prices from 10 to 35 percent in early 1990, South Sea pearl wholesalers in Asia said.

Increased production of better quality and larger sizes has been reported from the main producing countries – Australia, the Philippines

and Indonesia. However quality and size of pearls from Myanmar (formerly Burma) have dropped.

No official figures for South Sea pearl production are collected but wholesalers estimate production increased about 20 per cent in 1989. They said compared with previous years larger quantities were sold for higher prices at the two main South

Sea pearl auctions, in Darwin, Australia, in October 1989 and in Tokyo, Japan, in March 1990.

Managing Director of China Pearl Export Co. Ltd in Hong Kong, Harout Tchapanian, said, 'Prices are up 20 to 30 per cent.'

Wholesalers said South Sea pearls from 9 mm to 12 mm are scarce and prices have increased more than 30 percent. Also, demand for necklaces in sizes from 10mm to 14 mm has increased, particularly in Japan. Production of round pearls from 13 mm to 16 mm has increased because technology has improved.

A worldwide scarcity of *Pinctada maxima* oysters has increased the price of live oysters which, in turn, has increased cost of producing South Sea pearls, the Managing Director of South Sea pearl producing company, Jewelmer International

Corporation in the Philippines, Jacques Branellec, said.

Nuclei used in pearl grafting are also scarce and prices have increased 300 per cent in the past 12 months. For the sizes of nuclei required for South Sea pearls, prices in some cases went as high as US\$ 30 for one nucleus. Nuclei are in such demand and so scarce that for the first time there has been an auction of nuclei, Mr Branellec said. The auction was held in March 1990 in Japan and organised by producers of nuclei.

Scarcity of 17 mm and 18 mm pearls continues because a farm produces only about 20 pearls in these sizes each year. The average price for a momme of South Sea pearls exported from Japan in 1989 was US\$ 500. Demand for mabes has increased but prices have decreased from 10 to 15 percent in 1990 because production is higher.

### South Sea (Gold-lip) pearls increase in price and production: 1991

Source: Jewellery News Asia – May 1991

Cultured South Sea pearls are a new product. They were first introduced in the late 1950s but only became available in small, commercial quantities during the late 1960s and early 1970s. By the early 1980s both production and demand started to gain momentum.

Annual world production in 1983 was estimated at 100 kan (1 kan = 3.75 kg) of marketable goods. In 1990, the estimated production was close to 300 kan, with almost half, about 140 kan, produced by Australia. Other producing countries are Indonesia, the Philippines, Thailand, Malaysia, Myanmar and the People's Republic of China. These estimates do not include the black South Sea pearls produced by the *Pinctada margaritifera* oysters in Tahiti and the Cook Islands.

Reasons for increased South Sea pearl production are:

- better farming techniques, the introduction of off-shore operation of oysters to implant nuclei, and other improvements --longlines have replaced bottom systems and cleaning boats have replaced manual cleaning of oysters;
- better use of each oyster through multiple operations, resulting in an increased number of round pearls from each oyster and increased average size and weight of each pearl because pearls from the second and third operations are

larger than those obtained from the first operation;

- new farms, mainly in Indonesia, and full production of under-utilised farms, mainly in Australia. Australia alone has increased its annual production from a mere 40 kan in 1983 to 140 kan in 1990, although the oyster quota of 500,000 has remained unchanged during this period;
- increased availability of oysters through breeding at hatcheries has gained momentum, particularly in Indonesia.

In Australia, increases in annual production from the present 140 kan to around 200 to 250 kan are anticipated within a few years, even though the oyster quota is said to remain unchanged and hatchery projects are not likely to meet with immediate success.

The developments in Indonesia are stunning. As a result of numerous new farms and the gradual but obvious success of oyster hatcheries in Indonesia, some predict that this country has the potential not only to match but to exceed Australia's South Sea pearl production in the foreseeable future. Other producing countries, with the exception of Myanmar, are also expanding production.

These developments may lead to an estimated world production of white South Sea pearls of around 400

kan by 1993, four times the volume of 1983. Estimating production volume beyond this date is guesswork. Much depends on when countries like Australia will achieve a breakthrough with hatchery projects. But there is no doubt that the world's output of South Sea pearls is likely to keep expanding very significantly in the years to come.

In world markets in general, and Japan in particular, South Sea pearls have become so popular in recent years that the demand could hardly be satisfied, despite drastic increases in production. Prices remained high.

But a gradual decrease of prices, in line with increasing production could have its positive side. The lower the price, the wider the customer base. Popularity of the South Sea pearl would spread further into levels of lower income consumers, further establishing itself in world markets.

And, compared with alternate products such as freshwater and Akoya cultured pearls, South Sea pearls are relatively scarce, practically free from artificial bleaching and colouring and, most important, have a good and healthy coating. Noble and honest. With a long and bright future.

## Gold-lip hatcheries and farms in Asia (Philippines and Indonesia)

Source: Jewellery News Asia – May 1990

### Philippines

To increase production of South Sea pearls requires finding more locations suitable to farm pearls. Even if they could be found, more oyster beds would be needed. But all oyster beds appear to have been exploited. Instead of using natural oysters, the solution to the shortage of South Sea pearls may be breeding oysters to be used by existing pearl farms.

'Breeding must be considered as a market stabiliser to maintain prices and qualities at levels acceptable to all sectors of the trade', Managing Director of Jewelmer International Corporation in the Philippines, Jacques Branellec, said.

Al though oysters are available for Akoya, breeding *Pinctada maxima* oysters is long and difficult. Companies have been researching and developing oyster breeding for more than 20 years. Only recently have a few companies had success. One is Jewelmer and another is a company which has a pearl farm in Malaysia.

Oyster breeding is expensive and risky and it may take up to six years before pearls can be harvested from the oysters.

Mr Branellec said that after breeding the oysters there is the cost of bringing them to maturity which takes two to three years. Then there is pearl grafting and another two to three years before harvesting.

'During breeding, oysters require intensive care and attention so that they are maintained in ideal conditions to ensure satisfactory growth and good health because that will later directly influence the quality of their product – pearls.

'The main advantage to a producer of a successful breeding technique is that he can have batches of oysters grouped in different ages and sizes and generate a homogeneous production.

Oysters collected by divers, which are scarce, are a mixture of ages, sizes, and not all are in an ideal condition. They take time to adjust to a new environment', he said.

For a new pearl farm to produce the first pearls takes seven years and to recover the investment takes usually 10 years. Jewelmer International Corporation in Manila, which started a farm in the Philippines in 1979, recently passed the 10-year mark.

'Some years we were behind and some years we were ahead. There are conditions that neither man nor money can influence -weather, water temperature and pollution. But overall we achieved our goal within the 10 years,' Managing Director of Jewelmer, Jacques Branellec, said.

The company is a partnership between two Filipinos, Eduardo Cojuangco and Manuel Cojuangco, and Mr Branellec.

The farm is on the island of Agis Agis which is off the west coast of Mindanao in the Sulu Sea. There are 200 workers, a technician from France, four Filipino biologists and five biologists from Japan.

Natural oyster beds are about 1,000 kilometres from the farm at depths of up to 75 metres, Jewelmer employs about 1,500 contract divers during the diving seasons in February and September to collect

South Sea pearl oysters, *Pinctada maxima*, from the sea bed. About 35 per cent of oysters implanted with nuclei at the farm produce pearls.

### Indonesia

South Sea pearl production in Indonesia increased 30 per cent in 1990 because more farms were established and oyster breeding increased, director of pearl producing and wholesaling company, Cogent Trading Co. Ltd. in Hong Kong, Leung Sik Wah, said.

Cogent and a subsidiary in Japan, Kogen Trading Co. Ltd, have three farms in Indonesia and one each in Malaysia and the Philippines. All are joint ventures with companies in Japan.

Mr Leung said up to March 1991 the government in Indonesia had given about 30 licences to companies to operate farms and in 1990 Indonesia was the second largest producer of South Sea pearls after Australia.

'Two of our farms in Indonesia have been successful in breeding South Sea pearl oysters *Pinctada maxima*. We have bred more than 100,000 oysters in Indonesia,' he said.

'The first pearls from oysters bred at one of the company's farms in Indonesia were harvested in 1990. The company began farming in Indonesia in 1984. The farms are in remote bays, eight hours by boat from the nearest town.'

According to Mr Leung, 'The severe shortage of oysters from natural beds a few years ago was one

of the reasons for steep increases in South Sea pearl prices. Breeding oysters has helped to increase production and stabilise prices.'

Prices of oysters from natural beds increased 30 per cent to 50 per cent in 1990. Prices range from US\$ 10 to US\$ 15 an oyster.

Changes in temperature, pollution, and a shortage of natural food, plankton, could result in unhealthy oysters. About 30 per cent of oysters are discarded during the three years they take to reach maturity.

Although environmental conditions at farms in Indonesia have been stable for the past five years, Mr Leung said he expects conditions eventually to change. He said the company may consider starting another farm in Indonesia.

Smaller farms in a number of locations are less risky than one large farm because sudden environmental changes, particularly of temperature, can damage or destroy the entire production.

Cogent first started South Sea pearl farming in the Philippines in 1965. Production has decreased because the farm has been in operation for more than 25 years. Food supply has decreased and environmental changes have reduced productivity. We may consider moving the farm to a better location in the Philippines,' he said.

'In Malaysia, production has decreased because environmental conditions have deteriorated. The farm in Malaysia was established in 1970 and was one of the first in the world to start breeding *Pinctada maxima* oysters', he said.

## Government statistics have numbers that do not add up

Source: Jewellerv News Asia – Mav 1990

The way some government departments in Asia classify pearl imports and exports is confusing, sometimes misleading, and of little use to people in the industry.

Hong Kong puts all pearls under only two categories, natural and cultured, but only in value and not in weight; Japan has two pearl categories, freshwater and cultured, with figures both in value and in weight; and Singapore puts all pearls under one category, pearls, but only in value.

Hong Kong's figures can be misleading. Under the category, natural pearls, re-exports are given as US\$ 11.84 million in 1989, and under-cultured pearls,

re-exports are given as US\$ 38.69 million, yet most pearls are cultured.

No-one in the pearl business could explain what the natural pearl category in the import and export figures means. How should pearls be classified to be of use to the trade?

Most people in the pearl business say there should be two main categories: One called cultured pearls, which should be broken down into four sections of 1) freshwater pearls including Biwa pearls, 2) Akoya pearls, 3) South Sea pearls and 4) mabes; and a second category called natural pearls which should include Keshi pearls.

## Japanese Akoya production and market history

Source: Jewellery News Asia – May 1990

The period from 1947 to 1952 was one of increasing demand for Japanese Akoya cultured pearls with a sellers' market prevailing. Annual production was increasing and rose from 10,000 kan in 1947 to 20,000 kan in 1952. Average size was 4 mm to 5 mm and a 7-mm pearl was considered large and exceptional. Practically all strands were graduated, with 3 fill\ pearls at the ends and a 7-mm centre pearl, known as 3.5 momme graduations. The average price per momme was 400 yen to 450 yen or US\$ 1.10 to US\$ 1.25 since US\$ 1 is equivalent to 360 yen.

Markets in Europe were closed to pearl imports and nearly 100 per cent of exports went to the United States. The processor's average cost price of a 3.5 momme graduation was around US\$ 4 but due to very strong demand, it sold for around US\$ 10 the golden days of the pearl industry.

### 1953

Signs of a crisis appear because of over-production and fears of a price-drop but at the critical moment, Europe starts to liberalise cultured pearl imports, taking off the pressure.

### 1953 to 1968

United States currency is still at 360 yen. Worldwide demand is increasing and so is production in Japan. Average size is becoming larger and pearls with diameters of 8 mm and 9 mm are being produced. Necklaces with uniform sizes are becoming popular. Average price per momme remains at US\$ 2 to US\$ 2.50. But production increases too much – from 20,000 kan in 1953 to 50,000 kan in 1968 when an annual production of 25,000 kan would be sufficient to balance supply and demand. Overproduction.

### 1968

The pearl industry is in its worst crisis. Prices are falling through the floor. Many pearl companies in Japan go bankrupt, from the smallest to the largest.

Over-production (surplus) is being bought by the Agricultural Bank of Japan which keeps tens of thousands of kan in vaults until the last kan is finally sold in the early 1980s.

### 1969 to 1973

From 50,000 kan in 1969, production drops to 10,000 kan in 1973. Five difficult years for Japanese pearl producers and processors because demand is low.

### 1973 to 1985

Demand picks up and accelerates. Production cannot keep pace. Almost throughout this period, a sellers' market prevails. Average export price per momme increases from US\$ 2.65 in 1972 to US\$ 24 in 1984. In December 1984, US\$ 1 is worth 252 yen.

### 1985 to 1988

Supply and demand find a healthy balance. Annual production is 20,000 kan and around the same quantity is sold. Business is generally considered normal until 1987.

### 1988 to 1989

Demand drops, as do prices and 1988 is considered the worst year since the crash of 1968. The difference is that in 1988, both farmers and processors have good years behind them. Most have assets in real estate, which has multiplied in value over past years. Also, in contrast to 1968, money is easy to borrow at cheap rates. By the end of 1988, the value of United States currency has dropped to 125 yen. The mood is depressed and the outlook is gloomy.

### 1989 to 1990

To the surprise of processors, the market makes an unexpected 180-degree turn. Demand, mainly in Japan, increases. As stocks held by processors are depleting, scarcity of suitable merchandise becomes a problem. Prices increase. Yet nobody is really happy about these developments and many consider the situation unhealthy and volatile.

## Akoya production increases in China

Source: jewellery News Asia – May 1990

Japan's international dominance of the Akoya cultured pearl industry, which has so far been undisputed, seems to face a serious challenge: the

production of Akoya cultured pearls in the People's Republic of China.

During the past two years, China's annual production suddenly increased to an estimated 800 kan to 1,200 kan, about 5 per cent of Japan's total production.

What is of increasing concern to producers and traders in Japan is that China's present output will continue to grow rapidly. Poor quality pearls produced in China will further harm the Akoya pearl business which is faced with a serious problem of quality caused by thin coating.

Japan's annual Akoya production is between 17,000 kan and 20,000 kan, a level that is not likely to increase.

Several traders in Japan have publicly expressed concern about the future viability of their industry. Some are drawing parallels with what happened years ago to the freshwater pearl business from Lake Biwa in Japan when China started its virtually uncontrolled freshwater pearl farming.

### The winged pearl oyster, *Pteria brunnea*, in Hawaii

Source: Of Sea and Shore (Stephanie Price)

One of the most distinctive of the pearl oysters (Class: Bivalvia; Family: Pteridae) is *Pteria brunnea* (Pease, 1863), which is found in the Hawaiian Islands. It is easily identified by its short anterior wing and longer posterior wing hinge line and the iridescent golden-pearly interior.

There are two genera of Pteriidae represented in the Hawaiian waters. These are *Pteria*, with the winglike hinge, and *Pinctada*, rather subquadrate in shape. (*Avicula* is a synonym of *Pteria* and *Margaritifera* is a synonym of *Pinctada*.)

*Pteria brunnea* is found attached to black corals, usually at the base, by a strong byssus. However, on large corals it can be found at the base of each strong branch with the bivalve's 'wings' parallel to the branches. The corals grow in depths greater than 30 feet.

The exterior of the bivalve shell is dark brown and bears sculpturing of wavy incremental lines which are more concentrated on the wings. There is a thin brown periostracum which is brittle. The shell also has pronounced growth lines and is very fragile, especially along the margin.

The right valve is smaller and less convex than the left. The shape of the shell is obliquely ovate or rounded. The small pointed beaks are from the anterior to the midline, and the whole shell curves towards the base below the byssal notch.

While in Lahaina, Maui, one afternoon I stopped at the marina. Some divers had just brought in some black coral to be sold in the local stores. Three large bushes, covered with multi-coloured algae, were on the wharf and as I examined them, I saw several *Pteria brunnea* attached to each bush. The *Pteria* were also covered with algae and were quite slimy and smelly. Each bush had several *Pteria brunnea* holding fast to various branches.

The divers told me that they had to go quite a way out in the ocean to the coral beds and had to dive to depths of twenty to thirty feet to get the coral.

My specimens, six in all, measure about 2.5 inches long and 2 inches wide (high). Two similar species occur commonly in mainland American waters – the Pacific *Pteria sterna* (Gould, 1851) found from southern California to Peru and the Atlantic *Pteria colymbus* (Roding, 1798) occurring from North Carolina to Brazil.

### Genetic analysis of Cook Islands stocks

Source: South Pacific Commission, 23<sup>rd</sup> RTMF, Working Paper 5

A request for assistance in the coastal fisheries field was received from the Cook Islands for 'Genetic analysis of pearl oyster stocks'. The purpose of the project is to examine pearl oysters from three different lagoons in Cook Islands to identify genetic differences between stocks, prior to allowing the movement of juveniles or broodstock between

lagoons. In view of the wide interest in re-establishing pearl oyster stocks in the region, this project has implications for several Pacific Island countries.



Tom Rice, Editor of the magazine *Of Sea and Shore*, from which the article in page 28 was taken, is compiling a Directory of Conchologists. We have reprinted the registration form here for those members wishing to participate.

### THE DIRECTORY OF CONCHOLOGISTS

*Listing is free!*

We plan to publish this new Directory in late 1992. It will contain names, addresses and interests of those people, around the world, working on various aspects of shells or molluscs – be they professional, advanced amateurs or beginners. We hope this will facilitate specimen and information exchanges and enable those interested in similar subjects to correspond with one another. We hope you will participate by filling out and returning this form. Please feel free to duplicate this form and pass it to others you feel should be included in the Directory.

Tom Rice, Editor  
PO Box 219  
Port Gamble, W A 98364 USA  
(Of Sea & Shore Publications)

Please type or print your information.

NAME  
ADDRESS

#### TELEPHONE NUMBER (Optional)

I have checked the following areas of conchology in which I am interested:

all mollusks;	marine mollusks;	terrestrial mollusks;
freshwater mollusks;	fossil mollusks;	specimen exchange;
information exchange;	specimen purchase;	selling specimens;
photography;	shell crafts;	shell art;
micro mollusks;	color forms;	freak mollusks;
habitat studies;	anatomical studies;	mollusks on stamps;
crustaceans;		

#### Other invertebrates

I am specially interested in the following FAMILIES:

Cypraeidae;	Muricidae;	Conidae;
Pectinidae;	Terebridae;	Volutidae;
Mitridae;	Unionidae;	Strombidae;

#### Other families:

Comments or additional information:

# ABSTRACTS PUBLICATIONS WORKSHOPS AND MEETINGS

Abstracts of two papers presented to the Pacific Science Congress, held in Honolulu from 27 May to 2 June 1992:

**Pearl farming: an economic opportunity for Pacific Island Nations**, by R. Fassler and J. Corbin; Aquaculture Development Program, Department of Land and Natural Resources, State of Hawaii.

For many Pacific Island nations, pearl farming represents an outstanding economic opportunity. They possess protected open-ocean areas or lagoons with warm, clean saltwater and a supply of oysters that are capable of producing quality pearls. The market for this high-value product is rapidly expanding. In 1989 Japan, the leading pearl buyer, imported US\$ 162 million – double the value purchased in 1988. In a few countries, such as French Polynesia, pearls have become the leading export commodity. In many others, however, the industry has received little – if any – serious consideration.

To date, Japan has monopolised both the technology and marketing of pearls. The authors discuss new competitive forces threatening Japanese dominance which could expand production in pearl-producing nations and lead to the establishment of pearl culture throughout the Pacific.

Key words: Pearl farming, aquaculture, development

Source: Abstracts of the XVII Pacific Science Congress: Towards the Pacific Century: The challenge of change. p. 35.

**The compatibility of traditional and modern management in aquaculture: pearl culture development in Manihiki**, Cook Islands, by Neil Anthony Sims, 73-4369, Old Government Mauka R, Kailua-Kona, HI 96740, U.S.A.

This presentation examines the roles of traditional and modern fisheries management in the lucrative

black pearl culture industry in Manihiki lagoon. The causes of conflicts and dissension within the community and with the government are discussed. The progress towards management through consultation and consensus is outlined.

Management aims to prevent disputes by establishing equitable terms of access. The issues surrounding traditional tenure and modern forms of ownership are examined. Entry must still be controlled, to prevent over-exploitation.

Regulations governing farm management are also required to prevent disease problems. The compatibility of new regulations with established management mechanisms is reviewed.

A management plan for the industry has been drafted through extensive consultation with farmers, divers, and others involved in the industry.

Key words: Pearl culture, traditional management, marine tenure, aquaculture, black-lip pearl oyster.

Source: Abstracts of the XVII Pacific Science Congress: Towards the Pacific Century: The challenge of change. p. 126.

The work cited below was published on the occasion of the 1st and 2nd Festivals of the Pearl, organised in 1989 and 1990 at the Musee oceanographique de Monaco. A copy is held at the Bishop Museum Library in Honolulu.

Doumenge, F., Toulemont, A., and Branellec, J. 1991. Les perles des mers du sud: la perle dorée des Philippines. (The pearls of the South Seas: The golden pearl of the Philippines). Monaco. Musee Oceanographique.

## PEARL CULTURE FOCUS AT THE TWENTY-THIRD SPC REGIONAL TECHNICAL MEETING ON FISHERIES

The development of Pacific Island pearl oyster resources was listed as a specific agenda item at the last fisheries meeting, held at SPC headquarters in Noumea from 5 to 9 of August 1991. A recommendation was adopted by the meeting to 'follow up French Polynesia's offer to contribute to developing a policy and a regional programme for

co-operation in the field of pearl shell resource assessment'.

An overview of the discussion is contained in the extract given below from the draft report of the meeting. Excerpts from other papers presented at the meeting are also given.

### **Increasing interest in pearl oysters throughout the region: French Polynesia offers a co-operative programme**

Source: SPC, 23<sup>rd</sup> RTMF, Report– Agenda Item 8

#### **Development of Pacific Island pearl oyster resources**

The Senior Inshore Fisheries Scientist stressed the increasing interest being shown in the region in this aquaculture activity and indicated that some aid donors might be positively disposed towards pearl-farming projects.

The Representative of French Polynesia provided a report on the status of pearl oyster culture in French Polynesia, and conveyed to the Meeting his Government's wish to contribute fully and without reservation to drawing up a policy and a regional programme for co-operation in the field of pearl-shell resources.

French Polynesia could contribute in the following ways:

- Survey, appraisal and determination of sites suitable for pearl farming. Consultancies by French Polynesian specialists could be provided, with arrangements to cover the cost of these consultancies being made by SPC. Other conditions would be spelt out in trilateral agreements between French Polynesia, SPC and the recipient countries;
- Making available SIGMA POE RAVA, a computerised geographic information system for lagoon resource assessment and management that incorporates SPOT satellite imagery.

These preliminary steps would make it possible to measure and assess the extent, content and cost of subsequent stages of co-operation. It would also give political decision-makers an instrument for judging whether the proposed activities were feasible or not. The Representative of French Polynesia emphasised the need for a staged

approach to the implementation of any future co-operative project.

The discussion that followed this presentation enabled the Representatives of Kiribati, the Cook Islands, the Marshall Islands, Western Samoa, Fiji and the Secretariat to raise a number of issues related to pearl farming, in particular:

- The cost of using the SIGMA POE RAVA system for assessment and management of lagoon resources;
- The feasibility of transferring pearl oysters to countries which have few or no natural stocks;
- The possibility of organising an exploratory visit to French Polynesia through the SPC;
- Opportunities for training pearl culture technicians in French Polynesia.

During this discussion a pearl culture project being conducted in the Cook Islands, with funding from USAID, was described by the Cook Islands representative.

After all the queries and comments from the floor had been dealt with, the Chairman thanked the Representative of French Polynesia on behalf of the Meeting, which adopted the recommendation.

## Geographic Information System and Remote Sensing data for technical and administrative management of pearl oyster culture in French Polynesia

Source: IFREMER - Service de la Mer et de l'Aquaculture

Pearl farming in French Polynesia began in the early 1960's in several atoll lagoons. Only about a dozen companies and no more than a hundred people were involved in the activity in those early days and the first pearl exports were recorded in 1972: 1563 grammes of pearls for a value of 336.000 CFP (roughly 3,360 US\$ ).

After the cyclones which partly destroyed the coconut groves in 1983, islanders increasingly turned to pearl farming which had proved profitable. Gradually this activity brought new life to the Tuamotu and Gambier islands, slowing down out-migration by offering the local population a good source of income.

Since 1983, pearls have become French Polynesia's foremost export commodity. In 1989 a total of 662.4 kg of pearls were exported for a value of nearly 3.8 billion CFP francs (38 million US\$).

Today, the pearl sector directly employs about 1800 people and generates employment for many more in such related trades as jewellery manufacturing and handicrafts.

### Difficulties encountered

The 'Service de la Mer et de l'Aquaculture' (SMA), Department for the Sea and Aquaculture, which is in charge of the administrative and technical management of this sector, is encountering a range of problems, the major ones being:

- uncontrolled occupation of the lagoon;
- inadequate legislation, often ill-suited to the requirements of the operators;
- lack of knowledge on the actual status of the industry: as not all of the pearl producing sites have yet been inventoried, it is impossible to monitor activities;
- non-availability of a homogeneous set of maps of the appropriate scale for the thirty-odd pearl farming areas: the existing topographic and hydrographic maps do not give comprehensive coverage and are not of much practical use (they do not, for instance, show the **karena**, or coral pinnacles, which pearl farmers use to attach their ropes);

- lack of integrated lagoon management tools.

Management of pearl oyster resources and public marine areas

Sound management depends on:

- proper administrative procedures for consideration of applications of concessions of marine areas;
- on-site surveys of pearl farming activities and processing of relevant data;
- availability of a homogeneous set of maps (identical scale and type of projection) as a basis for mapping of activities;
- comparison of field data with the information contained in the application for concessions.

Occupation of public marine areas is governed by an administrative procedure for allocation of concessions specifically defined in terms of surface area, location and type of activity. Applications for allocation of concessions must be submitted to the SMA which consider each application individually. On the basis of the Department's recommendations, the Government Council then issues an order of allocation or a notification of rejection. In conjunction with this administrative procedure, field surveys are necessary to determine ongoing pearl culture activities and the areas available for new concessions. Methods for the collection of field data have been developed and enable accurate maps of activities (actual lagoon occupancy) to be drawn up. By comparing the administrative data concerning the concessions with the field data obtained, it is possible to:

- regulate pearl farming activities (reduction or extension of exploited areas, relocations...);
- determine the areas available for further concessions, and thus to ensure rational development of the lagoons.

### SIGMA POE RAVA

It is the Geo Information System developed by the Department for the Sea and Aquaculture (SMA) for administrative and technical management farming. In conjunction with the "Station Polynésienne de

Télédetection" -SPT (Polynesian Remote Sensing Facility), the SMA has set up a comprehensive computer system to assist in effective management of lagoon areas. It integrates the SMA pearl culture information system with a standard geographic mapping base and enables geographically referenced data to be processed and utilised.

SIGMA POE RAVA relies on two data bases. The first contains general data from the pearl culture information system, i.e. all the administrative and technical information from concession applications and field surveys. The second comprises digital maps derived from SPOT images of the pearl farming atolls and islands of French Polynesia on which the pearl culture activities (structures, concessions, etc.) are represented by conventional signs. These maps were produced from SPOT images available by means of an image processing system developed by the SPT and with the assistance of the "Service Hydrographique et Oceanographique de la Marine" -SHOM as regards geometric correction (UTM projection) of the maps.

### **Marine areas development planning**

SIGMA POE RAVA has given the SMA a valuable tool for effective administrative and technical

management of pearl farming. The integration of all relevant data within a single computer system greatly assists the Department's staff in making the proper decisions on applications for new concessions. Concessions can henceforth be granted or refused on the basis of objective criteria such as availability of sites (or, inversely, overcrowding in certain areas), production statistics, mortality figures and environmental parameters. Analysis of data also allows comparisons to be made between the productivity achieved with different grafting, farming and collection methods in various parts of the same lagoon or in different lagoons. The results will be used for information and training of pearl farmers (in particular, students attending the "Centre de Métiers de la Nacre et de la Perliculture"). The system has already optimised survey procedures (use of the latest positioning techniques -GPS -, automatic generation of maps).

Lastly although SIGMA POE RAVA was specifically developed for pearl farming, it could also be used in connection with any other activities conducted in tropical lagoon areas, such as various types of aquaculture, fisheries, and even tourism, and greatly assist in drawing up comprehensive long-term development plans for marine areas.

## **Conflict resolution in the development of the Cook Islands pearl industry**

By Julian Dashwood, SPC, 23<sup>rd</sup> RTMF, IP 30

In 1975, the Cook Islands government entered into a pearl farming agreement with an Australian company without consultation with the people of Manihiki or its island council. The island council, which is an elected body, has the responsibility of ensuring that the collective will of the people is taken care of through representation to government.

In the case of this Australian company, the government had not sought the views of the people, through the island council, with respect to this new development. As a foreign entity carrying out business in a very remote location, and without the people's blessing, the company naturally came into conflict with the inhabitants of the island. The company, which had to purchase oysters from the people for its farm (it was not permitted to carry out this activity on its own), found it difficult to meet its target, not because there were insufficient oysters, but because the people were reluctant to sell.

The company was forced to purchase oysters of a lower quality as people sold their best oysters to traders for mother-of-pearl. Company equipment would mysteriously disappear and the company

found it difficult to impose the 8-hour working day on its labour force. Apart from the problems that the company was experiencing with local attitudes and prejudices, it was also having great difficulties in recruiting and maintaining the services of Japanese pearl seeding technicians because of the extreme isolation of Manihiki.

By the late 1970s, the company was facing financial difficulties and was finding it hard to keep up its licence payments to the island council. This was the opportunity that the council had been waiting for, as grounds for approaching the government to terminate the company's licence. In 1981, the company was finally forced to curtail its pearl farming activities on Manihiki.

### **Developments over the last decade**

The 1980s can perhaps be labelled as the decade that pearl farming became established in Manihiki. It was also the period in which government decided to repeal legislation pertaining to the management of pearl oyster resources that had been in force since the colonial era. New legislation was

introduced in 1982, which effectively gave island councils total control over management of the living marine resources in their respective lagoons. For the people of Manihiki, this was a very welcome move. A treasured heritage was no longer being controlled and managed by bureaucrats from the capital 700 miles away.

One of the first decisions that was made by the island council under this new management regime was to open the hitherto closed lagoon to the harvest of pearl oysters. This open harvest season continued unabated until very recently, despite the appearance of several indicators showing that the stocks of wild oysters were at dangerously low levels. The bulk of the oysters that were harvested from 1982 to 1987 were killed and sold off as mother-of-pearl.

By the mid-80s, one local Manihikian began establishing a pearl farm. By 1987, this person had collected over 30,000 oysters which were in various stages of readiness for nucleation. During the same year, approaches were made to the island council and government by no less than five pearl farming entities that were operating out of neighboring French Polynesia for permission to establish a pearl farm. One company received permission from the island council and started operations the same year.

Under the terms of the licence, the company was given permission to cultivate up to 300,000 oysters and to have these oysters seeded. In the meantime, the sole Manihikian who had been cultivating oysters for a number of years was still unsuccessful in obtaining a pearl farming licence from the island council. He needed this licence in order for him to be allowed to hire pearl seeding technicians. Threats of court action by this person only lead to a greater resolve on the part of the island council not to issue him with a licence.

One must understand that up to this point, no person, other than the foreign company, had been given a licence to produce black pearls. What most of the people had received from the island council was permission to collect wild oysters and to set spat collectors. As most people were selling and receiving good prices from this company for oysters that they either collected from the wild or from their spat collectors, they were not in the least concerned at the future implications for them if the island council steadfastly refused to issue Manihikians with what became known as pearl seeding licences.

The matter was finally resolved when the Minister invoked his power of veto and granted the farmer

in question the necessary approvals to bring in pearl seeding technicians. This action led to a deterioration of trust and co-operation between government and the island council. However, it did break the impasse as well as opening up the release, by the island council, of pearl seeding licences to the local populace.

One area that is often overlooked in terms of good co-operative approaches to management is the lack of effective communications. Prior to the middle of last year, there were no scheduled flights to Manihiki. Sea transportation was at its worst ever, prior to the introduction of regular air service to Manihiki.

It was during this period that relations between government and the island council were at its lowest. Opportunities for face to face dialogue with the island council and the people of Manihiki were extremely limited. A great many of the problems and mistrust that were inherent on both sides could have been laid to rest if the opportunities for frequent dialogue were available. With the greater interaction that now occurs between government and the people of Manihiki as a result of regular air transportation, problems of management and user group conflicts are slowly being resolved.

The island council has recently appointed a representative based on Rarotonga to service the needs of the pearl industry and to liaise with government on matters affecting the industry. The pearl farmers on Manihiki have formed an association and therefore are able to deal directly with government if they wish to do so.

Government, through its Ministry of Marine Resources, continues to provide management and scientific advice to the industry through the island council and extension services.

Pearl farming has grown rapidly in Manihiki over the last three years with the total number of oysters under cultivation approaching 500,000. It is estimated that the capacity of the lagoon to sustain a safe population of farmed oysters is between 500,000 to one million oysters. The 500,000 figure will be reached this year. Unlike other islands in the Cooks, the population of Manihiki has been steadily growing, as the promise of wealth and the worsening unemployment situation in New Zealand combine.

The future of the pearl industry on Manihiki lies with the island council. The time is fast approaching when it will have to make hard management decisions such as putting a ceiling on the number of oysters that can be farmed. It will also have to deal

with many issues that will prove extremely unpopular, such as limiting the number of licences and allocating oyster numbers for each licence. Government will continue to give the industry the

best advice that it can, however, one thing is absolutely certain, and that is the industry cannot continue to grow unchecked if an outbreak of disease is to be avoided.

### Pearl shell survey project in the Solomon Islands

Source: SPC, 23<sup>rd</sup> RTMF, IP 6

Four exploratory surveys to assess the status of our gold-lip (*Pinctada maxima*) resources have been carried out by the Fisheries Division in the Western Ysabel and the Central Islands Provinces. It was found from the surveys that the resource around the Wagina area has been over-harvested through

the use of hookah gears, not much was available at the Ysabel sites and that the areas of the Florida Islands, Central Province possessed suitable habitat for gold-lip. Further surveys will be carried out in areas of the Western Ysabel, Malaita, Guadalcanal and the Central Islands Provinces.

### Update on ICLARM Coastal Aquaculture Center's pearl culture project

Source: ICLARM

The CAC is planning to launch a project aimed primarily at mass cultivation of black-lip and gold-lip pearl oysters, *Pinctada margaritifera* and *P. maxima*. As a prelude to this, Mark Gervis undertook a five-month preparatory study, starting in November 1990, which has resulted in a

comprehensive review, co-authored by Neil Sims, entitled *The biology, ecology and cultivation of pearl oysters: Bivalvia; Pteriidae*. In addition a comprehensive bibliography of the pearl oysters has been prepared. It is expected that the documents will be published before the end of 1991.

### Upcoming workshop

The First International Workshop on the Culture of Bivalve Molluscs will be held from 16 to 21 May 1992 at Charleston, South Carolina, USA.

Contact: Dr John Manzi, Marine Resources Research Institute, PO Box 12559, 217 Fort Johnson Rd, Charleston, SC 29412-2559, USA. (Tel: (803) 762-5033 -Fax: (803) 762 -5110)

### Welcome to new members

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

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

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