Acknowledgments

Organisers of the workshop would like to thank the Australian Fisheries Management Authority; the Torres Strait Fisheries Scientific Advisory Committee; the Department of Primary Industries; the Department of Business, Industry and Regional Development; Ansett Airlines; Flight West Airlines and Tawny's Seafood Restaurant for support of the Pearl Workshop.

We also thank all the participants to the workshop who in giving freely of their time and energy contributed to a successful outcome. A special thanks to our invited speakers and to Alison Page from the licensing section, for their assistance with the workshop.

Cover design: Piracy Graphics, Cairns

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<table>
<thead>
<tr>
<th>Abbreviation</th>
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<tr>
<td>ACIAR</td>
<td>Australian Centre for International Agriculture Research</td>
</tr>
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<td>ACM</td>
<td>Australian Crayfish Marketing</td>
</tr>
<tr>
<td>AFMA</td>
<td>Australian Fisheries Management Authority</td>
</tr>
<tr>
<td>APFA</td>
<td>Australian Prawn Farmers Association</td>
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<tr>
<td>AVA</td>
<td>Australian Volunteer Abroad</td>
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<td>CSIRO</td>
<td>Commonwealth Scientific and Industrial Research Organisation</td>
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<tr>
<td>DBIRD</td>
<td>Department of Business, Industry and Regional Development</td>
</tr>
<tr>
<td>DEH</td>
<td>Department of Environment and Heritage</td>
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<tr>
<td>DPI</td>
<td>Department of Primary Industries</td>
</tr>
<tr>
<td>DPIIF</td>
<td>Department of Primary Industries and Fisheries</td>
</tr>
<tr>
<td>FAA</td>
<td>Freshwater Aquaculture Association</td>
</tr>
<tr>
<td>FRDC</td>
<td>Fishing Research and Development Council</td>
</tr>
<tr>
<td>GBRMPA</td>
<td>Great Barrier Reef Marine Park Authority</td>
</tr>
<tr>
<td>ICC</td>
<td>Islander Coordinating Council</td>
</tr>
<tr>
<td>IPA</td>
<td>International Pearl Association</td>
</tr>
<tr>
<td>JCU</td>
<td>James Cook University</td>
</tr>
<tr>
<td>MOP</td>
<td>Mother of Pearl</td>
</tr>
<tr>
<td>NQACC</td>
<td>North Queensland Aquaculture Consultative Committee</td>
</tr>
<tr>
<td>NT</td>
<td>Northern Territory</td>
</tr>
<tr>
<td>OVL</td>
<td>Oonoonba Veterinary Laboratory</td>
</tr>
<tr>
<td>QOGA</td>
<td>Queensland Oyster Growers Association</td>
</tr>
<tr>
<td>PCA</td>
<td>Pearl Culture Area</td>
</tr>
<tr>
<td>QFMA</td>
<td>Queensland Fish Management Authority</td>
</tr>
<tr>
<td>RDO</td>
<td>Regional Development Organisation</td>
</tr>
<tr>
<td>SWOT</td>
<td>Strength, Weakness, Opportunity and Threat</td>
</tr>
<tr>
<td>TSPZJA</td>
<td>Torres Strait Protected Zone Joint Authority</td>
</tr>
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<td>WA</td>
<td>Western Australia</td>
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EXECUTIVE SUMMARY

Workshop Background

The Queensland pearl fishery has a history dating back to the 1860's and was part of the early cultural and economic development of northern Australia. The industry has always operated in areas remote from administrative centres and has remained independent of the sometimes complex management controls applied to most modern fisheries. Some of its participants are interesting characters who maintain that frontier tradition to this day.

The fishery is noted for a series of cycles of exploitation of shell stocks followed by collapse and a period of depressed activity. The most recent of these cycles being a shortage of shell starting in the late 1970's coincident with the "Oceanic Grandeur" oil spill and a recovery of shell stocks in the early 1990's. This recovery has not been without problems. Farms have experienced pre-insertion mortalities in the range of 50%. The cause of this was debated at the workshop.

This is an important Queensland fishery. Although small, it provides economic activity and most importantly employment in a part of Australia where the non Government employment opportunities are rare. It is an industry that has never trumpeted its achievements. Few Queenslander's would realise that there are 21 pearl farms spread along the tropical Queensland coast. Detail statistics on farm operations were the subject of one of the conference papers and discussion.

Marketing of pearls was a topic of discussion assisted by Andrew Barnes, a pearl jewellery specialist with Hardy Brothers in Brisbane and Maurice Downing, a marketing adviser for Agtrade DPI, who shared with workshop participants their views on marketing the Queensland pearl product.

Regulations under the Queensland Fisheries Act administered by the Department of Primary Industries guide the present management of the pearl farm industry. Responsibility for day to day management has been transferred to a DPI North Region facility, the Northern Fisheries Centre in Cairns. An opportunity comes with this change for the pearl industry and Government to work to develop a management strategy to prevent boom and bust cycles, to improve the profile of the industry and to insure long term profitability and security of investment for participants.

These opportunities where discussed at the workshop and subsequent industry meetings.

Workshop Objectives and Procedure

The Workshop which was part of a DPI Queensland Project funded by AFMA, aimed to improve the efficiency of the Torres Strait and East Coast Pearl Fishery and benefit Torres Strait Communities by examining research and management options. The project and workshop objectives were to:

- facilitate discussion between pearl farmers and government agencies
• collate and communicate research on pre-farm handling techniques and on farm management.
• provide a forum for discussion of hatchery technology, fisheries management options, licensing arrangements, seeding and marketing.
• establish the research needs of the industry.

These objectives were achieved through the Pearl Industry Workshop that was held on Thursday Island, the centre of the pearling industry in Queensland. Over 40 delegates representing all sectors of the Queensland Pearl Industry, attended the workshop which was held on 22 and 23 June 1994, at the Thursday Island College of TAFE.

This workshop was the first opportunity in many years for the Queensland pearl industry to meet as a single entity and discuss the problems and future direction of the industry with all other industry members, politicians, managers and researchers.

AFMA, the management agency for the Torres Strait pearl fishery, provided (through the TSFSAC) most of the funding for the workshop. The viability of the Torres Strait pearl fishery, which benefits the Torres Strait Communities, is dependent on the productivity of the entire Queensland pearl industry.

The timing of the workshop was ideal as the Queensland Fisheries and Aquaculture Acts were about to be rewritten and the Queensland pearl industry was asking for assistance due to:

• high mortality rates associated with collection and transport of live shell
• complex legislation and regulations
• lack of cooperation between members of the industry,
• lack of a representative organisation to lobby government and promote the marketing of Queensland pearls.

All of these issues were addressed by the invited speakers who provided background information required to sensibly discuss the industries problems and future direction. Question time after speaker presentations and workshop sessions allowed industry members, managers and researchers to debate the problems confronting the industry.

The first morning of the workshop set the scene by comparing the Queensland industry with pearl industries interstate and internationally. The importance of good marketing strategies and the value of industry associations were also discussed. Richard Bowie, a Torres Strait Islander fisher involved in the Pearl and Lobster fisheries in Torres Strait for many years, reported on the 1994 International Pearl Conference held in Hawaii. He commented that "Pearls '94 had opened his eyes to the potential for the Queensland Industry but that collecting and farming sectors of the industry needed to work together to overcome the recent high mortalities associated with the collection and transport of live shell. In the past collectors and farmers had tended to blame each other instead working together to solve the problem."
The Strength, Weaknesses, Threat, Opportunity (SWOT) analysis provided a structured workshop session where industry, managers and researchers could work together at identifying the key issues that need to be addressed for the development of the industry. The second day of the workshop was largely a technical sessions that presented handling protocols to reduce the mortalities associated with the collection and transport of live shell and a summary of current research on hatchery technology. Voting by industry members on Research and Development (R & D) priorities preceded the closing of the workshop.

Workshop Outcomes

The main outcomes of the Workshop were:
- research and development priorities identified by the industry
- key issues identified for the future development of the industry
- live pearl shell handling protocols to assist the reduction of shell mortality
- results of recent research on hatchery technology
- marketing strategies that could be used to promote Queensland Pearls
- increased communication and cooperation between the various members and sectors of the industry
- formation of an Association that government agencies involved with management of the Queensland Pearl Industry can work with in developing a management plan for the industry.

The industry participants identified the following top five research and development priorities for the Queensland Pearl Industry as a whole:
- effects of trawling / loss of habitat on shell stocks on the Queensland east coast
- training of technicians
- market research
- operating techniques
- shell mortality

and the following research priorities of relevance just to the pearl fishery in Torres Strait:
- shell mortality  (This was considered to be more of a development issue as the adoption of stricter handling and transport protocols may reduce much of the mortality associated with transport of live shell.)
- disease status
- stock recruitment
- shell growth rate
- stock assessment

Post Workshop Meetings

At the close of the workshop an industry meeting was convened to discuss the future direction of the industry. Members from all sectors of the industry were nominated to an industry committee. The function of the committee was to represent the industry and formally set-up an association.
This committee met in Cairns in July with QDPI and DBIRD. The meeting resulted in the election of an interim management committee and agreed to set up an incorporated Queensland Pearl Industry Association. Initial discussions were also held with Peter Neville, QDPI and David Wilkinson, QFMA on the rewriting of the Queensland Fisheries and Aquaculture Acts and regulations. These will allow simplification of licences and regulations. The complexity of the current licences and regulations was identified as a key issue at the workshop.

A subsequent meeting was held late in August 1994 with representatives of the new Queensland Pearl Industry Association, QDPI, DEH and GBRMPA to discuss the implementation of the new Fisheries and Aquaculture Acts.

Rob Coles
PRINCIPAL FISHERIES SCIENTIST
DPI North Region
PAPERS PRESENTED
QUEENSLAND AND NORTHERN TERRITORY PEARL INDUSTRIES

Management and Status of the Queensland Pearl Fishery
by
Dr Rob Coles, Department of Primary Industries, Cairns

Introduction

Although the Queensland pearl fishery has a long history the 1994 Pearl Workshop represents the first attempt to bring all sectors of the industry together for an exchange of views on industry management.

The pearl fishery extends across legislative jurisdictions. In the Torres Strait the collecting fishery is licensed by the Commonwealth Government and managed as a Torres Strait Treaty Article 22 fishery in accordance with the provisions of that Treaty. The management agency is the TSPZJA, a joint Commonwealth, Queensland agency. Pearl farming in the Torres Strait, and both farming and collecting on the east Queensland coast are licensed and managed by the Queensland Government. Pearl farming is considered part of the Queensland aquaculture industry.

Many pearl farms on the east Queensland coast are located within either Queensland marine parks or within the Great Barrier Reef Marine Park area (managed under Commonwealth legislation). For these regions there is a semi formal agreement to consult among agencies before licensing a pearl farm and farm applications must satisfy the requirements of all agencies. The DPI is generally the lead agency but application may go initially to any of the three agencies: GBRMPA, DEH or DPI.

All pearl farms regardless of their location are required to submit a quarterly report of their activities to the DPI. These reports and Queensland licensing data forms the basis of the information presented in this paper. My interpretation here should be seen as the basis for discussion and not as the only possible interpretation. At the time of the conference several changes were occurring in the structure and politics of fisheries management in northern Australia. These changes are outlined and management opportunities for the Pearl fishery are discussed.

Existing Farm Licenses

There are presently 21 PCA's fully licensed (Table 1). There are 9 applications for new PCA’s being considered for approval. A small number of farms have license fees unpaid but the license has not yet been withdrawn. These are not included in Table 1. The total area in which shell can be held on all farms is 1990.47ha. Farms range in size from 0.05ha to 400ha. There are some restrictions on farms in the Great Barrier Reef Marine Park and some farms are not able to utilise all the area licensed during an initial establishment period. All farms, including those not holding shell, supply information on their production as quarterly reports, a requirement for maintaining a valid pearl farm license. At the present time there are no formal
1994 Queensland Pearl Industry Workshop

fisheries management policy restrictions on the total number of farms or the total size of all the farms managed under Queensland legislation.

Approximately half the farms are located in or near the Torres Strait Protected Zone near the tip of Cape York (Figure 1). The others are scattered between Cooktown and Townsville (Figure 2) The total number of farms and the number holding shell have increased in the last 10 years (Figure 3).

Pearl Collecting

Almost all shell collected for Queensland farms is collected in the Torres Strait Protected Zone management area. Torres Strait islander divers and licensed Islander and non islander divers collect shell. Local Islanders are not required to be licensed so the number of people involved is uncertain but it is possible that up to one hundred local Islanders are involved in some aspect of the fishery in any one year. There are 4 - 5 pearling vessels active in the Torres Strait fishery with up to 11 licences available. All expansion of the collecting fishery is reserved for Torres Strait Islander fishers.

On the east Queensland coast there were 15 vessels licensed to collect pearls on 1 January 1994. All east coast license types increased in the late eighties and have recently declined emphasising the present lack of east coast pearl stocks (Figure 4).

Pearl Hatcheries

Three companies have produced hatchery reared shell on the east coast. Ward (1993) estimates that as much as 16% of shell held on Queensland farms is hatchery shell. Several farmers have also experimented with spat collection but with limited success.

Pearl farm Stocks

Between 80% and 90% of the shell on Queensland farms is *Pinctada maxima* (Ward 1993). The remainder is mostly *Pinctada margaritifera* and *Pteria penguin*.

There has been a steady decline in the number of shell inserted since 1980 (Figure 5). The number of shell not inserted but held on the farm increased in 1987-89 mirroring and increase in mortalities prior to nucleation from 5,000 in 1986 to 41,000 in 1988.

Stocks of pearl shell held on farms is governed by the availability of wild shell. Numbers of shell held on farms decreased dramatically from 159,000 in 1982 down to 47,000 in 1986 as wildstock shell supplies became limited (Figure 6) either as a result of limited stocks or reduced collecting activity. Although farm stock increased in 1987-8 to nearly 100,000 they quickly dropped back again to the current level of around 60,000. Ward (1993) estimated that in June of 1992 the a total of about 65,000 adult pearl shell were held on farms in Queensland and Torres Strait. Ward's estimate is close to the stock size of 57,500 shell which we have derived from pearl farms returns.
The number of new shell added to farm stocks has varied dramatically between years (Figure 7). In 1981 over 95,000 wildstock shell were purchased by farms whereas in 1985 only 9,850 new shell were purchased. In 1986 and 1990 considerable quantities of the new shell purchased by farms was from hatcheries and to a smaller extent spat collectors (Figure 7). This use of hatchery stock reflects the decreased availability of wildstock shell during the late 1980’s. The large reduction in the number of shell purchased between 1992 (80,000 shell) and 1993 (20,000 shell) possibly reflects concern by farmers that new shell mortality was excessive.

The line graph of collected shell (Figure 7) is data from the AFMA logbook for the Torres Strait Pearl Shell Fishery. The numbers of new shell stock is higher than the records of shell collected as some shell was collected from the Queensland east coast and some of the new shell is actually transfers between PCA’s.

**Pearl shell mortality**

The mortality of shell prior to nucleation as a percentage of farm stocks was generally low during the early 1980’s when farm stock sizes and introduction of new stock was highest. However, in the late 1980’s and early 1990’s mortality rates were generally high, while farm stock sizes and purchase of new wildstock shell was generally low (Figures 6 and 8). Mortality percentages for farm stocks range from a low of 6% in 1980 to a high of 57 % in 1991 (Figure 8). In other Queensland farm industries such as cattle or poultry, mortalities of this size would be unacceptable. It is unlikely pearl farming could continue if a reduction in mortalities does not occur.

**Discussion**

The Queensland pearl fishery has a low profile and few Queenslanders would recognise it as one of our most valuable aquaculture industries. This partly results from geographic location as the industry is entirely in far north Queensland and most farms are in remote locations. Collecting is also an activity that takes place in the very north of the State and I am sure most people equate pearling with the State's history rather than with an existing industry. The low profile is also the result of there not being a market recognition of Torres Strait pearls. They are sold as Australian pearls or by the generic name of South Sea pearls.

Interest in the fishery is high and despite the administrative difficulties of establishing a farm (see Ward 1993) the number of farms licensed under the Queensland Fisheries Act has nearly tripled since 1980.

Total shell held on farms is quite small at no more than 63,000. Even allowing for under reporting this is still a small number and represents less than one third of the shell that could be held on the existing farm area. Approximately 20% of farms carried no shell when data was analysed for this report and presumably do not utilise their PCA entitlements.

A major problem for the pearl farm industry appears to be locating sufficient stocks of healthy, mature shell and activating collectors to supply the shell. Hatchery reared shell to supplement wild stocks, when reliably available may be a solution to this problem. Pearl shell mortality of up to 57% of farms stocks has threatened the viability of farms. Experience from other states (Lea this workshop and Joll this workshop) indicate handling of
the shell after collection is the major cause of shell mortality prior to nucleation. Norton (this workshop) has prepared a protocol for handling shell and DPI will be working with the industry to provide advice on shell stress and disease. It is expected that these guidelines and advice, if implemented, should reduce the unexplained shell mortalities of the last three years.

Changes to administrative arrangements occurring in 1994/95 may provide an opportunity to improve the output of the fishery.

The DPI, which manages the Pearl farms, has been split into regions. Management of the pearl fishery is the responsibility of the North Region. The advantage to the industry will be in ease of access to the fisheries manager and in dealing with a regional office with direct experience with the fishery.

A new Queensland Fisheries Act has recently been passed by parliament. An opportunity exists in developing regulations and fisheries management plans under this Act to incorporate changes and simplifications which will improve efficiency, increase investment in the fishery, and reduce unnecessary administration.

To accept the opportunities presented by these changes, DPI is encouraging the industry to set up an industry association to represent the industry and to argue where necessary on behalf of the industry for management change and/or research support.

Finally, there is a need to recognise Native Title rights when doing business in north Queensland and in the fishing industry. The pearl fishery has always been a leader in incorporating cultural diversity in Australia. I feel certain future negotiation on regional autonomy, traditional land and sea rights will be incorporated into fisheries management plans. The expanding industry will provide an equitable role for all parties. I see few threats in these processes but, an opportunity to do business with groups of people with a strong commitment to the future of north Queensland.

I will rest as a fisheries manager when the Queensland pearl fishery again makes a significant contribution to the Australian Pearl fishery; when the east coast and Torres Strait pearl shell habitat and shell stocks are adequately protected from damage and depletion; when all farms are producing pearls and are provided with an adequate and varied source of healthy shell supply; and when a strong industry association is formed to provide guidance to Government on how best to manage the fishery and conduct productive research.

Reference:
Table 1: Queensland and Torres Strait Pearl Culture Areas for 1994

<table>
<thead>
<tr>
<th>COMPANY</th>
<th>PCA No.</th>
<th>LOCATION</th>
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<tr>
<td>Pacific Clam</td>
<td>1603</td>
<td>Fitzroy Island</td>
<td>0.09</td>
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<tr>
<td>Atlantic Fishing</td>
<td>1604</td>
<td>Arlington Reef</td>
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</tr>
<tr>
<td>Pirate Pearls</td>
<td>1606</td>
<td>Walker Bay</td>
<td>60.0</td>
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<tr>
<td>Great Barrier Reef Pearl</td>
<td>1607</td>
<td>Arlington Reef</td>
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<tr>
<td>Dombovari</td>
<td>1609</td>
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<tr>
<td>Marcum</td>
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<td>8.0</td>
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<tr>
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<tr>
<td>Foggin</td>
<td>1611</td>
<td>Double Island</td>
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<td>Maria Pearls</td>
<td>1701</td>
<td>Turtle Head Is.</td>
<td>423.6</td>
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<tr>
<td>Maria Pearls</td>
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<td>Escape River</td>
<td>305.4</td>
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<tr>
<td>Maria Pearls</td>
<td>1703</td>
<td>Trochus Island</td>
<td>28.4</td>
</tr>
<tr>
<td>Maria Pearls</td>
<td>1704</td>
<td>Trochus Island</td>
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<td>Albany Island</td>
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<td>Badu Island</td>
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<td>Badu Island</td>
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<tr>
<td>Indian Pacific Pearls</td>
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<td>Hinchinbrook</td>
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<td><strong>Totals</strong></td>
<td><strong>21</strong></td>
<td></td>
<td><strong>1990.47 (h)</strong></td>
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</table>
Figure 1 Pearl culture areas in Torres Strait.

Figure 1 Pearl culture areas on the east coast of Queensland
Figure 2 Pearl Farms in Queensland from 1980 to 1993

Figure 3 East coast pearling licences

Figure 4 Breakdown of pearl shell stocks held on farms
Figure 5  Stock of pearl shell held on farms from 1980 to 1993

Figure 6  Purchase of new wildstock and hatchery shell by farms and AFMA records of shell collected.

Figure 8 Mortalities prior to nucleation as a percentage of farms stocks and the number of new wildstock shell introduced to farms.
The Pearling Industry in the Northern Territory

by

Rosemary Lea, Department of Primary Industry and Fisheries, Darwin

The Northern Territory pearling industry comprises the pearl oyster fishery and the pearl oyster culture industry.

Northern Territory industry history:

1) 1890's to late 1930's
   • fishing for mother-of-pearl
2) 1940's to 1950's
   • little activity due to war and loss of MOP markets to plastics
3) 1960's to 1987
   • gradual development of culture farms by the Paspaley Pearling Company based primarily on Western Australia shell
   • implementation of a Pearling Industry Development Plan to encourage growth in the industry based on NT shell
   • implementation of Pearl Oyster Management Plans

Management arrangements

1) Pearl fishery
   • Northern Territory Fisheries Joint Authority with the Commonwealth Minister for Resources as chairman and NT minister for Fisheries as a member.

2) Pearl culture
   • NT Minister
   • Both sectors are managed under the NT Fisheries Act 1988

Legislation

1) Fisheries Act
   • allows for the issue of Fishery and Culture Industry licences and vessel registration
2) Fisheries regulations
   • sets the number of licences which may be issued and specifies licence transfer arrangements
3) Management plans
   • provides for the specific controls for both sectors of the industry
Steps taken to actively manage the industry

1. Industry declared under Fisheries Act as a managed industry

2. Minister establishes NT Pearling Industry Advisory Committee
   Members of the advisory committee include all licensees (only 5) and government representatives. The committee meet once a year to consider issues in the industry, draft management plans etc and report to Minister with their recommendations.

3. Development of Management Plans for Fishery and Culture Industry

4. Implementation of Management plans

Licensing arrangements

The Northern Territory pearling industry is a closed industry. There are 5 fishery licences and 5 culture licences. The licensed companies must hold both a fishery and a culture licence to operate. No farm lease is issued unless the Company holds a current licence.

Fishery characteristics

- only 2 of the 5 licensees currently collect wildstock shell. This will change to 5 in 1994-95.
- Total allowable catch (TAC) is 120,000. 4 licensees allocated 20,000 oysters and one is allocated 40,000 oysters.
- allocation may be used as part MOP and part live shell for farms
- to 1990 high MOP take, low live shell (7:3 ratio). In 1991 changed to mostly live shell take with little MOP (8:2 ratio)
- oysters taken primarily from Western grounds, west of Melville Island; some from Eastern grounds north of Arnhem Land
- many of historical beds disappeared, possibly from prawn trawler damage

Culture industry characteristics

- the 5 licensees have established farms around the NT coastline. Paspaley’s in the 1960's; Bynoe Harbour, Darwin Harbour, Cobourg Peninsular and Croker Island
- each licensee is entitled to establish a hatchery if they choose to do so. Two companies set up the Darwin Pearl Hatchery in 1991 under a joint arrangement
- production from farms varies considerably; some with high production, high quality and some still developing
MARKETING OF SOUTH SEA PEARLS

Pearls '94 International Pearl Conference and Exposition

by

Richard Bowie, Northern Star Seafood

Pearls '94 commenced on Sunday, 15 May 1994 with opening addresses from the governor of Hawaii and the organisers of the conference. Nick Paspaley spoke on the world pearl industry and Australia's position in it. There were over 600 individuals attending the conference.

Each day had a full program with plenary session, jewellery forum and technical forum in separate function rooms. There was an exposition of pearls, pearl jewellery and jewellery manufacturers and 75 exhibitors displaying their products including: nuclei manufacturers, book sellers and a historical display of pearling artefacts.

The technical forum was of most interest to us with leading pearl oyster marine biologists and zoologists explaining the progress and difficulties of their research in French Polynesia, Tahiti, Hawaii, Solomon islands, Samoa, Cook Islands, Southern California, Mexico, Philippines, Kuwait and Australia.

It became apparent throughout the conference that Australia, in particular Western Australia, is one of the only pearl fishery that is managing a sustainable fishery.

Other countries are trying to rehabilitate pearl grounds and farms that have been over fished or have high mortalities due to over stocking.

Australia has some of the best scientific expertise in the world regarding pearl oyster mortalities and regeneration. Little of this knowledge is being directed to the Queensland pearling industry and government funding is directing this research and assistance to our neighbours in the South Pacific. The expertise is in Townsville and researchers want to get involved in the Torres Strait Pearl fishery; however, there is insufficient funding.

Funding should be made available so that South Pacific research into black lip pearl oyster farming and spat collection can be adapted to the Torres Strait and Queensland.

Similar research into *Pinctada maxima* spat collection should be carried out with a full time program that includes monitoring mortality, spat falls and oyster numbers. This will assist in the management of a sustainable pearl industry.

Dr Lindsay Joll addressed the technical forum to explain the wild stock management himself and the Western Australian Fisheries Department have been undertaking. A similar scheme in Queensland should be implemented.

Before the conference closed Nick Paspaley, Salvador Assael, Robert Wan and Fred Ward were voted on to the Board of Directors of the IPA. It was agreed that the IPA would raise US $2 million to establish a world wide fund for promoting pearls and pearl jewellery.
South Sea Pearls- Future Marketing Options
by
Maurice Downing, Department of Primary Industries, Mareeba

Introduction

This paper examines the situation facing the Queensland south sea pearl industry from a marketing perspective. The objective is to prompt the industry into considering how it might address its slow rate of growth thus, enabling it to achieve its potential as a significant revenue earner and employment provider for Queensland. The basis of this paper is a presentation delivered to a pearl industry workshop held recently on Thursday Island.

An examination of the current situation is followed by a brief discussion on implementing a branding strategy. This is followed by an outline of the advantages of group marketing and the critical components involved in establishing such an entity. Lastly three future options for the industry are proposed and discussed.

The current situation

Although it has existed for more than 100 years the Queensland pearl industry is small and fragmented. Consequently, production in this state has been low (less than $10 million) compared with Western Australia ($100 million) and the Northern Territory ($40 million).

There are a few Australian owned operation which control their own marketing, however, it is thought that most of the pearls produced in the region go straight to Japan where they are sold at auction in strictly controlled conditions. The end result is that the industry has shown little growth for many years.

Two types of product are produced, spherical pearls and half pearls. The former is extremely valuable with wholesale prices ranging from $400 to $650 per item for pearls above 11mm (Ward 1993). However, despite their high price south sea pearls are undifferentiated commodities, devoid of any brand name that may enhance their ability to compete against producers of products found in Indonesia, Thailand and other Asian countries. From a marketing perspective this is a shortcoming that needs to be rectified.

Branding- a solution?

In a competitive market strong brand names can be your most effective weapon; however, they are not established overnight. When setting out to establish a brand name one of the most crucial tasks is to identify your product’s competitive edge; what can it give your customer that other products cannot?

To identify your competitive edge it is necessary to compare your product with its competitors on the key elements that consumers feel are important. In terms of pearls this may be colour and size. Is your product larger or smaller, does it have the desired colour or is it too pale relative to alternatives?

During the workshop, this exercise revealed that Queensland pearls are a superior product compared with those from other countries. Given this, it is imperative that a brand name be
developed and subsequently promoted to members of the distribution channel to start building a defensible position against emerging competitors.

Implementing a successful branding strategy also requires developing a good knowledge of who your customers are and where they are located. With this information suitable distribution systems can be put into place. For example, because pearls are an expensive item it is likely that exclusive jewellery stores, in more affluent areas, would be a better retail outlet than bargain price chain stores.

Consistent quality is essential if a branding strategy is to be successful. If this is not achieved the consumer will not have confidence in the product and is unlikely to buy it.

Building a brand name can be reasonably expensive and require a considerable production volume over which the cost can be spread. In the case of south sea pearls this may mean the various operations combine and establish a group marketing scheme to achieve the necessary "critical mass". While this is rarely easy it should be remembered that a strong brand name can be a company's most valuable asset.

**Group marketing**

**Advantages**

Marketing groups are emerging across a variety of industries ranging from horticulture to beef. Coming together under a united brand name gives the group "marketing muscle" and improves their ability to influence the market more than they can as individual producers.

Accessing outside expertise such as consultants is more feasible because the cost is spread across all of the members. Previously this type of service may have been too expensive for the individual operator. Promotional activities are also more affordable.

Better negotiating power with suppliers of necessary materials can also help lower costs. Access to government industry funding programs is also improved because the benefits of their programs flow down through all members of the group. This represents better value for money, a very important issue for the departments involved.

**Critical components**

The structure of the marketing group can range from a formal co-operative to a loose association of separate operators. To be successful members need to forego some of their inherent independence, although this does not necessarily mean they have to give all of their output to the group. The size of the industry is the key determinant in this regard. Thirty percent may be sufficient in a large industry whereas a higher proportion may be required in small industries if "critical mass" is to be achieved.

Members also need to have a common goal regarding what they are trying to achieve. This will tend to unite the group. Commitment is another key element of successful networks. Participants must resist the lure of short term gains such as, slightly higher prices offered by external parties, if the group is to remain intact.
Perhaps the key element in effective group marketing is trust; without this the very best efforts will fail. Quality assurance programs are often useful in establishing trust because whoever meets the set standards will receive the same payment as their neighbour. Everyone is equal providing they abide by the program and its guidelines.

**Future options**

There are three broad marketing options confronting the Queensland pearl industry:

1. Remain unchanged and continue doing things as they are now.
2. Concentrate on developing a brand name and promoting it to wholesalers and others in the trading environment.
3. Pursue the branding initiative to its fullest extent and establish brand awareness at the consumer level.

Option 1 involves the least change and upheaval but correspondingly promises little improvement in the future prospects of the industry. Option 2 would appear to be the most achievable and would require less resources than option 3.

Option 2 would require the Queensland industry coming together in a marketing group under the one brand name. It is realised that not all parties may want to collaborate; however, if the majority agree applications could be made to funding organisations to establish a brand name, undertake market research and promote the group and its products to wholesalers. In addition, this concept may be expanded to include other operators in Western Australia and the Northern Territory to build an "all Australia" brand name.

Option 3 may be adopted as a long term goal to be pursued once the group has acquired sufficient experience working together. Strong and effective brand names are not established overnight. They require careful planning, persistence and regular evaluation to ensure the group is heading in the right direction. The alternative is to remain a supplier of undifferentiated commodities with limited influence on what you receive for your endeavours and becoming increasingly vulnerable to emerging, low cost competitors.

**Reference:**

The Queensland Pearl Industry: a Jewellers perspective
by
Andrew Barnes, Hardy Brothers Jewellers, Brisbane

Traditional purchasing plan

1) Producer to cooperative or syndicate
   • supplies are graded according to size, colour, lustre and quality

2) Cooperative or syndicate to wholesaler
   • wholesaler distributes as loose stock or made up pieces

3) Wholesaler to retailer
   • retailer markets traditionally as completed item of jewellery with a small percentage of stock maintained for individual client commissioned pieces.

4) Retailer to customer
   • consumer is the most benefited from above chain. They receive pleasure from owning such a piece of jewellery.

Market research is essential, some products sell well in one location but not others. For example, Port Douglas is not a good area for selling pearls. Most Japanese tourists are not in the market. Our showrooms in capital cities have good track records for South Sea Pearl sales.

A brand name identifying your product in the market place adds prestige (Refer Downing this workshop). For example, Broome Pearls and Argyle Diamonds. A diamond is a diamond regardless of where it is mined. Argyle have created a demand through marketing and advertising.

Some brand name thoughts for Queensland Pearls: Gems of the Barrier Reef, Strait to the Reef

Once a brand name is established it will help to identify your product from the competition.

What can a retailer do?

1) Establish an exclusive stock list arrangement thus guaranteeing stability of:
   • price
   • quality

2) Arrange exhibitions of stock this will:
   • promote public awareness of product
   • increases store traffic

3) Jewellery design competitions create an interest within the industry thus opening market place potential for further stock lists as pearl production increases.

4) Produce high quality media releases and advertisements promoting the origin and quality of the product.
all promotions must reflect the quality of product creating consumer comfort with that product.

What can producers do?

As individual identities it is difficult to successfully market if you want the recognition your product deserves. As a co-operative with grading and sorting skills you will have a stronger representation in:
- marketing power
- government assistance- many departments within Queensland and Federal Government are established to assist in providing market research, advertising, advise or funds.

What can a co-operative achieve?

Retailers will not trade with individuals. As a co-operative with a full harvest sorted and graded, a retailer will show greater interest in a high percentage of yearly yield for exclusive marketing. This promotes a strong relationship between producers, retailers and consumers.

Points to consider

A cooperative or syndicate will:
- give greater strength to industry
- form exclusive retailing arrangements
- research the market place for domestic and international demand
- establish a brand name for the Queensland product
- research advertising, PR and promotions
INDUSTRY DEVELOPMENT

A Pearling Industry Association- Why have one?
by
Jim Gillespie, Department of Primary Industries, Brisbane

Examples of industry organisations

1) Trade Unions
   • Australian Workers Union

2) Employer organisations
   • Australian Confederation of Industry

3) Fisheries
   • Queensland Commercial Fishermen's Organisation

4) Club
   • Queensland Sport & Recreational Fishing

5) Aquaculture
   • Australian Prawn Farmers Association, APFA
   • Queensland Oyster Growers Association, QOGA
   • Freshwater Aquaculture Association, FAA
   • Australian Crayfish Marketing, ACM
   • North Queensland Aquaculture Consultative Committee, NQACC

Functions of Industry Organisations

Industry organisations create:

• a forum for discussion of industry problem
• an opportunity for information exchange to and between members
• representation when dealing with government agencies and other industries
• an influence on government management, research and extension
• industry development through promotion
• marketing opportunities

Benefits of industry organisations

Benefits of industry organisations are:

• improved information for producers, keeping up to date
• better management of the industry
• more relevant research
• potential for increased research funding
• development of new markets or expansion of existing markets
Processes to form an industry organisation

Below is a general list of the steps involved in forming an industry organisation or association. More information can be obtained from the Incorporated Associations Manual developed by Program on Nonprofit Corporations, Queensland University of Technology.

1) advice to industry members
2) establish a working group to
   • organise incorporation
   • set fees
3) draft a constitution
4) convene first Annual General Meeting to formally establish the Association
   election of officers

Issues for pearl industry association

Below are some important issues that may affect the development of an association for the Queensland pearl industry:

Geographic
• spread over vast area
• remoteness of industry members

Cultural
• multi-cultural industry. Includes Torres Strait Islanders, Japanese and other Queenslanders

Historic
• no recent history of industry working together or working with government

Other
• Queensland industry is relatively small compared to Western Australia
• need to work with the Northern Territories and Western Australia

Summary

• most industry groups are represented by Associations
• all levels of government looking to consult with and involve industry associations in management of the industry
• the Pearling industry in Queensland should benefit from having its own industry association
• QDPI is happy to assist if industry desires
Regional Business Development
by
Craig Humphrey, Department of Business, Industry and Regional Development, Cairns

The following overview indicates two options which maybe appropriate for the pearling industry based around Torres Strait to pursue the development of the existing and future position of the industry.

The economic environment, both internationally and in Australia, is extremely challenging. Many Australian enterprises find they are unable to compete in international markets because individually they lack the resources and skills needed to succeed in those markets. Networking can help companies overcome these difficulties.

A network is the coming together of a group of enterprises or companies of varying sizes, to use their combined talents and resources to achieve results which would not be possible for the enterprises operating individually. It may also be appropriate for research and educational institutions to participate in the networking activities. Networking is quite simple and cost effective.

Forming a network usually involves three phases:

1. The promotion phase - when a member of the potential network, or a promoter, raises the idea of a group of enterprises coming together to take advantage of a market opportunity. The promoter can be a business person, or from a Government agency, an industry organisation, or a lead firm.

2. The development phase - during which participants consider and decide on all the essential issues in establishing the network. During this phase, guidance from someone experienced in networks can be helpful.

3. The management phase - when the network has started operating. A network manager is normally appointed by the participants at this time.

A network should be specifically aimed at new business opportunities to target new markets and to obtain a competitive edge.

Networks are formed to:

- share knowledge, information and ideas
- improve performance and efficiency
- share market intelligence.
- share costs of market investigation, production, and research and development
- share market entry costs which might otherwise be prohibitive to individual enterprises.
- improve opportunities to meet customer demand for product and services
- improve ability to offer customers a broader range of products through the linkage of complementary products
- strengthen negotiating power and increase purchasing power
• share essential training and foster specialisation

Networks are not mergers. The key to successful networks is co-operation. A network, through co-operation, capitalises on the strengths of the individual enterprises, while at the same time helping to overcome some of the weaknesses of the individual enterprises.

The Department also offers, under the Regional Economic Development Program, a range of assistance which is designed to allow RDO’s to achieve local economic development.

These RDO's are able to gain assistance, which identifies and develops its role in promoting Regional Economic Development. Such projects may involve:

• identifying the role of the organisation
• preparing a business plan
• improving regional marketing and promotion
• developing local information and databases

Assistance is then available to the organisation for projects which enhance economic development in a region by analysing the region and assisting the development of industry.

These areas of assistance may be available to organisations which may seek to establish and promote the development of specific development options within the region.
PEARL OYSTER RESEARCH

Pearl Oyster Culture Research at James Cook University
by
Dr. John Lucas, James Cook University, Townsville

Following on from the ACIAR funded project on giant clams, JCU has continued to develop its tropical bivalve research. This has extended to pearl oysters.

Two research projects on pearl oyster culture commenced recently at JCU. One is a major project funded by ACIAR and involving JCU, OVL and Marine Resources, Republic of Kiribati. This project is based on the blacklip pearl oyster (Pinctada margaritifera) and will attempt to build up its stocks and possibly an industry in Kiribati, a Pacific nation consisting of a series of coral atolls.

The second project, funded by JCU, is investigating the culture of juvenile pearl oysters (goldlip, Pinctada maxima) in small recirculating systems and their nutritional requirements as a means to improving the management of hatchery produced spat.

ACIAR projects are part of Australia's role as a 'good neighbour'. Australian scientists are funded to work with scientists from less developed countries to solve problems of agriculture (including fisheries and aquaculture) and natural resources in those countries. In many cases the problems are common to Australia and the developing country partners and there are mutual benefits. The ACIAR/JCU blacklip pearl oyster project is one such project with mutual benefits. One aspect, at least, has major potential benefits for the Australian pearl industry.

The ACIAR/JCU blacklip pearl oyster project

There are three objectives:

1. To assess the pearl oyster stocks in various atoll lagoons of Kiribati and rates of spatfall on spat collectors deployed in appropriate atoll lagoons.

An AVA, Mr. Jamie Whitford, is based at Kiribati for two years to assist with the stock surveys and spat fall studies. Several atolls have been surveyed with dismal results for densities of pearl oysters: 1 live oyster found per 5 diver hours in Abaiang lagoon and only 1 live oyster found in Onotoa lagoon.

2. To develop low-technology hatchery and nursery culture methods appropriate to Pacific Islands.
Dr. Paul Southgate (bivalve larvae and larval nutrition specialist) and Mr. Masahiro Ito (pearl hatchery specialist) are involved in this aspect. The technology being considered here is similar to that developed for hatchery culture of giant clam larvae. It has been found that pearl oyster larvae will grow successfully in flow-through conditions; however, their long period of larvae development necessitates periodic total water changes. A diet of 50-50 culture microalgae and locally prepared microcapsules supported best larval growth from among the diets tested.

3. To improve yields of quality pearls through better bead insertion and oyster management practices.

Dr. John Norton (OVL, veterinary pathologist) is involved in this aspect. Studies relating to cultured half pearls (mabe) have investigated a range of different adhesives and the effects of location and size on success. Studies on cultured round pearls have considered anaesthetics and wound sealing methods to reduce operation trauma. Alternative sources of mantle tissue for insertion with the bead have been considered.

**Juvenile pearl oyster projects**

Ms. Serena Sanders (pearl hatchery specialist) is employed on this project, which has two objectives:

1. To assess the suitability of recirculating seawater systems for culturing juvenile pearl oysters. Such systems allow greater control of culture conditions. A preliminary experiment has been conducted with goldlip juveniles, testing the suitability of 'bio-ball' for water conditioning in a recirculating system.
2. To determine the nutritional requirements of juvenile oysters. This will determine and assess growth and biochemistry of juveniles fed with various cultured microalgae diets. On the basis of these results, i.e. optimum survival, growth rates and condition, microcapsules will be prepared with a composition reflecting the juveniles nutritional needs.

**Student projects**

In addition to these two projects, there is a series of postgraduate student projects being undertaken or planned:

1. A PhD study by Mr Pat Vance on the nacre secretion processes of pearl oysters. Further aspects of this study are being funded by a FRDC grant.
2. A MSc qualifying study by Ms Bernice Aquilina on mantle processes.
3. A MSc Qualifying study by Mr Steve Edgar on the reproductive seasonally of albino (bastard) pearl oysters.
5. A planned Honours study on the nutrition and growth of pearl oyster spat.

Further postgraduate student projects on topics such as the distribution and seasonally of pearl oyster spat and growth rates of various species are planned as graduate students become available.
Conclusion

With the existing collaboration between JCU and QDPI's OVL and with possible involvement of the Australian Institute of Marine Science, it is hoped to build up a substantial research group focussing on pearl oysters. The value of the industry in Australia undoubtedly warrants such a development.
HATCHERY OPERATIONS

Hatchery Development and Practice
by
Jeremy Barker, Industry Based Research, Townsville

Hatchery Technology

The development of pearl oyster hatchery technology has progressed rapidly over the last eight or so years. Working from the principles involved in the culture of rock oysters the techniques for pearl oyster propagation have been discovered. The life cycle of the pearl oysters is very similar to rock oyster but I have found them to be a great deal more sensitive to irritations in the system.

The primary requirement of a hatchery is a clean and regular water supply. The animals live in an environment of seawater thus, if it starts off clean the chances of success are increased. The seawater at Reefarm, a pearl hatchery on Fitzroy Island, is pumped in from the edge of the reef using two 150 mm lines into two 100,000 litre header tanks. From here it feeds down into the facilities including: the spawning area, the larval culture area, the nursery tanks and the algal laboratory. Seawater carries many microscopic predators of larval oysters thus, needs to be heavily filtered to 1 micron, prior to use in the larval rearing tanks. The larval tanks are made of fibreglass and carefully cleaned before and after each use. Spawning and larval work take place in the hatchery building where the environment is controlled. Temperature and salinity are controlled and filtered air is pumped into the water to ensure circulation of oxygen throughout the tank.

Every few days the tanks are drained and the larval oysters collected on screens. These are then carefully washed into buckets enabling a count to be made, their condition assessed and any selection to be undertaken. The animals are then transferred into their clean water in a new tank. This continues throughout their larval life until they are ready to settle. They are put into the settling tanks which have been prepared earlier with the suitable settling material. Once the larvae have settled and attached themselves to the culture material they are transferred to the nursery tanks where they are held until large enough to be sold.

Larval biology

All the initial stages of the life of a young pearl oyster are microscopic. From the initial release of eggs and sperm from separate animals the two are combined to allow fertilisation to occur. The developing embryo hatches into a free swimming trochophore larvae. This stage does not feed and within a few days has metamorphosed into the veliger larval stage. This is when it first develops a shell, is free swimming, but unlike its earlier form, it feeds. The veliger larvae feed on phytoplankton and requires a mixed diet to satisfy its nutritional requirements. The oceans of course are full of many types of phytoplankton and this can not be replicated in the hatchery. The average diet for hatchery reared larval pearl oysters consists of between three and four species of algae. This is using standard culture principles developed over many decades in the rock oyster hatchery industry.

The algal laboratory is a critical part of any hatchery. The production of nutritionally healthy and bacteria free algae require extended and careful attention to the smallest detail. Bacteria
are excluded by a system of very fine filtration and sterile handling techniques. This is important because otherwise the food becomes a soup of bacteria and if fed to larval oysters can very quickly destroy the whole batch. Feeding is required from approximately 2 days old for the rest of their lives on a least a daily schedule. Hungry larvae do not perform well. Even if it is only for a short period it is detrimental to their overall survival and health later on.

The larvae grow in size as they get older and eventually develop what is known as the 'eye spot'. This is a secretory gland for the byssus, the filaments that it will use to attach itself to the substratum as a juvenile. This is an exciting time for the hatchery operator because it means that the larvae will soon be ready to settle. The next sign that is looked for is the development of a foot and crawling activity. At this stage they are known as a pediveliger, as in 'footed' veliger. Once this is observed the larvae are transferred to the settling tanks which are filled with the necessary settling material. This varies depending on the wishes of the hatchery operator and the industry requirements, but is often some form of netting. The whole larval process takes approximately 25 days.

Benefits to the industry

The pearl industry on the east coast has always suffered from a lack of available shell. This is because of man-made disasters, the beds being a long way off shore or are too deep so that the cost of retrieval in monetary and human terms is high. With recent political developments it appears that the shell may become even harder to obtain.

The primary benefit that a hatchery offers to the industry is a guaranteed supply of high quality juveniles. The selection of adults that is possible in the hatchery can potentially enhance the development of quality pearls. There is debate about whether it is the donor or the host animal that determines the quality of the pearl; if both are high in quality then it comes back to the technicians ability and the knowledge of the farm operator. Potentially, a hatchery can produce a very large number of animals if the facility is large enough and suitable ripe adults can be obtained. The fear from the industry is that large numbers of animals will be available and potentially oversupplying the pearl market. If the obvious advantage of selecting high quality juveniles and culling the excess is followed then oversupply should never be a problem.

Another benefits to the industry includes: the reduced initial costs of the juveniles, the reduced dependence on the wild fishery and the irregularities in supply. Retrieval, dumping and transport all stress the chicken shell; if the shell are not handled correctly, the result will be shell losses or poor performance for the farm. Hatchery produced shell never goes through these processes, except for transport to the farm. This has successfully been done via aircraft which minimises the stress.
Hatchery success is proportional to the degree of support

The main problems facing any hatchery are the availability of quality adults at spawning time, good quality water, trained personnel and government and industry support. Reefarm is in an ideal location for the biological requirements of a hatchery. It has excellent quality water, extensive facilities including a high quality algal laboratory, seawater filtering systems, an adjacent ocean lease area and trained personnel. Many pearl companies have supported the teething stages of the hatchery programme but one of the main problems that has occurred over the last three years is the availability of ripe adults.

The ideal situation is for the hatchery to have access to many adults at any time so that sequential spawning can take place throughout the season. Plans were lodged more than 12 months ago for the establishment of a longline at Fitzroy Island for the holding of broodstock which would allow this to happen. Reefarm is still waiting for the permission to come through. Secondly, if there was a cohesive attitude to the development of the industry within the many government bodies it would ease the headache of obtaining and renewing permits and hopefully reduce cost.
HANDLING AND TRANSPORT OF PEARL OYSTERS

Pearl Oyster Transport and Handling Techniques
by
John Norton, DPI Oonoonba Veterinary Laboratory, Townsville

Summary: Heavy losses have been associated with the transport of pearl oysters in Torres Strait. Guidelines are given for the healthy transport and handling of pearl oysters.

Introduction

Over recent years, heavy losses have been recorded in association with the transport of pearl oysters from the fishing grounds in Torres Strait to the pearl farms (Norton, unpublished data). These heavy losses have been widespread and have been as high as 50% of 4000 within 2 months of arrival on the farm. At a cost of approximately A$18 to A$20 each, this represents a significant loss to the pearl farmer. It also makes farmers reluctant to buy more oysters from the fishing grounds and this affects the income of the people who collect the oysters.

The following is a protocol or a list of techniques gleaned from the scientific literature and from consultations with researchers and scientists working in the Western Australian pearling industry. Where these procedures have been tried, they have proved to be highly successful in eliminating deaths and unwanted sickness in pearl oysters both during and following transportation.

Aim of transport

The aim is to collect and transport pearl oysters from wild fisheries in Torres Strait to the farms with a minimum of stress, with no deaths or sickness either during transport or during the two months after arrival on the farm. A further aim is to avoid introducing any infectious agents into a farm's healthy stock of pearl oysters.

Some basic ideas when handling Pearl Oysters

- Keep all stress (any adverse effect) to a minimum.
- One stress adds to another. When it reaches a certain level, it causes sickness and death.
- Disease (including sickness and death) is a result of an imbalance between the pearl oyster, the environment (for example, poor water quality) and the likely disease organisms (for example, marine bacteria).
- Prevention is all important. There are no cures.
- Pearl oysters need to be handled as living animals, not as lifeless rocks.
- Handle pearl oysters as little as possible. Rest the oysters between each handling procedure where possible. This allows them to feed and to regain energy.
- Pearl oysters feed by filtering organisms out of the water. They don't like fouled cloudy water with high levels or mud, algae and bacteria.
- Pearl oysters prefer clean well oxygenated, warm sea water around 25-30°C.
- Pearl oysters don't like man-made chemicals (for example, antifouling chemicals).
The quarantine or isolation of all new batches of pearl oysters is essential to avoid either introducing or spreading infectious organisms.

Any person who handles pearl oysters needs to adapt to the oyster's needs and way of life and not force the oyster to adapt to their's. If this is not done, the oysters will become stressed, sick and die.

### Collecting Pearl Oysters

- Remove each oyster from the sea bed by either cutting the byssal threads which anchor it or by grasping the byssal threads prior to pulling the oyster free.
- If oyster dumps are to be formed before transportation, lay the oysters on the sea bed in a single layer. Avoid placing the oysters on a sandy bottom since the sand may cover the oysters, it may damage the tissues and it may block the gill-filtering system. One suggestion is to place the oyster in net frames. These may in turn be attached to a long line anchored to the sea bed.
- Oysters left on the sea bed need to be turned every 3 to 4 weeks to kill any algae and other fouling organisms growing on the upper shell and to remove any accumulated silt.
- Take care when suspending oysters along the side of a boat. The presence of antifouling agents from the hull is stressful. Suspend oysters in net panels well below the hull and preferably from the bow of the boat.

### Transport of Pearl Oysters "on deck" (out of seawater)

- Suitable only for short journeys of up to about 6 hours duration. The shorter the time, the better for the oysters.
- Avoid throwing or dropping oysters onto the deck of the boat. Cracked and damaged shells are stressful. Severe vibrations can damage the oyster's tissues.
- Shade oysters from the heating and drying effects of the sun.
- Cover oysters with hessian bags or poly tarp sheeting to avoid chilling and drying from strong winds or from the slipstream on a speed boat. Alternatively place pearl oysters in a large insulated "cold" box or esky. Cover the oysters with clean wet towelling or hessian bags. Avoid free water in the bottom of the container.
- Wet oysters with clean seawater every 15 minutes or so if not in a closed container, otherwise tissues will dry out.
- Avoid jarring of oysters. Drive speed boats at reduced speeds over rough seas.
- If "on deck" transport is required for more than 6 hours, rest the oysters by suspending them in the sea in net panels for 1 or more days before commencing the next 6 hours stage of the journey.

### Transport of Pearl Oysters "in tanks" (in seawater)

- All tanks, pipes and pumps need to be of the standard as used in aquaculture. They need to be environmentally safe. That is, they must not contain any metals, dyes or chemicals which may enter the water and poison the oysters.
- Double pump systems should ideally be used. If a single pump is used and breaks down, the oysters may die from lack of oxygen or be stressed from an accumulation of waste products from the oysters.
• All tanks, pipes, pumps and net frames should be cleaned, disinfected, rinsed and dried before the transportation of each new batch of pearl oysters. Refer to appendix A
• Clean all oysters of external fouling organisms, mud and algae by scraping and rinsing or by spraying with a high pressure water jet. Be careful not to damage the shell, especially the soft growing edge.
• Place cleaned oysters in net panels.
• Suspend net panels containing the oysters in the boat's tank. Allow space between panels so that the oysters can open during transport and so that there is a good flow of water.
• The entire water volume in each tank needs to be exchanged every 30 minutes. For example, if a tank holds 8000 litres, then the pumps need to pump in 8000 litres every 30 minutes and also pump out 8000 litres every 30 minutes.
• The entry and the removal of the water from each tank needs to be done smoothly preferably with fine jets of water. "Fire hose" jets of water are unacceptable to the oyster as this will prevent the oysters from opening. Several large diameter entry and exit pipes will need to be distributed, one to carry water into the top of each tank and one to carry water away from the bottom of each tank.
• At all times, the water in each tank must be kept clear and free of all foreign material, and the bottom of each tank needs to be kept free of mud, algae and other sediment. The bottom of each tank must be visible at all times. The water must not become cloudy or discoloured.

Arrival at the Pearl Farm

• Each batch of pearl oysters should be quarantined or, isolated on a separate raft or long-line away from the rest of the farm's oysters. They should be observed for several months for signs of sickness and death.
• The use of long-lines appears to be less stressful than the use of rafts because of less crowding and improved water circulation.
• Remove any sick or dead oyster as soon as they are detected. Inspect oysters regularly, for example, weekly.
• When cleaning pearl oysters, whether by hand or by machine, do not empty the wastes into the sea anywhere near your oysters. Preferably, dump the wastes on shore.
• Keep simple records on each batch so that if losses occur, the likely cause may be traced and corrected for future batches of oysters. Refer Appendix B.
• Preserve sick oysters in 10% seawater formalin and send to the laboratory to find out what disease is affecting them. Refer Appendix C.
APPENDIX A

Cleaning and Disinfection Procedure

Cleaning

All tanks, pipes, pumps, net frames, etc. should undergo a thorough mechanical cleaning, preferably using a 1% solution of sodium hydroxide containing 0.1% solution of Teepol (a detergent). It is necessary to remove the biofilm which coats the tanks, pipes etc.

Disinfection

Following cleaning, all the tanks and equipment are dried and sprayed with a chlorine solution containing 100 mg/L free chlorine. With chlorine solution use, contact time should be 60 minutes. Alternatively, the equipment is immersed in water and sodium hypochlorite is added in sufficient amounts so that a residual chlorine concentration of a least 10 mg/L remains after 30 minutes. A simple swimming pool chlorine test kit may be used here. All surfaces should be kept wet with disinfection solution during the 30 minute period. Chlorine is available from swimming pool and butcher's suppliers.

Rinsing

All equipment are rinsed free of disinfectant using seawater or freshwater.

Drying

All surfaces are then allowed to dry. The tank transport facilities are now ready for the next batch of pearl oysters.

Please note:- Suitable protective clothing including gloves, face masks, eye goggles, etc., should be worn when handling the above chemicals.
APPENDIX B

Records of each batch of Pearl Oysters shipped/introduced to a farm

Records help to detect the cause(s) of sickness and death so that losses can be prevented in future shipments.

1) Batch number

2) Date of arrival

3) Name of transport boat

4) Method of transport eg. "on deck" or "in tanks"

5) Duration of transport

6) Location from which oysters were fished

7) Number of oysters shipped

8) Raft/long-line identification (I.D.)

9) Number oysters alive on arrival

10) Number oysters dead on arrival

11) Number oysters sick on arrival

12) Health of oyster on arrival eg. retracted mantles; failure to open and feed, etc

13) Two months after arrival
   • number dead
   • health of survivors
APPENDIX C

Submission of specimens from sick/diseased pearl oysters

1) Process oyster before the die i.e. before they lose their reflexes. Oyster tissue decomposes rapidly after death.

2) Small pearl oysters i.e. up to 10 cm, dorso-ventral measurement. Remove and preserve all the soft organs as a group. A shallow incision may be made on one side of the organs to allow the preservative (formalin) to enter more rapidly.
   Large pearl oysters. These may be sampled in either of two ways:
   - Remove one shell valve by cutting the tissues close to the inside of that shell valve. Make a half-depth incision along the line C-D (Figure 10) to allow preservative (formalin) to enter and fix the tissues more rapidly. Remove all the tissues from the second valve and place in 10% sea water formalin. If the containers are not large enough to hold the whole oyster, cut the oyster in half along A-B (Figure 10) and place half in each of two containers.
   - An alternative method of sampling is to chock open the oyster and, using a large knife, to cut the oyster tissues in half by bringing the knife down between the two open shell valves e.g. as when harvesting half pearls. The oyster tissues are removed from each shell valve and placed in 10% sea water formalin. If there is insufficient room in one container, place half of the oyster in each of two separate containers.

3) Generally, for good preservation, tissues should not be thicker than 5 mm.

4) Place tissues in ten (10) times their volume of 10% sea water formalin for 5 to 7 days or more. 10% sea water formalin is prepared by adding one (1) volume of 40% formaldehyde (full strength) to nine (9) volumes of sea water.

5) Remove tissues from the 10% sea water formalin after 5 to 7 days. Place specimens into a plastic bag, remove excess air, and seal with heavy packing tape. There should be no free fluid in the bag. A piece of paper towelling or cloth may be placed in the bag with the specimens to keep the specimens moist and to absorb any free sea water formalin.

6) Place the bag and specimens into a second plastic bag, remove excess air and also seal with heavy packing tape. There should be no smell of formalin from the package.

7) Label each bag if more than one lot of specimens is to be sent in the same box.

8) Place labelled plastic bags containing the specimens into a strong cardboard box. You may need to add packing to fill any empty space in the box to prevent the specimens from being thrown about and damaged during transport.

9) Complete the "pearl oyster specimen advice sheet" on page 33, place inside a plastic bag, seal and also place in the cardboard box.

10) Use heavy packing tape to seal the edges of the box. Be careful not to cover the addresses and other instruction.

11) Address the box as follows:-

   Pearl Oyster Project
   Oonoonba Veterinary Laboratory
   PO Box 1085
   TOWNSVILLE 4810
   QUEENSLAND

12) Also add AIR MAIL and "Preserved marine specimens of no commercial value" and your (the sender's) name and address.

13) If you have any problems or questions, please request advice from

   JOHN NORTON OR IAN ANDERSON:
   Postal address (as above).
   Facsimile (077) 784 307
   Telephone (077) 222 688
PEARL OYSTER SPECIMEN ADVICE SHEET

Date ___________________
Name of sender: ____________________________________________________________
Postal address: ________________________________________________________________
Telephone ( ) ___________________________ Facsimile ( ) __________________________

DETAILS OF AFFECTED OYSTER
Species _______________________________________________
Age _______________________________________________
Shellheight _______________________________________________________________________
Location    _______________________________________________________________________

History (including movements, treatments, water quality etc) _________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________

Abnormal signs/behaviour (retracted mantle, valves closed etc) _________________________________
____________________________________________________________________________________
____________________________________________________________________________________

Pattern of sickness and/or deaths _______________________________________________________
____________________________________________________________________________________

Suspected cause of sickness and/or deaths _________________________________________________
____________________________________________________________________________________

Specimens submitted (ie. the number of oysters, their identification and the organs sampled) ______
____________________________________________________________________________________

Post this sheet with specimens to the OONOONBA VETERINARY LABORATORY, PO BOX 1085
TOWNSVILLE Q 4810, AUSTRALIA.
Figure 9: Internal anatomy of the pearl oyster *P. margaritifera* (from Gervis, M.H. and N.A. Sims. 1992. The biology and culture of pearl oysters (Bivalvia: Pteriidae). ICLARM Stud. Rev. 21, 49p.)

Figure 10: Line C-D is for making a half-depth incision to allow rapid fixation of internal tissues. Line A-B is for cutting the oyster in half if the container you have is too small to contain the whole oyster.
Shell Handling and Mortality- the Western Australian Experience
by
Lindsay Joll, Western Australia Fisheries Department, North Beach

Introduction

Over the period from the mid 1970's to the mid 1980's, the Western Australia pearl oyster fishery experienced high levels of mortality (up to 80%) (Pass et al., 1987). The mortality occurred on pearl farms after oysters were transported to the farms from catching grounds. Typically the mortality began about seven days after transport and continued for about seven weeks. The levels of mortality were of great concern to the industry and led to a research programme being set up to establish the reasons for the mortality.

The characteristics of pearl oyster mortality

The typical characteristics of pearl oyster mortality were:

- gaping valves
- withdrawn mantle
- brown staining of the nacre between the mantle edge and the nacre edge
- the mortality was non-contagious (ie. mortality did not move through a group of oysters, but occurred apparently randomly)

Identified cause of mortality

The primary cause of the mortality was identified as a bacterial infection resulting from the exposure of oysters to high levels of bacteria in the holding tanks on transport vessels. The main bacterial group involved in the infection were *Vibrio* bacteria, with *Vibrio harveyi* being the main isolate identified.

Handling practices in the industry during the period of high mortalities

*Vibrio* bacteria are a normal component of the bacteria found in seawater and on the surfaces and in the guts of pearl oysters. However, the handling practices in use in the industry at the time were found to be causing extreme increases in the numbers of *Vibrio* bacteria in the holding tanks during the period that oysters were being held in the tanks on board vessels. In addition there were a number of other handling practices which compounded the problems of exposure to high bacterial levels. The handling practices which were identified as potential contributors to pearl oyster mortality were:

A. In collection and transport
   1) Oysters held in baskets in tanks on vessels for up to five days.
      - this allowed bacterial levels to build up to thousands of times normal background levels
      - oysters collected in the first few days were exposed to high bacterial levels for several days
2) Pumps were not used and seawater circulation through the tanks was only by movement of the vessel through the water.
   - this method of water circulation led to intermittent flow (ie. only when the vessel was moving) and low exchange rates- both of which promoted bacterial build-up.
   - low exchange rates and intermittent flow may also have caused oysters to be stressed by exposure to lowered oxygen levels in the tanks.

3) Oysters were tightly packed in baskets and the baskets were closely packed in the tanks.
   - the solid mass created by the tight packing of oysters and baskets may have led to water taking the path of least resistance around the oysters, causing those oysters in the middle to suffer low water exchange rates and lowered oxygen levels.

4) Transport to farms was at the time of low water temperatures on the fishing grounds and maximum water temperature difference between the fishing grounds and the farms.
   - pearl oyster cellular defence mechanisms perform poorly at low temperatures, leaving oysters unable to defend themselves against bacterial infection.
   - exposure to a rapid change in temperature as oysters were moved from the fishing grounds to the farm may have stressed the oysters.

B. On farms
1) Pearl oysters on farms were being held in baskets on rafts
   - This arrangement creates an obstruction to water flow and pearl oysters in the middle of the raft have lowered water exchange rates.

**Changes in handling practice which led to reduction in mortality**

In response to the identification of the primary cause of mortality and a variety of handling practices which were contributing to and compounding the problem, the industry developed new handling practices to reduce the problems of bacterial build-up, oxygen-stress and low temperature during transport.

Oysters were `dumped' (ie. returned to the seabed in panels) within one to four hours after capture.
   - this minimised the period that oysters were held in tanks during transport, as they could be readily retrieved from the bottom and placed in tanks within 1/2 to 1 day of transport.

   - dumping oysters allowed the period of transport to be delayed to later in the year when temperatures were higher and pearl oyster cellular defence mechanisms functioned more effectively and the temperature differential between the fishing grounds and the farms was reduced.

Oysters were handled carefully at all times.
temperature stress and dehydration were avoided by keeping oysters out of the sun and wind and by keeping oysters damp using sprinkler or trickle systems off the deck hose.

Exchange rates and flow rates in holding tanks were increased by the use of pumps.

- the increased exchange rate reduced bacterial build-up.

Oysters were held in panels (rather than baskets) in the holding tanks, with the panels hung in an arrangement which allowed more space between oysters.

- this allowed better flow patterns within the tank, ensuring that oysters in the middle of the tank received adequate flow rates. This reduced localised bacterial build-up and oxygen stress.

Oysters were transported later in the year, when temperatures were higher.

- pearl oyster cellular defence mechanisms were more effective at the higher temperatures.

- temperature differentials between the fishing grounds and the farm were reduced, lessening any thermal stress experienced by oysters.

Oysters on farms were changed from being held in baskets on rafts to being held in panels on long-lines.

- all oysters were maintained in good water flow.

**Mortality problems in the Torres Strait and Queensland fishery- Learning from the Western Australian experience**

Although some the catching and handling practices currently being used in the Torres Strait and Queensland differ from those used in Western Australia at the time when high mortalities were being experienced, it is likely that bacterial infection as a result of poor handling practices is the basic cause of pearl oyster mortalities in Torres Strait and Queensland. However, local arrangements and conditions in the Torres Strait and Queensland may mean that the techniques developed in Western Australia cannot just be transferred and it will be necessary for local solutions to be developed to resolve the mortality problems currently being experienced.

In developing local solutions to the pearl oyster mortality problem, the basic principles recognised in the Western Australian situation should be considered. Handling practices should be examined to determine areas where bacterial build-up may be occurring and for sources of physiological stress to pearl oysters (e.g. temperature oxygen, chemical pollutants). Careful and critical examination of handling practices will be required and once likely harmful practices are identified, there will need to be a willingness to expand the money and energy required to develop a solution to the problem.
PLENARY SESSIONS
Strengths, weaknesses, opportunities and threats in the Queensland pearl industry

The 1994 Queensland Pearl Industry Workshop presented an excellent opportunity for industry members to discuss the current state of the industry and to begin formulating plans for future research projects, legislation and regulations.

A business planning technique called a Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis was used in the first plenary session to facilitate discussion and the exchange of ideas on the pearl industry in Queensland. A SWOT analysis of the Queensland pearl industry should:

1. produce a clear picture of the industry's present situation
2. outline future opportunities for the industry
3. create action and/or strategic plans for the industry
4. (if results are used) strengthen the future performance of the industry

A SWOT analysis is a technique used to examine the current situation of a business. It analyses a company's performance by listing a combination of internal factors (strengths and weaknesses) and external factors (opportunities and threats). This type of analysis gives an excellent picture of the business's current situation, this will enable a company (or in this instance an entire industry) to make strategic decisions so that future performances will bring economic benefits to the company (or industry).

Six groups of between four and ten people were formed with each group comprising people from the collecting and culture sectors as well as individuals from government agencies. Approximately 30 minutes was allocated to write down 5-10 strengths, weaknesses, opportunities and threats. At the end of the 30 minutes the groups gathered together and reported their findings to the whole workshop. The table on the following page outlines the most mentioned strengths, weaknesses, opportunities and threats. Two groups had to mention a S, W, O and T for it to be included in the table.

Discussion

Several strengths, weaknesses, opportunities and threats were identified by all six groups. The "quality and image of the product" and the "clean environment" in Queensland and Torres Strait were strengths of the industry. Half of the six groups identified "consumer or tourism demand" as an important opportunity. All of the six groups identified "mortality during transport" as a weakness and "overseas and Indonesian production of pearls" as a threat to the industry.

Weaknesses identified by two or more groups were far greater in number than the identified strengths, opportunities, and threats. Thus, several areas need to be addressed if performance of the industry is to improve.

Industry and government have begun to deal with a number of the weaknesses listed in table 2. "Lack of long term tenure licences" is a weaknesses currently being addressed in the new fisheries regulations. These regulations are in the process of being written as the new Fisheries Bill moves through the Queensland Parliament.
The opportunities mentioned give industry and government an opening to expand the development and prosperity of the pearl industry. "Consumer and/or tourism demand" is a potential opportunity for the pearl industry to expand its market within Australia especially in Queensland were tourist numbers are high.

Table 2  Strengths, weaknesses, opportunities and threats identified at the Queensland Pearl Industry Workshop 22-23 June, Thursday Island

<table>
<thead>
<tr>
<th>STRENGTHS (S)</th>
<th>WEAKNESSES (W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Quality/image of product (6)</td>
<td>• Mortality in transport (6)</td>
</tr>
<tr>
<td>• Clean environment (6)</td>
<td>• Lack of coordination between sectors (4)</td>
</tr>
<tr>
<td>• Access to technology (3)</td>
<td>• Lack of Australian Technicians (4)</td>
</tr>
<tr>
<td>• WA/NT experience/role models (3)</td>
<td>• Lack of communication (3)</td>
</tr>
<tr>
<td>• Gov't assistance available (3)</td>
<td>• Lack of long term tenure</td>
</tr>
<tr>
<td>• PCA sties available (2)</td>
<td>• licences (3)</td>
</tr>
<tr>
<td>• Price of shell (2)</td>
<td>• Joint lobster/pearl fishery (2)</td>
</tr>
<tr>
<td></td>
<td>• Lack of wild stocks (2)</td>
</tr>
<tr>
<td></td>
<td>• Remoteness/high costs (2)</td>
</tr>
<tr>
<td></td>
<td>• Number of agencies (2)</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>OPPORTUNITIES (O)</th>
<th>THREATS (T)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Consumer/tourism demand (3)</td>
<td>• Indonesian/overseas production (6)</td>
</tr>
<tr>
<td>• Research and development (2)</td>
<td>• Pollution (4)</td>
</tr>
<tr>
<td>• Sharing of expertise (2)</td>
<td>• Traditional land rights (3)</td>
</tr>
<tr>
<td>• Simple jurisdiction (2)</td>
<td>• Disease (3)</td>
</tr>
<tr>
<td>• Value adding (2)</td>
<td>• Lack of quota on shell quantities (2)</td>
</tr>
<tr>
<td>• Skill the industry ie. divers, culture techniques (2)</td>
<td>• GBRMPA (2)</td>
</tr>
<tr>
<td>• Hatcheries (2)</td>
<td></td>
</tr>
</tbody>
</table>

The number in brackets is the number of groups which identified that particular issue.
A primary goal of the workshop was to establish research priorities for the pearl industry. Time was set aside on the second day of the workshop for an exercise to outline and priorities research and development issues for the Queensland pearl industry.

Important research and development issues concerning the industry were discussed and listed. Industry members were allocated 10 points which they could designate to one or more of the research and development issues.

The lists were collected and points added up. The table on the following page displays the points given to each research and development issue.

This exercise involved 'industry' only and individuals from government agencies were not allowed to participate in the voting.

"Effects of trawling and/or habitat loss" and "training of technicians" received the most points (42) followed by "market research" with 27 points. "Larval nutrition in hatcheries" received the least amount of points (0).

The industry participants identified the following top five research and development priorities for the Queensland Pearl Industry:

1. Effects of trawling / loss of habitat on shell stocks on the Queensland east coast (42)
2. Training of technicians (42)
3. Market research (27)
4. Operating techniques (22)
5. Shell mortality (22)

The Effect of Trawling/ habitat loss priority applies specifically to the Queensland east coast Pearl Fishery and is not relevant to the Torres Strait Pearl Fishery. The old pearl grounds to the west of Babu have never been a commercial prawn trawl ground and only some areas of the waters around Darnley Island have been trawled. Much of the seabed around Darnley Island is difficult and dangerous to trawl. Commercial prawn trawling is now prohibited on both of these pearl grounds by area (spatial) closures.

The top five research priorities that are of relevance to the just pearl fishery in Torres Strait are:

1. Shell mortality (22). This was considered to be more of a development issue than research at present as the adoption of stricter handling and transport protocols may reduce much of the mortality associated with transport of live shell.
2. Disease status (17)
3. Stock recruitment (16)
4. Shell growth rate (11)
5. Stock assessment (8)
Table 3 Research and development priorities of the Queensland Pearl Industry

<table>
<thead>
<tr>
<th>POINTS GIVEN</th>
<th>RESEARCH AND DEVELOPMENT ISSUES</th>
</tr>
</thead>
<tbody>
<tr>
<td>42</td>
<td>Effect of trawling/ loss of habitat</td>
</tr>
<tr>
<td>42</td>
<td>Training of technicians</td>
</tr>
<tr>
<td>27</td>
<td>Market research</td>
</tr>
<tr>
<td>22</td>
<td>Operating techniques</td>
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<tr>
<td>22</td>
<td>Shell mortality</td>
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<tr>
<td>21</td>
<td>Hatchery technology</td>
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<tr>
<td>17</td>
<td>Disease status</td>
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<tr>
<td>16</td>
<td>Stock recruitment</td>
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<tr>
<td>13</td>
<td>Technology</td>
</tr>
<tr>
<td>13</td>
<td>Spat collection</td>
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<tr>
<td>11</td>
<td>Shell growth rate</td>
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<tr>
<td>9</td>
<td>Selective breeding</td>
</tr>
<tr>
<td>9</td>
<td>Growout husbandry</td>
</tr>
<tr>
<td>8</td>
<td>Stock assessment</td>
</tr>
<tr>
<td>4</td>
<td>Value adding</td>
</tr>
<tr>
<td>4</td>
<td>Alternative nuclei</td>
</tr>
<tr>
<td>4</td>
<td>Identifying pearl culture areas</td>
</tr>
<tr>
<td>0</td>
<td>Larval nutrition in hatcheries</td>
</tr>
</tbody>
</table>
Industry issues identified at the 1994 Queensland Pearl Industry Workshop

Issues concerning members of the pearl industry were recorded and are listed below. This list encompasses several different management, research, business and marketing issues which could be addressed in future by government agencies and an industry association. Issues identified at the workshop may not reflect the concerns of the entire industry.

**WEDNESDAY 22 JUNE 1994**

- maximum returns to community
- training and role of foreign investment, immigration and techniques
- interstate transfers of oysters
- limits to PCA’s and pearl oyster stocks
- simplify pearl licences and regulations
- more details from Government on requirements for potential growers, GBRMPA insurance, researching sites, identifying suitable sites etc.
- limitations required in Straits
- Torres Strait Marine Strategy
- overall limitation on size of Australian industry
- control level of production - quality and quantity
- commonwealth role plus offshore Constitutional Settlement in Queensland
- interstate cooperation Australian industry and input to International Pearling Association
- wild stock management program for Torres Strait (adopt from NT/WA)
- diving safety
- client/customer profile know the market and develop strategies accordingly
- consistent quality
- Australian brand/marketing
- association for management and for marketing and brand recognition
- cooperative for farms/ all sectors of industry
- environmental pollution, loss of habitat, trawl damage
- disease and other disasters
- hatchery development
- transportation techniques
- financial support from State/ Federal Government eg: research
THURSDAY 23 JUNE 1994

- longer lease security as long lead times are needed for profits on farms
- financial problems and guarantee of recouping. 25 year terms as consistent with NT and follows WA (50 years)
- liaising with GBRMPA, ICC and DEH
- foreign ownership. Compatible with NT and WA (51% Australian 49% foreign). Not retrospective/ grandfather clause
- transferability arrangements of GBRMPA
- trawl fishery. Identify shell replenishment areas and trawl closures on the East Coast.
- limitation of the number of permits issued
- introduce performance criteria for farmers
- wild stock management
WORKSHOP PARTICIPANTS
WORKSHOP PARTICIPANTS

The following is a list of the speakers and delegates who attended the 1994 Queensland Pearl Industry Workshop. Workshop participants can be contacted through the Northern Fisheries Centre.

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Member for Cook

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Ms Romina Fujii                      Mr Pedro Stephens
Port Kennedy Member                  Mayor Torres Shire
Torres Shire Regional Authority

PRESENTERS

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Department of Primary Industry and Fisheries Industry Based Research

Mr Jim Gillespie                     Dr. John Norton
Queensland Department of Primary Industries Oonoonba Veterinary Laboratory

Dr Robert Coles                      Mr Richard Bowie
Queensland Department of Primary Industries Northern Star Seafoods

Professor John Lucas                 Mr Maurice Downing
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James Cook University

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                                            Regional Development

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WA Marine Research Laboratory
                                           Maria Pearls

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Bureau Rural Sciences                Roko Pearl

Mr Lindsay Drake                     Mr Bill Shibasaki
Pirate Pearls Pty Ltd.               Maria Pearls

Mr Lindsay Drake                     Mr Bill Shibasaki
Pirate Pearls Pty Ltd.               Maria Pearls

Mr Derek Staples                     Mike and Joanne Gunsburg
Bureau Rural Sciences                Roko Pearl
Mr William Coutts  
Barrier Pearls Pty Ltd.  

Mr Bruce Stevens  
Reefarm Hatcherries  

Mr Michael Crimp  

Mr Moses Abednego  

Mr Sam Kris  

Ms Vena Singleton  

Mr Mick Bishop  
AFMA  

Mr Saliman Bin Juda  
AFMA  

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QFMA  

Mr Geoff Lucas  
Barrier Pearls  

Mr Joe David  
ICC  

Mr Mick Angelo  
TSFA  

Mr John Mills  

Mr William Coutts  
Barrier Pearls Pty Ltd.  

Mr Bruce Stevens  
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Barrier Pearls  

Mr Joe David  
ICC  

Mr Mick Angelo  
TSFA  

Mr John Mills  

Jean-Claude Colin  
Australian Pearl Farms Pty Ltd.  

Dr Ian Poiner  
CSIRO  

Mr Eric Babia  

Mr R.P. Adams  

Ms Grace Fischer  

Mr Brian Singleton  

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AFMA  

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AFMA  

Mr Alan Gamble  
AFMA  

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Mr Colin Creighton  
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Ms. Monica Norris  
Flight West Airlines  

Ms Stephanie Golden  
QDPI  

Ms Allison Page  
QDPI