

trochus spawning experiments at the Tongareva Marine Research Station pearl oyster hatchery. From the Federated States of Micronesia, we have an article on some recent trochus introductions to the outer islands there. Another article describes the present status of a trochus reseeding exercise in the Loyalty Islands of New Caledonia. Unfortunately, as with most other experiments of this type relating to the seeding of reefs with hatchery-reared stock, the results were disappointing. However, as usual, lessons have been learned, and success could some day be achieved.

I would like to thank all those people who have taken the time and effort to send in the details of their work on trochus. I encourage those from

other Pacific Island countries and territories to follow their example, and let the rest of us know what is happening in your own countries. Articles can be as brief as you like and SPC has excellent English editors who correct anything requiring attention. For the French speaking readers and authors, SPC also has excellent translators . . .

I hope you find this edition informative, and look forward to receiving your future contributions, so that we can get another bulletin out within the next 12 months.

Kelvin Passfield



Aspects of the industry, trade, and marketing of Pacific Island trochus May 1997

*A report for the World Bank
Prepared by: ICECON, Reykjavic, Iceland
Funded by the Government of Iceland*

Introduction

In June 1995, the World Bank issued their Third Regional Economic Report for the Pacific Islands (World Bank, 1996). The report recommended, among others, that a trochus marketing study be carried out to assess the competitiveness of Pacific Island products and opportunities for further development. This has formed the basis for the present study, which was carried out by ICECON, a specialist fisheries consultancy group, and funded through Icelandic Trust Funds.

The study's basic findings were compiled during late 1995. Visits were made to seven major supplier countries in the Pacific Islands region. Fisheries officials in the remaining countries were contacted by mail or phone.

Limited surveys were carried out in the major end-market countries (Italy, France, Germany, United Kingdom, United States and Japan) with the objective of gaining insights into market potential, future trends, demand and likely fluctuations. A review was also undertaken of the effect of competition from trochus substitutes.

The major author of the study was Mr Robert Gillett in Fiji, who assessed the trochus harvesting,

processing and opportunities in the Pacific Island region. Mr Sturlaugur Dadason of Icelandic Freezing Plants Corporation, and Mr Petur Einarsson of ICECON were responsible for assessing international marketing prospects. ICECON is also grateful to the field experts who assisted in data collection in the Far East, Italy and the US.

The authors would like to express their appreciation to all government and industry representatives in the Pacific Islands, Far East, Europe and the US for the support and information provided. It is hoped that this report will contribute to a better understanding of trochus marketing prospects and opportunities for Pacific Island countries.

1. Trochus production

1.1 *Trochus production in the Pacific Islands*

Trochus (*Trochus niloticus*) shells are one of the most important coastal resources of the Pacific Islands and a key source of income for numerous coastal households. Although trochus is used primarily in the manufacture of valuable mother-of-pearl buttons, other minor uses include jewellery, handicrafts, polishing agents, and trochus meat.

Reliable information on the amounts of trochus harvested by the various countries is vital for efforts aimed at maximising production benefits. Proper resource management, marketing strategies, and evaluation of processing capacity are all dependent on the knowledge of the amount of trochus harvested. Despite their importance, the trochus statistics for most Pacific Island countries remain poor and need to be derived from a variety of sources, including fisheries statistics, export permit records, customs export data, and specialised surveys. All of these have shortcomings.

Mindful of the above statistical difficulties, an attempt was made to estimate trochus production from each of the 22 Pacific Island countries and territories during the last decade. Table 1 gives the nominal trochus production for the region. The averages are depicted in Figure 1 on next page.

Table 1 reveals that, on the basis of the best available documentation, the Pacific Island countries harvested an average of 1,845 metric tonnes (t)

of trochus annually over the past decade. Allowances must be made, however, to account for the amount of unreported trochus, which is estimated at 25 per cent.

The actual amount of trochus production during the period 1985–1994 is therefore likely to be about 2,300 t annually. The current export value of this production is estimated at US\$ 15 million per annum.

There is considerable annual variability in trochus production as shown by Figure 2 (see next page) which depicts trochus exports from Pacific Island countries from 1900 to 1990.

1.2 World trochus production

An estimate of the world-wide trochus production was obtained through available trochus harvest data from key producing countries, import statistics from Asian and European countries, previous estimates, and discussion with

Table 1: Pacific Islands trochus harvests (t)

Country	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	Average 1985–94
American Samoa	—	—	—	—	—	—	—	—	—	—	0
Cook Islands	27	45	18	0	26	0	0	26	0	0	14
Fed. States of Micronesia	132	332	132	339	132	227	199	172	132	266	206
Fiji	294	250	250	400	250	200	n/a	n/a	n/a	243	271
French Polynesia	43	0	0	0	0	380	36	82	87	27	66
Guam	1	1	1	1	1	1	1	n/a	n/a	0	1
Kiribati	—	—	—	—	—	—	—	—	—	—	0
Marshall Islands	n/a	n/a	100	150	145	100	0	0	0	0	62
Nauru	—	—	—	—	—	—	—	—	—	—	0
New Caledonia	518	305	270	110	213	103	127	190	107	274	222
Niue	—	—	—	—	—	—	—	xxx	xxx	xxx	0
Northern Marianas	n/a	n/a	n/a	n/a	(15?)	n/a	n/a	n/a	n/a	n/a	n/a
Palau	104	32	87	163	257	0	0	229	29	0	90
PNG	437	535	441	437	275	346	164	282	392	n/a	368
Pitcairn	—	—	—	—	—	—	—	—	—	—	0
Solomon Islands	500	662	445	460	371	376	287	320	394	306	412
Tokelau	—	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	0
Tonga	—	—	—	—	—	—	—	xxx	xxx	xxx	0
Tuvalu	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	0
Vanuatu	75	75	67	86	100	170	130	150	160	107	112
Wallis & Futuna	n/a	n/a	15	15	18	17	34	17	16	34	21
Western Samoa	—	—	—	—	—	—	—	xxx	xxx	xxx	0
Total											1,845

n/a : Harvest data not available

— : Trochus niloticus does not occur

xxx : Trochus transplanted but not yet harvested

Non-commercial harvesting usually excluded. For FSM, the data given is for Pohnpei, complemented with estimates for other states. For Solomons, figures for recent years include some PNG (Bougainville) trochus.

Sources: Miscellaneous references provided at the end of the report

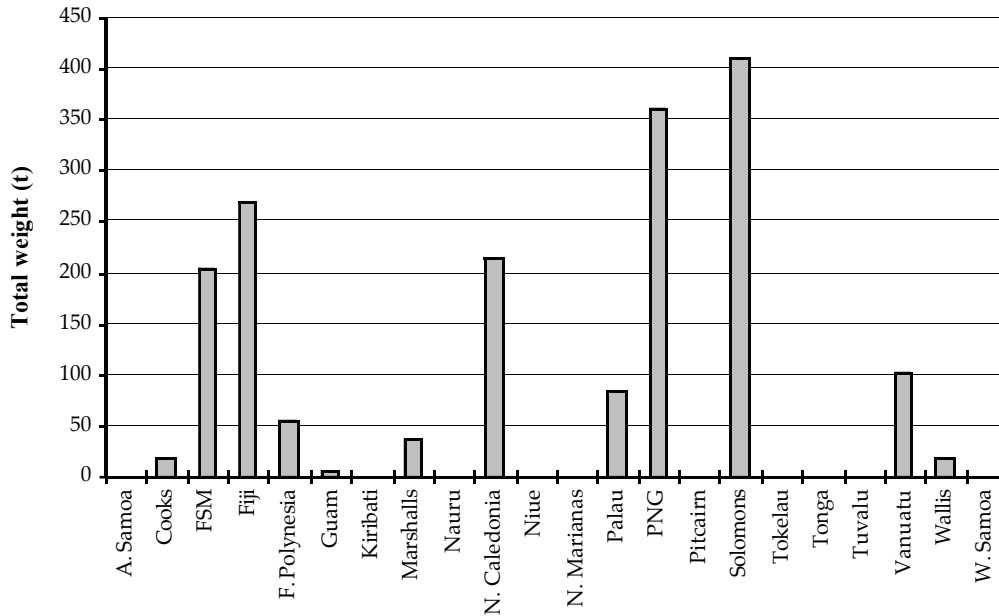


Figure 1. Average annual trochus harvests in the Pacific region (1985-1994)

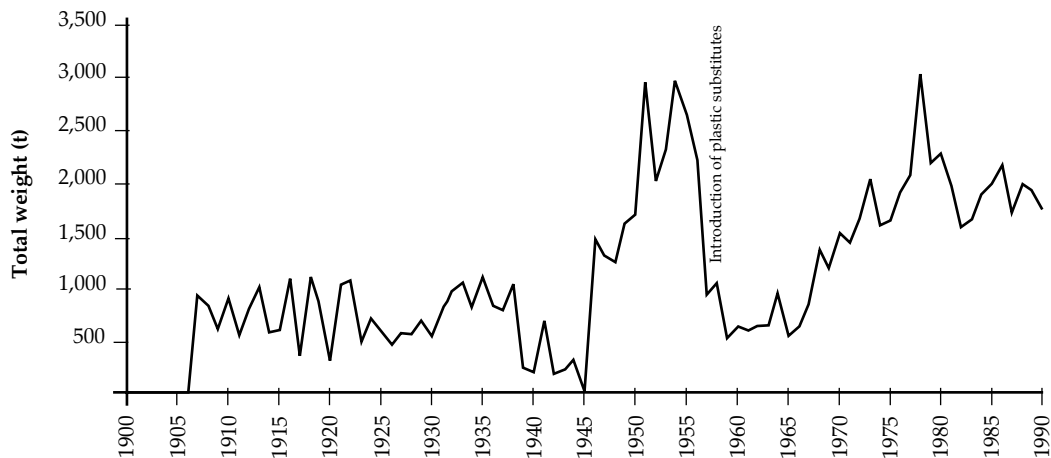


Figure 2 Trochus exports from the Pacific Islands (1900-1990)
(Source: SPC unpublished data)

individuals knowledgeable in the trochus trade. The results indicate a worldwide trochus production of 3,900 t annually (Table 2).

Although subject to revision, certain points are suggested by these preliminary estimates. **The most significant is that the Pacific Islands produce about 59 per cent of the global trochus harvest.**

It is noteworthy that Australia harvests more trochus than any other single country and that the second largest producing country is Indonesia, despite a ban prohibiting the harvesting, transport, or export of trochus.

2 Trochus processing

2.1 Trochus processing in the Pacific Islands

The processing of trochus involves the fairly simple production of button blanks followed by a more sophisticated processing into finished buttons. The first blanking operation in the Pacific Islands was set up in Levuka, Fiji, over 40 years ago. Since that time, 31 other trochus factories have been established in 9 Pacific Island countries. **Of these 32 factories, only 14 remain operational.**

Table 2: Estimates of worldwide annual commercial trochus production in the early 1990s

Area	Weight (t)
Pacific Islands	2,300
Indonesia	475
Philippines	200
Okinawa	200
Australia	500
Minor areas	225
Total	3,900

Sources: Official trade statistics and miscellaneous sources

Table 3: Quantities of trochus processed in the Pacific Islands

Country	Year	Weight processed locally (t)	Percentage of harvest processed locally (%)
Fiji	1994	200	72
Vanuatu	1993	115	72
	1994	73	68
Solomon Islands	1993	370	94
PNG	1993	138	35
FSM	1992	8	5
	1993	0	0
	1994	15	6
French Polynesia	1994	10	37

Sources: Trochus processors and fisheries officers

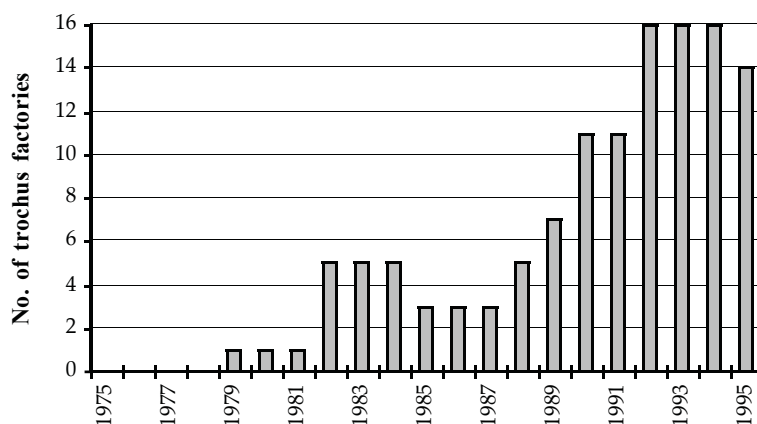


Figure 3
Number of trochus factories
in the Pacific Islands region (1975–1995)

These operational factories employ a total of 213 workers. Figure 3 shows the number of trochus factories in the region over the years.

Table 3 shows an estimate of the amounts and percentages of trochus processed locally in selected Pacific Island countries.

From Table 3 it can be seen that in recent years about 800 t of trochus were processed annually within the region. This represents about 35 per cent of the total regional trochus harvest or 21 per cent of the total world harvest.

Most Pacific Island trochus processing operations produce blanks for Korea or Japan. Only two of the present factories attempt to produce finished buttons and both of these export more blanks than buttons. Many Pacific Island manufacturers state that they are unable to produce the quality of buttons demanded by the Asian and European buyers.

Information on the operational costs associated with blank production shows that raw trochus accounts for approximately 74 per cent of the total production costs, wages for 12 per cent and the other costs for 14 per cent.

2.2 Trochus processing outside the Pacific Islands

Although Japan has historically dominated trochus button manufacturing, many of the key Japanese shell button companies have relocated, or at least established manufacturing branches, in low wage countries. The Japanese Tomoi Company has a factory near Chiang Mai, Thailand which has 30 employees and produces one-third of Tomoi's total production. Lookwell Company manufactures on Cebu Island in the Philippines. The once-largest button manufacturer in Japan, Iris Company, has ceased domestic production and now produces in Dalian, China. There are also reports of trochus

button manufacturing in Vietnam, but its affiliation is unknown.

Five or six companies are presently manufacturing trochus buttons in Korea. As has occurred in Japan, the Korean button manufacturer, Buyoung Industries, has opened a button plant in Guang Dong, China, which specialises in shell buttons. Many of the South Pacific trochus processing operations are currently affiliated with Korean firms and some of them appear to have relocated to the Pacific Islands from South East Asia.

The processing situation in Indonesia is unclear. The trochus ban in 1987 probably had an impact on the level of trochus processing, but this is difficult to quantify. Should trochus harvest become legal in the future, it could easily result in substantial in-country processing which, considering the resources available, their quality, and very low labour costs, could result in Indonesia producing a large portion of the world's button blanks or finished buttons.

There is little recent information on Taiwan, but the latest source indicates that much of the processing is oriented to shell-based accessories, rather than buttons.

The European button industry is centred in northern Italy. About 210 firms are involved in the production of buttons and 20 of these companies produce shell buttons, with two producing only blanks. The three largest button producing companies are vertically integrated and it is reported that they attempt to offset the high Italian labour costs by using advanced technology manufacturing techniques. Some Italian manufacturers have stated that, although the Asian countries can produce low-cost trochus buttons, Italy can deliver much faster and therefore cater better to the rapidly changing high fashion market.

The largest button manufacturer in Europe, TOAR, is located in Spain. One German shell blank manufacturer is listed in the catalogue of 1995 International Exhibition of Buttons. Other sources indicate a small amount of trochus button manufacturing in Austria. Market research carried out during the survey indicates that only one company is manufacturing shell buttons in the United Kingdom at the present time and may be confining production to engraved buttons. This lack of major button production is attributed to the fact that clothing, once a major industry in the UK, has largely moved offshore.

At least one manufacturer produces trochus buttons in the United States. Emsig Manufacturing Corporation has manufacturing facilities in New York and New Jersey in addition to a plant in Taijin, China.

According to European sources, there are two shell button factories in Mauritius, which reportedly use Pacific Islands raw trochus. A button factory was set up in the Seychelles soon after the

trochus transplantation, but switched to making jewellery. During the market survey in France, one fashion house stated that they purchased trochus buttons from Madagascar.

2.3 Pacific Island processing compared to other areas

Factories in the Pacific Islands have neither the low wage structure of the newly established ventures in China and Southeast Asia, nor the high technology of the European manufacturers, nor the long-established and vertically integrated nature of the larger Japanese, Italian, and Spanish companies. Proximity to resources is not a major comparative advantage to the region in view of the relatively low transportation costs, ranging from US\$ 1,700 to US\$ 4,000 for a 20 foot container to Japan. Productivity tends also to be lower relative to Asian processors. These factors suggest stiff future competition for Pacific Island trochus processors. The Pacific Islands factories have few advantages except for being located in a region which presently produces 59 per cent of the world's trochus supply. It appears therefore that the region's processors, in order to compete successfully, must capitalise on this strength and use this attribute as the basis for their comparative advantage.

3 Trochus prices

3.1 Domestic trochus prices

Domestic buying prices for trochus shells in mid-1995 are shown in Table 4.

There is considerable variability in factory gate prices between countries. The highest price paid is in Fiji where there is domestic processing and (during the period of the quoted price) a ban on the export of raw trochus. One of the lowest prices is in Pohnpei where there is domestic processing and no export restrictions. This appears somewhat contradictory to the perception that export restrictions lower the price of raw shells to fishers. The most likely explanation is that Fiji, despite the ban on raw exports, had a higher number of buyers than in Pohnpei, with three processing operators in 1995. **Domestic competition for the purchase of trochus is therefore a major factor in determining price levels.**

3.2 International trochus prices

During the study, export prices for trochus were quoted by various sources in the Pacific Islands as ranging from US\$ 6,000 to US\$ 7,500 per tonne (presumably FOB). Trochus prices are often quoted for Indonesian 'Makassar' shell and this commodity has assumed the role of the price ref-

Table 4: Factory gate prices for raw trochus (1995)

Country	1995 price per kg (local currency)	1995 price per kg (US\$ @ UN rate)
Cook Islands	NZ\$ 8.10 *	5.30
FSM (Pohnpei)	US\$ 2.53	2.53
Fiji	F\$ 6.25	4.60
French Polynesia	CFP 300	3.16
Marshall Islands	US\$ 2.95	2.95
New Caledonia	CFP 250	2.81
Palau	US\$ 3.08	3.08
PNG	K 4.50	3.49
Solomon Islands	SBD\$ 11.00	3.28
Vanuatu	VT 300	2.70
Wallis & Futuna	CFP 320	3.57
1995 average		3.41

* cleaned

Sources: Trochus processors and fisheries officers

Notes: The Solomon Islands has a 10% withholding tax for each transaction. Prices quoted are for fairly small amounts (less than 500 kg) of legal sized trochus. Where a range of prices is offered, the price given is the average of the range. Prices are for the first half of 1995. For Marshall Islands, French Polynesia and Cook Islands, prices are for the last available sale, adjusted to 1995 values. Prices are factory gate prices. Where no factory exists, prices are those given in the principal city.

reference point for trochus from all areas. A comparison of the 1980 Makassar price of US\$ 1,070 and 1995 prices shows a nearly eight-fold increase in 15 years (in nominal terms).

During the present study, current prices for trochus were obtained from Japan and Italy. The price of trochus in Japan has followed the trend experienced in most Pacific Island countries: a peak in 1989/1990 followed by low prices for a few years and then a recovery. In mid-1995 the FOB price of Makassar in Japan rose to 930,000 yen per tonne (US\$ 9,300), but later in the year stabilised at 850,000 yen. Market research carried out for this study indicates that the most likely explanation is that the fluctuation was caused by the production of blanks in trochus producing countries, resulting in a shortage in the supply of raw trochus and a subsequent price rise. **This suggests some inelasticity in the demand for trochus and serves as an indication of the impact that supply restrictions can have on market prices.**¹

The global demand for trochus products is obviously a major price determinant. Moreover, the price paid to Pacific Island exporters for raw trochus is strongly influenced by trochus quality and shipping charges. The type of buyer/seller

relationship also has a strong effect on prices. Unlike trochus quality and shipping costs, this relationship is one area where producers in the Pacific Islands can change the situation for their benefit. Overseas importers of trochus value long-term business relationships and are willing to pay a higher price for trochus purchased from a company they can trust (see Section 5.3).

Several new trochus factories have opened in Asian countries without local supplies of raw material. At the same time, the production of blanks is increasing in trochus producing countries, restricting the availability of raw trochus. **These conditions suggest upward pressure on prices of raw material.**

4. Future demand for trochus

4.1 Perceptions from the fashion industry

Marketing surveys were carried out in the major end-user countries. Information was obtained from 56 designers, fashion houses, button distributors, apparel manufacturers, and up-market retailers in Italy, France, Germany, the United Kingdom, the United States, and Japan.

¹ An inelastic demand occurs when the change in the quantity demanded is proportionally smaller than the price change. Under these circumstances, restricting the supply of product results in higher total revenues to producers.

The main findings of the survey of the fashion industry were the following:

- the general state of the economy, fashion trends, and the use of substitutes are the dominant factors affecting demand for trochus. The relative weight of economic constraints and fashion trends varies by country. In the US, economic considerations tend to be the main factor influencing demand; in France, fashion trends appear to be dominant;
- the fashion industry anticipates a slight to moderate increase in the use of trochus in the near future;
- substitution for alternative materials is not likely to produce a major shock in the industry (see Section 4.2);
- about half of the clothing manufacturers contacted believed there is some potential for direct purchases of finished buttons from producing countries; and
- there is a possibility that consumers' environmental concerns could have a negative effect on demand.

The perceptions of many representatives of the fashion industry contacted during the survey are embodied in the statement by a French designer that *'nothing can replace the luxury and excellence of mother-of-pearl buttons'*.

4.2 Competition from trochus substitutes

In the history of trochus button manufacturing, the most remarkable feature has been the sharp downturn in the business in the late 1950s and early 1960s due to competition from plastic polyester buttons (see Figure 2). This state of development is indicated by an Italian fashion designer who recently stated that *'polyester imitation is nowadays done so well that a non-professional eye cannot distinguish between real and imitated mother-of-pearl'*. Because polyester buttons have not displaced trochus to date, it is unlikely that any future variations will.

Two related substitution phenomena are presently affecting trochus buttons:

- Substitution to cheaper material
This type of substitution is strongly affected by the price of trochus and the general state of the economy; and
- Substitution to more appealing material
This type of substitution is strongly affected by fashion trends and subject to high variability.

The market surveys conducted for this study indicated both types of substitution are presently important. It is possible that the two types of substitution actually buffer changes in trochus demand. An increase in use by the high fashion industry, for example, would tend to place

upward pressure on prices. This in turn tends to result in a decrease use by mid-term retailers, placing a downward pressure on prices.

The market surveys also indicated differences in the preferred substitute materials between end-user countries. Shell substitutes predominate in the UK, Japan, Korea, and Italy. Nut, wood, horn, steel, and other shells are important substitutes for trochus in the United States.

Pearl oyster, sometimes used as a substitute for trochus, is not favoured by button manufacturers due to brittleness and colouring factors. In general, according to button distributors, most of the shell substitutes are considered inferior to trochus for reasons of brittleness or uneven texture and thickness.

In summary, **substitutes for trochus buttons will be an important consideration in the future and will probably cause considerable price variations. It is unlikely, however, that competition from these alternatives will lead to a collapse in the demand for trochus.**

4.3 Effects of tariffs and trade blocks

The present tariff structures give only a very small advantage to the Pacific Island countries relative to other developing trochus processing countries (e.g. China and Indonesia). All developing countries have a slight advantage over Korea and Japan in the European market. Overall, however, the tariff structure does not alter significantly the existing comparative advantage amongst producing regions.

With respect to the General Agreement on Tariffs and Trade (GATT), the present special preference accorded to the Pacific Islands is so small in the trochus trade that the impact of preference erosion is likely to be insignificant. In overall terms, however, because of its anticipated trade stimulation effect, GATT should have a positive impact on trochus trade.

4.4 Environmental concerns

Environmental concerns may have a significant effect on the future demand for trochus products. Conraths and Schroeder (1995), in a study of the trochus trade in Italy, state the following:

'In the last ten to twenty years people of the industrial countries have become more and more aware of their responsibility towards the preservation of natural resources and protection of their environment. This consciousness is growing stronger and spreading to other countries. Concerning the trochus product, it cannot be ignored that a living animal has to be killed for production. Most of the consumers who can afford to buy high quality clothes, fitted with real mother-of-pearl buttons, belong to countries where this awareness was born.'

The above study pointed out that at least one designer in Italy had stopped using trochus buttons altogether due to environmental concerns. The present United States survey, involving nine leading fashion designers, also indicated some environmental sensitivity among designers. **Environmental concerns may therefore become a future factor affecting the demand for trochus.**

5 Opportunities

5.1 *The export of raw trochus versus processing*

Several Pacific Island countries have adopted export restrictions as a way to encourage domestic processing. These are summarised in Table 5.

Restrictions on the export of raw supplies result in a reduction in the number of buyers competing for trochus supplies. This may result in lower prices to fishers than would otherwise happen under open competition, while factories obtain their trochus supplies at considerably less than prevailing market prices. It has been stated that trochus export bans result in village fishers subsidising urban factories. This policy is also likely to be a major contributing factor to the overcapacity problem experienced by local processors (see below).

The majority of the trochus processing operations established in the Pacific Islands have failed: 18 out of the 33 formed since 1950 no longer operate. Interviews with several individuals involved in those unsuccessful operations reveal that the

Table 5: Restrictions on the export of raw trochus (mid-1995)

Country	Restriction	Exemption	Recent raw reports
Fiji	Schedule 8 of Customs Regulations 1986 specifies a ban on the export of unprocessed trochus shells. Formerly, trochus exporters were limited to exporting an amount of raw trochus equal to the amount sold to the processors, but this policy was abandoned in January 1987.	Permanent Secretary for Commerce, Industry, Tourism, and Civil Aviation	In 1993 and 1994, 110 t of unprocessed shells were exported.
Vanuatu	Cap 158 Regulation 17 states that no person shall export trochus except with the written permission of the Minister. The policy is to discourage the export of unprocessed trochus. Raw trochus exports are taxed at 15%. The rate for processed trochus is 3%.	Minister of Agriculture, Forestry, Livestock and Fisheries	In 1992, 103 t were exported. Subsequent raw trochus exports included with processed trochus in customs statistics.
Solomons	30% tax on unprocessed trochus exports, none on button blanks.	Minister of Agriculture and Fisheries	In 1993 and 1994 about 90 t of unprocessed trochus were exported.
FSM	None at present. In Pohnpei State legislation was recently submitted (but not yet considered) restricting the export of unprocessed shell.	Pohnpei Director of Commerce and Industry	In 1994, 251 t were exported, all but 15 t raw.
French Polynesia	Deliberation No. 93-133 limited the export of raw shell in the period December 1993 to July 1994 to 50% of the harvest. Since July 1995, 100% of the harvest must be processed locally.	No exception possible other than the Territorial Assembly changing the law.	17 t exported raw in 1994; 10 t exported raw in the first half of 1995.

Sources: Local fisheries office and industry

most common cause of failure has been inadequate supply of raw material or the related problem of industry over-capacity.

The size of a trochus processing operation in the Pacific Islands is usually given in terms of the most important piece of equipment, the blanking machine. The number of these machines largely determines the number of workers, the physical size of the factory and raw product requirements.

The managers of processing facilities contacted in the region operated factories ranging from 2 to 21 blanking machines, with an average of 11. Smaller operators cited the poor availability of raw product as a reason for their choice. Larger operators mentioned overly optimistic assessments of resource availability, which in some cases led them to acquire the assets of failed companies. The number of blanking machines used at present is therefore not a reliable indicator of optimal factory size. According to the managers surveyed, **a processing facility with 10 to 12 blanking machines would result in the most efficient operation.**

A blanking machine requires about one tonne of raw trochus per month at full operation. Allowing for maintenance and repair, an optimal-sized trochus factory in the region would require an estimated 120 t of raw trochus per year. An inspection of the annual trochus harvest in Table 1 gives an indication of the existing over-capacity. It can be seen that in only five Pacific Island countries (FSM, Fiji, New Caledonia, PNG and Solomon Islands) is the average annual harvest greater than the 120 t/year required for an optimal-sized factory. **In many countries, the processing capacity greatly exceeds the available resource.** In Fiji, for example, there are 65 blanking machines in operation requiring an input of 702 t of raw product annually. The average annual harvest is, however, only 271 t, of which 200 t are available for local processing.

The resulting over-capacity problems and the relatively small number of workers employed in trochus factories in the Pacific Islands (213 people) compared to the large number of trochus harvesters, suggests that protecting the trochus processing industry by limiting raw product exports is not justified in the region. This policy tends to create inefficiencies in the industry, and contribute to oligopsonistic² control over producers' prices—particularly given the small number of factories operating in each country. **It is therefore recommended that industry protection be removed over the long term.**

It is important to note, however, that Pacific Island countries harvest around 59 per cent of the world's supply of trochus. A lift of the current export bans would likely depress global prices. If

further analysis can confirm that the demand for trochus is relatively inelastic, a coordinated policy of restricting the supply of raw trochus among producing countries would likely be beneficial to the region as it would help keep world prices high. The optimal mechanism for such a regional initiative needs to be examined carefully. Restrictions in the supply of only raw trochus, as seen above, may result in higher prices, but disproportionately benefit the processing industry. **A more appropriate mechanism would be the imposition of a tax, harmonised across the region, and applied at the same rate for both raw supply and processed products.** In order for the tax to be effective in the long run, careful coordinated action by major Pacific Island producing countries would be required to ensure compliance at the ports of export. In addition, the impact of substitutes and competition from other producing countries (e.g. Australia or Indonesia) would need to be assessed carefully, as it could erode the region's comparative advantage. The optimal export tax should be set at a rate that would optimise world market prices. The tax on processed products could be phased in over time to allow processors in the region to adjust to the new regime.

5.2 Improvements in management

There is growing recognition that the management of trochus, or any other of the inshore fisheries, cannot be done exclusively by central government authorities. Substantial local community input is necessary for effective management regimes. The central feature of this approach is that communities have a stake in the long-term future of the resource. Community involvement in trochus management and other activities which engender a long-term relationship between the harvester and the resource should therefore be encouraged throughout the region.

Trochus is arguably the best managed marine resource in the Pacific Island region. However, some effective management regimes such as the one followed in Pohnpei involve long periods of closure, followed by very short harvesting seasons. These regimes are detrimental to the domestic processing industry due to the high costs of stockpiling, and interest charges on large inventories of raw materials. In countries where trochus processing is being encouraged, long periods of non-availability should be avoided. While local governments should not sacrifice the effectiveness of management regimes to the needs of the industry, there may be scope, for example, for rotating closed seasons to increase the availability of raw material throughout the

2 Oligopsony occurs when there are only a few buyers in the market, tending to result in lower prices to producers.

year. The enforceability of such measures would need to be considered further.

There are other management-related issues affecting industry viability which deserve consideration, namely the size of the shells. There is both biological justification (larger individuals are more fecund) and support from industry (very large shells are poorly suited for blank production) for establishing upper size limits. Despite this, only about half of the trochus producing Pacific Island countries have legal maximum size regulations.

Where there is trochus management by quota, consideration should be given to having the total yield of a harvest compatible with shipping requirements. It is most efficient to ship full containers of trochus and therefore harvest sizes in multiples of 17 t should be considered.

Enforcement of trochus regulations remains a problem throughout the region. There is a need for local Fisheries Divisions to better publicise the existing regulations. The fines for contravening trochus regulations in several countries are also too low to serve as an effective deterrent. For example, the fine for possessing under-sized trochus in one Pacific Island country is US\$ 29.85 or only 0.02 per cent of the value of a shipping container. Anecdotal information further suggests that individuals who have been detected violating trochus legislation are often not prosecuted. These aspects need to be addressed further to improve the overall benefit of trochus exploitation in the region.

5.3 Improvements in the sales of raw trochus

At present, the majority of trochus producing countries in the Pacific do not produce the amount of trochus to support even one optimally-sized factory. The sale of raw trochus by many countries will therefore continue and various mechanisms for increasing the benefit from these sales should be examined. Possible options include increasing the number of buyers and direct sales.

The price paid for trochus domestically appears strongly related to the number of buyers. Efforts to increase the number of buyers bidding for trochus where there are presently few is probably the simplest mechanism to improve local prices. The alerting of international trochus buyers to purchasing possibilities may be facilitated by the contact addresses listed in Appendix A.

Direct sales offer another mechanism for increasing benefit from the sales of raw trochus, albeit on a long-term basis. Much of the world's raw trochus is purchased by brokers based in the producing countries and then resold to processing factories in other parts of the world. Various observers suggested that more benefits would accrue to the exporting countries if trochus were to be sold directly to the factories, cutting out the wholesaler.

The market for trochus in Europe is oligopsonistic, involving one large and a few small brokers. In this situation, it is likely that direct sales could produce substantial benefits to both buyer and seller. In Italy, the prices of direct sales are approximately 34 per cent higher than those offered by local agents. The logistics of direct sales do not appear very difficult. The most convenient shipment size, a 20 foot shipping container, amounts to 17–18 t of trochus which is a manageable amount for a medium/large trochus operation.

Although it is likely that direct sales by Pacific Island firms to factories overseas can result in greater profits, it should be realised that the brokerage firms provide valuable services, such as cementing buyer/seller confidence and establishing regular communications. The latter advantage, however, will tend to become eroded with the increasing availability of fax and Internet communications in the region.

Regular dissemination of price information could help both producers and domestic processors obtain a 'fair' price for trochus. The Trade Promotion Division of INFOFISH, an intergovernmental organisation dedicated to providing marketing and technical information on various fisheries products, would be the most appropriate body to disseminate this information.

The establishment of a long-term business relationship between buyers and sellers is an important step to increase overall benefits to the region. At present, the overseas importers claim many problems in this area. For example, the Italian button manufacturer Bonetti recently stated he has had disappointing experience with Asian and Pacific business partners. A healthy business relationship, in addition to improving prices through confidence, may help overcome more technical constraints.

It has long been stressed that the reliable grading of trochus would have an overall positive effect in the long term. For this to occur, the overseas purchaser must have confidence in the exporter's quality judgements. Speed of supply is another attribute that importers value and are willing to pay for. Some of the smaller processors would also be more willing to purchase directly from Pacific sources rather than through a European-based wholesaler if they had confidence in the Pacific suppliers. In summary, there appears to be substantial potential for improvement in Pacific Island trochus prices based on the development of long-term buyer/seller relationships.

6 Conclusions

Historically the countries of the Pacific have been 'price takers', exercising little control over markets and prices. Because the region produces a large share of the world's trochus supply, the Pacific Islands are in the favourable but unaccus-

tomed position of being able to influence an international market in their favour. To date, this has consisted largely of four major countries (Solomon Islands, Fiji, Vanuatu and French Polynesia) independently restricting trochus exports in order to encourage local processing.

The likelihood of a moderate rise in the consumer demand, together with the establishment of new trochus processing facilities in countries without domestic supplies, suggests that the Pacific Islands' major advantage in the trochus trade, control over a large portion of the supply of raw material, will grow in importance in the near future. It should, however, be noted that Pacific Island government policies on the trochus industry have rarely, if ever, been intentionally formulated to use this advantage in their favour.

A major conclusion of this study is that to maximise benefits from trochus in the future, Pacific Island countries should capitalise on their market share. One possibility would be to impose a trochus export tax at the same rate over both raw and processed products, harmonised across major producing countries.³ The recent history of the region suggests that such an initiative is possible; fisheries cooperation among Pacific Island countries, fostered by the regional organisations, is a striking feature of the region. The US multi-lateral tuna treaty, the agreement over minimum terms and conditions of access, and the regional register of foreign fishing vessels are examples of complex but effective regional cooperation in the sector. It is therefore suggested that the Forum Fisheries Agency (FFA) take a coordinating role in the harmonisation of the trochus industry policies of the main Pacific Island producers. FFA could provide advice on the optimal level of a trochus export tax, encourage consultation among countries before major change in policies are effected, and facilitate the exchange of price and industry information. There may be merit in inviting New Caledonia, a non-FFA member country who is also a major producer of trochus, to participate in these discussions.

The drawbacks of subsidising the domestic processing industry through export bans or tariff restrictions on raw trochus appear to outweigh its benefits. This policy is likely to have contributed to the existing over-capacity of the industry, and lead to lower prices to village producers than might otherwise prevail under open competition. Applying an export tax at the same rate for both raw and processed products would remove the intrinsic subsidy to the industry, while enabling producing countries to capture the tax and preserving the region's control over world prices.

Management regimes for trochus could be improved by adopting best practice approaches that optimise benefits to both producers and processors. Upper size limitation should also be encouraged to prevent growth overfishing and adjust the supply to the needs of the processing industry. There appears to be considerable potential for strengthening buyer/seller relationships between Pacific Island suppliers and end-market retailers. Sales could be encouraged further through the establishment of direct links with international distributors.

Given the small number of buyers involved in the trochus market, the availability of market prices information would be an important benefit to trochus producers. By virtue of their mandate, INFOFISH would be the most appropriate organisation to carry out this task.

7 Summary of major recommendations

The study's major recommendations for domestic producers and processors are as follows:

- Long-term buyer/seller relationships could be fostered further by establishing direct sales with retailers in major end-markets. Major considerations in establishing these links are quality considerations and reliability of supply.
- Prospective processors should analyse carefully the existing capacity, management regimes, and availability of raw supply before investment decisions are taken.

Major recommendations for Pacific Island Governments include:

- Trochus statistics need further improvement to allow, among others, a more precise determination of annual harvest levels.
- In countries where domestic processing is being encouraged, there may be merit in encouraging rotating closed seasons amongst producing regions to stabilise supply and prevent a stockpiling effect on prices. Improved enforcement of existing regulations should also take place through higher fines and effective prosecution.
- Consideration should be given to removing preferential raw trochus restrictions that encourage inefficiencies and over-capacity in the domestic processing industry. Any tax imposed with the objective of increasing the region's marketing power should be har-

³ Prior to its adoption, it would be important to assess the long-term impacts of such a tax in terms of possible substitution effects.

monised across countries and set at an equivalent rate for raw and processed products.

At the regional level, the study's recommendations are:

- The South Pacific Regional Environment Programme, in conjunction with the South Pacific Commission, play a leading role in disseminating to international environmental groups and the public at large the benefits and sustainability of well-managed trochus fisheries to Pacific Island communities, in order to correct possible misconceptions of environmental damage.
- The Forum Fisheries Committee should consider the benefits of having FFA take a coordinating role in the harmonisation of the trochus policies of the main Pacific Island producers, including the provision of advice on a trochus export tax.
- Because of the major importance of trochus price information, consideration should be given to having the Chairman of the Forum Fisheries Committee request INFOFISH to regularly publish trochus price information.

References

- ADAMS, T., C. ALDAN, V. ALFRED, I. BERTRAM, A. BUKURROU, J. CRUZ, T. FLORES, F. ROSA, R. SEMAN & J. TAMAN. (1994). Assessment of the Northern Marianas trochus resource and recommendations for management of the fishery. Inshore Fisheries Research Project, South Pacific Commission, Noumea.
- AMOS, M. (1995). Fisheries resource management and licensing system for newly elected Provincial Governments. Fisheries Department, Vanuatu.
- Anon. (1992). Pêches maritimes et aquaculture: les chiffres de 1990 et 1991. Service Territorial de la Marine Marchande et des Pêches Maritimes, Noumea, New Caledonia.
- Anon. (1993). Division of Marine Resources Annual Report 1992. Bureau of Natural Resources and Development, Koror, Palau.
- Anon. (1993). Fiji Fisheries Division Annual Report 1992. Ministry of Primary Industries, Suva, Fiji.
- Anon. (1994a). Fiji Fisheries Division Annual Report 1993. Ministry of Primary Industries, Suva.
- Anon. (1994b). Bulletin statistique du secteur de la mer. Ministère de la Mer, French Polynesia.
- Anon. (1994c). Pêches maritimes et aquaculture: les chiffres de 1992 et 1993. Service Territorial de la Marine Marchande et des Pêches Maritimes, Noumea, New Caledonia.
- Anon. (1994d). Statistical indicators 1994. National Planning and Statistics Office, Port Vila, Vanuatu.
- Anon. (1995). Trochus harvests in Pohnpei. Division of Marine Resources, Pohnpei, Federated States of Micronesia.
- BERTRAM, I. (1995). The Aitutaki experience in the development of management strategies for the trochus fishery (Cook Islands). In: SPC and FFA Workshop on Management of South Pacific Inshore Fisheries, Vol. 2. Background Paper 34. South Pacific Commission, Noumea.
- BOUR, W. (1989). Biologie, écologie, exploitation et gestion rationnelle des trocas (*Trochus niloticus*) de Nouvelle-Calédonie. Ph.D. Thesis, Academy of Montpellier.
- BOUR, W. (1990). The fishery resources of the Pacific Islands—Part 3: Trochus. Fisheries Technical Paper 272.3, Food and Agriculture Organization of the United Nations, Rome.
- BOUR, W., F. GOHIN & P. BOUCHET. (1982). Croissance et mortalité naturelle des trocas de Nouvelle-Calédonie. ORSTOM, Noumea, New Caledonia.
- CHENESON, R. (1997). Status of the trochus resource in French Polynesia. In: Workshop on Trochus Assessment, Development and Management (1991). Integrated Coastal Fisheries Management Project Technical Document No. 13. South Pacific Commission, Noumea.
- CONRATHS, K. & H. SCHROEDER. (1995). The trochus shell market in Italy in view of the Pacific Islands [report prepared for Icecon].
- DALZELL, P. & T. ADAMS. (1994). The present status of coastal fisheries production in the South Pacific Islands. Working Paper Number 6, 25th Regional Technical Meeting on Fisheries, South Pacific Commission, Noumea.
- DALZELL, P., T. ADAMS & N. POLUNIN. (1995). Coastal fisheries of the South Pacific. Background Paper 30, Workshop on the Management of South Pacific Inshore Fisheries, South Pacific Commission, Noumea.
- DAVID, D. & F. CURREN. (1997). Status of trochus exploitation in Pohnpei State, Federated States of Micronesia. In: Workshop on Trochus Assessment, Development and Management (1991). Integrated Coastal Fisheries Management Project Technical Document No. 13. South Pacific Commission, Noumea.
- DINAS PERIKANAN. (1994). Buku Tahunan Statistik Perikanan Tahun 1993. Pemerintah Propinsi Daerah Tingkat I Maluku.
- DINAS PERIKANAN. (1995). Buku Tahunan Statistik Perikanan Tahun 1994. Pemerintah Propinsi Daerah Tingkat I Maluku.
- FANAFAL, J. (1997). Status of trochus exploitation in Yap State, Federated States of Micronesia. In: Workshop on Trochus Assessment, Development and Management (1991). Integrated Coastal Fisheries Management

- Project Technical Document No. 13. South Pacific Commission, Noumea.
- GILLESPIE, J. (1997). Queensland's trochus fishery. **In:** Workshop on Trochus Assessment, Development and Management (1991). Integrated Coastal Fisheries Management Project Technical Document No. 13. South Pacific Commission, Noumea.
- IANELLI, J. & R. CLARKE. (1995). Current paradigms in trochus management and opportunities to broaden perspectives. Background Paper 15A, Workshop on Management of South Pacific Inshore Fisheries, South Pacific Commission, Noumea.
- ISA, J., H. KUBO & M. MURAKOSHI. (1997). Mass seed production and restocking of trochus in Okinawa. **In:** Workshop on Trochus Assessment, Development and Management (1991). Integrated Coastal Fisheries Management Project Technical Document No. 13. South Pacific Commission, Noumea.
- KATAOKA, C. (1983). The progress of the pearl shell fishery in the South Pacific [in Japanese], Memoirs of the Faculty of Fisheries of Kagoshima University, Volume 32.
- KAILOLA, P. (1995). Papua New Guinea fisheries resources profile. Forum Fisheries Agency, Honiara, Solomon Islands.
- KANEYASU, N. (1995). Study on the trochus market in Asia. Fuji Chimera Research Institute, Tokyo.
- LEQATA, J. (1997). Trochus assessment, development and management in the Solomon Islands. **In:** Workshop on Trochus Assessment, Development and Management (1991). Integrated Coastal Fisheries Management Project Technical Document No. 13. South Pacific Commission, Noumea.
- LEDUA, E., A. SESEWA & A. RAHIM. (1997). Status of Trochus in Fiji. **In:** Workshop on Trochus Assessment, Development and Management (1991). Integrated Coastal Fisheries Management Project Technical Document No. 13. South Pacific Commission, Noumea.
- MAGRO, K. (1997). Resource statement – Western Australia. **In:** Workshop on Trochus Assessment, Development and Management (1991). Integrated Coastal Fisheries Management Project Technical Document No. 13. South Pacific Commission, Noumea.
- NASH, W., T. ADAMS, P. TUARA, O. TEREKIA, D. MUNRO, M. AMOS, J. LEQATA, N. MATAITI, M. TEOPENGA, & J. WHITFORD. (1995). The Aitutaki trochus fishery: A case study. IFRP Technical Document No. 9. South Pacific Commission, Noumea.
- PHILIPSON, P. (1989). The Marketing and processing of pearl shell in South Korea, Taiwan, and Japan. **In:** P. Philipson (ed.) The Marketing of marine products from the South Pacific. Institute of Pacific Studies, University of the South Pacific, Suva, Fiji.
- REIPEN, M. & D. KENNETH. (1990). Economic assessment of the commercial shell industry in Vanuatu. Department of Fisheries.
- RICHARDS, A., L. BELL, & J. BELL. (1994). Inshore fisheries resources of the Solomon Islands. Report 94/1, Forum Fisheries Agency, Honiara, Solomon Islands.
- RICHARDS, A., M. LAGIBALAVU, S. SHARMA, & K. SWAMY. (1994). Fiji fisheries resource profiles. Report No. 94/4, Forum Fisheries Agency, Honiara, Solomon Islands.
- UNDP. (1989). Fishery sector review Papua New Guinea. Project PNG/88/004, United Nations Development Programme, Port Moresby.
- WORLD BANK. (1996). Pacific Island economies: Building resilient economic base for the twenty-first century. World Bank, Washington, D.C., U.S.A.



Appendix A

Useful addresses in the trochus industry

JAPAN

Hirose Craft Co. Ltd (shell buyer)
38-10 Uzaki Kawanishi-cho
Shikigun Nara 636-03
Japan
Tel: 07454 4 0016
Fax: 07454 4 0023

Inana Co., Ltd. (shell buyer)
4-3-18 Daido Tenoji-ku
Osaka 543
Japan
Tel: 06 779 9031
Fax: 06 779 9099

Kiyohara & Co.,Ltd (shell buyer)
4-5-2 Minamikyuhojimachi
Chuo-ku, Osaka 541
Japan
Tel: 06 252 3497
Fax: 06 252 4377

Kobe Trading Co. (shell buyer)
3-8-15-106 Wasaka Akashi City
Hyogo 673
Japan
Tel: 078 924 1380
Fax: 078 924 1381

Kogen Trading Co., Ltd. (shell buyer)
6-17-2 Shinbashi Minato-ku
Japan
Tel: 03 3433 5837
Fax: 03 3433 5836

Koyo Shoji Co., Ltd. (shell buyer)
18-21 Chayamachi Kita-ku
Osaka 530
Japan
Tel: 06 374 2201
Fax: 06 371 4565

Kubota Trading Co., Ltd. (shell buyer)
4-13-10 Imai
Kashihara City
Nara 634
Japan
Tel: 0745 55 2025
Fax: 0745 55 2026

Tomoi Co., Ltd. (button manufacturer)
201 Toin Kawanishi-cho
Shikigun Nara 636-03
Japan
Tel: 07454 4 0066
Fax: 07454 3 1314

Lookwell Co., Ltd. (button manufacturer)
7-4 Horikoshi-cho. Tenoji-ku
Osaka 543
Japan
Tel: 06 779 7771

Iris Co., Ltd (button manufacturer)
1933 Likuka-cho Ota-City,
Gunma Pref. 373
Japan
Tel: 0276 45 3941

KOREA

Imna Mulsan Co., Ltd (button manufacturer)
824, Changnim-dong
Saha-gu, Pusan
Korea
Tel: 051 261 4905
Fax: 051 263 5841

Daochang Co., Ltd. (button manufacturer)
SI Kangnam
P.O. Box 606, Seoul
Korea
Tel: 82 2 544 2020
Fax: 82 2 514 6569

Samguk Trading Co. (button manufacturer)
San 15-5, Suha-ri, Shindun-myon
Ichon-gun, Kyonggi
Korea
Tel: 0336 34 5010
Fax: 02 757 3891

Young Nam Industries
(button manufacturer)
Busan-shi, Kita Kitani-to 1301
Kouk Dong
Korea
Tel: 051 336 1010

Sam Dong
(button manufacturer)
304, Shinseong Bldg.
589-13 Bangwa-dong
Kangseo-gu, Seoul
Korea
Tel: 82 2 756 7080
Fax: 82 2 773 1512

ITALY

Rag. Giovanni Corna
(importer, agent for Hamburgur, UK)
24060 Chiuduno, Via Trieste 46
Italy
Tel: 035 838317
Fax: 035 839263

Terzi Fratelli (importer)
24050 Palosco
Via San Lorenzo 83
Italy
Tel: 035 845461
Fax: 035 846540

Bottonificio Bonetti Francesco
(button manufacturer)
Via Marconi, 20/22 -25030 Rudiano (BS)
Italy
Tel: 030 716115
Fax: 030 716582
Telex 300324 BONETI
also: Via Lavoro e Industria 1200
Tel: 030 716361
Fax: 030 7060143

Buttons s.r.l.
(button manufacturer)
Via Vittorio Alfieri
1-24060 CREDARO (BG)
Italy
Tel: 035 927223
Fax: 035 935203

Plebani Giuseppe & C.s.n.c
(button manufacturer)
Via Franzi
12-24060 Foresto Sparso (BG)
Italy
Tel: 035 930013
Fax: 035 930503

Gritti S.p.A. (button manufacturer)
24050 Grassobbio
Via Zanica 6/F, Italy
Tel. 035 586111
Fax 035 586112

Mauro Gaspari
(President of Italian button producers, 1995)
G. Gaspari Bottoni s.r.l.
24060 Chiuduno, Italy
Via Pizzo Camino 1
Tel: 035 838401
Fax: 035 838786

Italian Foreign Trade Center
00100 Roma, Italy
Via Liszt 21
Tel: 06 59921
Fax: 06 59926899

SIBA
International Exhibition of Buttons, Raw
Materials, Machinery and Related Items
29100 Piacenza, Italy
Via E. Parmense 17
Tel: 0523 593920
Fax: 0523 62383

CHINA

Buyoung (Dong Guan) Button Factory Co., Ltd.
(button manufacturer)
No.3, Industrial Zone, Quing 11 town
Dong Guan (Guang Dong)
China
Tel: 769 7620 732741
Fax: 769 7620 732472

Hong Kong Office
Block a 9/F, Wah Shing Ind. Bldg.
18 Cheung Shun St
Cheung Sha Wan, Kowloon
Hong Kong
Tel: 7425147 or 7452866
Fax: 7850953 or 7862767

GERMANY

Lüna Design GmbH
(button manufacturer)
Wulwes Str. 12-28203
Bremen
Germany
Tel: 49 421 72210
Fax: 49 421 701407

Shellex Germany GMBH
(shell button manufacturer)
Sudetenstrasse, 15-D-64521
Gross-Gerau
Germany
Tel: 6152 2724
Fax: 6152 3386

SPAIN

Toar S.A. (button manufacturer)
 C/Rosellon 254-Pral.2a-08037
 Barcellona
 Spain
 Tel: 488 29 80
 Fax: 487 84 74
 Telex: 52649 TOAR E

UNITED STATES

Adonis Buttons (button wholesaler)
 39th Street
 New York

Silverstein Pearls (button wholesaler)
 7th Avenue
 New York

Emsig Mfg. Corp. (button manufacturer)
 253 West 35th Street
 New York, N.Y. 10001
 Tel: 212 563 5460
 Fax: 212 971 0413

UNITED KINGDOM

M. Hamburger & Sons Ltd (shell buyer)
 P.O. Box 9, Woking,
 Surrey GU237HB
 England
 Tel: 44 1483 223501
 Fax: 44 1483 224403

British Button Merchants Association
 London
 England
 Tel: 44 171 403 2300

FRANCE

Yves Saint Laurent (fashion designer)
 5 Rue Marceau
 75016 Paris
 France
 Tel: 1 44316400
 Fax: 1 42974880

Note:

The findings, interpretations, and conclusions expressed in this study are the results of research supported by the World Bank, but they are entirely those of the authors and should not be attributed to any manner to the World Bank, to its affiliated organisations, or to members of its Board of Executive Directors or the countries they represent.

For further copies of the report, please contact:

Ms Elizabeth George
 Agriculture Operations Division
 Country Department III
 East Asia and Pacific Region
 The World Bank
 1818 H Street, NW
 Washington DC, U.S.A. 20433
 E-mail: Ebgeorge@worldbank.org@internet

