

**FISHERIES DEPARTMENT**

**SERVICE DES PÊCHES**

**ECONOMIC ASSESSMENT  
OF THE COMMERCIAL SHELL INDUSTRY  
IN VANUATU**

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## SUMMARY AND RECOMMENDATIONS.

### Summary

1. The resources of commercial shells in Vanuatu are relatively small compared to other Pacific countries. Scientific assessments of the respective populations and maximum sustainable yields have not been undertaken and hence accurate information on the potential long-term annual harvests are not available. However, based on current information and knowledge of the industry, Fisheries Department is of the opinion that the current production and export quotas in place are about right (ie, Trochus 75 tonnes per year, Greensnail 20 tonnes per year) and that these should remain in force until such time as scientific research on the stocks have been undertaken and conclude quotas should be amended.
2. The processing and marketing of commercial shells is dominated by Japanese and South Korean companies. The trend in the recent past has been towards moving the semi-processing of shells to the lower-cost labour nations (eg, South Korea & Taiwan) and/or to the countries supplying the raw material. Japan remains the major marketing country for finished buttons with most of the higher valued products actually being processed in Japan. Machinery for the processing of raw shell into blank buttons cannot be done on the same machine but differs according to shell type.
3. The marketing of commercial shells differs according to individual shell types. All Trochus and most of the Blacklipped Oyster shell are processed into buttons for the high quality garment industry. Japanese companies are the leaders in this sector and set the price trends for these products. Greensnail is almost totally consumed by South Korea for inlay material for the highly valued lacquerware furniture industry. All the shell is imported in the raw form and processed by a few local companies for resale by the commercial shell wholesale markets. Supply is very limited (approximately 200 tonnes per annum) and is the most highly valued commercial shell in South Korea.
4. The price for commercial shells varies widely according to type, quality and size. The current price standard for good quality raw shell Free on Board (FOB) from Vanuatu would be as follows,

Trochus	400 - 500 Vt/kg
Blacklip	600 - 650 Vt/Kg
Greensnail	1500 -1800 Vt/Kg
5. Semi-processing of commercial shells have been undertaken in a number of locations in the Pacific over the years, but the track record of success has not been good. Most have failed, mainly due to managerial difficulties and the inability of the operations to support excessive overhead costs when supplies of raw material declined significantly. In Fiji up to five companies were processing shell but now only two or three are actively operating.

The viability of processing commercial shell for button manufacture (ie, Trochus and Blacklip) in Vanuatu is reasonable given sufficient supply of raw material. From the visits to Fiji and South Korea it is estimated that a single small factory will require between 60 to 100 tonnes of raw material per annum for it to be financially viable and paying internationally competitive prices for its raw material supplies.

7. Semi-processing of Trochus in Vanuatu by MSP has been at levels equal to the production and export quotas of 75 tonnes per year. In 1987 MSP purchased 67 tonnes of trochus and in 1988 they purchased about 86 tonnes of raw trochus. It is quoted that this processing is being done in the name of added value to the country whereas unfortunately, in fact, it is estimated that Vanuatu has received a lower total economic return from the venture than it could expect from the export of raw shell. Fishermen have also not received internationally competitive prices for their shell. Current prices paid by MSP to fishermen are between 130 to 140vt/kg. This compares to 400 to 500vt/kg for the export of raw shell.
8. The viability, in terms of added value, of processing Greensnail in Vanuatu for the furniture inlay trade in South Korea is highly suspect. No factory outside South Korea exists for this purpose and given the low volume of product available in Vanuatu and the marketing and processing structure of the industry this is not considered to be a viable venture in Vanuatu. It is considered that Vanuatu would maximise its economic returns to the country and fishermen if shell was allowed to be exported in the raw form direct to South Korea.

## Recommendations

1. Local processing of Trochus and Blacklip shells should be encouraged on the condition that they pay internationally competitive prices for raw shell from the fishermen. Greensnail shell should be allowed to be exported in the raw form.
2. The resources of commercial shell in Vanuatu have yet to be accurately calculated. Scientific research to determine the standing stocks and potential long term annual production levels should be done as a matter of high priority.
3. Based on the current knowledge and understanding of the commercial shell resources and processing industry, local processing of Trochus and Blacklip should be restricted to one single factory. This will allow the factory to be financially viable and give it the ability to pay internationally competitive prices for its raw material supplies. This recommendation should obviously be reviewed upon completion and conclusions of the research work specified in 2. above.
4. A price control mechanism should be implemented to guarantee local fishermen receive a fair return for harvesting commercial shells. This could take the form of either
  - a) Price setting authority or
  - b) First option to buy.

Under a) a body of representatives from Government, processing company and industry would establish buying prices for a term based on current market information on the international price movements for the shell. The aim would be to set a buying price close to that which a fishermen could expect if he exported the shell in the raw form. Under b) Fishermen must first offer shell to the local factory at prices the factory offers and/or the fishermen received from international buyers. If factory declines to buy at the internationally competitive price the fisherman then can apply to export shell in the raw form.

5. Fisheries legislation relating to the capture and export of shells should be reviewed. Production limits by specie by area and by person should be specified. This could be done under the Fish Export Processing Establishment Licences under the Fisheries Act. Provisional production limits for Blacklip should be enacted. Also maximum size limits for some of the shells could be considered to improve the total economic returns to the industry and increase the total spawning of the resource. This has been enacted in some Pacific countries.

## INTRODUCTION

The Ministry of Lands, Minerals and Fisheries has received a number of proposals and requests from companies indicating interest in establishing Shell processing plants in the country. Melanesian Shell Product Ltd, (MSP) is currently the only company engaging in processing trochus in Vanuatu. However, it has been obvious from MSP's operation that divers in the islands are not receiving the best returns for their efforts and that Vanuatu is not achieving the best economic return from the industry. A development option would be to allow for the establishment of another shell factory to compete with MSP for the shell resources. In 1988, the Council of Ministers decided (ref decision 1988/96) to investigate the possible establishment of another Shell factory.

As part of this investigation, the Ministry responsible for Fisheries and the Department of Fisheries commissioned an economic assessment of the shell industry. This was to be done by the Fisheries Department in conjunction with the Department of Industries.

This assessment will explore the operations of Melanesian Shell Products, the resources of commercial shells in Vanuatu, the background to the Shell industry including the marketing and pricing of Trochus, Greensnail and Blacklip, experience of other Pacific Island States in trochus processing and provide recommendations to ensure Vanuatu receives the maximum economic benefit from the industry.

This assessment was unfortunately not well supported by either Department of Industries and Melanesian Shell Products. Some information requested from Melanesian Shell Product either directly or through Department of Industries and Development Bank was not supplied and hence this study took a long time to complete and required extensive overseas contact to obtain industry, market and price information.

## OPERATIONS OF MELANESIAN SHELL PRODUCTS LIMITED (MSP).

The Melanesian Shell Product (MSP) was established in June 1984. About 63% of the shares is owned by the Vanuatu Government through Development Bank and 37% is owned by an expatriate of French origin.

The first two years of its operation concentrated on producing button blanks and exporting them to France where they were made into finished products. The initial objective of exporting finished products overseas did not eventuate because it could not meet the quality standards required by the international market.

### Pricing

The prices offered to local fishermen for raw shells ranges from 130 vatu to 140 vatu per kilo depending on and sizes. This means that MSP would purchase at 140 vatu per kilogram if there was a large quantity of larger shells 11cm to 15 cm in diameter and 130 vatu per kilo for small quantities of smaller shells 9cm to 10cm in diameter.

### Processing

MSP annual processing output is currently at levels which utilises all of the production and export quotas of 75 tonnes per year. Purchases of raw material for 1987 and 1988 was approximately 67 tonnes and 86 tonnes respectively. It is estimated that the total cost of processing trochus into button blanks per month which includes labour and machinery ranges between 600,000 vatu to 800,000 vatu. Total transportation cost of buying raw shells from the islands to the factory is between 50,000 vatu to 60,000 vatu per month.

All processing is confined to producing blank buttons for export. No final products are produced and By-product is not utilised for the production of ancillary jewellery items.

### Marketing

Button blanks are exported mainly to Italy, Korea, Japan and France. The FOB prices were not released by the Company. For reference in South Korea button blank manufactures receive between 8vt to 10vt per piece which relates to an FOB equivalent to raw shell of 1600 to 2000vt per kilogram

### Government Revenue

Government revenue is generated through establishment licence, export duties and dividends. No report on exact figures were received from the company.

## COMMERCIAL SHELL RESOURCES IN VANUATU.

### Trochus

To date very little scientific research on commercial shells has taken place in Vanuatu and thus we have no estimates on the volume of trochus, blacklip or green snail in Vanuatu waters. There are also no available figures on the rate of harvest which will indicate appropriate levels of exploitation.

The Fisheries Department which is responsible for the management of the harvesting and conservation of these marine shells is collecting trochus production data in terms of island production and size. The records for the exploitation of trochus in Vanuatu have been regularly collected since 1966. For the period 1966 to 1982, approximately 1,200 tonnes of shell were exported with an average annual production of 75 tonnes.

Exports of unprocessed shell from the country was prohibited unless the shell was surplus to local processing requirements. In 1984 when MSP was established the Government implemented a ban on the exportation of raw trochus shell to protect the local industry. An annual quota of 75 tonnes raw trochus production for the country was also introduced together with a minimum harvesting size of 9 centimeters.

Regarding the ability of the resource to sustain high levels of exploitation for development, the ORSTOM and Fisheries Research section carried out a study on the dynamics and biology of the trochus fishery in Vanuatu waters in 1983. Table 1 overleaf shows the data collected for the exportation of trochus shell by the Vanuatu Cooperative Federation chartered boats from 1976 to 1982 and MSP sources of supply for 1987-1988.

From the records, it showed that there is a significant annual variation in the production of trochus from regions within the country and for the country as a whole. There was difference in annual production of trochus from each island with Banks and Malekula regions supplying between 15 and 25 percent of trochus for export.

Table 1. Source of Trochus supply 1976-1982 and 1987-1988

Vanuatu Cooperative Federation 1976 - 1982			MSP 1987 - 1988	
Islands	Weight (KG)	%	1987	1988 %
NORTHERN			21.3	21.5
Banks	23,573	16.0		
Banks - Torres			2.3	5.5
SANTO REGION	9,033	6.2	32.2	1.4
Ambae	7,343	5.0		
Maewo	1,169	0.8		
MALEKULA	41,306	26.1	15.8	19.4
EPI - SHEPHERDS			3.7	28.0
Shepherds	6,135	4.2		
Paama	5,308	3.6		
EFATE & OFFSHORE ISLANDS	6,913	4.7	9.3	5.6
Efate	688	0.5		
SOUTHERN REGION	6,135	4.2	14.4	18.6
Erromango	13,196	9.0		
Tanna	5,687	3.9		
Futuna	1,421	1.0		
Aniwa	3,175	2.2		
Aneityum	6,848	4.7		
TOTAL	146,863	100.0	100.0	100.0

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(Bour & Grandperrin 1985)  
(Fisheries Research 1989)

The studies on the examination of the growth rates for the wild stocks of trochus was carried out on Efate Island. Growth was described from data provided by tag/recapture information for trochus released to their natural habitat on the Island. Bour and Grandperrin in their study on the growth of trochus in Vanuatu in 1985 showed that trochus grows rapidly in the earlier part of their life cycle and attain 9cm in diameter (the minimum legal size for harvesting) in just over three years. The growth tend to be slower after that so that it takes 6 years to reach 13cm in diameter. After this growth rates are very slow and it takes 12 to 13 years for a trochus to grow to 15cm in diameter.



In Vanuatu information on the length of time it takes for trochus to be sexually mature is not precisely known. However, it is known that from studies undertaken in New Caledonia, trochus are sexually mature when they are just over 5.5cm in diameter. For Vanuatu a figure of 6cm could be expected to be the size of sexual maturity. The age of the shell at this time is approximately 2 years old.

## Greensnail

Greensnail has not been intensively researched in Vanuatu or in any other Pacific country and therefore our knowledge and understanding of the biology and life cycle of the shell is very limited. This also applies to Blacklip and a great deal of research is required on both these shells before we are able to develop comprehensive management regimes on the exploitation of these shells.

Greensnail can grow to in excess of 20cm in diameter and weigh over 2kgs. The shell is not ~~Pacific-like trochus~~ and Blacklip and is exploited in only a few countries including PNG, Solomons and Vanuatu. It is also found in some Southeast Asian countries such as Burma, Indonesia and the Philippines.

Greensnail tend to habit the seaward reef slopes in shallow water down to about 15 metres. They are nocturnal in nature and feed on the algae growing on the reef. No definitive work has been done on age, size and sexual maturity. However from work done by the Japanese in Okinawa and observations made by an SPC Scientist in Vanuatu in the early 1960's the size at sexual maturity is expected to be between 13cm and 16cm in diameter. The age of the shell at this size could be about 10 years old.

The current minimum legal size for harvesting Greensnail in Vanuatu is 15cm in diameter. This is very close to the estimated size at sexual maturity and considering that the shell takes around 10 years to grow to this size the stock is very liable to be fished out quickly and therefore very strict quantity management controls must be enforced to avoid the stock being rapidly depleted. This in fact has happened in many countries where there has ready access to the resources.

## BACKGROUND TO COMMERCIAL SHELL INDUSTRY

### TROCHUS

Trochus is principally used as raw material for the manufacture of shell buttons. Around 25 per cent by weight of shell is provided by Pacific Island countries. The following Table shows the amount of Trochus exported by various countries for the years 1980 to 1987.

#### Trochus Shell Export (Tonnes)

	1980	1981	1982	1983	1984	1985	1986	1987
Indonesia	1456	1221	1501	1438	1907	2132	1568	
Philippines	174	204	159	272	223	151	224	
Solomon Islands	370	400	273	393	534	500	662	445
New Caledonie	1012	724	435	241	206	518	305	
French Oceania	161	186	23	73		43		
Fiji	316	191	206	353	324	237	234	250
Cook Islands		200		36	46			45
Vanuatu	54	49	59	18	17	18		

( Philipson 1987 )

Since the ban in 1986, Vanuatu has not exported any raw trochus shell as an measure to support the local button blank processing industry.

The major buyers of trochus shell are now South Korea and Japan. In 1987, South Korea imported 1,722 tonnes and Japan 1,014 tonnes of trochus shell. This compares to 1984 where South Korea imported 1,556 tonnes compared to 2,018 tonnes for Japan.

### Processing

Button blanks are semi-processed products of Trochus shell. These are produced after the shell rings are cut using a special machine with a diamond cutting ring. Once the blanks are produced, they are sorted for blemishes.

It is estimated that a factory will need Ten (10) tonnes of raw shell to produce one (1) tonne of button blanks. One tonne of raw shell will produce approximately 200,000 button blanks.

Shell button or blank processing enterprises have been set up at a number of locations in the region over the years, but with the exception of a few (including Vanuatu) all have failed. In the Forum Fisheries Agency analysis of the reasons for the failures it was expressed that these were due to lack of managerial ability and the inability to support overheads due to the limited and reducing supplies of raw shell.

From information obtained from various sources in Fiji and South Korea, Trochus blank processing factories require a supply of raw material exceeding 5 tonnes per month for such factories to be viable. The major cost elements in cutting button blanks are labour and the cost of the machinery. Factories with more efficient machinery and labour having a higher total production will in general be able to offer better raw material supply prices. Efficient button blank processing plants in Korea about the size of MSP were processing approximately 200 metric tonnes of raw material and currently pay in excess of 4,000 USD per tonne for raw trochus shell.

## GREENSNAIL

### Marketing

Greensnail has been commercially exploited in the Pacific from Vanuatu, Solomon Islands and Papua New Guinea as well as by South East Asian countries such as Indonesia, ~~Burma~~ and the Philippines. Due to the shell being a very slow growing animal stocks of Greensnail have rapidly diminished and hence supply is now very limited.

The major market for Greensnail is South Korea for inlay material of furniture lacquerware and jewellery. The nacreous shell of greensnail is the most highly prized shell for inlay work and hence attracts a premium over all other shells. South Korea therefore is estimated to account for in excess of 90% of total global consumption of greensnail. Current estimates suggests that approximately 200 tonnes of greensnail is imported and consumed in South Korea and Vanuatu supplies 10% of this volume.

### Pricing

Greensnail is the premium commercial shell and prices paid for the shell reflect this standing. Current FOB prices for good grade product range from 15,000 to 18,000 USD per tonne. Towards the end of 1988 and early 1989, there was a severe shortage of greensnail for inlay work which pushed FOB prices up to around 30,000 USD per tonne. Prices for greensnail can be expected to remain in excess of 15,000 USD per tonne FOB for good quality product with wide fluctuations following periods of high demand and or low supply.

### Processing

Greensnail is almost all used for shell inlay for furniture lacquerware in South Korea. The processing of greensnail is very specialised and not similar to either Blacklip or Trochus. Machinery used to cut and then slice the shell is very technical and costly. In South Korea there are only a few factories processing greensnail with no factories operating in any of the countries supplying the raw material.

## BLACKLIP

### Marketing

The Blacklip pearl oyster predates trochus shell for raw material for button manufacture. Exploitation from the Pacific dates back to the mid 1800s whereas trochus has only been utilised since the 1930s. The table below shows major exporting countries for Blacklip.

Blacklip Exports 1980 - 1987								
	1980	1981	1982	1983	1984	1985	1986	1987
Indonesia	555	770	601	585	449	323	388	
Philippines	381	278	252	292	245	99	137	
P N G	8	5	1	13	6	4	5	16
Solomon Is.	7	9	26	20	46	17	38	39
Fiji	13	35	7	11	13	10	12	23
Cook Island	11	35	46					

( Source : Philipson 1989 )

The major importers of Blacklip shell are Japan and South Korea. In 1987, imports of Blacklip into Japan totalled 737 tonnes with South Korea importing 477 tonnes respectively.

### Pricing

Blacklip oyster shell a relatively high price and is directly related to shell size. Top grade shell from the Cook Islands can expect to obtain prices exceeding 8,000USD per tonne. Raw shell from Vanuatu can expect prices (quoted by buyers in South Korea) ranging from 6,000 USD to 6,500 USD per tonne. Blacklip oyster shell generally attracts a 30 % margin on top of prices offered for Goldlip oyster shell.

### Processing

Blacklip oyster is utilised mainly to produce buttons but is also used in small quantities for furniture inlay work.

For button manufacture Japan still appears to be the major nation producing the final product. Raw material supplies to Korea tends to be mainly semi-processed and button blanks re-exported to Japan for final processing.

The machine used to cut button blanks from Blacklip shell is not the same as for Trochus. Blacklip blanks are cut by a vertical drilling machine which require per machine quantities exceeding One tonne per month for it to be economically efficiently operated.

## EXPERIENCE OF OTHER PACIFIC ISLAND STATES IN TROCHUS PROCESSING.

### FIJI

Trochus industry is encouraged by the Government of Fiji for revenue generation to the country. Raw shell, button blanks and buttons are all exported to overseas markets with no quotas being imposed on them.

#### Marketing

During the period 1985 to 1987 it was estimated that of all the trochus collected, 60% was sold to local trochus industries and 40% was exported as raw shell. In 1988 it was estimated that local processing accounted for 200 tonnes of production and exports in the raw form totalled 400 tonnes. Scraps, button blanks and buttons are exported mainly to Japan and South Korea.

The FOB prices for button blanks to overseas markets was not known by those interviewed, however, for raw shells FOB price was 5,700 USD per tonne.

#### Pricing

The prices of raw shell varies according to sizes and quality. Currently prices being offered to the fishermen are as follows.

Grades	Sizes (cm)	Prices (USD/Kg)
1	9	\$4 - \$5
2	8 - 8.5	\$4
3	7 - 7.5	\$3.50

The prices offered by the local processors for buttons manufacture was reported to be the same as for the purchase for the export of raw shell.

Trochus meat is also being sold in the smoked form. There is no reports of export of trochus meat, but currently the local prices for trochus meat is between \$1.60 - \$2.40 Fiji per kilogram.

#### Processing

There were up to five companies that were engaged in processing trochus into semi-processed and finished products. Three other companies trade in purchasing trochus and exporting them in the raw form to foreign markets mainly South Korea and Japan. From visits to the processing factories and discussions with the supervisors and managers it is apparent that they are not receiving sufficient shell for the factories to remain financially viable. About two thirds of the shell harvested is exported in the raw form. As a result of this many factories are reviewing their investment in shell processing including looking to process other shells than Trochus and withdrawing from the industry. The number of factories processing Trochus has reduced markedly over the last few years and currently there appears to be only 2 or 3 actively processing Trochus.

## Management Regime

1. Minimum size restriction. These are intended to prevent the harvest of immature trochus. A minimum size of 4.0 inches (10cm) is prescribed in the Fisheries Regulations.
2. Closed seasons. These usually cover the summer spawning season.
3. Raw shells for export and shell for processing by local factories are required to be licenced and are subject to inspection by Fisheries Division.

## Government's Future Management Policy

1. An overall export quota for Fiji of between 500 and 600 tonnes is about to be imposed.
2. Further investment encouraged. not
3. Consideration is being given to measures to limit quantity of raw shell export and mechanisms to sustain high price levels for local fishermen. Licencing of exporters is also under evaluation.