SHRINKAGE AND WEIGHT LOSS OF NINE COMMERCIAL SPECIES OF HOLOTHURIANS FROM FIJIAN WATERS

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Introduction

In Fiji, several species of beche-de-mer (or sea cucumbers) are traditionally used for food; they include *Holothuria scabra*, *Holothuria atra* (**loliloli**), *Stichopus chloronotus* (**tarasea**) and *Bohadschia* spp. (**vula**). *Holothuria scabra* specimens can either be eaten fresh, marinated in lemon juice and salt or cooked in coconut milk. Other species are also prepared by cooking them in coconut milk for a few hours. *Holothuria atra* is sometimes fermented for a few days before marination or before it is cooked in coconut milk.

At present, 15 species of beche-de-mer are exported in dried form to Hongkong, Singapore and Taiwan, although Hongkong is the 'traditional' market.

Beche-de-mer have historically been important to Fiji. They replaced sandalwood to become Fiji's main export in the early 19th century. By 1840 stocks of beche-de-mer had been depleted to levels where it was non-economic to harvest them.

In the early part of the century, the beche-de-mer trade started to pick up again. But the trade was interrupted during the Second World War. In the 1970s, production was never more than 30 t but in 1984 beche-de-mer exports began to increase dramatically. In 1987 alone, over 600 t of beche-de-mer were exported. The marked increase in exports can be attributed to several factors, such as an increase in the number of species exploited. Currently about 15 commercial species are exported compared to the 2—3 species traditionally exported. New trade links between Hongkong and mainland China also provide new markets for beche-de-mer. In addition, many people in Fiji have become interested in the industry as a quick source of cash and 27 exporters were registered at the Fisheries Division in 1988.

However, the increase in beche-de-mer production has led the Fisheries Division to introduce guidelines on minimum size limits for beche-de-mer so that some degree of control can be exerted over exploitation of the resource. Since the animal shrinks during the process of cooking and drying, it was essential to determine the shrinkage and weight loss of beche-de-mer after processing, to enable the Fisheries Division to establish minimum size limits for dried products. The shrinkage rate would also be used to tell fishermen the minimum size of beche-de-mer to harvest from the sea, so that when dried, they would be greater than the minimum size allowable for export.

Method

Nine species (*Microthele nobilis*, *Microthele fuscogilva*, *Holothuria atra*, *Actinopyga miliaris*, *Thelenota ananas*, *Holothuria fuscopunctata*, *Stichopus chloronotus*, *Stichopus variegatus* and *Actinopyga mauritiana*) were collected from Suva Reef. In the field, the length of each individual was measured dorsally from the mouth to the anus. Each individual was tagged and

placed in a labelled plastic bag. Then they were all transported to the laboratory where they were weighed individually. Eviscerated specimens were excluded from samples.

Three major processing stages—boiling, smoking and drying, as outlined in the SPC Handbook *Beche-de-mer of the tropical Pacific*—were used. The boiling stage varied for each species but was within a range of 30—60 minutes. All species were smoked for approximately 48 hours and sun-dried for 3—4 days.

Results

The summary of results is presented in Table 1.

Table 1. Summary of results showing mean percentage weight and mean shrinkage of nine commercial species of beche-de-mer after processing (n = sample size)

Species	No.	Mean per cent Wt ± SD	Mean per cent shrinkage rate ± SD
Microthele fuscogilva	30	9.8 ± 2.6	52.5 ± 6.3
Microthele nobilis	6	8.1 ± 1.9	55.3 ± 6.3
Actinopyga miliaris	30	9.7 ± 4.5	52.3 ± 8.9
Holothuria atra	30	7.7 ± 3.5	47.7 ± 8.4
Thelenota ananas	12	5.6 ± 0.6	35.9 ± 2.1
Holothuria fuscopunctata	30	9.3 ± 2.9	50.1 ± 5.1
Stichopus chloronotus	37	2.7 ± 0.7	32.4 ± 3.8
Stichopus variegatus	7	3.9 ± 1.1	33.6 ± 3.9
Actinopyga mauritiana	30	4.9 ± 1.1	45.7 ± 5.0

Results showed that all species of holothurians processed had a very high weight loss and very high shrinkage rate. *Stichopus chloronotus* had the highest percentage weight loss of 97.3 ± 0.7 per cent and also the highest shrinkage rate of 67 ± 3.8 per cent.

Stichopus variegatus, *Thelenota ananas* and *Actinopyga mauritiana* had a very high weight loss and shrinkage rate when compared with other species processed.

Microthele fuscogilva, had the lowest mean percentage weight loss (90.2 ± 2.6 per cent) while *Microthele nobilis* had the lowest mean shrinkage of 44.7 ± 8.9 per cent.

Discussion

In general, the results of this study (see Table 1) indicate that the majority of species of holothurians processed had shrunk by almost 50 per cent. This suggests that the length of the dried beche-de-mer represents half the length of the live animal. Thus, there is a considerable reduction in the length of holothurians during processing.

In contrast, the weight of the dried product would be approximately 10 per cent of the live animal. The variable weight may not be practical for resource management but will be a useful measure for approximating equivalent dried product for those exporters who are currently purchasing live animals for processing.

The relatively high loss of processed beche-de-mer is mainly due to the removal of guts and the high water content lost during gutting, smoking and sun-drying.

A comparison of this study and other studies by Crean (1977) and Conand (1979) is shown in Table 2. The results of this study and of Conand (1979) are similar in terms of shrinkage and weight loss for *Microthele nobilis*, *Thelenota ananas* and *Microthele fuscogilva*.

The weight loss of *Microthele nobilis* was slightly higher in Crean (1977) than in Conand (1979) and this study. This could have been due to Crean's very small sample size (n=5) and variable drying period in the different studies.

Table 2. Shrinkage (L) and weight (W) of dried bêche-de-mer as a percentage of the live animal from various studies in the South Pacific (n = sample size)

	Microthele nobilis			*Thelenota ananas*			*Microthele fuscogilva*		
	No	L	W	No	L	W	No	L	W
Crean (1977) Solomon Isl.	5	51.8	6.8	-	-	-	-	-	-
Conand (1979) New Caledonia	70	51.0	9.0	18	38.0	5.0	13	44.0	8.0
This study	6	55.3	8.1	12	35.9	5.6	30	52.5	9.8

In terms of resource management, it is suggested that size limits for individual beche-de-mer species would be easier to implement than weight limits. When imposing the size limit, the 50 per cent shrinkage must be taken into consideration.

It may be possible to give special consideration to species such as *Stichopus chloronotus*, *Stichopus variegatus*, *Thelenota ananas* and *Actinopyga mauritiana*. These species have a much higher shrinkage rate and a recommended 30 per cent shrinkage rate should be taken into account.

It must be emphasised that the size limit obtained from a study such as this can be only used as a temporary measure until research has been undertaken on the reproductive biology and age-maturity-size.

References

Crean, K. 1977. The beche-de-mer industry on Ongtong Java, Solomon Islands. *South Pacific Commission Fisheries Newsletter* 15: 36—48.

Conand, C. 1979. Beche-de-mer in New Caledonia: weight loss and shrinkage during processing in three species of holothurians. *South Pacific Commission Fisheries Newsletter* 19: 14—15.