

Study on the Quality of Beche-de-mer in Trade and Shrinkage of Specimens During Processing

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The beche-de-mer industry in India is a cent percent export oriented industry being confined to south east coast in Palk Bay and Gulf of Mannar in Tamilnadu. Chemical quality of 180 trade samples of beche-de-mer of four sizes collected from the beche-de-mer curing centres of Ramanathapuram district was studied. Moisture ranged from 6.2 to 24.4% and sand content from 0.11 to 20.42% for all grades. Mean values of sand content are for grade 1=3.47%, grade 2=4.50%, grade 3=3.68%, grade 4=6.87%. Sodium chloride was almost constant for all grades at 5.7%. TVBN values ranged from 10 to 78.4 mg%. 44 laboratory samples of different grades were prepared following trade practice and examined for chemical quality. Mean moisture values are for grade 1=13.4%, grade 2=12.44%, grade 3=12.62%, grade 4=12.08% and mean values of sand are for grade 1=0.70%, grade 2=0.90%, grade 3=1.16%, grade 4=2.15%. The percentage of shrinkage of the animals ranged from 56% to 60% for dried beche-de-mer of 7.5 cm size and above.

Hornell (1917) has described the beche-de-mer industry of Tamilnadu, its revival, exploitation, processing and marketing. James (1973) has given an account of the beche-de-mer resources of India. Jacob (1973) has given a description of *Holothurian scabra* which support the beche-de-mer industry of India. The beche-de-mer fishery, season, collection centres, curing practices, proximate composition, defects in curing, percentage loss in curing, export trade and quality inspection are also described (Shenoy, 1977; Durairaj, 1982).

The export of beche-de-mer, a high unit value dry fish item at present is of the order of 40 t on an average against the estimated potential of 150 t per year available in Tamilnadu. The average unit export price realised for beche-de-mer was Rs. 61/kg in 1981 and Rs. 6.60/kg in 1972, more than ten times increase in price over a period of 10 years. No other marine product has increased in price to that extent during this period. There are at present no precise quality standards for beche-de-mer excepting visual examination for insect, mite infestation and shape of the product. A tolerance level of 5% by weight has been fixed for size variations. Beche-de-mer is

inspected for export from July 1978. No specific standards are available for the upper limit of moisture and sand content and to evolve quality standards for beche-de-mer the present study was undertaken. Since the beche-de-mer of lower grades (below 7.5 cm) formed a significant portion for export, studies on size of live and dried ones were also taken up to suggest suitable commercial sizes. Size grades for beche-de-mer in the export trade are,

Grade 1	10.1 cm and above
Grade 2	7.6 to 10 cm
Grade 3	5.0 to 7.5 cm
Grade 4	below 5 cm

Recently Government of India banned the export of beche-de-mer of less than 7.5 cm long to ensure rational exploitation of the fishery and for improving the quality of the product for export. The ban on the export of beche-de-mer below 7.5cm has since been relaxed in favour of pre-ban commitments.

Materials and Methods

To study the quality of the commercial samples, 180 beche-de-mer in size grades 1 to 4 already mentioned were collected and

examined for moisture, ash, acid insolubles, and sodium chloride by AOAC (1960) method and total volatile bases by the method of Conway (1947). For suggesting improvements, 44 samples were prepared in grades 1-4 following the trade practices but with greater care in evisceration, removal of sand and white deposit and sun drying. (These samples are hereafter called laboratory samples). These were also examined for shape, white deposit, shape, and chemical properties as in the case of trade samples (Table 2). The details of length of live specimens and end product, mean values, range and standard deviation (S.D.) are given in Table 3. The percentage loss in weight of beche-de-mer during different stages of processing are given in Table 4.

Results and Discussion

Of the 180 trade samples examined for chemical quality (Table 1) 49 samples were of grade I. The moisture range was 6.4–22.4% with a mean value of 13.12%. Ash content had a mean value of 16.99% in the range of 9.44–26.78%. Acid insolubles ranged from 0.11 to 13.2% with a mean value of 3.47%. Sodium chloride was more or less constant in all size grades (5.7%). TVBN value for grade I had a mean value of 48.11 mg% with a range of 11.6–88 mg%. Mean value for TVBN for all the grades varied from 42.3% to 50.52 mg%. Very little difference in the mean values of moisture for different grades was noticed (12.78% to 13.50%). It is significant to note that mean values for acid insolubles showed an increasing trend with decreasing size of the products. Thus, grade 4 specimens had a sand content of 6.87% (mean) while grade 1 specimens had only 3.47% (mean). Number of trade samples (n) examined under each grade are given in Table 1.

Of the 44 laboratory samples, grades 1 and 2 had 12 nos. each, grade 3 had 11 and grade 4 had 9 nos. As in the case of trade specimens, the moisture variation in the laboratory samples (mean values) between different grades was 12.08 to 13.41%. Although the mean values of acid insolubles for laboratory samples showed an increasing trend with decreasing size of specimens as in trade samples, the mean values for laboratory samples were much lower than those of trade

samples, namely 0.7 to 2.15% as against 3.47 to 6.87% (Table 2). The maximum values of acid insolubles of laboratory samples were 2.44% (grade 1), 2.98% (grade 2), 3.20% (grade 3) and 4.2% (grade 4). The corresponding values for trade samples were 13.2% (grade 1) 18.2% (grade 2), 20.42% (grade 3) and 17.16% (grade 4) respectively. Thus the sand content of trade samples was 3 to 5 times higher than the sand content of laboratory samples. The maximum content of laboratory samples of each grade could be suggested as the maximum permissible limit for sand content for the corresponding grades of trade samples namely 2.5% (grade 1) 3.0% (grade 2) and 3.5% (grade 3) and 4% (grade 4).

The higher mean values of ash content of trade samples, namely, 16.99 to 19.50% were possibly due to the higher acid insolubles present in trade samples (mean values 3.47 to 6.87%).

The slightly higher TVBN values of trade samples (grade 2) may be attributed to the slightly higher mean value of their moisture content. Similar is the case with grade 1 of laboratory samples. An upper limit of 15–20% moisture may be suggested to ensure storage stability.

To restrict the export of grade less than 7.5 cm size, a study on the relationship between live size and the size of its corresponding dried beche-de-mer assumes greater importance. The measurements of live animals has to be done with great care as these animals contract on external stimuli such as contact, jarring, prodding etc. The animal in general shortens during such situations.

A number of tagged specimens were measured before and after curing (Table 3). It is clear that specimens less than 17 cm (grade 3) have generally yielded and products less than 7.5 cm with the exception of three specimens reported under grade 3 where 15 cm specimens also resulted in 7.5 cm size dried beche-de-mer. At the same time sample 1 measuring 20.5 cm under grade 3 yielded a dried product of only 6 cm. Corresponding live sizes for the dried beche-de-mer measuring 7.5 cm and above may be arrived by taking the mean value of shrinkage reported under grade three 59% shrinkage was observed

Table 1. *Chemical analysis of trade samples of Beche-de-mer at different size groups*

	Moisture %		Ash %		Acid insoluble %		Sodium chloride %		TVBN mg%	
	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range
Grade 1 n = 49	13.12	6.4-22.4	16.99	9.44-26.78	3.47	0.11-13.2	5.70	5.5-5.8	48.11	11.6-68.0
Grade 2 n = 51	13.50	6.8-23.8	18.49	9.1-37.6	4.50	0.14-18.2	5.68	5.5-5.8	50.52	10.4-78.4
Grade 3 n = 60	12.95	6.8-22.0	19.50	10-29.89	5.68	0.66-20.42	5.7	5.5-5.8	44.58	10.0-71.2
Grade 4 n = 20	12.78	6.2-24.4	18.94	13.26-34.20	6.87	1.02-17.16	5.7	5.5-5.8	42.3	13.6-76.0

Table 2. *Chemical analysis of laboratory samples of Beche-de-mer of different size grades*

	Moisture %		Ash %		Acid insolubles %		Sodium chloride %		TVBN mg %	
	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range
Grade 1 n = 12	13.41	9.0–22.0	12.35	9.58–19.44	0.70	0.08–2.44	5.7	5.5–5.8	53.05	32.36–116.0
Grade 2 n = 12	12.44	8.2–19.4	14.80	10.5–20.8	09.0	0.03–2.98	5.7	5.5–5.8	45.93	30.4–64.0
Grade 3 n = 11	12.62	9.6–19.0	13.91	10.78–20.0	1.16	0.15–3.20	5.67	5.34–5.77	36.18	25.2–50.0
Grade 4 n = 9	12.03	9.0–16.4	14.33	8.6–19.34	2.15	0.20–4.2	5.7	5.5–5.8	34.67	17.2–45.6

Table 3. *Studies on the shrinkage of holothurians (H. Scabra) during processing*

Grade 1		Grade 2		Grade 3		
Length of fresh holothurians	Length of dried beche- de-mer	Length of fresh holo- thurians	Length of dried beche- de-mer	Length of fresh holo- thurians	Length of dried beche de-mer	
cm	cm	cm	cm	cm	cm	
29	11	24	9	20.5	6	
30	12	23	9.5	21	7.5	
29	11	20.5	9.5	19	7.5	
28	10.5	17.0	8.5	20	7.5	
25	11	18	9.5	16	7	
25	10.5	19	8.5	15	7.5	
30	12	18	8.5	15	7.5	
33	14	20	10	19	7.5	
28	11	19	8	15	7.5	
33	12	20.5	8.5	15	7.0	
35	14.5	19	8.5	16	7.0	
36.5	14.5	19	8.5	17	7.5	
30	12	18	8	17	7.5	
25	10.5	19	8.5	16	7.0	
25	11	25	10	17	7.5	
24	10.5	25	10	16	7.0	
30	11.5	20	8.5	17	7.0	
26	10.5	20	8.0	16.5	7.0	
31	12	19	8.0	17	7.5	
30	12	19	8.5	17	7.5	
Mean	29.12	11.7	20.1	8.8	17.1	7.25
Range	24-36.5	10.5-14.5	17-25	8-10	15-21	6-7.5
S.D.	3.41	1.25	2.27	0.68	1.81	0.37
Shrinkage, % (Mean value)	60%	..	56%	..	59%	

Table 4. *Percentage loss of weight during processing of beche-de-mer*

Wet weight kg	Weight after eviscera- tion kg	No.	Average wet weight kg	Final dry weight kg	Average weight of finished product g	weight loss after drying %	weight loss of dried eviscerated samples %
14.48	8.71	44	0.32	0.92	21.1	93.60	89.37
11.03	5.13	19	0.58	0.52	27.6	95.24	89.78
27.00	13.25	35	0.77	1.35	38.6	94.99	89.82
25.00	12.27	34	0.73	1.25	36.8	95.00	89.82
8.70	4.37	12	0.72	0.39	33.1	95.43	90.92
20.58	9.75	27	0.76	0.99	36.9	95.18	89.78
20.00	9.00	37	0.54	1.00	27.2	94.96	88.82
22.30	9.76	33	0.67	1.14	34.7	94.87	88.27
					Mean	94.91	89.57

in specimens of 7.5 cm and above. So the corresponding live sizes of the animals may be worked out as 18.3 cm. However 8 samples of live size ranging from 15 to 17 cm (reported under grade 3) have also produced dried ones measuring 7.5 cm. Thus it appears difficult to specify the corresponding live sizes for obtaining dried beche-de-mer of 7.5 and above. However, 15 to 20 cm live size range may be suggested from the present study for getting dried products of size 7.5 cm and above. Tagging of more specimens for assessing shrinkage of the animals may be necessary to confirm the commercial sizes of live animals suggested above.

The mean loss in weight of beche-de-mer during curing is 94.91% of the wet weight of the animals and 89.57% of the eviscerated weight (Table 4).

The present quality control inspection for beche-de-mer before export consists mainly of visual examination for appearance, shape, freedom from excessive white deposit, freedom from the mite infestation and tolerance limit for size grades. No quality standards have been prescribed for upper levels of moisture and sand. The survey of the quality of the trade samples of beche-de-mer conducted revealed that sand content in the trade samples was 3 to 5 times higher than that present in the laboratory samples prepared as per trade practice. A maximum permissible limit of 2.5% sand for grade 1, 3.0% for grade

2, 3.5% for grade 3 and 4% for grade 4 are suggested. Upper level of moisture may be fixed as 20% for ensuring good storage stability for beche-de-mer.

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