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## Observations on the Wastage of Raw Material and Recovery of Meat in the Prawn Processing Industry

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The wastage of prawns due to spoilage in processing factories accounted to about 0-12% in 1974, 0-35% in 1975, 0-3% in 1976 and 0-4% in 1977. Spoilage increases with the time lag between catching and processing and also due to defective icing. The paper discusses the counts of whole prawns required for obtaining meat of specified size grades.

The delay in processing the prawns in factories soon after it is caught accounts to considerable wastage owing to spoilage. It is essential to control this phenomenon not only to conserve the material but also to improve the quality of the finished product. Rao & Pillai (1967) have indicated correlation between the occurrence of defective pieces at pre-freezing and earlier stages. The present study conducted during 1974-77 aims at factors responsible for wastage and the counts of whole prawns required for a specified size grade by the processing industry.

### Materials and Methods

Observations on wastage at processing factories, primary processing centres (P.P.C.) and landing centres were made during 1974-1977. About 10% factories in and around Cochin were covered in this study. The number of factories/P. P. C. observed varied between 5 and 17 over the years and the number of observations between 19 and 65. The sources of raw material were the local catches and those brought from the landing centres of east and west coasts. On an average two observations were made per week. When all the selected factories were covered, a second round was made followed by a third one and so on. The quantity of prawns processed each day from morning to noon and the materials spoiled were noted. The percentage of spoiled material by weight was also calculated. To observe the recovery of size grades, about 235 observations on the counts of whole prawns were carried out and the percentage yield by weight of the different size grades obtained

on peeling/cooking and peeling were recorded. Three factories/P. P. C. where regular records of yield in different size grades were kept were also visited.

### Results and Discussion

The main cause of wastage was due to spoilage of the raw material. About 1% lost during washing and handling. There was no wastage during the other stages of processing. Discolouration and damage were noticed but these did not account to any wastage. Table 1 presents the species-wise spoilage by weight (percentage) in factories/P. P. C. during 1974-77. The range of spoilage was observed to be 0-35% in 1975 and 0-3% in 1976. Of the 5 species *Metapenaeus dobsoni* (Poovalan), *Parapenaeopsis stylifera* (Karikadi), *Penaeus indicus* (Naran), *Metapenaeus affinis* (Kazhanthan) and *Penaeus carinatus* (Kara), the first three formed the bulk of the material processed in factories. Spoilage of material reduced from 12.5% and 35% in 1974 and 1975 respectively to 3% and 4% in 1976 and 1977 respectively. Spoilage of 35% was in a small lot of *P. indicus*. The reduction in spoilage during 1976 and 1977 was owing to the payment of the processors to good quality material only and consequent care on the part of the suppliers who started sorting of spoiled prawns at landing centres.

Table 2 shows the percentage weight of the discoloured material. It is clear that discoloured material was more in *P. stylifera* except for 17% in *M. dobsoni* in 1975.

**Table 1.** Combined species-wise spoilage of prawns in P. P. C. and factories

Year	<i>M. dobsoni</i> %	<i>P. styliifera</i> %	<i>P. indicus</i> %	Total %	Observations	P. P. C/ Factories
1974	0-12.5	0-12.5	0- 4.5	0-12.5	19	5
1975	0-12.0	0	0-35.0	0-35.0	40	15
1976	0- 3.0	0	0	0- 3.0	57	17
1977	0- 0.5	0-4.0	0	0- 4.0	65	17

**Table 2.** Discoloured material observed in P. P. C. and factories

Year	<i>M. dobsoni</i> %	<i>P. styliifera</i> %	<i>P. indicus</i> %	Total %	Observations	P. P. C/ Factories
1974	0-11	0-12	0- 7	0-12	19	5
1975	0-17	0-12	0-10	0-17	40	15
1976	0- 6	0-11	0-10	0-11	57	17
1977	0- 4	0- 8	0- 5	0- 8	65	17

**Table 3a.** Mean yield (%) and 95% confidence interval of the size grades recovered from 300 and 400 counts/kg of whole prawns on peeling

Species	No. of lots observed	Count per kg	Size grades recovered per pound	Mean yield %	Standard error	95% confidence interval for the mean
<i>M. dobsoni</i>	19	300	130/200	40.9	2.46	3.57-46.1
			200/300	31.8	1.87	27.9-35.7
			300/500	20.7	2.39	15.7-25.8
			Broken	6.5	0.81	4.8- 8.2
<i>M. dobsoni</i>	17	400	130/200	10.5	1.21	7.9-13.1
			200/300	38.3	1.49	35.1-41.5
			300/500	39.9	2.13	35.3-44.4
			Broken	11.3	1.43	8.3-14.3
<i>P. styliifera</i>	16	300	130/200	31.9	3.34	24.7-39.0
			200/300	44.3	2.67	38.7-50.0
			300/500	18.9	3.67	11.1-26.7
			Broken	4.9	0.87	3.0-6.7
<i>P. styliifera</i>	16	400	130/200	13.8	1.38	10.9-16.8
			200/300	31.7	2.55	26.3-37.1
			300/500	45.7	2.40	40.6-50.8
			Broken	8.7	0.78	7.1-10.4

**Table 3b.** Mean yield and 95% confidence interval for size grades recovered from 200, 250, 300, 350, 400, 450 and 500 counts per kg of whole prawns (cooked and peeled)

Species	No. of lots observed	Count per kg	Size grades recovered per pound	Mean yield %	Standard error	95% confidence interval for the mean
<i>M. dobsoni</i>	10	200	100/200	30.0	8.47	11.2-48.9
			130/300	55.5	7.27	39.3-71.7
			300/500	8.1	3.67	...
			Broken	9.6	3.52	1.7-17.5
-do-	21	250	130/300	57.1	1.97	53.0-61.2
			300/500	29.3	2.69	23.7-34.9
			500 up	4.3	1.50	1.2-7.4
			Broken	8.4	0.79	6.8-10.2
-do-	17	300	130/300	40.1	3.27	33.2-47.0
			300/500	33.3	3.68	25.5-41.1
			500 up	14.4	2.95	8.1-20.7
			Broken	12.5	0.99	10.4-14.6
-do-	10	350	130/300	28.4	3.85	19.7-37.1
			300/500	32.5	4.89	21.4-43.6
			500 up	23.6	3.40	15.9-31.3
			Broken	16.4	2.26	11.3-21.5
-do-	19	400	130/300	19.8	2.44	14.7-24.9
			300/500	37.3	2.54	32.0-42.6
			500 up	29.1	2.73	23.4-34.8
			Broken	13.3	3.21	6.6-20.0
-do-	7	450	130/300	8.6	0.62	7.1-10.1
			300/500	35.1	3.11	27.5-42.7
			500 up	37.9	2.61	31.5-44.3
			Broken	18.3	1.55	14.5-22.1
-do-	7	500	130/300	4.1	1.18	1.2- 7.0
			300/500	35.5	3.99	25.8-45.2
			500 up	36.8	4.39	26.1-47.5
			Broken	23.5	3.13	15.8-31.2
<i>P. styliifera</i>	7	200	100/200	19.8	2.66	13.3-26.3
			130/300	34.5	4.88	22.6-46.4
			300/500	35.9	2.49	29.8-42.0
			Broken	8.0	1.79	3.6-12.4
-do-	20	250	100/200	16.4	2.31	11.6-21.2
			130/300	28.9	1.85	25.0-32.8
			300/500	41.9	2.74	36.2-47.6
			500 up	5.4	2.01	1.2- 9.6
-do-	16	300	Broken	9.3	0.80	7.6-11.0
			100/200	4.2	1.55	0.9-7.5
			130/300	23.0	1.60	19.6-26.4
			300/500	55.9	3.38	48.7-63.1
			500 up	6.0	1.29	3.3- 8.7
			Broken	11.8	0.97	9.7-13.9

Table 3b. (Contd.)

Species	No. of lots observed	Count per kg	Size grades recovered per pound	Mean yield %	Standard error	95% confidence interval for the mean
<i>P. styliifera</i>	21	350	100/200	1.7	0.65	0.4- 3.0
			130/300	17.7	1.74	14.1-21.3
			300/500	55.1	2.54	49.8-60.4
			500 up	13.1	1.35	10.3-15.9
			Broken	12.2	0.75	10.6-13.8
-do-	12	400	100/200	2.1	0.93	0-4.2
			130/300	14.1	2.10	9.5-18.7
			300/500	47.2	2.93	40.8-53.6
			500 up	20.7	1.36	17.7-23.7
			Broken	15.6	1.23	12.9-18.3

Table 4. Counts of whole prawns required in a specified size grade

Size grade required per pound	Count of whole prawns to be used per kg	Species	Expected % yield in the specified size grade
(a) Peeled			
130/200	300	<i>M. dobsoni</i>	41
130/200	300	<i>P. styliifera</i>	30
200/300	300	<i>P. styliifera</i>	43
200/300	400	<i>M. dobsoni</i>	38
200/300	300	<i>M. dobsoni</i>	32
200/300	400	<i>P. styliifera</i>	32
300/500	400	<i>P. styliifera</i>	46
300/500	400	<i>M. dobsoni</i>	40
(b) Cooked and peeled			
130/300	200 to 250	<i>M. dobsoni</i>	56 to 57
130/300	300	<i>M. dobsoni</i>	40
130/300	200	<i>P. styliifera</i>	35
130/300	250	<i>P. styliifera</i>	29
130/300	350	<i>M. dobsoni</i>	28
130/300	300	<i>P. styliifera</i>	23
300/500	300 to 350	<i>P. styliifera</i>	55 to 56
300/500	400	<i>P. styliifera</i>	47
300/500	250	<i>P. styliifera</i>	42
300/500	300 to 500	<i>M. dobsoni</i>	33 to 37
300/500	200	<i>P. styliifera</i>	36
300/500	250	<i>M. dobsoni</i>	29
500 up or 400/600	450 to 500	<i>M. dobsoni</i>	37 to 38
500 up or 400/600	400	<i>M. dobsoni</i>	29
500 up or 400/600	350	<i>M. dobsoni</i>	24
500 up or 400/600	400	<i>P. styliifera</i>	21

No data on *P. styliifera* for counts above 400

Table 3a and 3b give the mean yield in different size grades for a particular count of the whole prawns, 95% confidence interval and standard error for the means. Table 3a presents the figures for peeled prawns and 3b for cooked and peeled. The rate of recovery varied for the two species. For peeled 300 and 400 counts per kg and for cooked and peeled 200, 250, 300, 350, 400, 450 and 500 per kg were used.

Differences in the recovery rate for each size grade and between two species of the same count were examined by t-test. Significant differences were observed with respect to size grades. The differences in the recovery rates of the same species of different counts were studied by t-test and analysis of variance (when the counts exceeded 2.) The differences between counts were found significant.

Table 4 is based on the yields presented in Table 3a and 3b and the results of the tests for significance. The counts for cooked and peeled were grouped on the basis of 'test for comparison among means' as described by Snedecor (1961).

The 'count' refers to number per kg which indirectly specifies the average size of prawns in the lot. But, if the size variability of prawns differs among lots of the same count, it may cause variations in the yield in the same size grades obtained from different lots having the same counts. Variation in rate of recovery among the same species was found to be caused by the differences in the method of peeling.

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