

VARIATION IN TOTAL LENGTH OF FRESH AND PRESERVED BROWN SHRIMP (*PENAEUS AZTECUS* IVES) MEASURED BY TWO METHODS¹

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ABSTRACT

Brown shrimp (*Penaeus aztecus*), measured by placing the rostrum over the zero mark on a measuring scale, showed no detectable changes in total length after being preserved in 10% buffered formalin for 16 weeks. An apparent decrease in length occurred when the preserved shrimp were measured by placing the rostrum against a block on a measuring scale. This apparent decrease was attributed to the flexibility of the rostrum of the preserved shrimp. Between-observer variation in measurements of mean length was greater than within-observer variation. Differences in estimates of mean length obtained by four observers ranged between 1.5 and 3.8% and were not improved by changing the method of measurement.

INTRODUCTION

Length measurements of shrimp are often made on preserved specimens. It is necessary, therefore, to know if the lengths change after preservation. Also, in-

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formation is needed on the variability in length measurements among different observers as well as in those measurements obtained by different methods.

Lindner and Anderson (1956) measured 300 live white shrimp (*Penaeus setiferus*) and remeasured them after they had been preserved in 10% formalin for 1 day, 1 week and 3 weeks. The shrimp ranged from 96 to 170 mm total length (tip of rostrum to tip of telson). Differences in mean lengths of shrimp measured at different times were less than 1% and were attributed to measurement error.

The study reported herein was designed to determine if the information on the effects of preservation developed by Lindner and Anderson (1956) for white shrimp 96 to 170 mm total length was applicable to brown shrimp 25 to 99 mm total length. Additional objectives were to define the variation involved when different investigators measure shrimp, to evaluate two methods used for measuring shrimp and define the variation associated with each method.

EFFECTS OF FORMALIN

Six hundred small brown shrimp, collected with an otter trawl from Galveston Bay, Texas, were kept on ice until their total lengths were measured within 24 hours after capture. They were then preserved in 10% buffered formalin.

The shrimp were divided into three groups of 200 each according to length: 25 to 49, 50 to 74 and 55 to 99 mm. Each length group was then subdivided into five samples of 40 shrimp each and each sample was preserved for 1, 2, 4, 8 or 16 weeks. The same person measured the fresh and preserved shrimp by placing the rostral tip directly over the zero mark on the scale rather than letting the tip of the rostrum come in contact with a block fixed to the measuring board at the zero mark.

Differences in mean length of fresh and preserved shrimp were negligible. The greatest difference was 1.3% (Table 1). We concluded that the length did not change in juvenile brown shrimp preserved as long as 16 weeks in 10% buffered formalin.

TABLE 1

Average lengths (mm, tip of rostrum to tip of telson) before and after preservation in 10% formalin for different periods and percentage differences for small brown shrimp of three length groups

Period of preservation (weeks)	Length group (mm)								
	25-49			50-74			75-99		
	Fresh	Preserved	Difference (percentage)	Fresh	Preserved	Difference (percentage)	Fresh	Preserved	Difference (percentage)
1	34.47	34.62	0.44	54.20	54.07	-0.24	80.42	80.05	-0.46
2	35.52	35.12	-1.13	53.82	53.70	-0.22	81.15	81.15	0.00
4	43.10	43.45	0.81	53.25	53.40	0.28	81.80	82.47	0.82
8	42.57	42.50	-0.16	57.62	56.87	-1.30	88.25	88.32	0.08
16	35.97	36.00	0.08	61.50	62.30	1.30	88.15	87.88	-0.31

VARIATION BETWEEN OBSERVERS IN RELATION TO MEASURING TECHNIQUE

Two samples of 40 shrimp each were used to determine the difference in measurements of mean length by four trained observers. All shrimp in each sample were measured while fresh and after 1 week in formalin by placing the rostral tip against a block at the zero mark on the scale.

Differences in mean length of samples of shrimp were greater between observers when determined from preserved samples than from fresh samples (Table 2). The observers noted that they had difficulty in measuring the preserved shrimp accurately because the rostrum had become flexible during preservation and bent easily when placed against the block on the measuring scale. The mean length measured by each observer was shorter after the shrimp had been preserved than when they were fresh (Table 2).

Because of apparent bias caused by the flexible rostrum on preserved shrimp, two additional samples of 40 shrimp each were measured fresh and after 1 week in formalin by the same four observers by placing the rostral tip over the zero mark on a scale. This method apparently eliminated the bias (Table 3); the number of overestimates in mean length were equal to the number of underestimates, using mean length estimates of fresh shrimp samples as the base. The difference in estimates of mean length between observers ranged from 1.6 to 2.9%, whereas the greatest within-observer variation was about 1.2% (Table 3).

In conclusion, (1) differences between mean lengths of fresh and preserved brown shrimp 25 to 95 mm total length were negligible, (2) placing the rostral tip of the shrimp over the zero mark of the scale rather than against a block on the zero mark was an unbiased and rapid technique for measuring shrimp and (3) between-observer variation was greater than within-observer variation regardless of the method of measurement.

TABLE 2

Average lengths (mm, tip of rostrum to tip of telson) of 40 small brown shrimp in each of two samples, before and after preservation for 1 week in 10% formalin, as measured by four observers by placing the rostral tip against a block

Observer	Sample 1			Sample 2		
	Fresh	Preserved	Difference (percentage)	Fresh	Preserved	Difference (percentage)
A	73.47	73.42	—0.07	63.02	62.95	—0.11
B	74.22	73.00	—1.64	63.82	62.85	—1.52
C	74.42	73.05	—1.84	63.97	61.20	—4.33
D	74.57	74.25	—0.43	64.00	63.53	—0.73
Maximum difference (percentage) in mean length determined by different observers	1.50	1.71		1.56	3.81	

TABLE 3

Average lengths (mm, tip of rostrum to tip of telson) of 40 small brown shrimp in each of two samples, before and after preservation for 1 week in 10% formalin, as measured by four observers by placing the rostral tip over the zero mark

Observer	Sample 1			Sample 2		
	Fresh	Preserved	Difference (percentage)	Fresh	Preserved	Difference (percentage)
A	107.70	108.13	0.40	81.54	81.20	-0.42
B	109.57	109.73	0.15	81.67	82.40	0.89
C	107.65	106.60	-0.98	80.55	81.11	0.70
D	110.10	108.83	-1.15	82.21	81.98	-0.28
Maximum difference (percentage) in mean length determined by different observers						
	2.28	2.94		2.06	1.59	

LITERATURE CITED

- Lindner, M. J. and W. W. Anderson. 1956. Growth, migrations, spawning and size distribution of shrimp, *Penaeus setiferus*. Fishery Bull. Fish Wildl. Serv. U.S. 56: 553-645.