On Certain Allometric Relations of the Spiny Lobster
Panulirus polyphagus (Herbst)

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Certain allometric relations of the spiny lobster *Panulirus polyphagus* are derived. While the relation between tail length and tail weight is made for both the sexes together, separate relations are derived for the sexes in the case of tail length versus total length. For conservation and economic purposes, it appears that the under-sized ones are to be released alive.

Spiny lobsters popularly called as rock lobsters are commercially very important in view of its export potential. Of the six species of spiny lobsters recorded off Indian coasts, *Panulirus polyphagus* is the most predominant species off Goa. The same species is reported to be the most prevalent one off Bombay (Anon, 1962; Chhapgar & Deshmukh, 1961; Deshmukh, 1964). The relations derived here are restricted to *P. polyphagus* only. The lobster tails are graded according to their weight before they are packed for export. Difficulties have arisen to find the total length and weight of lobster caught in relation to the tail length and tail weight of the finished products. An attempt has been made by the authors to relate the tail length and tail weight and the total length and tail length of *P. polyphagus* and the results are reported in this communication.

Materials and Methods

340 lobsters were collected from private trawlers at Panaji in 1972. The total length, total weight, carapace length, tail lengthand tail weight were measured.

Results and Discussion

Tail lengths are plotted against tail weights (Fig. 1). Correlation co-efficient (r) was found to be 0.94, suggesting a linear relationship. For the purpose of conversion, a regression line of tail length on tail weight was fitted as follows:

Tail length $= 88.3400 + 0.4104 \times$ (tail weight)

Standard error of the regression co-efficient $= 0.0202$
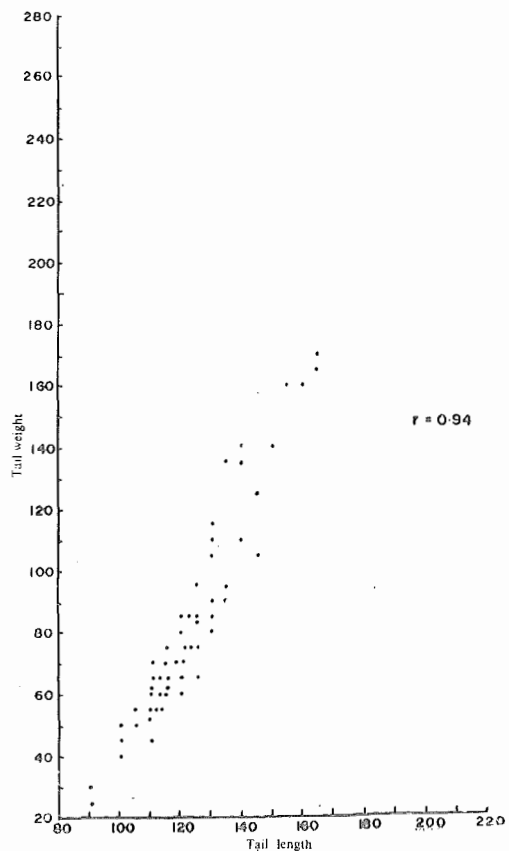

Fig. 1. Tail weight (g) x tail length (mm) of male and female

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Table 1. *Analysis of covariance*

	df	$\lessgtr x^2$	$\lessgtr xy$	$\lessgtr y^2$	Regression co-efficient	Deviations from regression		
						df	ss	ms
Within males	99	29,202.19	52,813.63	102,770.91	1.8085	98	7,254.81	74.0287
Within females	99	52,074.75	85,292.75	144,914.75	1.6379	98	5,214.55	53.2097
						196	12,469.36	63.6191
Pooled, within	198	81,276.94	138,106.37	247,685.66	1.6992	197	13,014.31	66.0625
			Difference between slopes			1	544.95	544.95

$\lessgtr x^2$, $\lessgtr xy$ and $\lessgtr y^2$ are the corrected sums of squares and products. X and Y have usual meanings

Comparison of slopes: $F = \dfrac{544.95}{63.62} = 8.57$ with 1 and 196 df (Significant at 1% level)

Table 2. *Analysis of variance of tail length*

Source	ss	df	ms
Total	85,957.2188	199	
Between sexes	4,680.2813	1	4,680.2813*
Error	81,276.9375	198	410.4895*

* Significant at 0.1% level

Table 3. *Analysis of variance of total length*

Source	ss	df	ms
Total	256,771.18	199	
Between sexes	9,085.52	1	9085.52*
Error	247,685.66	198	1250.94*

* Significant at 1% level

Table 4. *Percentage composition of tail weights of lobsters sampled*

Tail grades	Weight g	Percentage composition
U/1	0– 28	0.826
1/2	29– 56	16.528
2/3	57– 84	55.371
3/4	85–112	15.702
4/5	113–140	4.958
5/6	141–168	2.479
6/7	169–196	0.826
7/8	197–224	0.826
8/9	225–252	0.826
9/10	253–280	1.652
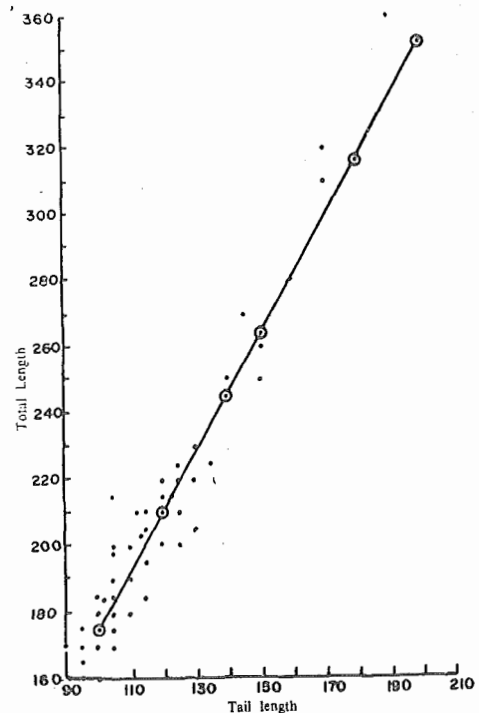
Fig. 2. Total length × tail length (male)

As it was not possible to differentiate the sexes in the finished products at the processing factories, the form of relationship between tail length and tail weight could not be derived separately for male and female. Tail lengths were plotted against total lengths separately for males and females (Figs. 2 & 3). The correlation co-efficients between the two measurements were 0.96 for males and 0.98 for females. As these values were quite high,

analysis of covariance was made with the original measurements to ascertain whether the form of relationship between total length and tail length were the same for both the sexes. (Table 1). The F–value was found significant at 1% level. The slopes of the regression lines therefore are to be considered different indicating that the forms of relationship between total length and tail length, are different for males and females. A combined regression line for males and females would not hold good and individual relations were worked as follows:

Males: Total length= —5.6915 +1.8085 ×(tail length)

Standard error of regression co–efficient = 0.0503

Females: Total length=11.6318 + 1.6379 ×(tail length)
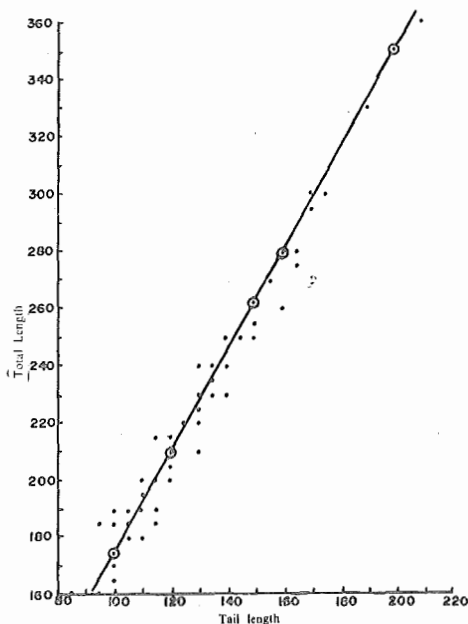
Standard error of regression co-efficient=0.0320

Fig. 3. Total length × tail length (female)

The average total length and tail length for females were 203 mm and 115 mm respectively, while they were 216 mm and 125 mm respectively for the males. From the analysis of variance of tail length (X) and total length (Y), the average tail and total lengths were found significantly different for the sexes. (Tables 2 and 3). This may be due to the difference in growth rates and sizes in the sexes. The grades accepted by the factories and the percentage composition of tail weights of *P. polyphagus* sampled and graded are furnished in Table 4.

The predominant size group, namely, 29-112 g (corresponding to the grades 1/2 to 3/4) constituted 87.6% of the total lobsters sampled. The mode lies in the grade 2/3 and the corresponding weights are in the range of 57–84 g (55.371%). Their tail length taken from the regression lines are in the range of 112–123 mm. The corresponding total lengths of males and females are in the range of 196–216 mm and 195–213 mm respectively. But the tail weight of 29 g and over, that fall under the predominant size group is acceptable to the industry. The tail length corresponding to a tail weight of 29 g is calculated from the equation as 100 mm. The corresponding total lengths for males and females are calculated to be 175.5 mm and 175.7 mm respectively. Apart from purposes of conservation, for economic reasons also larger lobsters are preferred to younger ones, to get better grades of tail. Widening the mouth of the trap will also allow the entry of young ones and consequently in traps, all sizes will be caught. The young ones that are thus trapped are to be released to the water alive.

References

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