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Short Communication

Length-weight relationship of black sea urchin (*Stomopneustes variolaris*) in Sri Lanka

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Abstract: This study attempted to describe the length and weight frequency, and length-weight relationship in the black sea urchin, *Stomopneustes variolaris*, in Sri Lanka. The sampling sites Mount-Lavinia (n=43), Beruwala (n=99) and Tangalle (n=55) were selected from South-west coast in Sri Lanka. The shell length and body weight were measured separately for three sampling sites. The mean length and weight of *S. variolaris* were 5.55±1.04 cm, 101.40±57.76 g; 6.54±0.86 cm, 147.90±50.40 g, and 6.41±1.05 cm, 150.50±59.45 for Mount-Lavinia, Beruwala and Tangalle, respectively. In addition, the length-weight relationship of *S. variolaris* were $W=0.9953*L^{2.6472}$, $W=0.9651*L^{2.6536}$ and $W=1.4665*L^{2.4637}$ for Mount-Lavinia, Beruwala and Tangalle, respectively.

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Introduction

The black sea urchin (*Stomopneustes variolaris*) (Fig. 1) is one of the warm water species found in the Indian Ocean. They belong to the family Stomopneustidae and are distributed in the tropical and subtropical regions of the Indo-Pacific from the East African coast to Samoa and to the Bonin Islands to the north (Giese et al., 1964). They are omnivores feeding mainly on algae and seaweeds. Distribution of *S. variolaris* is limited to a depth up to 18 m (Giese et al., 1964; James, 1982; Kroh, 2014). Of the 28 species of sea urchins found in Sri Lankan seas (Jayakody, 2012), *S. variolaris* is highly restricted in distribution to the Western and Southern coastal areas (De Zoysaa et al., 2016; Jinadasa et al., 2016).

In biological aspects, the growth rate of sea urchins and natural mortality mainly depend on temperature and food availability (Reynolds and Wilen, 2000). Sea urchins accumulate nutrients in the gonads, which is a highly economically important delicacy in the world (James and Siikavuopio, 2011; Salon, 1985; Scheibling and Mladenov, 1987). According to James (1983), this species is the most abundant edible species found in the Indian Ocean such as Lakshadweep Islands, Andaman Islands and Sri Lanka. Apart from the few studies done on the diversity, abundance and their distribution (Jayakody, 2012), very little is known about the biology of Sri Lankan sea urchins. Therefore, this study was conducted to examine the length-weight relationships of the common sea urchin, *S. variolaris* in Sri Lanka.

Materials and Methods

A total of 197 individuals were collected from rocky reefs in Mount-Lavinia (n=43), Beruwala (n=99) and Tangalle (n=55) (Fig. 2) in 2014. All collected individuals were transported to the Institute of Post-Harvest Technology (IPHT), National Aquatic Resources Research and Development Agency (NARA). After that, the total body weights of all specimens were weighed to the nearest 0.01 g. The length of the sea urchin body was determined by measuring horizontal test diameter twice in right angles to the nearest 0.02 mm in all the specimens using a vernier caliper and the two measurements were averaged to obtain the diameter.

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Figure 1. *Stomopneustes variolaris*.

The length-weight relationship was calculated using the $W=aL^b$ equation and after logarithmically transferred form Log W=Log a b Log L. Where W is the weight in g, L is the total length cm, 'a' is the intercept and b are the slope. Both of a and b were estimated by using the linear regression analysis (Le Cren, 1951). All the data were analysed by using the Minitab 16.0 version and the Microsoft Excel 2010 version.

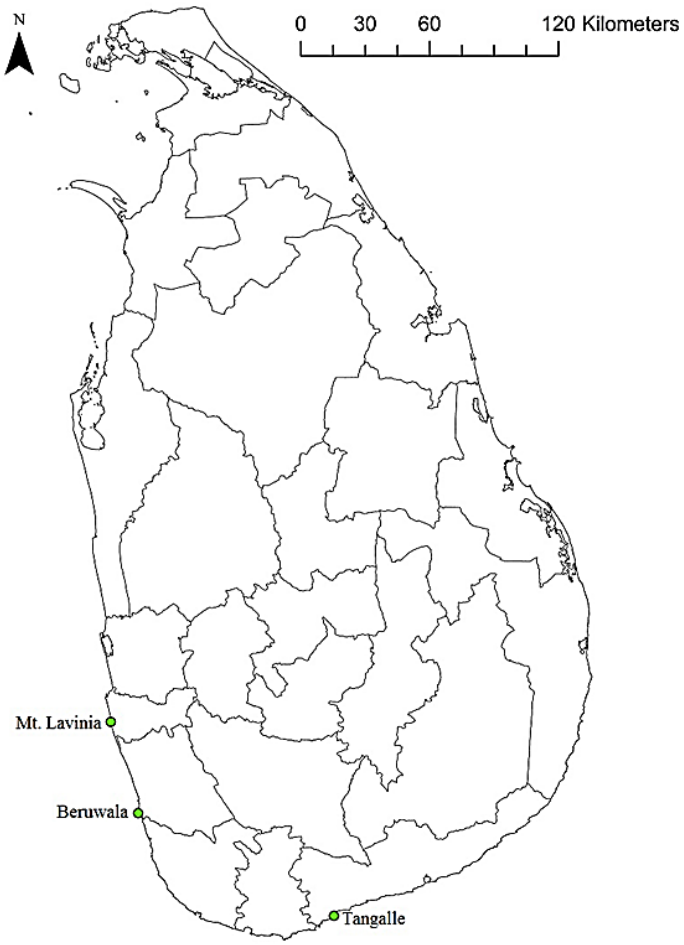


Figure 2. Sampling sites of *Stomopneustes variolaris*.

Results

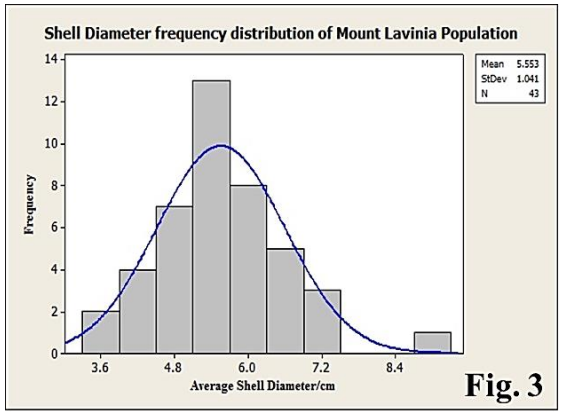
Weight and Average Shell Length frequency distribution: The most common shell length in the sample from Mount-Lavinia reef was 5.4 cm with an average of 5.55±1.04 cm (Fig. 3). The most frequent total body weight in the Mount-Lavinia reef sample was 80 g and the average weight of the sample was and 101.40±57.76 g (Fig. 4). For the Beruwala reef, the commonest shell length was 6.5 cm with the average of 6.54±0.86 cm (Fig. 5) and most frequent weight was 160 g with the average of 147.90±50.40 g (Fig. 6). The Tangalle reef population 6.5 cm was most frequent shell length while the average was 6.41±1.05 cm (Fig. 7) and the most frequent total body weight was 150g with an average of 150.50 ± 59.45 g (Fig. 8).

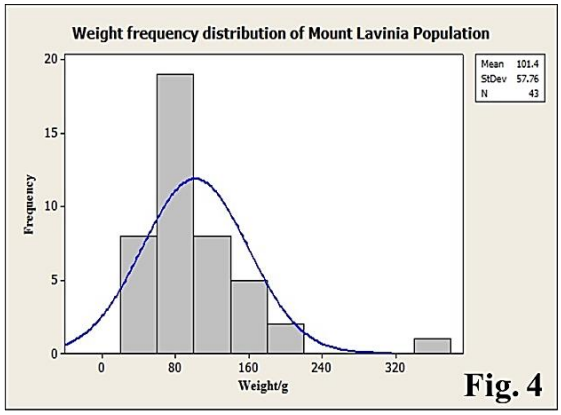
Length-weight relationships (LWR): There was a significant correlation between *S. variolaris* shell length and total body weight ($P<0.05$) for all three sampling sites (Figs. 9, 11, 13). There was significant linear correlation between logarithmic values of shell length and total body weight ($P<0.05$) for all three sampling sites for *S. variolaris* (Figs. 10, 12, 14, Table 1).

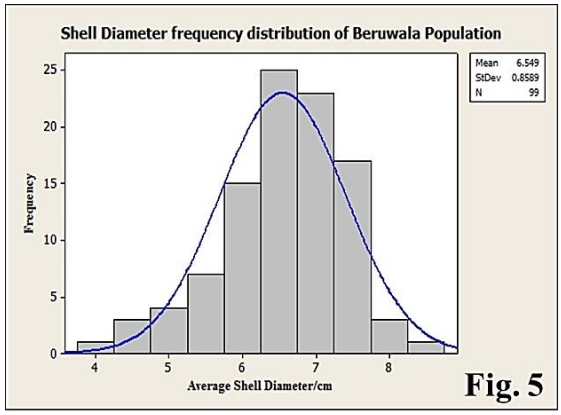
Discussion

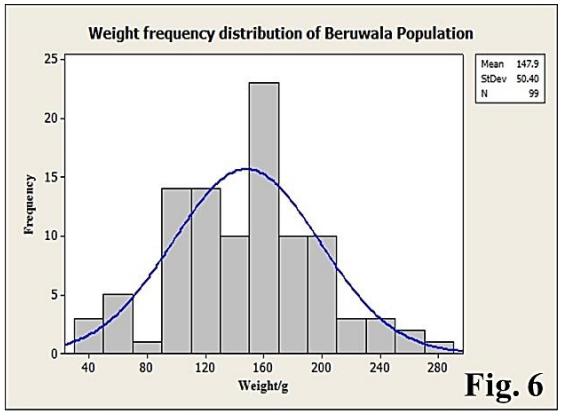
The frequency distribution of shell length and weight of *S. variolaris* reveals that the shell length ranges from 3.30 to 8.90 cm and weight from 30.15 to 346.56 g for all the studied populations. But according to the Smith and Kroh (2011), *S. variolaris* from Visakhapatnam Coast (India) has a maximum shell length of 11 cm.

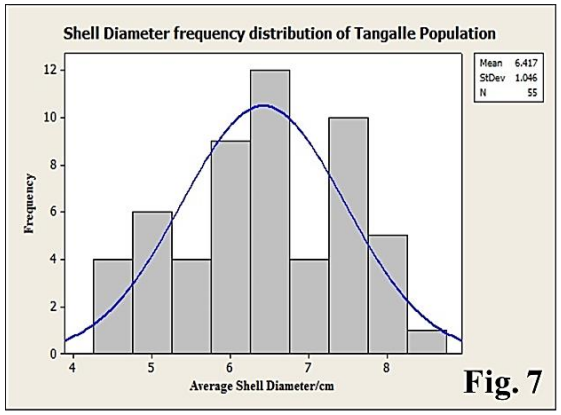
This is the first time a study has been conducted in Sri Lanka to determine the LWR of *S. variolaris*. In fisheries research, the LWR is used as a good indicator, because it gives an idea about well-being,











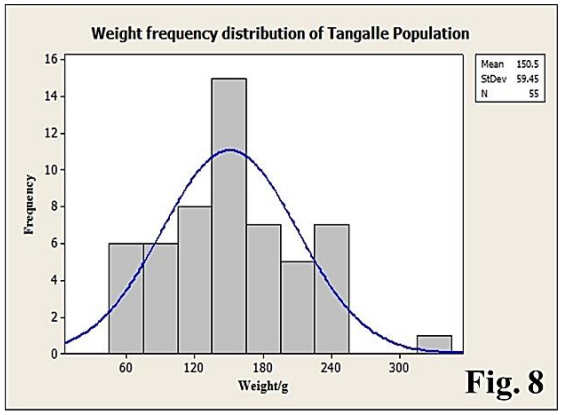
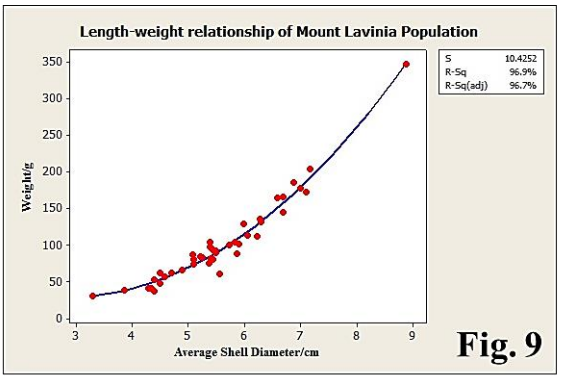


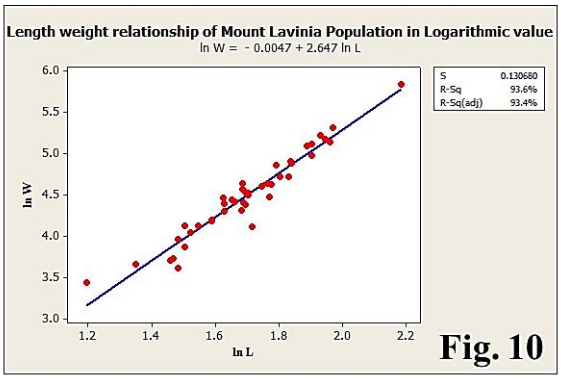
Figure 3. Shell length frequency distribution at Mount-Lavinia reef.
Figure 4. Weight frequency distribution at Mount-Lavinia reef.
Figure 5. Shell length frequency distribution at Beruwala reef.
Figure 6. Weight frequency distribution at distribution at Beruwala reef.
Figure 7. Shell length frequency distribution at Tangalle reef.
Figure 8. Weight frequency distribution at Tangalle reef.

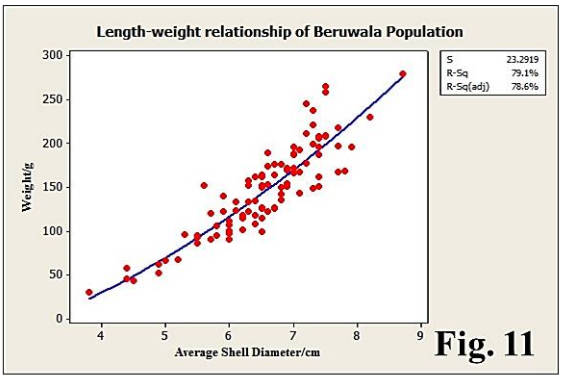
Table 1. Length-weight relationships and other parameters of *Stomopneustes variolaris* at selected sites

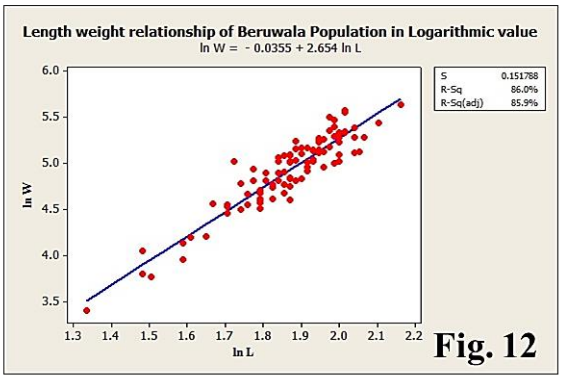
Locations	Length-weight relationships (Log W = Log a + b Log L)	a	b	W	r^2
Mount- Lavinia	y = - 0.0047 + 2.6472x	0.9953	2.6472	$0.9953*L^{(2.6472)}$	0.9360
Beruwala	y = - 0.0355 + 2.6536x	0.9651	2.6536	$0.9651*L^{(2.6536)}$	0.8600
Tangalle	y = + 0.3829 + 2.4637x	1.4665	2.4637	$1.4665*L^{(2.4637)}$	0.9402

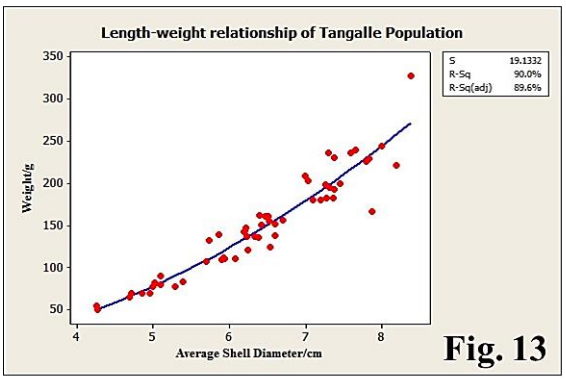
maturity, the rate of feeding and the rate of growth of a particular species (Le Cren, 1951; Rahman et al., 2012). The value of the exponent (b) determine whether the growth isn weight is isometric (b=3) or











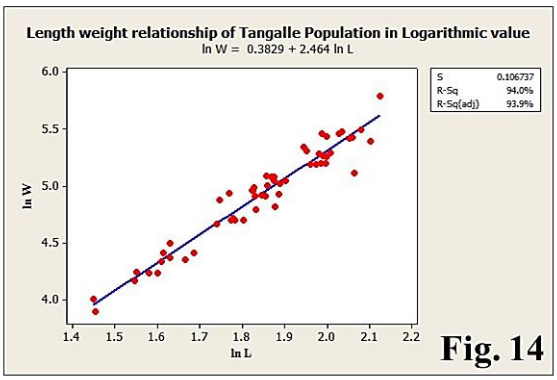


Figure 9. Length-weight relationship for Mount-lavinia population.
Figure 10. Logarithmic scale Length-weight relationship for Mount-lavinia population.
Figure 11. Length-weight relationship for Beruwala population.
Figure 12. Logarithmic scale Length-weight relationship for Beruwala population.
Figure 13. Length-weight relationship for Tangalle population.
Figure 14. Logarithmic scale Length-weight relationship for Tangalle population.

not and if the b value differs from 3, it indicates the change of the body shape as they grow. Normally allometric growth can be negative (If b<3) or positive (If b>3) (Rahman et al., 2012). The present study revealed the b value for Mount-Lavinia (2.6472), Beruwala (2.6536) and Tangalle (2.4637) were less than 3, which concludes that *S. variolaris* from all selected sites were close to isometric growth in weight, because "b" exponent value usually lay between 2.5 to 4.0 and that depends on the age, sex or maturity of species (Le Cren, 1951; Rahman et al., 2012). According to the above "b" value, *S. variolaris* have relatively negative allometric growth. The reasons for negative allometric growth should be further explored under the different environmental parameters and feeding conditions. These findings about length-weight relationship study will be helpful to get an idea about the growth of *S. variolaris* in Sri Lanka.

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