

Morphometric Analysis of Pearl Oyster *Pinctada Radiata* (Leach, 1814) in the Syrian Water of the Eastern Mediterranean

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Abstract

This research was achieved between June 2014 to May 2015 at Afamia region from Lattakia Coast, monthly samples from littoral zone were collected (manually) and by using diving goggles from sublittoral zone to depth (3m).

The number of studied Individuals were 205, the shell sizes varied between (19.2 – 65.8 mm) for height (SH), and between (20.1 – 57.7 mm) for Length (SL) and between (6.5 – 20.5 mm) for width or Thickness (SW), and between (20.1 – 47.2 mm) for hinge length (HL), while the total weight (TW) (0.7235 – 27.3119 g), all the morphometric and biometric relationships were positive and reliable.

Keywords

Morphometric Relationships – Pearl Oyster – *Pinctada radiata* - Lattakia Coast - Syria.

I. INTRODUCTION

The pearl oyster *Pinctada radiata* is characterized by fragile, with two unequaled valves, asymmetrical shell. The shell border is circular in shape and the right valve is relatively smaller than the left one, the outer surface markings are like chains with united center, the external color of the shell is bright brown or grey, while it is pearl color internally, its length from 50-65 mm, sometime reaches 106 mm. This species is found in our coastal water after its migration from the Red Sea through the Sues Canal to the eastern basin of Mediterranean [1].

P. radiata depends on water filtration for feeding and feeds mainly on aquatic algae, the gills that are supported with delicate cilia in small and adult individuals play an important role in feeding besides their basic role in respiration, where they collect food covered it with mucous material then pushed up into the mouth. The oyster growth differs with species and genetic composition, and influenced by geographical distribution and forecast, besides to the place where the individual is found on the substrata. Usually, the growth is measured by shell length and height, as well as to the increasing in total weight and visceral mass weight, in general, it was noticed that the growth

increased during Spring and Summer due to the increasing of temperature and food availability, while in winter it ceased and this caused to the appearance of annual rings on shell which can be used in oyster age determination ([19], [20]).

P. radiata is a foreign exotic species and is considered one of the first immigrants to Mediterranean. This indo-pacific bivalve succeed in distribution in the whole western and eastern Mediterranean as an intruder species that maintained the appearance in its new environment till now ([2], [18]). This specie was first recorded in Egypt as *Meleagrina* sp. [3], in Cyprus [4], Greece [5], in Southern Turkey and Syria [6], and in Malta [7], while it was registered in the Central Mediterranean Basin since 19th century in Gabes Gulf in Tunis [8], and its excessive assemblages lasted till now along the Tunisian Coast Line from Libyan Borders till Bizerta Lagoon ([9], [10]).

This research aimed to study the relationships between morphometric measurements like hinge length with length, height, width or shell thickness, in addition to the relation among total weight and hinge length.

II. MATERIAL AND METHODS

A) Sample collection

205 individuals were collected monthly/ year round from June 2014 to May 2015 from Afamia region, Lattakia Coast, Syria, the samples were gathered manually from littoral zone to one meter depth, and by using diving goggles from sub littoral zone to 3 meters depth. The samples were transferred to the High Research Lab in Zoology Department, Faculty of Science, Tishreen University.

B) Morphometric Measurements and Data analysis

A set of morphometric measurements were performed according to (Fig. 1), that represents the shell dimensions in mm by using Vernier Calipers with accuracy 0.1 mm, and contained: Shell Height (SH) or Dorsoventral Measurement (DVM): the massive distance between umbo and the furthest edge.

Shell Length (SL) or Anteroposterior Measurement (APM): the greatest horizontal distance between anterior and posterior margins of the shell that parallel to hinge line. Shell Width (SW) or Thickness (T): the greatest distance (the maximum) between the two external surfaces of the valves while they were closed. Hinge Length (HL): the distance between the tips of the anterior and posterior ears along the hinge line. Total Weight (TW): the weight for visceral mass with shell and was calculated by using a sensitive electronic balance to the nearest 0.0001 g [11].

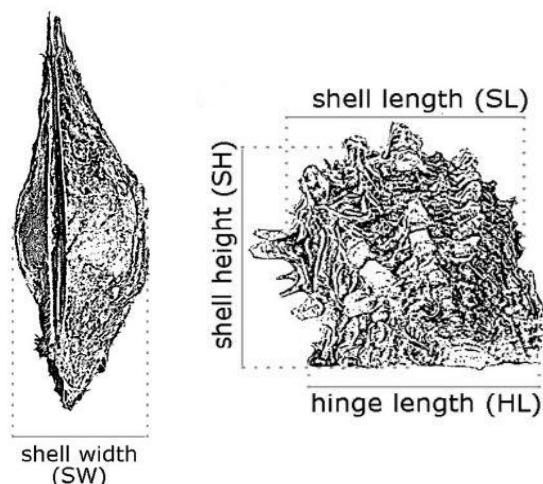


Fig 1: Morphometric measurements (SH, SL, HL and SW) for the pearl oyster *P. radiata*.

The correlation relationships were calculated between the following morphometric measurements:

- (SH- HL), (SL-HL) and (SW-HL), all have linear equation from the shape $y = a + bx$
- (TW- HL) gives nonlinear exponential equation from the shape $y = ae^{bx}$

Where (y and x) represent the two variables according to each former equation, while (a: the constant, b: regression coefficient) and all are calculated from the line equation.

III. RESULTS AND DISCUSSION

The shell height of the studied individuals ranged between (19.2- 65.8 mm), length ranged (20.1- 57.7 mm), width or thickness ranged (6.5- 20.5 mm), the hinge length ranged (20.1- 47.2 mm), while the total weight (TW) ranged (0.7235 – 27.3119 g) Table I.

The correlation relationship was calculated:

- between hinge length and shell height (Fig. 2A) gives the equation: $HL = 0.4695 SH + 18.429$, the correlation coefficient was $R = 0.85$.
- between hinge length and shell length (Fig. 2B) gives the equation $HL = 0.5498 SL + 16.322$, the correlation coefficient was $R = 0.89$.
- between hinge length and shell width (Fig. 2C) gives the equation $HL = 1.3656 SW + 19.101$, the correlation coefficient was $R = 0.84$.

- between total weight and hinge length (Fig. 2D) gives nonlinear exponential equation:

$TW = 0.0992e^{0.1145HL}$, the correlation coefficient was $R = 0.89$. This indicates that the relationship is positive and reliable for the four cases.

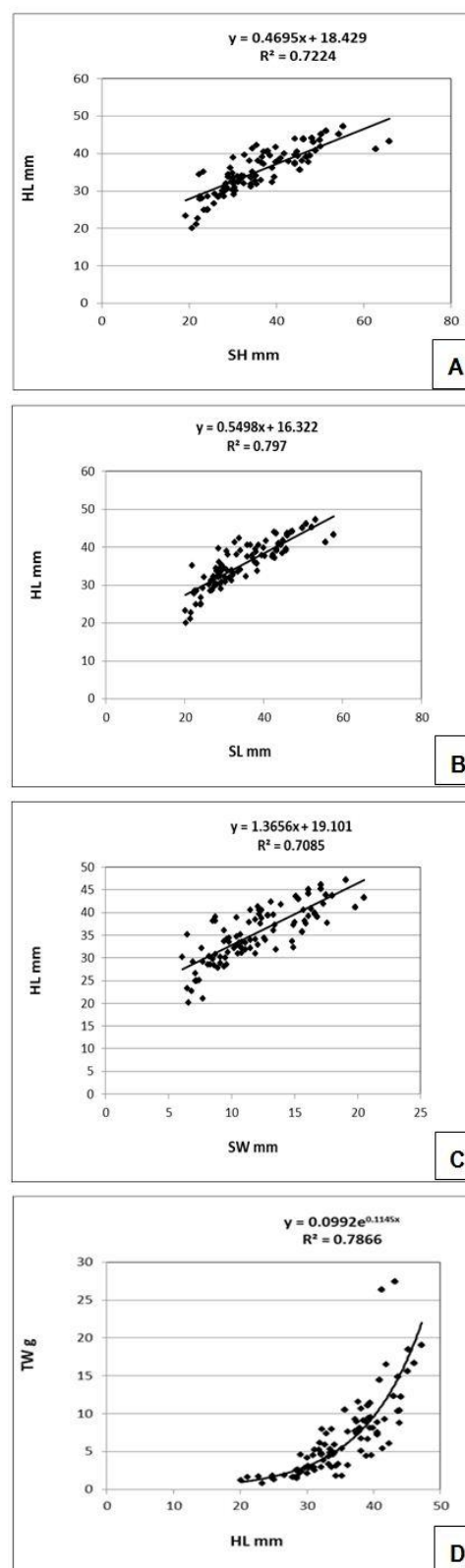


Fig 2: The relations between morphometric and weight measurements for *P. radiata*.

Table I. Weight and morphometric measurements of *P. radiata* in Lattakia Coast through a whole year.

Date	N	TW	HL	SW	SL	SH
10/6/2014	25	5.0552 – 11.3539	38.1 – 39.4	8.5 – 12.9	30.9 – 45.7	33.8 – 47.6
15/7/2014	25	7.8965 – 16.6140	33.7 – 46.1	14.8 – 17.1	38.3 – 50.7	39.5 – 51.3
17/8/2014	25	9.4562 – 26.2338	39.6 – 41.2	16.6 – 19.8	43.3 – 55.7	44.2 – 62.8
20/9/2014	25	8.0158 – 27.3119	39.9 – 43.2	16.6 – 20.5	39.9 – 57.7	41.8 – 65.8
21/10/2014	25	8.0256 – 18.9664	37.9 – 47.2	15 – 19.1	39.5 – 53.1	42.7 – 55.3
18/11/2014	20	9.0224 – 18.3971	38.4 – 45.2	11.9 – 17.1	44.7 – 52.1	40.6 – 54.3
21/12/2014	10	0.7235 – 5.3745	23.3 – 35.2	6.5 – 7.5	20.1 – 29.4	19.2 – 34.4
27/1/2015	10	1.2013 – 6.6991	20.1 – 38.1	6.6 – 8.7	20.3 – 33.1	20.6 – 35.8
23/2/2015	10	1.5432 – 7.2793	21.1 – 37.5	7.7 – 12.3	21.3 – 35.8	21.6 – 36.6
19/3/2015	10	1.7556 – 7.4678	34.4 – 40.5	9.8 – 12.2	29.9 – 35.8	22.3 – 37.1
21/4/2015	10	1.6432 – 7.1915	28.5 – 40.6	8.1 – 11.5	22.4 – 36.6	22.5 – 38.1
19/5/2015	10	1.7645 – 8.0256	35.2 – 39.5	10.7 – 13.3	21.9 – 37.8	23.3 – 38.6
	205					

It was found by comparing the present results with some international studies, that the highest limit for shell height for mature oysters was (85 mm) in the Northern and Eastern Coast of Tunis [12], and (78.7 mm) according to the study [13], while in the Red Sea it was (93.2 mm) [14], in Egypt, it was (64 mm) [15] and this is the nearest value that agreed with the present study. This difference could be explained by the intervention of numerous environmental parameters such as spatial competition with another species, predation, pollution, food scarcity in addition to irregular seasonal growth and reproduction process [13].

The present results are closed to the study [13] for *P. imbricata radiata*, and their morphometric measurements in the Italian Linosa Island in the middle of Mediterranean, the correlation relationships between HL and SH, SW and TW, are reliable and solid, where the correlation coefficient values were (0.92, 0.94, 0.89 and 0.92) respectively. Morphometric measurements for *P. radiata* assemblages in Malta Islands, the correlation coefficient were (0.77, 0.79 and 0.75) for the relations (SH-HL), (SL-HL) and (SW-HL), respectively, it is noticed that the relations were positive but the values were slightly lower from the present study and the study [13], this may due to the scarcity of the studied species, besides that most studied samples were small in dimensions.

In the study [17] that compared between morphometric measurements for *P. radiata* in six locations along the Tunisian Coastal Line (N1: Bizerta Lagoon, N2: Tunis North Lagoon, N3: La Marsa, E1: Hammamet Harbor, E2: Monastir and E3: StahJaber)

the correlation coefficient values for the relation (SH-HL) in these locations were (0.76, 0.91, 0.69, 0.95 0.91 and 0.84), respectively, and these values are close to the present study and indicates to positive reliable relationship, except the location N3 where the value was low, and this may due to the difference of environmental parameters as well as the geographical position for individuals in this location.

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