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Original article

Study of the Morphological Traits of *Monodonta turbinate* (Gastropoda) in Susa, Eastern Libya, Mediterranean Sea

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ABSTRACT

***Aim**. Establishing the morphological characteristics of Monodonta turbinata from the rocky intertidal of the location (Susa) in eastern Libya. **Methods**. 50 Monodonta turbinata in all were taken at random from the location. Each snail had ten important morphometric parameters measured. **Results**. The maximum height from base to apex (HBA) and total weight were 26.91mm and 10.00g; the minimum height from base to apex (HBA) and weight were 12.34mm and 1. 84g.Strong linear, power, and logarithmic regressions were obtained for TW-HBA (having a high R^2). R^2=0.8053. Virtually all of the parameter-to-parameter binary correlations were strong, highly significant, and positive. The results of the Monodonta turbinata parameters' linear, power, and logarithm regressions using HBA were strong and negative. **Conclusion**. This study provides information on growth by examining the length-weight relationship as well as the morphological characteristics of Monodonta turbinata, which can be used to identify species and sizes.*

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INTRODUCTION

A number of morphological, physiological, behavioral, and biochemical characteristics are used in the identification and classification of animals [1], but phenotypes based on descriptive, morphometric, and meristic traits are considered the earliest and easiest methods for identification and for measuring discreteness and relationships among various taxonomic [2-6].

Descriptive traits are nonmeasurable. non-countable body morphological characters Morphometricis the external measurement of an organism, while meristic means serial counts of body elements [7]. Morphological variability among living organisms is considered an important adaptive strategy for populations experiencing inconsistent environments. Therefore, morphological characters often vary along geographic gradients [8]. The current study's objective is to examine *Monodonta turbinata* morphology in the southern Mediterranean Sea using the eastern Libyan coast as a model.

METHODS

Susa study site

Susa is a small commercial and fishing port located in the north-east of Libya, between latitudes 320 91" N and 320 75" S and longitudes 220 75''E and 210 75'' W. The Susa area is characterized by its beautiful beaches, natural scenery, ancient and historic Greek and Romanian remains, and the diversity of commercial fish that are caught and marketed in nearby small cities. Preliminary visits to the site showed that the intertidal zone is rocky but alternates

with sandy beaches. It is characterized by high biological diversity, with the dominant animals being gastropod limpets and periwinkles, and tubeworm polychaetes (Fig.1).

Figure 1. The site from which the study M. turbinata was collected: Susa Source: [9]

Numerous trips were made to the Susa rocky and sandy intertidal zone in the fall of 2022 to record its characteristics. Susa is located in the eastern Libyan Mediterranean Sea. Samples that were required for the study were gathered.

The morphometric traits

A total of 50 *M. turbinata* were collected from the rocky intertidal zone of Susa and taken to the Zoology Laboratory of the University of Omar Al-Mukhtar in Albaida for establishing the morphological parameters shown in Fig 2. The morphological measurements and their descriptive features were recorded; 10 key morphometric measurements were taken with a digital Vernier caliber to the nearest mm. Weights were measured with a sensitive balance to 0.01g.

Figure 2. The morphometric measurements measured during thepresent study

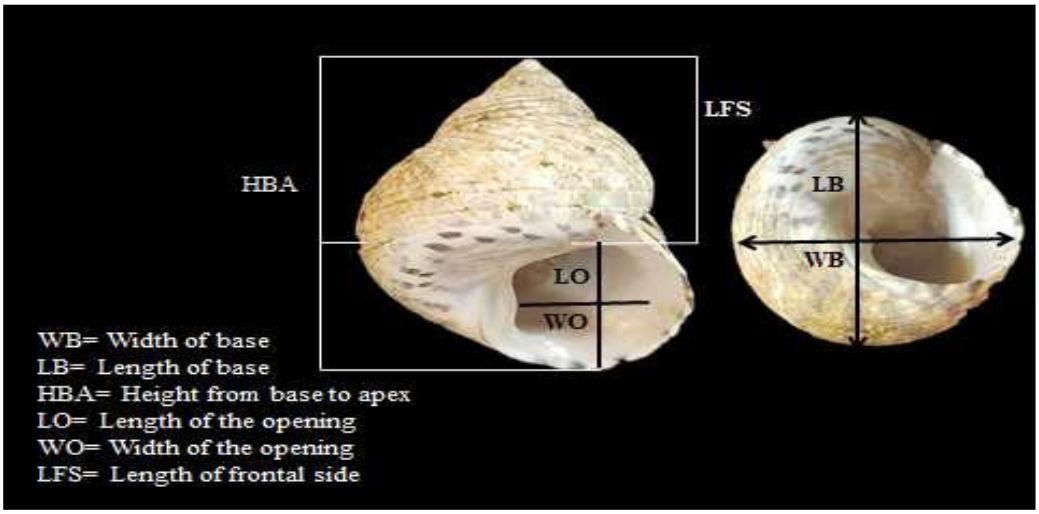

Fig. 3a Morphometric parameters established for M. turbinata obtained from Susa Source [10]

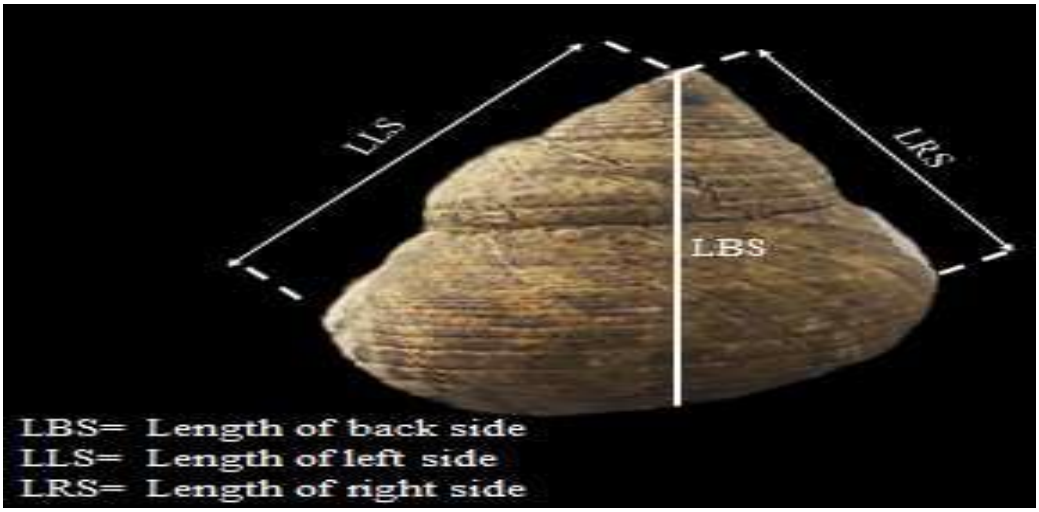

Fig. 3b Morphometric parameters established for M. turbinate obtained from Susa Source [10]

Length-weight relationship

Linear (W = a+bX), logarithmic (W = a+b*log(x)), and power (W = aXb) relationships were estimated according to [11]. where: W= a+bx where:

X= is the HBA, or width in mm,
W= is the live weight in gm
"a" and "b"are the regression constants.

Statistics

Statistics performed in the present study included: Descriptive statistics for the measured morphometric parameters of *M. turbinate*. The height from base to apex-total weight relationship and the condition factor of *M. turbinata* Pearson's binary correlations for the morphometric parameters Regressions of height from base to apex with the lengths of the morphometric parameters Tables and figures used in the present study were created in Excel and SPSS.

RESULTS

50 *Monodanta turbinata* were used in the present study to establish the morphological traits of the snail. The morphogenic features of *M. turbinata* are shown in Figs.3a and 3b. *M. turbinata was*collected from Susa snails. The Values of 10 key morphometric parameters were established. The maximum height from base to apex (HBA) and total weight were26.91mm and 10.00g; the minimum height from base to apex (HBA) and weight were 12.34 mm and

1.84g. All binary correlations of Susa *M. turbinata* measured parameters were very strong (high correlation coefficients) and highly significant (Table 2).

Table 1. Morphometric traits of the studied M. turbinate (weights in grams, lengths in mm)

Parameter	Min	Max	M± StE
TW	1.84	10.00	5.76 ± 0.393
HBA	12.34	26.91	21.7 ± 0.65
WB	12.91	28.18	20.6±0.56
LB	13.40	22.46	18.0 ± 0.39
LO	6.57	10.78	8.36 ± 0.22
WO	5.02	10.87	7.89 ± 0.23
LFS	5.25	20.83	14.87 ± 0.59

Table 2. Pearson's correlations of calculated parameters of Susa M. turbinate

Parameter	TW	HBA	LFS	LB	WB	LO	WO	LLS	LRS	LBS
TW	**1**									
HBA	**.811****	**1**								
LFS	**.781****	**.884****	**1**							
LB	**.662****	**.658****	**.642****	**1**						
WB	**.722****	**.721****	**.688****	**.654****	**1**					
LO	**.228**	**.201**	**.178**	**.348**	**.281**	**1**				
Wo	**.697****	**.670****	**.553****	**.707****	**.659****	**.394***	**1**			
LLS	**.926****	**.779****	**.793****	**.710****	**.760****	**.225**	**.623****	**1**		
LRS	**.848****	**.715****	**.797****	**.709****	**.628****	**.315**	**.618****	**.865****	**1**	
LBS	**.779****	**.635****	**.730****	**.691****	**.584****	**.276**	**.545****	**.848****	**.872****	**1**

The length-weight relationship

Linear, power, and logarithm regressions generated in the present study predicted the height from base to apex -total weight relationship for *M. turbenata* (Fig. 4) very well. This was deduced from their high R^2 values, which ranged from 0.7472 to 0.8053. However, the linear regression was accurate, as it is the one that has the highest R^2. The regression constants "a and b" were significant. The b values of the power regression, 2.319, were less than 3, indicating negative allometric growth.

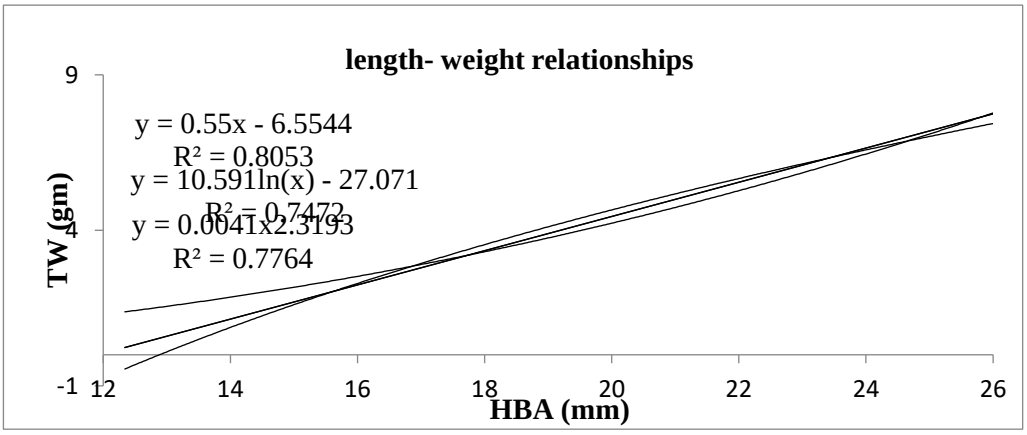

Figure 4. Power Linear and logarithmic regressions of HBA-TWrelationship of Susa M. turbinata.

DISCUSSION

Maximum base-to-peak height (HBA) and overall weight were 26.91 mm and 10.00 grams; The minimum height from base to summit (HBA) and weight were 12.34 mm and 1.84 grams in Susa, because it is the area most vulnerable to human activities in Libya. Susa is a seaside resort popular with many people [12]. In a previous study of the morphometric characteristics of *Pachygrapsus marmoratus*, it was found that the size of the cancer in the apse is larger than what is found in Sousse. The reason for this difference is that there are differences in the two locations in terms of the health of the coastal environments [13]. On the eastern coast of Algeria, a study was conducted on the heavy metal contents of *Phorcus turbinatus*. This study gave that the maximum height and total weight of gastropods was 27.96 mm and 14.47 grams, while the minimum height and weight were 24.14 mm and 6.34 grams [14]. The shell size of M. turbinata was found to range between 15 mm and 43 mm. Because *M. turbinata* was larger in size than *M. turbinata*. All pairwise correlations for morphometric measurements in *M. turbinata* were very strong .All regressions of morphometrics vs base-to-apex length or base-to-apex length had a high coefficient of determination. This is agreed upon [13].

The morphological study on the eastern coast of Algeria, which analyzed biological data on the marine snail *Monodonta turbinata*, indicated that there is a high and significant relationship between the measured morphometric factors and shell height. In this study, linear, power, and logarithmic regressions for *M. turbenata* predicted very well predicted the height from base to apex -total weight relationship for *M. turbenata* as the R2 values were high, ranging from 0.7472 to 0.8053, whereas the linear regression was more accurate because it had the highest R2 value. The regression constants A and B were large. The b values of the power regression, 2.319, were less than 3, indicating negative allometric growth (TW increased at a faster rate than HBA).

CONCLUSION

Morphometric(measured) traits of *M. turbinata* in Susa *M. turbinata i*s found in the lower littoral zone of rocky shores.*M. turbinata*is completely absent from sandy shores because it cannot attach itself to the soft substratum. *M. turbinata i*s a suitable bio-indicator for use in bio-monitoring programs of rocky intertidal areas because it is abundant throughout the year, has reduced mobility, and is easy to sample.

Conflict of Interest

There are no financial, personal, or professional conflicts of interest to declare.

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