International Journal of Applied Research 2015; 1(10): 660-664

ISSN Print: 2394-7500
ISSN Online: 2394-5869
Impact Factor: 5.2
IJAR 2015; 1(10): 660-664
www.allresearchjournal.com
Received: 22-07-2015
Accepted: 24-08-2015

Khansaa S Farman
Department of Biology,
Collage of Science for Women,
Baghdad University Iraq.

Emaduldeen A Almukhtar
Department of Biology,
Collage of Science for Women,
Baghdad University Iraq.

Correspondence
Khansaa S Farman
Department of Biology,
Collage of Science for Women,
Baghdad University Iraq.

Gastropods Morphometric Shell Landmarks variation in Diyala River Basin, Iraq

Khansaa S Farman, Emaduldeen A Almukhtar

Abstract
The present study was conducted to detected the variation in the shells of the Freshwater Gastropods species of Diyala River Basin in Iraq. For this purpose the study area was divided to two sectors, Northern and Southern sectors. The morphological variation in the shells among common species to Northern and Southern sectors using a Geometric Morphometric technique were examined.
The most abundant species *Theodoxus jordani*, *Melanopsis praemorsa, Lymnaea natalensis,* and *Planorbis gibbonsi* were collected and their shells variation in the size and shape were measured. The results showed significant difference in centroid size for *M. praemorsa* and *L. natalensis* while didn't record in *T. jordani* and *Poggibonsi*. Also the study didn't record significance variance of symmetrical for size and shape of the shell in all species.

Key words: Geometric morphometric, Landmarks, Gastropods, Diyala river

Introduction
Diyala river is one of the most important tributaries of River Tigris, and is one of the main water bodies of Iraq. It runs through Iran and Iraq drains an area of 32600 km^2 and about 445 km. (Al-Adili and Al-Suhail, 2010) [2]. Along it path it affected by different type of agricultural, industrial wastes, human activities, all these factors effect on the physical and hydrochemical properties of the stream that undoubtedly effect on organisms (Al. Hassany *et al*., 2012) [3]; (Nasif *et al*., 2012) [14], and as Shell of snails confirm information about their life histories and environmental habitats because it contact with its habitat even after death that make it to be suitable case to us the shells as indicator to record information about snails life histories and environmental habitats. (Brusca and Brusca, 2003) [5]
The Morphometric technique measure morphological similarities between organism and capturing the variation of shell shape so it can give the answer questions about structure, environments, classification, and biodiversity (Yousif, 2012) [18]
Geometric Morphometric methods depending on indicate Landmark points either along axial sculpturing or by in all outline of the shell that every point between two whorls is an appropriate landmark (Carvajal - Rodri´guez *et al*., 2005) [8], and that point should be homologous between the specimens. So is it important to use such accurate technique to examine the morphological variation among individuals of the same species living in northern and southern sectors.

Materials and Methods
The study area
Diyala River Basin is located between latitudes (33º 13 -35º 50) and longitudes (44º 30 - 47º 50). According to Al abadi (2012) [1] the river basin can be divided into two parts: Feeding basin Starts from the Iranian mountains down to the Strait of Himreen in and Drainage basin starts from Himreen to the point Confluence with Tigris River in the south of Baghdad so in current the basin divided in two sector: Northern sector in the north of Himreen lake and Southern sector from Himreen lake confluence with Tigris (fig. 1).

Morphometric Measurements
This study included individuals belonging to four species, collected the two sector (Theodoxus *jordani*, *Melanopsis praemorsa*, *Planorbis gibbonsi, Lymnaea natalensis).*

Sixteen individuals of each species from each sector were selected randomly and photographed using a digital camera**.** The shells were oriented in such a way that the spire was at 90º of the x axis with the ventral side of the shell facing the top. All shells were captured in the same position (Yousif, 2012) [18]. The camera was constant focal length and mounted on a tripod to maintain a constant distance from the top of the shell and in order to obtain good images to minimize measurement error.
After photographing the shells of species, the data of each species in sectors collected separately by using CLIC program (Collecting Landmark for Identification and Characterization) that described by Dujadin *et al.* (2010) [11] and Dujardin (2014) [10] that available in online (http://mome-clic.com/).

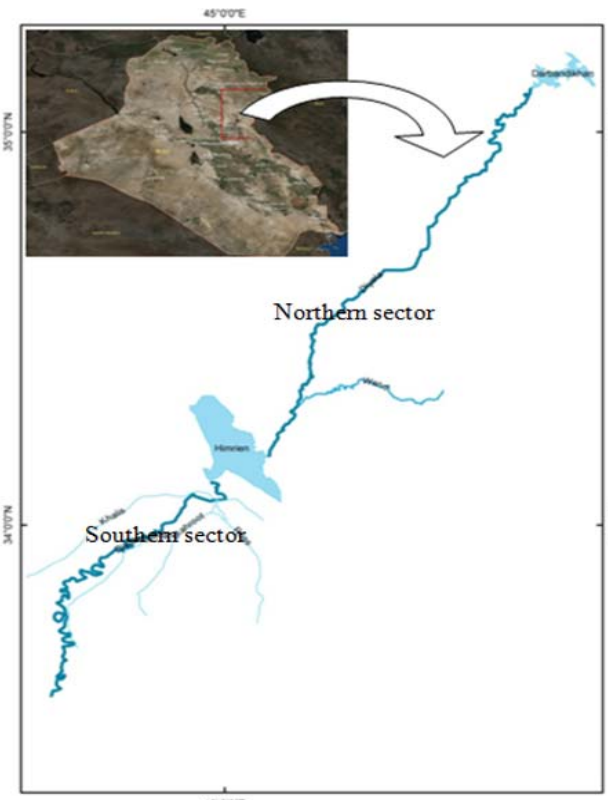

Fig 1: Diyala River Basin showing study sectors and Himreen lake.

The computer program includes several operation to integrate the data obtained from the shells. The information lead to calculation of mean centroid size and shape of the shells.
In this study we depended on centriod size for comparing between the species which represented the sum of square distances between the center and every landmark put on the shell (Caro-Raino *et al*., 2009) [7].

Results and Methods
Morphometric Analysis
Landmarks have been pointed on the shell of each individual (Fig 2). The matching between the shells of the two sectors was done using Geometric analysis through the MOG unit. and as observed in (Fig 3) which shows the mean coordinate of the landmark of the two sectors for each speacies that there no matching Landmark between the individual of both sector.

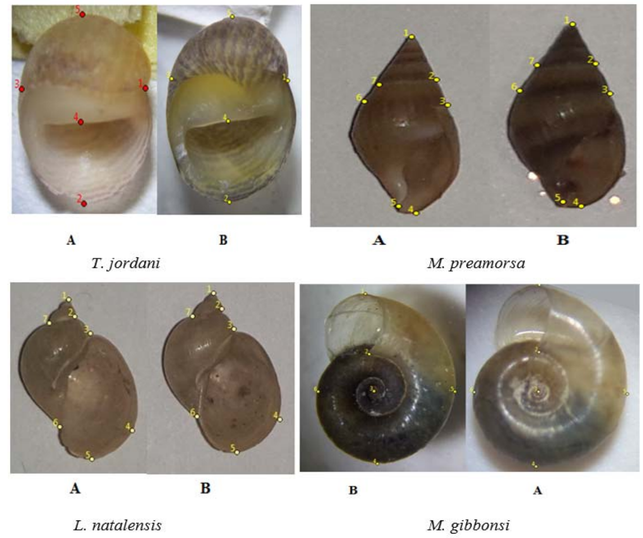

Fig 2: Landmarks on the shells which were used in geometric analysis, **A** the shell from northern sector, **B** shell from southern sector

As it appear in Fig 3 the comparative range of the cenroid size of the shells appeared that most of the individual were within the median range of the centriod size of each sector as it represented by the blue bar under the box. The Discriminative analysis showed there were variation in centriod size of the shell between the two sectors (fig4) with mean centriod size of northern and southern sector were existed for *T. jordani* 324.29, 349.90, *M. praemorsa* 1016.19, 959.42, *L. natalensis* 971.75, 940.07 and *P. gibbonsi* 1371.9, 1465.9 respectively. As it showed in table (1)

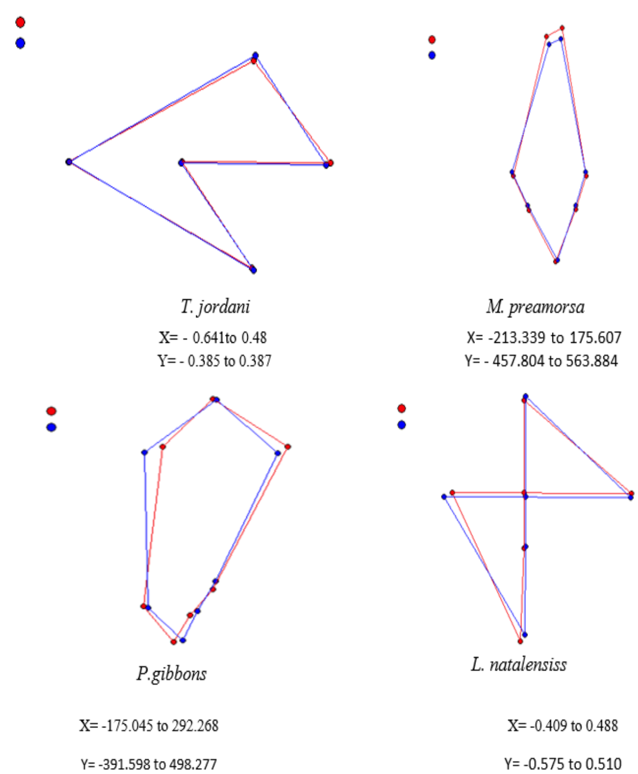

Fig 3: Mean coordinates of landmark on the shell Red color represents individuals from the northern sector and Blue color represents individuals from the southern sector

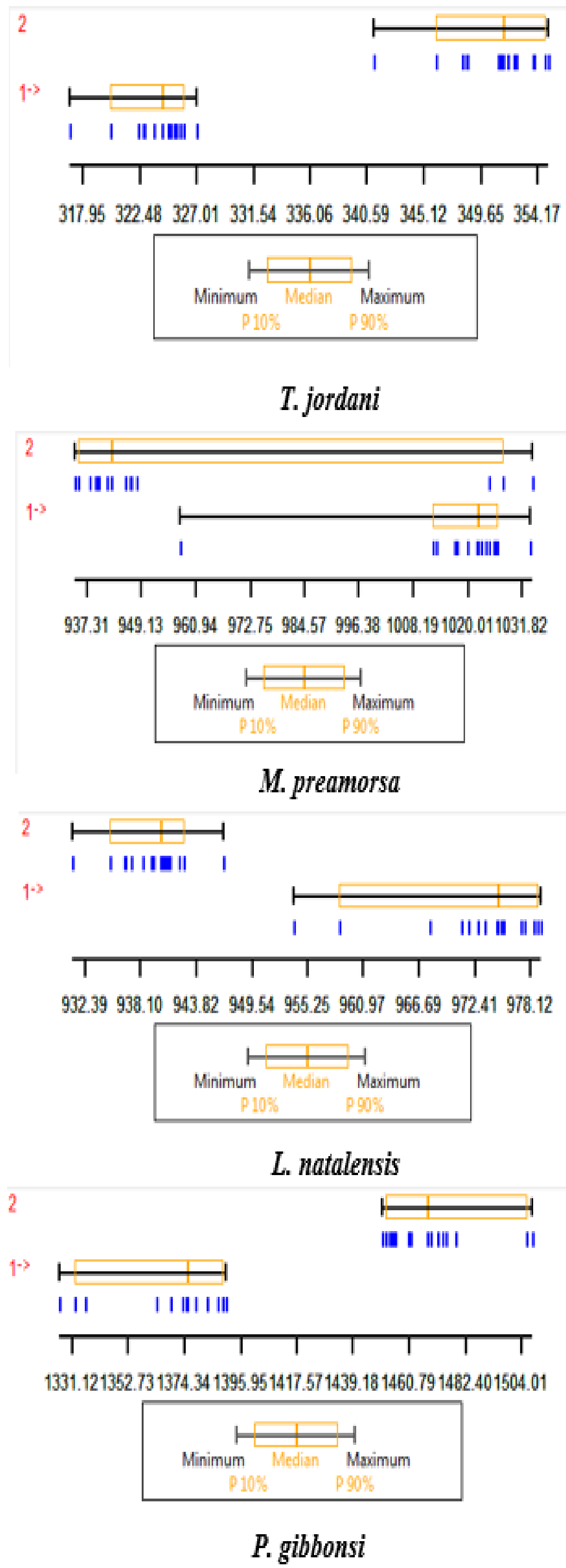

Fig 4: Variation of the centroid size of shell of studied species in both sectors, each box shows the group median separating the 10th and 90th quartiles. Vertical bars under the boxes represent individuals numbers. 1 and 2 represent individuals in the Northern sector and Southern sector respectively.

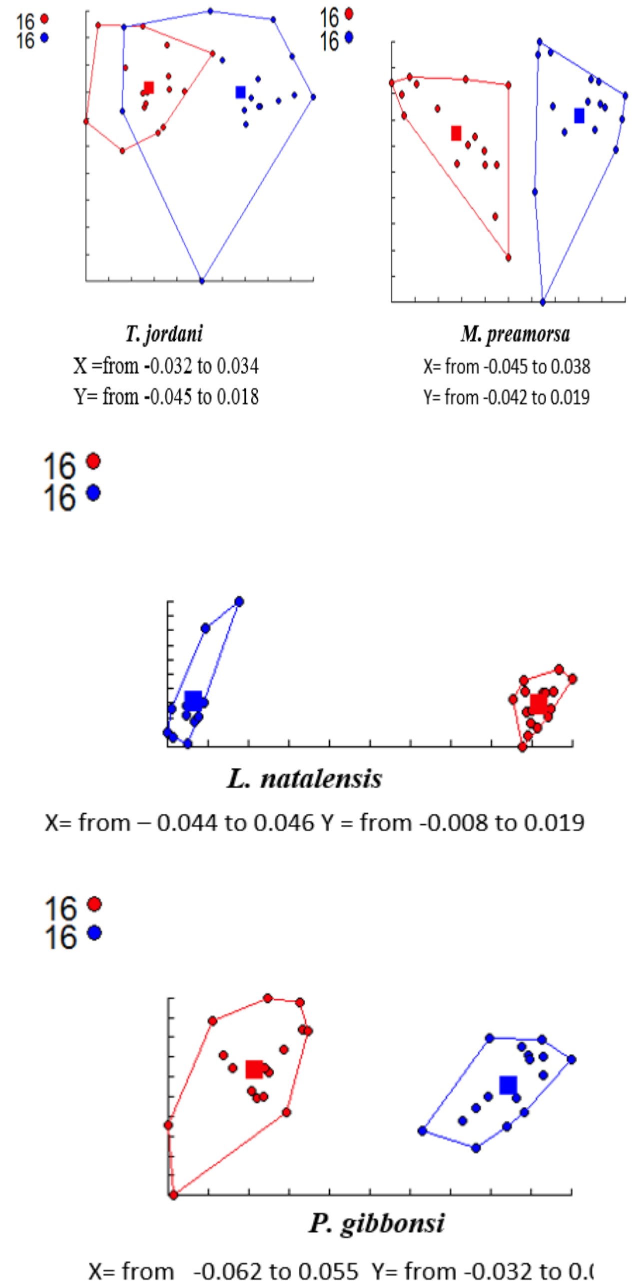

Fig 5: Scatter plot of the principle component analysis of studied species individuals on Geometric Morphometric, Red spots represent individuals from the Northern sector and Blue spots represents from the Southern sector, Red square represent mean centroid size of the individual on the Northern sector and Blue square represent mean centroid size of individual in Southern sector.

Table 1: Comparison of the centroid size of the individuals shells of studied species between Northern and Southern sector.

Species	Source	F	Signification
T. jordani	Shell size	0.04	0.99
	Shell shap	0.36	0.99
M. praemorsa	Shell size	0.10	0.96
	Shell shap	0.52	0.98
L. natalensis	Shell size	0.05	0.98
	Shell shap	0.05	1.00
P. gibbonsi	Shell size	0.01	0.99
	Shell shap	0.9	1.00

Table 2: Analysis of variance for shells asymmetry in size and shell shape of the four species between Northern and Southern sector.

	Group	M.CS.	St.D.	Va.	F	P	T	P	A.D.
T. jordani	Northern sector	324.29	2.35	5.54	2.11	0.15*	24.6	0.00*	25.6
	Southern sector	349.90	3.42	11.7					
M. praemorsa	Northern sector	1016.19	16.04	257.35	4.40	0.006*	6.08	1.09	56.77
	Southern sector	959.42	33.68	1134.37					
L. natalensis	Northern sector	971.75	6.79	46.14	4.05	0.01*	1.67	0.00*	31.6
	Southern sector	940.07	3.37	11.36					
P. gibbonsi	Northern sector	1371.9	19.1	364.83	1.28	0.62	14.7	2.66	93.99
	Southern sector	1465.9	16.8	283.17					

(* significant)

Table (2) showed the variance analysis for symmetry shells between the Northern and southern sector by using ASI unit in morphometric program, the results appeared there were no significant difference in shell size even in shell shape between the individuals in the two sector

For the four species investigated in the current study no matching recorded between the coordinate landmarks in the same species in two sectors. Variance in centroid size of species was evident, which referred a significant variance in *T. jordani M. praemorsa* and *L. natalensis* this may be attributed to geographical location that cause variation in species Jamasali *et al.* (2014), and to variance in environment variables conditions between sectors which that agree with Kitthawee and Rupgsri (2011) [12] and Werle *et al.* (2013) [17] whom referred to the not matching case between the identical landmark as due to the differences of environmental between the studied area such as influence of pH and Calcium concentration which important for shell construction and repair (Camama *et al.*, 2014) [6], the differences in food supply especially when it be abundance also that effect on growth rate of the shell (Chase, 1999) [9].

Preston and Roberts (2007) [15] referred that variation in shell between the species may be due to genetic differences in addition to environmental variance that effect on genotype to influence phenotype expression of shell.

In the current study and because the change in environment was not drastic that did not cause a significant variance in shell shape and size. In addition this analysis is very sensitive to the particular distances and ratios chosen in the study and indicated by landmarks that occurred because variation is only quantified between the endpoints of linear distance, and even then does not specify which endpoint moves relative to the other. (Sobrepeña and Demayo, 2014) [16].

The result of the current study differed from that of Milton, *et al.* (2011) [13] reached who to it as they recorded variation in shell when even it was applied in small distance in river and differ from the result of Sobrepeña and Demayo (2014) [16] in thier study on shell of *Achatina fulica* in the Philippine, they suggested some degree of intrapopulational variations and showed significant differences among populations, and suggested that the differences can be due to many possible factors including genetic, biotic and a biotic factors (Bocxlaer and Schultheib, 2010) [4].

References

1. Abadi Al RS. Study in geographical water resource for joint international basin. International Journal of the Environmental and Water. (In Arabic) 2012; 1(4):135-144.
2. Adili Al A, Suhaili Al Q. Spectral analysis of some selected hydrochemical parameters of Diyala River, Iraq. Fourteenth international water technology conference, IWTC142010, Cairo. Egypt, 2010.
3. Hassany Al JS, Zahrawi Z, Murtadeh A, Hassan Ali, Sulaaiman N. Study of the Effect of Himreen Dam on the Phytoplankton Diversity in Dyala River, Iraq Journal of Environmental Protection 2012; 3:940-948
4. Bocxlaer B, Schultheib R. Comparison of morphometric techniques for shapes with few homologous landmarks based on machine-learning approaches to biological discrimination. Paleobiology 2010; 36(3):497-515.
5. Brusca R, Brusca J. chepter twenty Mollusca, Invertebrate, 2nd edition, 2003.
6. Camama CG, Camama MAJ, Torres MME, Manting JJ, Gorospe, Demayo CG. Landmark-based geometric analysis in describing the shell of the freshwater gastropod (Gastropoda: Viviparidae) from Lake Dapao, Pualas, Lanao del Sur, Mindanao, Philippines. AES Bioflux 2014; 6(1):44-54
7. Caro-Riano H, Aramilo NJ, Dujapdin JP. Growth changes in Rhodnius pallescens under simulated domestic and sylvatic conditions. Infection Genetics and Evolution 2009; 9:162-168.
8. Carvajal-Rodriguez *et al.* decomposing shell form into size and shape by geometric gorphometric methods in two sympatric ecotypes of *Littorina saxatilis.* Journal J Mollus. Stud. 2005; 71(4):313-318.
9. Chase JM. To grow or to reproduce? The role of life-history plasticity in food web dynamics. American Naturalist. 1999; 154:571-586.
10. Dujardin JP. MoMe-CLIC. (http://mome-clic.com), 2014.
11. Dujardin J-P, Kaba D, Henry AB. The exchangeability of shape. BMC Research Notes 2010; 3:266.
12. Kitthawee S, Rungsri N. Differentiation in wing shape in Bactrocera tau complex on a single fruit fly species of Thailand. Science Asia. 2011; 37:308-313.
13. Minton RL, EM Lewis, B Netherland. Large Differences over Small Distances: Plasticity in the Shells of *Elimia potosiensis* (Gastropoda: Pleuroceridae). International Journal of Biolog. 2011; 3(1):23-32.
14. Nsief RM, Abdullah A, AAAl Azawy. Study of Water Quality of Diyala River in some regions of Middle-Lower Basin. Scientific Journal of Karbla University. 2012; 10(2):221-234.
15. Preston SJ, Roberts P. Variation in shell morphology of *Calliostoma zizyphinum* (Gastropoda: Trochidae). Journal of Molluscan Studies. 2007; 73(1):101-104.
16. Sobrepeña JM, CG Demayo. Outline-based geometric morphometric analysis of shell shapesin geographically isolated populations of *Achatina fulica* from the Philippines. Journal of Entomology and Zoology Studies. 2014; 2(4):237-24.

17. Werle GB, Santos CR, Petry MV. Morphometric analysis of the shell *Nacella concinna* predated by gull *Larus dominicanus* in three island in south Shetland. Annual activity report. Science Highlight. Thematic area, 2, 2013.
18. Yousif M. Warped Ideas: Geometric Morphometrics as a Complementary Technique for Studying Gastropod Shell Morphology. Thesis. Msc. University, Hamilton. Ontario (Biology), 2012.