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RELATIVE GROWTH IN THE INTERTIDAL AMPHIPOD *Parhyale basransis* (SALMAN 1986) FROM GARMAT-ALI RIVER,BASRAH,IRAQ.

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SUMMARY

Amphipod *Parhyale basrensis* relative growth was studied . Specimens were collected from the intertidal zone of Garmat-Ali river, Basrah, Iraq. The first and second pairs gnathopods growth were analysed versus the total length . The log-untransformed regression was applied to explain the growth patterns, whereas transition point techniques give very correct estimation of size at maturity. Significant differences were found between relative growth coefficients between mature and immature , males and females of each gnathopod pairs and between the first and second gnathopod.

INTRODUCTION

The amphiopod *Parhyale basrensis* is a common species of the macro-invertebrates assemblage in the intertidal substrate and the shallow subtidal macrophytes (Salman , 1986). The reproductive biology , growth and production and the energetics of this species were intensively investigated (Ali and Salman, 1986 ; Ali and Salman, 1987; Ali, 2001) Studies of relative growth is a useful tool for sexual discrimination and to determin the size at sexual maturity (Simpson , 1961; Hartnoll, 1982; Felder and Lovett, 1989; Ali and Al-Adhub,1999). The aim of this study was to determine relative growth and theis relationships with sexual maturity and size.

MATERIALS AND METHODS

Samples were collected from a selected population of *Parhyale basrensis* inhibiting the intertidal zone of the Garmat-Ali river, during the period January - September 2002 ; amphipods were preserved in 4% formalin. In laboratory , morphometric measurements were determined (55) animals by a micrometer fitted with an eye-piece of a binocular stereomicroscope to the nearest 0.1 mm. The following measurments were taken :

Total length (TL), from anterior margin of head to posterior end of telson (was between 1.175 to 9.75mm). The length of 1st. thoracic segment (1st.

SL)- the maximum length of the segment. The gnathopods (1 and 2) length (GL , maximum length of the palm) and the gnathopods (1 and 2) width (GW , maximum width of the palm).
Regression analysis of the Allometry were as described in Lovett and Felder (1989) in which the least squares regressions estimates of log-untransformed data were used . The transition points at which the growth pattern were changed and determined from the smoothed curves of the polynomial regression. All statistical analysis were done according to Zar (1984).

RESULTS

Females smooth curves of the log-linear regression relations between the total length (TL) and the first gnathopod length (GL1), first gnathopod width (GW1) , second gnathopod length (GL2) and the second gnathopod width (GW2) were shown in Fig.1(a,b) . In general, the transition points were located at 4.00 mm TL and negative specific growth rate appeared below the transition points.

In males, Fig.2 (a,b) the features of these characters were quite different while the allometry patterns shows positive specific growth rate below the transition points .

The plott of the relation between the total length (TL) and the 1st. body segment (grouped data for males and females) indicated two transition points located at the sizes 3.9 and 6.2 mm TL (Fig.3) . The relative growth of gnathopods length and the formula and statistics for the relationships are given in Table (1). The relative growth of the expanded gnathopod (GL2) were showed significant differences between the both sexes, and between the juvenils and both the males and females. However, below the transition point (approximately 4.0 mm TL) the allometric coefficient was isometric (0.093) , the points above this size were splited into two groups. The males which have positive allometric growth coefficient (0.199) and the females one which became negatively allometric (0.042). The significant differences were obtained by comparing the regression coefficients of the juveniles and males ($t_{(2),22}$ = 3.331, $p < 0.01$).

The relative growth of the first gnathopod length (GL1) were also significantly different between, mals and females ($t_{(2),22}$ = 11.282,$p < 0.01$) and between both the juveniles and males ($t_{(2),26}$ = 32.39, $p <$

0.01) and the juveniles and females ($t_{(2),12}$ = 22.064 , p < 0.01). However, the allometric growth of both males and females become negative above the transition point (4.0 mm TL). The comparision allomatric growth coefficients at the juvenile stage between the gnathopods 1 and gnathopods 2 were indicated significant higher rate of gnathopod 2 (0.093) than the gnathopod 1 (0.069) ($t_{(2),\ 13}$ = 5.788 , p < 0.01). In Fig. 4 the expanded gnathopod width (GW2) was plotted versus the gnathopod length (GL2) for both sexes and for all amphipods sizes. The relationship can be expressed by linear regression equation : ($Y=aX^b$) were a=0.0125 and b= 0.616, (r=0.99).

Table (1). Linear regression formula of the relative growth of gnathopods 1and 2 length G_2L, G_1L versus total body length TL in the amphipod *P. basrensis* .

Parameters	equation	r	P
G_2L x TL			
J	y = 0.093 x–0.023	0.99	0.01
♂		0.99	0.01
♀	y = 0.199 x– 0.436	0.99	0.01
	y = 0.042 x– 0.027		
G_1L x TL			
J		0.99	0.01
♂	y =0.069 x – 0.051	0.99	0.01
♀	y =0.029 x – 0.187	0.99	0.01
	y = 0.007x – 0.175		

DISCUSSION

Commonly , studies of relative growth in crustacec focus on the slope of a log-transfomed data for the two body parts by the regression techniques (Huxley, 1932; Teissier,1960; Hartnoll,1978 ;Blackstone,1986).

Lovett and Felder (1989) had proposed other practice by which the analysis of untransformed data with regression techique such as the reduced major axis which they considered more appropriate for the descripton of relative growth. Moreover, these authors applied this procedure on the estuarine ghost shrimp *Callinassa louisianensis* (Felder and Lovett , 1989).

However in the former method the researchers used the pattern of relative growth as a tool to detect the point at which the crustacean reach the sexual maturity (e.g. Hartnoll, 1978; Ali & Al-Adhub, 1999), whereas in the latter practice the investigators used the biological data and the morphological characters of the sexual maturity to determine the point at which the differences in the allometric growth may occurre . This idea was applied in the present study. Salman (1986) showed that the second gnathopod of the males were relatively expanded compared with that of the first pair and with the first and second gnathopods of the females. Ali & Salman (1986) in their study of the reproductive biology of *Parhyale basrensis* found that the first appearance of oostegites in females with body length of about 3.5 mm whereas the mature oostegites did not appear until females reached a length of 4 mm. In males, based on precopula, the attainement of sexual maturituy occurred at a size of about 4.5 mm.

In the present investigation we tried to use the two practice, the analysis of data which showed a transition point at about 4mm TL. was well confirmed the biological result particularly that of the females. Therefore, these results support the previous technique which used the relative growth as a tool to determining the maturity size. Although that we had used the untransformed data to plot the regression lines which represent the relative growth after the separation of the point two below and above the transition point which was actually equivelent to the points below and above the size at maturity. This presentation of the data which corresponding to that proposed by Lovett & Felder (1989) is more appropriate and may reduce of avoiding the errors which results from the log- transformed data particularly when data are statistically combined (Zar, 1984).

REFERENCES

Ali,M.H. 2001. The energy gains and energy losses by the intertidal amphipod *Parhyale basrensis* from the Shatt Al-Arab region. Marina Mesopotamica 16(1): 141-159.

Ali ,M.H. and Al-Adhub, A.Y. 1999. Relative growth of the crab *Elamenopsis kempi.* Marina mesopotamica 14(1):149-166.(in arabic)

Ali, M.H. and Salman ,S.D. 1986. The reproductive biology of *Parhyale basrensis* Salman (Crustacea, Amphipoda) in the Shatt Al-Arab River. Estuar.coast.Shelf Sci. 23; 339-351.

Ali,M.H. and Salman, S.D. 1987. Growth and production of the amphipod *Parhyale basrensis* (Talitridae) in the Shatt Al-Arab reigon. Mar.Ecol.Prog.Ser. vol. 40: 231- 238.

Blackstone, N.W. 1986. Relative growth and specific growth rates in crustaceans. Growth , Vol.50: 118-127.

Felder, D.L. and Lovett, D.L. 1989. Relative growth and sexual maturation in the estuarine ghost shrimp *Callianassa louisianensis* Schmitt, 1935. Journal of crustacean biology, vol. 9(4) : 540-553.

Hartnoll,R.G. 1978. The determination of relative growth in crustacea . Crustaceana, 34:281-293.

Hartnoll,R.G. 1982. Growth . In: L.G.Abele, ed., The biology of crustacea .Vol. 2. Embryology, morphology and genetics. Pp. 111-196. Academic Press, New York.

Huxley,J.S. 1932. Problems of relative growth. -Dial Press. New York, New York. Pp. 1-276.

Lovett,D.L. and Felder, D.L. 1989. Application of regression techniques to studies of relative growth in crustaceans. Journal of crustacean biology. 9(4): 529-539.

Teissier, G. 1960. Relative growth.- In: T.H. Waterman, ed., The physiology of Crustacea. Pp. 537- 560. Academic Press. New York., New York.

Salman,S.D. 1986. *Parhyal basrensis.* A new species of talitrid amphipod from the Shatt Al-Arab region ,Iraq. Crustacea 50(3): 287-249.

Zar,J.H. 1984. Biostatistical analysis. Prentice-Hall, Inc. Engle wood cliffs. New Jersy, 718pp.

النمو النسبي في مزدوج الأقدام
Parhyale basrensis (Salman,1986)
من منطقة المد والجزر لنهر كرمة علي ،البصرة ،العراق

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الخلاصة

درس النمو النسبي في عينات مزدوج الأقدام *Parhyale basrensis* التي جمعت من منطقة المد والجزر في شط العرب . استخرجت علاقة انحدار خطية بين الطول الكلي للحيوان وطول الحلقة الصدرية الأولى والطول الكلي للحيوان مع طول وعرض الحلقة الأخيرة من الزوج الاول والثاني من الاقدام الفكية (اللاحقين الصدريين الأول والثاني) لكل من اليافعات والذكور والاناث . لوحظ وجود اختلافات معنوية بين النمو النسبي لليافعات والحيوانات البالغة وبين الذكور والاناث وذلك للزوجين الاول والثاني من اللواحق .

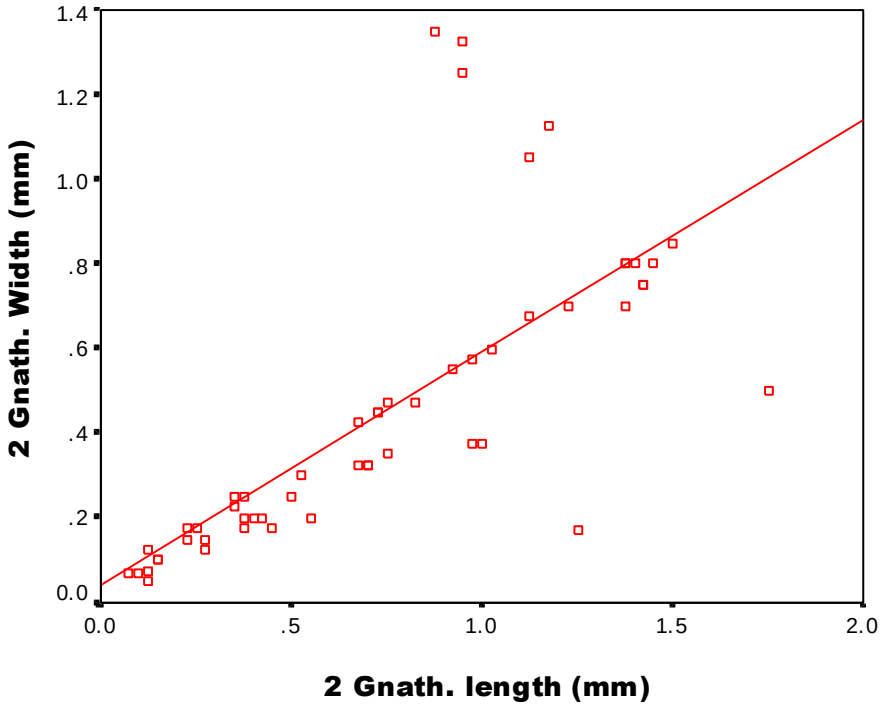

Fig.4.The linear regression relationship between the expanded gnathopod width (GW2) and the gnathopod length (GL2) for both sexes and for all sizes of amphipod *P.basrensis* .