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AN ANALYSIS ON GROWTH OF SCALES IN *PLATYCEPHALUS INDICUS* L.

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ABSTRACT

This study highlights the relationship between growth of scales and their different parameters of *Platycephalus indicus* L. Six body regions were selected for the study. The dorsal side of fish body contains ctenoid scales while, ventral side of fish body contains cycloid scales. The results show that there is no relationship present between the growth of scale length and its width in ctenoid scales and scale does not grows in its width with proportion to the growth of its length. In cycloid scales, the growth of scale width is strongly related to the growth of scale length and shows that scale also grows in its width with the growth of its length. Further, the weak correlation between scale length and selected scale parameters in ctenoid scale shows that growth in scale length does not affects the growth of other scale parameters. In cycloid scales, it was observed that growth of all selected scale parameters is related to the growth of scale length. It is notable that the results for scale width and number of radii in both ctenoid and cycloid scales were found significant and shows that number of radii also increase when scale grows in its width.

Key-words: Flathead fish, Scale growth, Ctenoid scales, Cycloid scales, Scale parameters, *Platycephalus indicus*.

INTRODUCTION

Platycephalus indicus L. is a food fish and belongs to order Scorpaeniformes, family Platycephalidae. They are commonly known as flatheads. Reported from Indo-West Pacific and found commonly in Red Sea, East Africa to the Philippines, Australia, Japan and Korea. Head is compressed. Dorsal fin with IX-X spines and 13 soft rays. Anal fin lack spines and have 13 soft rays only. Yellow colour on center and black stripes on upper and lower margins of caudal fin helps to identify this species (Froese and Pauly, 2016). Several scientists have worked on different aspects of biology of *P. indicus* from various areas of the world. Hashemi and Taghavimotlagh (2013) reported *Sardinella sindensis* and *Cynogluss arel* fishes as dominant food item in stomach content of *P. indicus.* While, shrimps were observed as secondary food and crabs and cuttlefish were found as accidental food. Isa *et al.* (2012) from Kedah and Daliri *et al.* (2012) from Iran, studied positive allometric growth of *P. indicus*. However, Hashemi *et al*. (2013) and Mousavi-Sabet *et al.* (2015) estimated isometric growth pattern in *P. indicus* from Persian Gulf of Iran. Bariche (2012) has reported the occurrence of *P. indicus* in Mediterranean Sea as an alien species. Mohammadnabizadeh *et al.* (2014) studied the heavy metals in *P. indicus.* Hashemi *et al*. (2012) investigated the mean condition factor (K) as 0.71 for male and 0.75 for female *P. indicus* and mean Hepatosomatic Index (HIS) as 1.23 for male and 1.32 for female *P. indicus.*

To the best of our knowledge, no information is available on the growth of scales of *P. indicus.* Therefore, present investigation collects a basic information regarding the growth of scales of *P. indicus* in relation to the selected scale parameters (*i.e.*, TLS= scale length, WDS= scale width, Rs= distance from focus to outer margin of scale, HRS= horizontal row of ctenii, VRS= vertical row of ctenii, RDS= number of radii).

MATERIALS AND METHODS

Samples of *Platycephalus indicus* L. were collected from the Korangi fish harbour. In order to study the variations in scales, six regions of fish body were selected (Fig. 1).

Four regions of dorsal side of body:

Region A= Head
Region B= Body
Region C= Lateral line
Region D= Caudal

Two regions of ventral side of body:

Region E= Body
Region F= Caudal

A total of 100 scales were collected from these selected regions. Scales from each region were cleaned with 10% NaOH and then dehydrated with different grades of alcohol (30%, 50%, 70% and 90%) separately. Scales were not placed in 100% alcohol because it damages the margins of scale. The cleaned and dehydrated scales were placed on clean glass slide and covered with other glass slide to prevent them from dust particles and from curling. Both ends of slides were bound with masking tape and labeled with their respective body region (Esmaeili *et al*., 2007). Slides were studied under the microscope. Six scale parameters were selected to study the growth of scales (Fig. 2).

TLS= scale length
WDS= scale width
Rs= distance from focus to outer margin of scale
HRS= horizontal row of ctenii
VRS= vertical row of ctenii
RDS= number of radii

Photograph of scale was taken by a digital camera attached to the microscope. All data were analyzed with Minitab 17 Statistical software after Niel (1995).

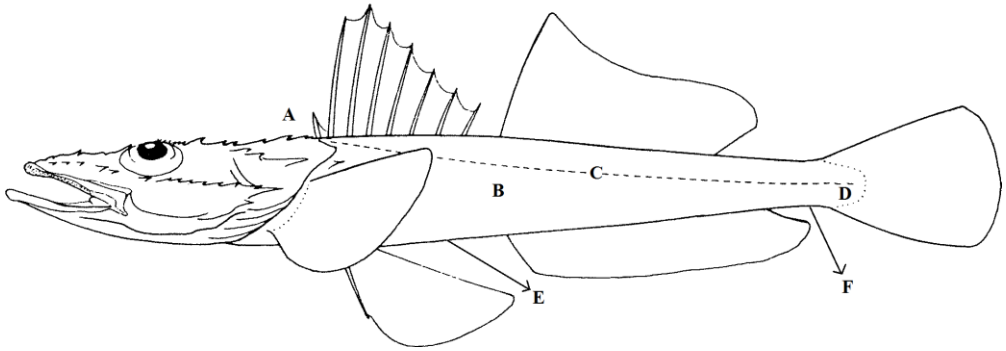

Fig. 1. Showing six body regions selected for scale collection (Fisher and Bianchi, 1984).

RESULTS AND DISCUSSION

For this study, six body regions of *Platycephalus indicus* were selected for the collection of scales (*i.e.*, four regions from dorsal side of body and two regions from ventral side of body). It is observed that the scales of dorsal side of body contains comb like structures (ctenii) on their posterior margin and categorized as, ctenoid scales. While, the scales of ventral side of body lack these comb like structures (ctenii) on their posterior margin and termed as; cycloid scales.

The results for regression analysis of ctenoid scales of *P. indicus* (Table 1) show that there is no relationship present between the growth of scale length (TLS) and scale width (WDS) and represents that, when the scale grows in its length, it does not effect on width of scale. The other scale parameters (Rs, HRS, VRS, RDS) are also shows weak correlation ($r < 0.50$) with the growth of scale length (TLS) and scale width (WDS). While, the results are significant ($p < 0.05$) for the relationship of growth between scale length (TLS) and growth of radius of scale (Rs) and horizontal and vertical rows of ctenii (HRS, VRS) which specifies that radius of scale and numbers of ctenii in horizontal and vertical rows on scales also grows significantly when scale grows in its length. However, insignificant results ($p > 0.05$) for scale length (TLS) and number of radii (RDS) illustrates that radii do not increased in numbers with the growth of scale length (TLS). While, the relationship with the growth of scale width (WDS) and growth of radii (RDS) is observed significant ($p < 0.05$) which specifies that number of radii also increase when scale grows in its width.

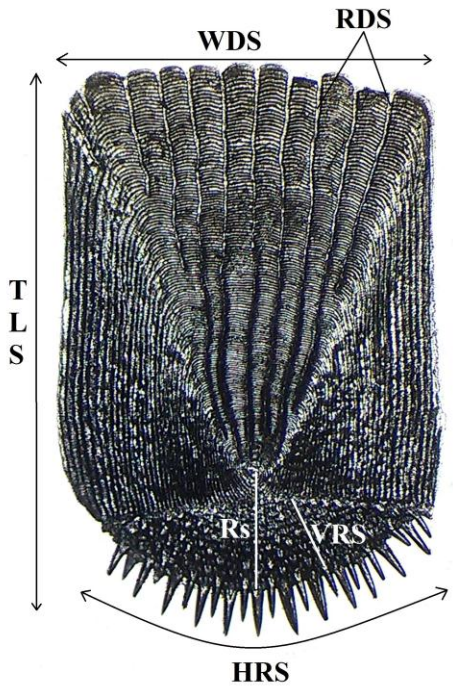

Fig. 2. Showing selected scale parameters for growth study.
TLS= scale length, WDS= scale width, Rs= distance from focus to outer margin, HRS= horizontal row of ctenii, VRS= vertical row of ctenii, RDS= radii

Table 1. Correlation and regression analysis of the parameters of ctenoid scales of *Platycephalus indicus*.

N=58					Significance of correlation		
X	Y	a	b	r	S.E (b)	t-test	p-value
TLS	WDS	2.033	0	0.001	0.085	0.01	>0.05^{NS}
TLS	Rs	-0.088	0.293	0.482	0.071	4.11	<0.05*
TLS	HRS	10.63	4	0.32	1.59	2.53	<0.05*
TLS	VRS	3.72	0.929	0.273	0.438	2.12	<0.05*
TLS	RDS	9.92	0.212	0.054	0.523	0.41	>0.05^{NS}
WDS	Rs	0.501	0.177	0.185	0.125	1.41	>0.05^{NS}
WDS	HRS	20.63	1.44	0.074	2.61	0.55	>0.05^{NS}
WDS	VRS	8.03	0.641	-0.12	0.708	-0.91	>0.05^{NS}
WDS	RDS	4.01	3.242	0.528	0.697	4.65	<0.05*

* = significant correlation ($p < 0.05$), NS = not significant ($p > 0.05$).

Table 2. Correlation and regression analysis of the parameters of cycloid scales of *Platycephalus indicus*.

N=42						Significance of correlation		
X	Y	a	b	r	r^2	S.E (b)	t-test	p-value
TLS	WDS	0.58	0.355	0.747	55.83	0.049	7.11	<0.05**
TLS	Rs	-0.284	0.332	0.923	85.15	0.021	15.15	<0.05***
TLS	RDS	7.53	0.659	0.298	8.86	0.334	1.97	<0.05*
WDS	Rs	-0.216	0.582	0.768	58.95	0.076	7.58	<0.05**
WDS	RDS	5.34	2.543	0.546	29.77	0.618	4.12	<0.05*

*= significant correlation ($p<0.05$), *** shows strong correlation ($r\geq0.80$), ** shows high correlation (r=0.70-0.79),
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At the other hand, the results for regression analysis of cycloid scales of *P. indicus* (Table 2) show the moderate ($r = 0.51$-0.69) to strong correlation ($r \geq 0.80$) for growth of different scale parameters (Rs and RDS) with the growth of scale length (TLS) and scale width (WDS) except for relationship between scale length (TLS) and number of radii (RDS), which shows the weak correlation ($r < 0.50$) and specifies that the increase in scale length does not affects the number of radii. All results for regression analysis of cycloid scales is examined significant at 5% significance level ($p < 0.05$).

No information available regarding the growth of scales of *Platycephalus indicus* however, Musarrat-ul-Ain *et al.* (2016) have estimated a strong correlation between scale length and horizontal row of ctenii in scales of *Scatophagus argus.* Kanwal *et al.* (2015) studied moderate correlation between length of scale and width of scale of *Labeo rohita.* While, other scientists such as; Lagler (1952), Kaur and Dua (2004), Esmaeili *et al.* (2009), Esmaeili *et al*. (2014) and Johal *et al.* (2014) have signifies the importance of fish scales in identification and taxonomy of fishes.

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