

AGE AND GROWTH OF *POLYDACTYLUS INDICUS* (SHAW)

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ABSTRACT

In *Polydactylus indicus* the scale is in curvilinear relationship with the fish in size. Six rings are recognised on the scales and these are formed at the fish size of 34.5 cm, 54.5 cm, 74.5 cm, 84.5 cm, 94.5 cm, and 104.5 cm respectively. The causes and periodicity of ring formation could not be studied due to the non-availability of material for the whole year. Since the sizes at the first three rings agree with the sizes at ages 1 to 3 obtained from a separate study on the length frequency distribution, it has been presumed that the rings are of an annual nature and hence the above lengths can be taken to represent sizes attained by the 1- through 6-year olds. The growth parameters and growth characteristics of the species have been given.

INTRODUCTION

The age of *Polydactylus indicus*, one of the economically important species amongst the thread-fin fishes has so far not been fully studied. Based on the length frequency distribution of the commercial catches from the Dwarka region, Nayak (1959) gave a brief account of the first three age groups of this species. Although the adults are rare in the trawler landings they support an inshore fishery of a fairly good magnitude by gill nets. As the length frequency methods is not suitable for the samples collected from the highly selective gill nets, the scales have been used for the interpretation of age of *P. indicus* in the present study. The age and growth of *Polynemus heptadactylus* of the Bombay-Saurashtra region have been studied in detail by Kagwade (1972). Longhurst (1965) has studied the growth of two African species of polynemids, *Galeoides decadactylus* and *Pentannemus quinquarius*.

MATERIAL AND METHODS

A total of 116 fishes representing the different length groups of the trawl catches landed at Sassoon Dock, Bombay, and bottom-set gill net catches at Dahanu, which is about 170 km north of Bombay, was obtained for this study during the period extending from January 1968 to May 1970. Scales were collected from the lateral side, beneath the tip of the pectoral fin. The scales were preserved dry and before examining they were soaked in water for some time and cleaned thoroughly. From each specimen about three to six scales, considered good for this study were chosen.

OBSERVATIONS

Relationship between scale length and fish length

The relationship of the scale length with the fish length was found out using the formula, $\log y = a + bx$, where x = fish length and y = scale length (Fig. 1). The equation obtained was

$$\log y = -0.3416 + 0.008094 x$$

and the coefficient 'b' was found to be significant.

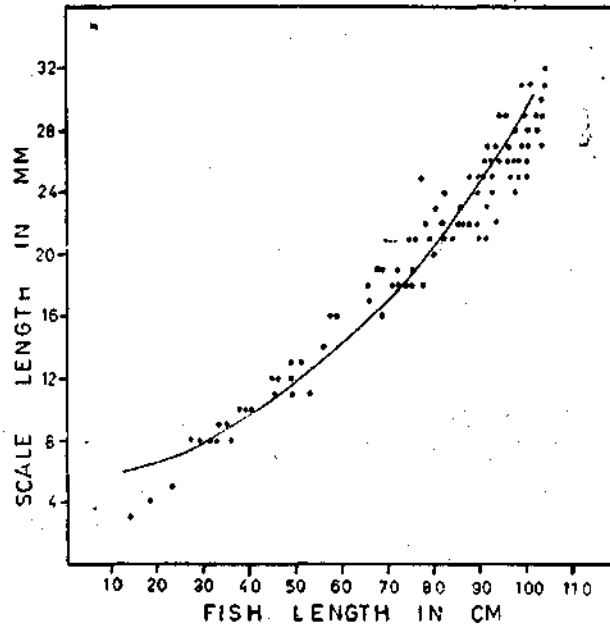


FIG. 1. The relationship between the scale length and fish length in *P. indicus*.

Nature of rings on scale

The sclerites on the scales of *P. indicus* are continuous in small fish, but show branching frequently in bigger fish. The branching or the interruption of the sclerites continues concentrically for a narrow strip of the scale after which the sclerites stop branching. After a small stretch of continuous sclerites, there again appears another strip where the sclerites branch. The alternate strips of continuous and branching sclerites are noticed clearly in the anterior part of the scale. In the posterior part, where the ctenii are present, corresponding to the strip of branching sclerites, there sometimes is noticed some kind of disturbance or dislocation in the concentric arrangement of the ctenii.

The bands of continuous sclerites and ctenii alternating with branched sclerites and disturbed ctenii respectively, give the appearance of rings on the scales of *P.*

indicus. In some parts of the scale, like the strip along the line separating the sclerites from the ctenii on either side of the nucleus and also in the antero-lateral corners, the rings are more distinct.

The first 3 rings in *P. indicus* are comparatively narrow, showing moderate branching of the sclerites, and the gaps between these rings are wide. From the fourth ring onwards the branching of the sclerites becomes more and more profuse and the rings formed are comparatively broader (Pl. I).

Number of rings in relation to fish length

The number of rings on the scales of *P. indicus* of the sizes between 15.7 cm and 106.0 cm ranges from 0 to 7. The percentage frequency distribution of the number of rings has been determined for the various length groups with 10 cm class intervals and presented in Table 1.

TABLE 1. *Percentage frequencies of number of rings in the scales of P. indicus at different lengths*

Size group (mid point) cm	No. of fish examined	No. of rings on the scales							
		0	1	2	3	4	5	6	7
14.5	2	100	—	—	—	—	—	—	—
24.5	3	33	67	—	—	—	—	—	—
34.5	7	14	72	14	—	—	—	—	—
44.5	8	—	63	37	—	—	—	—	—
54.5	6	—	—	100	—	—	—	—	—
64.5	5	—	—	40	60	—	—	—	—
74.5	17	—	—	—	94	6	—	—	—
84.5	16	—	—	—	19	81	—	—	—
94.5	36	—	—	—	—	31	61	8	—
104.5	16	—	—	—	—	—	31	56	13

It is obvious from the table that in *P. indicus*, till the size of about 14.5 cm the scales do not show any ring. The first ring dominates at 34.5 cm, second at 54.5 cm, third at 74.5 cm, fourth at 84.5 cm, fifth at 94.5 cm and sixth at 104.5 cm. At 104.5 cm some fish also showed seven rings (Pl.I) But in the absence of specimens in higher size groups, it is not possible to judge the fish length when seven rings will occur in maximum percentage.

There appears some regularity in the size at which the rings make their appearance. But, due to the seasonal nature of its fishery, extending three to six months during the November-May period, it has not been possible to collect specimens all through the year which would facilitate to study the time and causes of ring formation.

on the scales. However, the first three rings are noticed to dominate at lengths corresponding to the growth during the first three years as concluded by Nayak (1959) based on the length frequency distribution of this species. Kagwade (1968) has mentioned that *P. indicus* matures for the first time at the age of four years. The rings studied here show broadening from the fourth ring onwards and this broadening may be due to the effect of prolonged spawning strain. Though the periodicity of ring formation could not be studied the above evidences seem to suggest that the rings are of annular nature. However, confirmatory evidence is required on this. It is thus assumed that the fish measures 34.5 cm at the end of first year, 54.5 cm at the end of second year, 74.5 cm at the end of third year, 84.5 cm at the end of fourth year, 94.5 cm at the end of fifth year and 104.5 cm at the end of sixth year. Though seven rings are noticed on the scales of some specimens, because of the presence of only a small number of larger sized fish in the sample, the growth in the seventh year could not be correctly assessed.

Growth parameters and growth characteristics

Using the length-at-age data derived from the interpretation of rings on the scales, growth parameters have been estimated by von Bertalanffy's growth equation and growth characteristics by the method of Chugunova (1963).

The values of growth parameters are as follows:

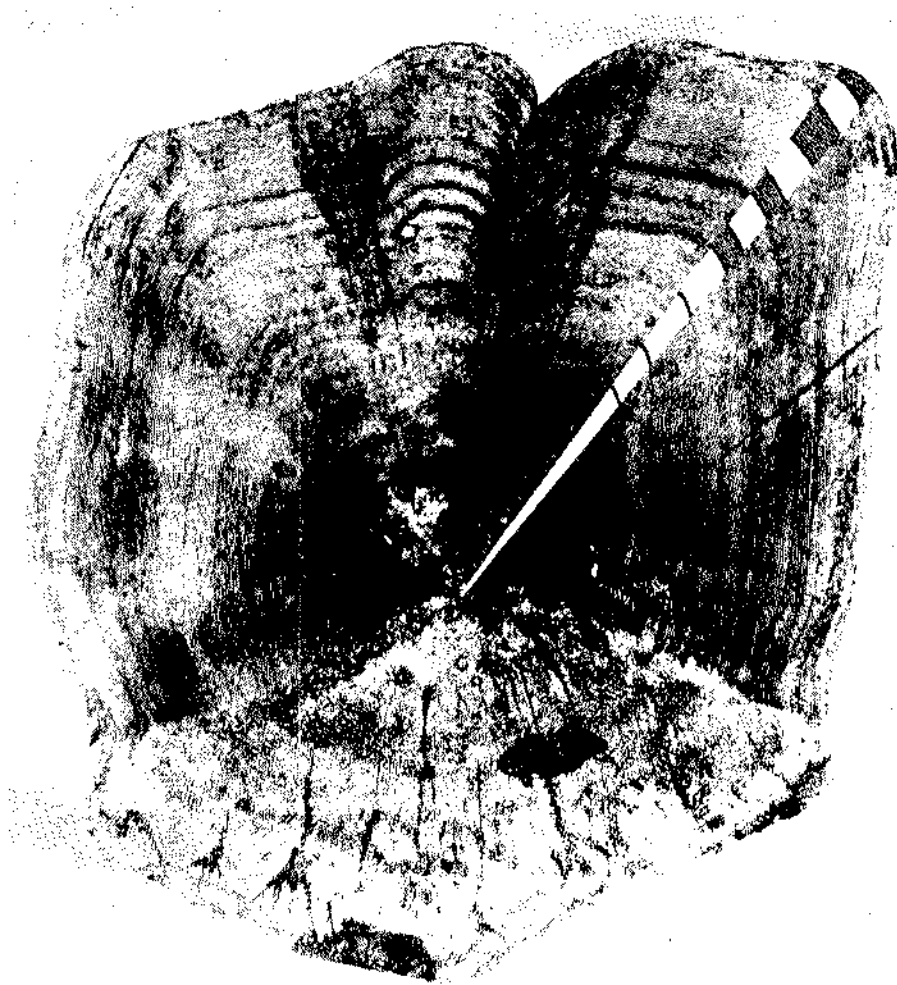
$L_{\infty}=135.2$ cm, $K=0.23$ and $t_0=-0.30$ years.

TABLE 2. *Observed and expected lengths of P. indicus at different ages*

Age	Observed length (cm)	Expected length (cm)
I	34.5	—
II	54.5	55.6
III	74.5	72.3
IV	84.5	85.5
V	94.6	96.0
VI	104.5	104.2

Table 2 shows the observed length and expected length worked out on the basis of growth equation for ages I to VI.

Kagwade (1972) employing the formula given by Chugunova (1963) established three distinct growth characteristics in the life of *P. heptadactylus*. Using the same method on the age-length data of *P. indicus*, it was found that during the first period of juvenile stage, extending for three years, the average growth characteristic was 16.40, and in the second period, lasting from the fourth to the sixth year, it was 9.44 (Table 3). Due to lack of adequate data the growth characteristic of the old



Scale of *P. indicus* with 7 growth rings. (Fish length 103 cm).

(Facing P. 168)

TABLE 3. Growth characteristics of *P. indicus*

Age	Length (cm)	Growth characteristics	Average growth characteristics
I	34.5	—	
II	54.5	15.77	16.40
III	74.5	17.04	
IV	84.5	9.38	
V	94.5	9.43	9.44
VI	104.5	9.51	

age period beyond the sixth year could not be worked out. The growth characteristics of *P. heptadactylus*, a smaller polynemid which grows to about 30 cm, shows its first phase of juvenile stage up to two years; the second phase of maturing and spawning extends from third to sixth and the old age starts at the seventh year (Kagwade, 1972).

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REFERENCES

- BERTALANFFY, L.VON. 1938. A quantitative theory of organic growth. *Hum. Biol.*, 10: 181-213.
- CHUGUNOVA, N.I. 1963. *Age and growth studies in fish*. Published for the National Science Foundation Washington, D.C. by the Israel Program for scientific Translations, Jerusalem: 1-132.
- KAGWADE, P.V. 1968. Polynemid fishery resources of India. *Symposium on the living resources of the seas around India*, Central Marine Fisheries Research Institute, Cochin.
- KAGWADE, P.V. 1970. The polynemid fishes of India. *Bull. cent. mar. Fish. Res. Inst.*, 18: 1-69.
- KAGWADE, P.V. 1972. Age and growth of *Polynemus heptadactylus* Cuv. and Val. from the Bombay-Saurashtra region. *Indian J. Fish.*, 18: 33-51 (1971).
- LONGHURST, A.R. The biology of West African polynemid fishes. *J. Cons.*, 30 (1): 58-74.
- NAVAK, P.D. 1959. Some aspects of the fishery and biology of *Polydactylus indicus* Shaw. *Indian J. Fish.*, 6 (2): 280-297.