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OBSERVATIONS ON SOME ASPECTS OF BIOLOGY OF *JOHNIUS (JOHNIEOPS) VOGLERI* (BLEEKER) AND *PENNAHIA MACROPHTHALMUS* (BLEEKER) IN THE KAKINADA REGION

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ABSTRACT

The length-weight relationship in *J. vogleri* and *P. macrophthalmus* can be described by the equations log W=-5.08923+3.07931 log L and log W=-4.63735+2.89703 log L respectively. The length at first maturity in *J. vogleri* is estimated as 190 mm and in *P. macrophthalmus* as 147 mm. These two species appear to spawn atleast twice in a year during protracted spawning periods: November-June in *J. vogleri* and October - June in *P. macrophthalmus*.

INTRODUCTION

AMONG the demersal fishes landed by the private trawlers at Kakinada, the sciaenids constitute the most dominant group. Though 18 species contribute to the fishery, only a few are dominant. The present paper gives an account of length-weight relationship and spawning in *Johnius vogleri* and *Pennnahia macrophthalmus* on the basis of data collected from the landings of private trawlers during 1975-1979. Though considerable information is available on the biology of sciaenid from India, in the case of *J. vogleri* the only account available is from Bombay (Muthiah, 1983) and *P. macrophthalmus* from Visakhapatnam (Rao, 1967, 1983).

MATERIAL AND METHODS

Samples were collected at weekly intervals from the landings of private trawlers. Data on length, weight, sex and stage of maturation were taken from fresh specimens and ova diameters were taken from formalin-preserved ovaries. Ova diameters were measured following the procedure of Clark (1934); in each ovary a minimum of 300 ova were measured at a magnification where 1 mm = 59 divisions of occular micrometer. The gonads were classified into seven stages of maturation. Length - weight relationship was calculated following Le Cren (1951) using the formula $\log W = \log a + b \log L$.

LENGTH - WEIGHT RELATIONSHIP

In *J. vogleri*, the study is based on 132 males ranging from 94 to 234 mm length and from 10 to 138 g weight and 144 females ranging from 99 to 238 mm length and from 11 to 145 g weight. The relationship was calculated separately for sexes and equations are:

Males: $\log W = -5.01103 + 3.04169 \log L$; $r^2 = 0.99$

Females: $\log W = -5.13942 + 3.10374 \log L$; $r^2 = 0.99$.

In *P. macrophthalmus*, a total of 90 males ranging from 98 to 222 mm length and from 15 to 148 g weight and 100 females ranging from 91 to 219 mm length and from 12 to 140 g weight was used for the calculation of

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the relationship. The equations for sexes separately are:

Males: $\log W = -4.56767 + 2.86347 \log L$; $r^2 = 0.94$.

Females: $\log W = -4.70991 + 2.931936 \log L$; $r^2 = 0.98$.

The differences between the regression lines of males and females of these two species were tested by analysis of covariance following Snedecor and Cochran (1969). It was found (Table 1) that the differences are not significant at 5% level. The data of males and females were, therefore, pooled and relationships for the two species obtained (Fig 1). The equations for the species are:

J. vogleri: $\log W = -5.08923 + 3.07931 \log L$; $r^2 = 0.99$.

P. macrophthalmus: $\log W = -4.63735 + 2.89703 \log L$; $r^2 = 0.96$.

The t-test (Pauly, 1984) was applied to see whether the values of regression coefficient (b) in the above equations were significantly different from 3; it was observed that the b values are not significantly different from 3; hence growth in weight with length in these two species can be taken as isometric.

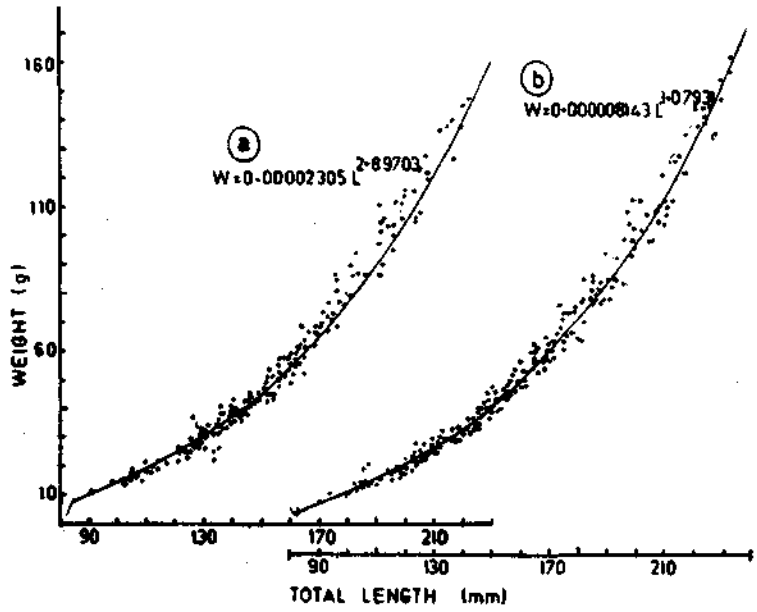

Fig. 1. Length-weight relationship in: a. *P. macrophthalmus* and b. *J. vogleri.*

Length at First Maturity

For determining the length at first maturity, only females were considered and fishes in stages IV-VI of maturation were taken as

TABLE 1. *Analysis of Covariance to test significance of differences between regression lines of sexes in the length weight relationships of* J. vogleri *and* P. macrophthalmus

Source of variation	df	*J. vogleri* Deviation from regression SS	MS	df	*P. macrophthalmus* Deviation from regression SS	M
Due to regression within sexes	272	0.308146	0.001133	186	0.419714	0.002257
Difference between regression coefficients	1	0.002205	0.002205	1	0.001514	0.001514
Residuals due to regression pooled within	273	0.310351	0.001137	187	0.421228	0.002253
Difference between adjusted means	1	0.003591	0.003591	1	0.002483	0.002483
Total	274	0.313942		188	0.423711	

Comparison of slopes F= 1.95, df = 1,272; F = 0.67, df = 1,186; NS

Comparison of elevations F = 3.16, df = 1,273 NS., F = 1.10, df = 1,187; NS

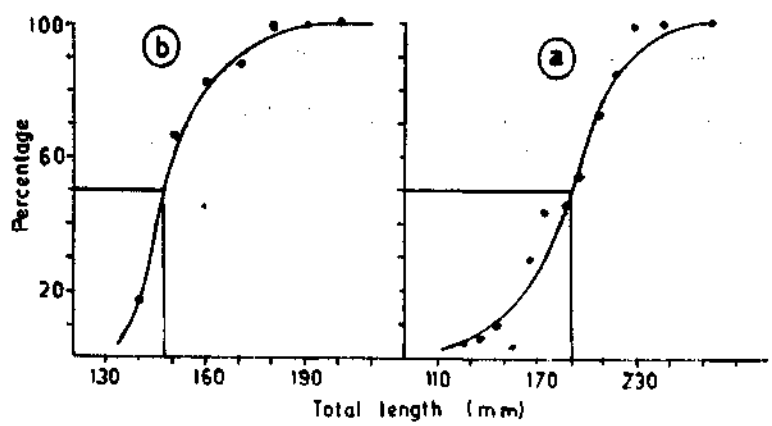

Fig. 2. Percentage of mature females in the total numbers of females examined in each length group in: a. *J. vogleri* and b. *P. macrophthalmus*.

mature (Fishes with fully spent ovaries - stage VII - were not encountered in the samples). The total lengths were grouped into 10 mm class intervals.

In *J. vogleri*, the smallest mature female was observed in 120-129 mm group. The percentage of mature females in each length group (Fig. 2 a) shows that 50% of fishes were

mature at 190 mm; hence this length was taken as length at first maturity.

In *P. macrophthalmus* (Fig 2 b), the percentage of mature fish in each length group indicates that 50% are mature at 147 mm; hence this length can be taken as length at first maturity.

lucent maturing ova and the other group (mode b) consists of mature, opaque ova. In stage VI the above two groups are present with more or less same modal diameters; there is another group consisting of ripe ova with distinct oil globules. The above observations indicate that each adult female spawns at least twice during the course of one year.

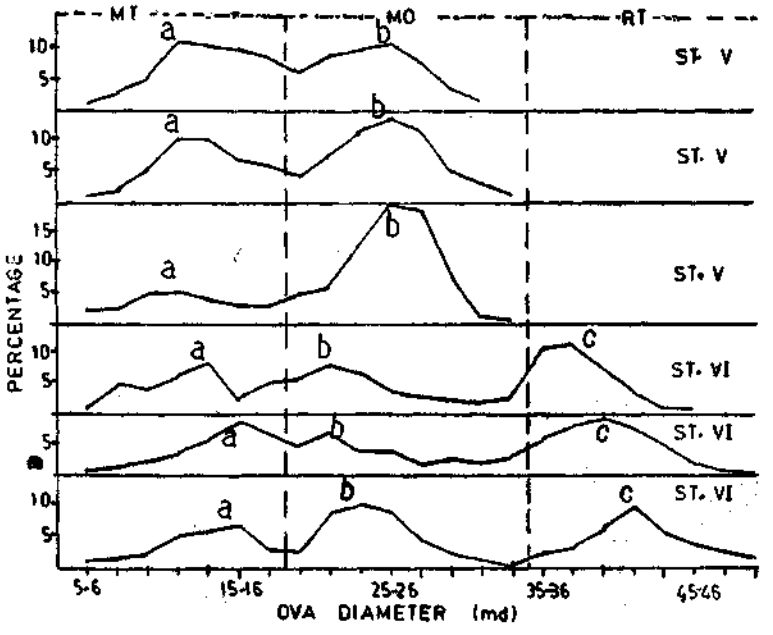

Fig. 3. Ova diameter frequency distribution in mature and ripe ovaries of *J. vogleri* (diameter ranges of : maturing translucent ova MT; mature opaque ova MO; ripe translucent ova RT).

Spawning

The ova diameter frequency distribution in gravid (St. V) and ripe (St. VI) ovaries of *J. vogleri* (Fig. 3) shows that two groups of ova (in addition to immature ova measuring upto 4 md which were not considered in the present study) are present in stage V ovaries. One group (mode a) consists of yolked, trans-

In *P. macrophthalmus*, fishes with ripe ovaries were not available in the samples, therefore only those with stage V ovaries were considered. The ova diameter frequency distribution (ova measuring upto 4 md were not considered in this species also) in stage V ovaries (Fig. 4) in this species shows a situation similar to that in *J. vogleri* indicating similar spawning habits.

For purpose of determining spawning season only females of and above length at first maturity were considered and data of corresponding months of different years pooled. In *J. vogleri* fishes in stage IV of maturation occurred in almost all the months and the proportion of gravid and ripe adults in each shows that spawning takes place from November to June with maximum spawning activity during May-June. In *P. macrophthalmus*, fishes with stage V ovaries (fishes with ripe ovaries were not encountered in samples) occurred during September, November, December and February-May (Fig 5) indicating that spawning takes place during October-June. It is thus clear that spawning season in these two species is more or less the same and that it is protracted. The study of ova diameter frequency distribution (Fig. 4 & 5) lends support to this conclusion.

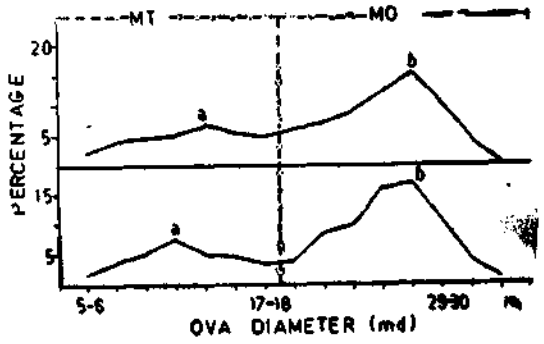

Fig. 4. Ova diameter frequency distribution in mature ovaries of *P. macrophthalmus* (Abbreviations as in Fig. 3).

Discussion

Muthiah (1983) calculated the length-weight relationship separately for males and females of *J. vogleri* from Bombay, but did not calculate the relationship for the species as a whole nor did he state that the regression coefficients are significantly different. The values of regression coefficient (b=3.2861 males; 3.2808 females) of males and females from Bombay appear to be different from those of sexes of this species, from Kakinada. The value of 'b' for *P. macrophthalmus* from Visakhapatnam (Rao, 1983), however, is close to the one obtained from Kakinada. The above authors did not test whether the growth is isometric in these species; however the fact that the values of b are not significantly different from 3 in the two species from Kakinada shows that Beverton-Holt (1957) yield equation can be used in yield studies without any modification.

In *J. vogleri*, Muthiah (1983) estimated the length at first maturity as 159 mm whereas the same estimated from Kakinada is larger (190 mm). In the ova diameter frequency distribution in ripe ovaries of *J. vogleri* from Bombay, Muthiah (1983) observed a situation comparable to that observed from Kakinada (Fig. 3), but stated that "the spawning in this species seem to be restricted to a short period with an indication of second spawning, the duration in between being short". He, however,

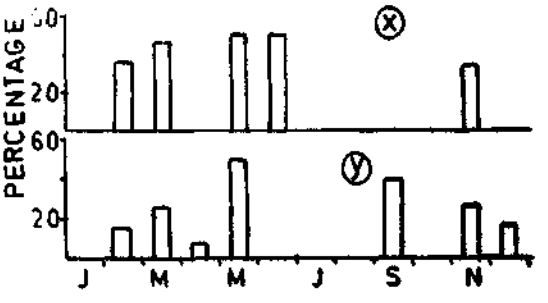

Fig. 5. Monthly percentage of gravid and ripe females in the total number of adult females examined each month: x. *J. vogleri* and y. *P. macrophthalmus*.

observed mature (st. IV) fish throughout the year, but stated that *J. vogleri* spawns twice a year during June-July and October-November. The ova diameter frequency distribution

(Fig. 3) in *J. vogleri* from Kakinada shows that the maturing translucent ova and mature opaque ova have more or less the same modal values in stage V and VI ovaries. This indicates that by the time the mature opaque ova in stage V reach ripe stage the maturing translucent ova in the same ovary become mature and opaque. This further suggests that after the ovary reaches stage VI and spawns the batch of ripe ova, it reverts to stage V and again reaches ripe stage and this process continues (James and Baragi, 1980). The ova diameter frequency distribution in *P. macrophthalmus* also suggests a similar conclusion. Rao (1967) however stated that *Pseudosciaena aneus* (= *Pennahia macrophthalmus*) spawns only once a year during December - March. The present observations show that both *J. vogleri* and *P. macrophthalmus* have more or less the same spawning period and that the periods are protracted.

References

Beverton, R. J. H. and S. J. Holt 1957. On the dynamics of exploited fish populations. *Fish. Invest. Ser.* II, **19**: 1-533.

Clark, F. N. 1934. Maturity of the California sardine (*Sardina caerulea*), determined by ova diameter measurements. *Calif. Div. Fish. Game Fish. Bull.*, **42**: 1-49.

James, P. S. B. R. and V. M. Baragi 1980. Ovary as an indicator of frequency of spawning in fishes. *Proc. Indian natn. Sci, Acad.*, B **46** (4): 479-489.

Le Cren, E. D. 1951. The length-weight relationship and seasonal cycle in gonad weight and condition in the perch (*Perca fluviatilis*) *J. anim. Ecol.*, **20**: 201-219.

Muthiah, C. 1983. Study on the biology of *Johnieops vogleri* (Bleeker) of Bombay waters. *Indian J. Fish.*, **29**: 118-113 (1982).

Pauly, D. 1984. Fish Population dynamics in tropical waters : a manual for use with programmable calculators. *ICLARM studies and Reviews*, **8**: 325 pp.

Rao, T. Appa 1967. Maturity and spawning habits of some sciaenids in offshore waters at Visakhapatnam. *Indian J. Fish.*, **11**: 121-126 (1964).

——— 1983. Length-weight relationship in *Pennahia macrophthalmus* (Bloch). *Ibid.*, **29**: 263-266 (1982).

Snedecor, G. W. and W. G. Cochran 1967. *Statistical Methods.* Oxward and IBH publishing Co. New Delhi, Sixth edition, 593 pp.