

Studies on the reproduction of *Priacanthus hamrur* (Forsskal) off central Kerala

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Abstract

The Dusky - finned Bullseye, *Priacanthus hamrur* (Forsskal) exhibited five maturity stages, with two peak spawning seasons, March-August and November-December. Southwest and north east monsoons play an important role in the reproduction in this fish. The minimum size at maturity was found to be 198 mm. In the commercial catches, the sex ratio showed no significant deviation from the general pattern. i.e., 1:1 ratio. The maximum fecundity noted was 1,52,112 eggs. A linear relationship exists between fecundity and different variables such as total length, body weight and ovary weight.

Priacanthus hamrur (Forsskal) belonging to the family *Priacanthidae* is one of the most economically important fishes in Kerala. They are comparatively deep water fishes occurring on the outer shelf in EEZ of India. Priacanthids are commonly known as Bullseye and in Malayalam they are called as *Chempallykutti*. This fish is very popular among the common man and is usually caught along with a variety of other fishes by the trawlers. Although, the fish has a gradual increasing demand in the country, only little is known about the biology of the fish. Eventhough, G.S.I. has been used as an indicator for gonadal development in many fishes, no such work has been done in *P. hamrur* off central Kerala. Some of the contributions are those of Rao (1984) on *Priacanthus macracanthus* (Cuvier), Philip (1994) on

Priacanthids from Visakhapatnam, Premalatha (1997) on the fishery and biology of *Priacanthus hamrur* (Forsskal) and Tessy and Inasu (1998) on the sexual dimorphism. The Dusky - finned bullseye, constitutes an important component in trawls operated from Munambam, Central Kerala. Since not much is known about this fish, a study was undertaken on various biological aspects of this species. The present paper reports the results of the work carried out on the reproduction of *P. hamrur*.

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for providing necessary assistance in the Munambam Harbour for collecting specimens.

Material and methods

Monthly samples of *P. hamrur* were collected from the Munambam fisheries harbour, central Kerala, between January 1997 and December 1998 (24 months) and analyzed for total length, weight, sex and stages of maturity. After removing moisture, the total length (in mm), and weight (in g) were recorded in fresh condition. The ovaries were removed and their length, weight and colour were noted and then preserved in 5% formalin for further studies. For classification of maturity stages, the International Council for the Exploration of the Sea, (I C E S) scale was adopted. (Wood, 1930 and Lovern and Wood, 1937). In order to study the frequency of spawning, ova diameter measurements were recorded following the procedures described by Clark (1934) and June (1953). The gonadosomatic index (G.S.I) was determined by applying the equation, $G S I = \text{wt. of gonad} \times 100 / \text{wt. of the fish}$.

Size at first maturity was determined by tabulating the percentage occurrence of the fish belonging to mature and ripe stages. For sex ratio studies, the Chi-square test was applied. For fecundity estimation mature ovaries belonging to stages III and IV were studied. From each ovary a small portion was removed, weighed, ova separated, counted and the total number of mature ova in the whole ovary was computed. The relationship

between fecundity and different variables like fish length, fish weight and ovary weight was worked out by the least square method. The regression line was fitted using the formula.

$\log F = a + b \log X$, where F = fecundity, a and b are two constants, X = length or weight of fish or ovary weight. The correlation coefficient "I" was calculated.

Results and discussion

The ovaries of *P. hamrur* are paired symmetrical organs lying in the posterior part of the abdominal cavity and attached to the dorsal wall by the mesovarium. The data on the frequency distribution of ova belonging to the five maturity stages are presented in Fig. 1. In stage (immature) the ovaries are small and light cream in colour and the dominant ova measured 175 microns. The stage II (maturing) ovary is yellow coloured and the dominant ova indicated a diameter of 275 microns. In stage III (mature) the ovary is yellow coloured and the ova diameter was 325 microns. The stage IV represented the ripe stage with golden yellow ovary (dominant ova diameter 375 microns). In stage V (spent) the colour of the ovary has faded and shrunk in size. The trend of the modal shift observed from stages I - VI indicated that once the mature batch of ova is spawned another group of mature eggs takes its place. If there is periodicity in spawning, all the fish collected at any particular time are expected to belong to the same stage of maturity (Clark, 1934). But in the present study, a sample collected on a day

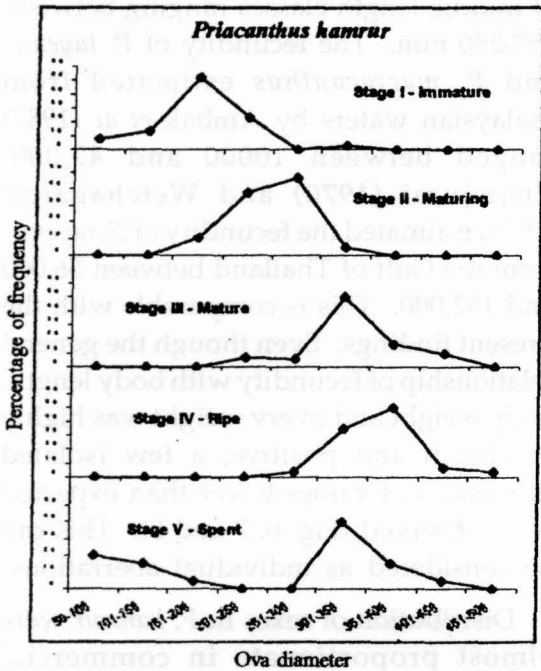


Fig. 1. Ova diameter frequency polygons for stages I-V during January 1997 to December 1998

contained fish in different stages of maturity. During most of the months, advanced stages along with spent fishes were recorded.

Breeding season was determined on the basis of the occurrence of individuals in the mature, ripe and spent stages of maturity in each year. Two peak spawning seasons were noticed in each year. The ova diameter and G.S.I. values reached the maximum level during March-August and November-December and so these periods are considered to be the two spawning seasons of the fish. (Fig. 2 & 3). June to September represents the period of south west monsoon and November-December the last quarter of north east

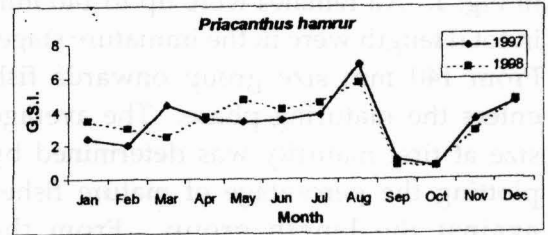


Fig. 2. Monthly average gonado-somatic index

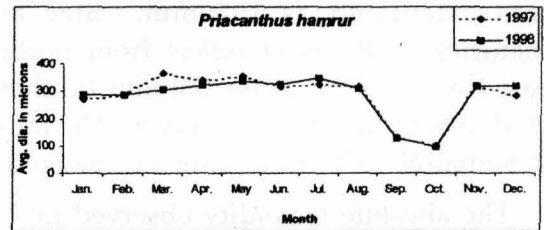


Fig. 3. Monthly variations in average ova diameter during 1997 and 1998

monsoon. The two monsoons greatly influence the breeding biology of *P. hamrur*. While studying maturation and spawning in marine teleosts from Indian waters, Qasim (1973) found that along the east coast spawning mainly occurs during pre-monsoon months (February-May) whereas along the west coast the same is taking place during monsoon (June-September) and post monsoon (October-January). Ambak *et al* (1986) opined that *P. taylorus* and *P. macracanthus* from Malaysian waters spawned through out the year as indicated by the presence of ova with advanced maturation in the ovary. In the case of *P. hamrur* from Visakhapatnam too, ripe specimens were found through out the year except during June-August (Philip, 1994).

Data on the size at first maturity, gathered from 222 females are presented

in Fig. 4. All females were up to 140 mm in total length were in the immature stage. From 140 mm size group onwards fish enters the maturing phase. The average size at first maturity was determined by plotting the percentage of mature fishes against the length group. From the maturity curve drawn the length at which 50% of the female fishes attain maturity was calculated as 198 mm. Size at maturity in *P. macracanthus* from north east was reported to be 170 mm (Luther *et al* 1988) and in *P. tayenus* as 140 mm (Chomjurai 1970) from Gulf of Thailand.

The absolute fecundity observed in *P. hamrur* was 1,52,112 for a fish of length 340 mm and weight 372 g. Higher fecundity values were observed in fishes

of middle length classes ranging between 255-290 mm. The fecundity of *P. tayenus* and *P. macracanthus* estimated from Malaysian waters by Ambak *et al* (1987) ranged between 10000 and 47,000. Chomjurai (1970) and Wetchagarun (1971) estimated the fecundity of *P. tayenus* from the Gulf of Thailand between 56,000 and 152,000. This is comparable with the present findings. Even though the general relationship of fecundity with body length, body weight and overy weight was highly significant and positive, a few isolated incidences of values lower than expected were observed (Fig. 6, 7 and 8). This can be considered as individual aberrations.

Distribution of sexes in *P. hamrur* were almost proportionate in commercial

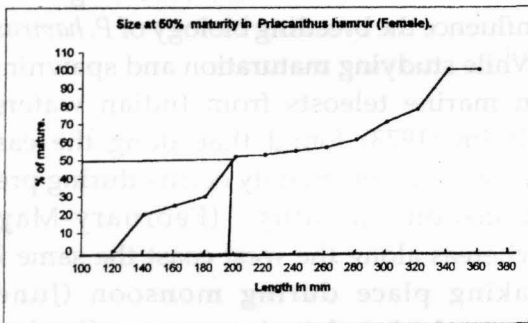


Fig. 4. Size at maturity

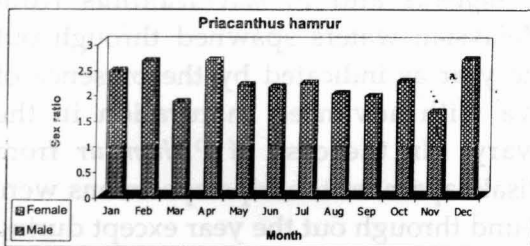


Fig. 5. Sex ratio (male and female pooled) 1997 and 1998

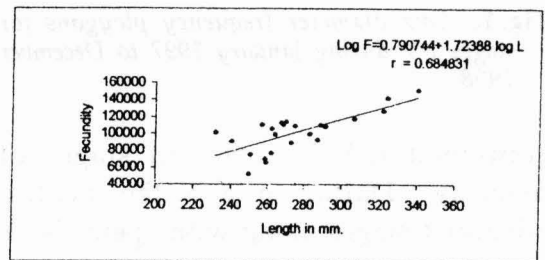


Fig. 6. Relation between fish length and fecundity in *P. hamrur*

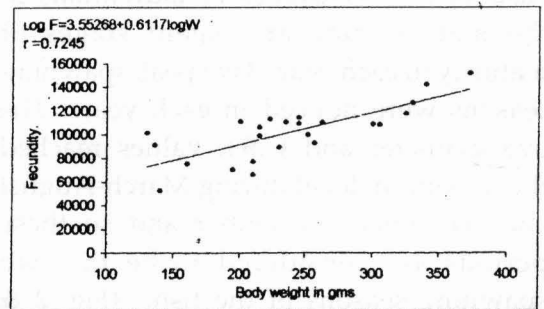


Fig. 7. Relation between body weight and fecundity in *P. hamrur*

Table 1. Percentage occurrence of female *Priacanthus hamrur* in different stages of maturity during January 1997 to December

| Month | Percentage occurrence of various stages of maturity | | | | | | | | | |
|-----------|-----------------------------------------------------|------|-----|----|----|------|------|-----|----|------|
| | 1997 | | | | | 1998 | | | | |
| | I | II | III | IV | V | I | II | III | IV | V |
| January | 37.5 | 62.5 | 0 | 0 | 0 | 33.3 | 50 | 0 | 0 | 16.6 |
| February | 62.5 | 37.5 | 0 | 0 | 0 | 25 | 75 | 0 | 0 | 0 |
| March | 25 | 25 | 25 | 25 | 0 | 50 | 25 | 25 | 0 | 0 |
| April | 40 | 20 | 20 | 0 | 50 | 25 | 25 | 0 | 0 | |
| May | 25 | 25 | 50 | 0 | 0 | 0 | 20 | 60 | 20 | 0 |
| June | 20 | 20 | 20 | 40 | 0 | 0 | 0 | 20 | 60 | 20 |
| July | 0 | 25 | 50 | 25 | 0 | 0 | 0 | 20 | 60 | 20 |
| August | 0 | 20 | 20 | 60 | 0 | 0 | 25 | 25 | 50 | 0 |
| September | 100 | 0 | 0 | 0 | 0 | 75 | 0 | 0 | 0 | 25 |
| October | 100 | 0 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 |
| November | 25 | 50 | 0 | 0 | 0 | 33.3 | 33.3 | 0 | 0 | 0 |
| December | 20 | 20 | 20 | 20 | 20 | 25 | 0 | 25 | 50 | 0 |

catches. The month wise sex ratio is presented in Fig. 5. The male to female ratio in the entire sample was 1:1.2. The slight deviation observed is not statistically significant, (Table 2). Zacharia *et al* (1991) observed predominance of females, with a male to female ratio of 1:1.6 in *P. hamrur* collected from the trawl catches at Mangalore. Rao (1984) observed dominance of females in his studies on *P. macracanthus* from the north-east coast of India.

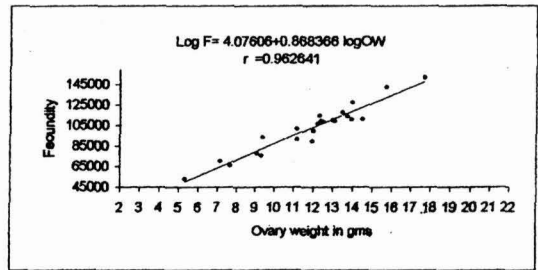


Fig. 8. Relation between ovary weight and fecundity in *P. hamrur*

Table 2. Test of variance of homogeneity of year wise sex ratio in *Priacanthus hamrur* during 1997 & 1998

| Year | Total No. | Male | Female | Observed Sex ratio | X ² | 5% Table | Remarks |
|---------------------|-----------|------|--------|--------------------|----------------|----------|---------|
| 1997 | 226 | 100 | 126 | 1:1.260 | 1.496 | 3.841 | N.S. |
| 1998 | 168 | 86 | 82 | 1:0.953 | 0.048 | 3.841 | N.S. |
| Pooled data 97 & 98 | 394 | 186 | 208 | 1 : 1.118 | 0.614 | 3.841 | N.S. |

1% (5%) Table X² value for 1 d.f.

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