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Note

Gonado-somatic index and fecundity studies in two species of ribbon fishes, *Trichiurus lepturus* (Linnaeus, 1758) and *Lepturacanthus savala* (Cuvier, 1829) off Visakhapatnam, east coast of India

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ABSTRACT

The gonado-somatic index (GSI) and fecundity of two species of ribbon fishes *viz*., *Trichiurus lepturus* and *Lepturacanthus savala* from Visakhapatnam coast were studied during June 2006 – May 2007. The GSI of males of *T. lepturus* was high in December 2006 (2.06 ± 0.22) and low in May 2007 (0.05 ± 0.09) whereas in females, it was high in February 2007 (1.54 ± 3.68) and low in May 2007 (0.03 ± 0.05). In *L. savala*, high GSI values in males and females were observed in July 2006 (1.94 ± 0.07) and March 2007 (2.73 ± 0.17) respectively, and low in September 2006 (0.03 ± 0.02 in males and 0.07 ± 0.05 in females). The fecundity varied from 10,395 to 3,20,712 in *T. lepturus* and from 9,566 to 7,20,862 in *L. savala*. The relationship between fecundity to total length, body weight and ovary weight was linear and a similar trend was observed in the relationship of ovary length - total length and ovary weight - body weight.

Keywords: Fecundity, Gonado-somatic index, *Lepturacanthus savala*, Ribbon fishes, *Trichiurus lepturus*, Visakhapatnam coast

Ribbon fish fishery has emerged as one of the leading fisheries at Visakhapatnam in view of its abundance in trawl catches (Reuben *et al.,* 1997) and its expansion into the deeper waters coinciding with market demand. Ribbon fishes belong to the family Trichiuridae. Nine species of ribbon fishes have been reported from Indian waters (Rizvi *et al.*, 2010) and six species *viz., Trichiurus lepturus*, *Trichiurus russelli*, *Lepturacanthus savala*, *Lepturacanthus gangeticus*, *Eupleurogrammus muticus* and *Eupleurogrammus glossodon* are recorded in the coastal waters of Visakhapatnam (Reuben *et al*., 1997). Among them, the large head cutlassfish *T. lepturus* and small head, *L. savala* are mostly found in the trawl catches.

Reproductive parameters such as sex composition, size at first maturity, maturity stages, gonado-somatic index (GSI), fecundity, spawning frequency and recruitment are of great importance in the prediction of a fishery (Bal and Rao, 1984). Fecundity varies with the species, size and age of the fish (James *et al.*, 1983).

James (1967) has brought out a comprehensive monograph on ribbon fishes. The reproductive biology of *T. lepturus* has been studied by Prabhu (1955), Tampi *et al.* (1968), James *et al.* (1983), Narasimham (1976; 1983), Lazarus and Sarma (1991) and Thigarajan *et al.* (1992) from Indian waters; Dawson (1967) in the northern Gulf of Mexico, Kwok and Ni (1999) in China seas, Martins and Haimovici (2000) in the South-West Atlantic, Wojciechowski (1972) in the North-East Atlantic, Sheridan *et al.* (1984) in the Gulf of Mexico and Al- Nahdi *et al.* (2009) in the Arabian sea coast of Oman. The present study presents a comparative account of GSI and fecundity in two species of ribbon fishes, *T. lepturus* and *L. savala*.

Samples of *T. lepturus* (n= 204; 102 males + 102 females) and *L. savala* (n= 206; 105 males + 101 females) were collected from the Visakhapatnam Fishing Harbour for a period of one year from June 2006 - May 2007. The samples were brought to the laboratory and thoroughly washed. After removing the surface moisture with blotting paper, the length and weight of individual fish were taken to an accuracy of 1 mm and 1 mg respectively. Each fish was then cut open to record the sex, gonadal condition and gonad weight. The ovaries were preserved in 5% formalin for fecundity studies.

The GSI was calculated using the following formula (June, 1953; Yuen, 1955) :

$$GSI = \frac{\text{Weight of gonad}}{\text{Weight of fish}} X \ 100$$

The relationships between body weight (BW) and ovary weight (OW) and total length (TL) and ovary length (OL) were worked out by the least square method.

To estimate fecundity, 35 ripe ovaries each of *T. lepturus* and *L. savala* each were used. From formalin

preserved ovary of known weight, a small portion was removed and weighed to the nearest 0.001 g using an electronic balance and all the mature eggs in the sample ovary were counted under binocular microscope using a counting chamber (Bagenal, 1968). The fecundity was estimated using the formula:

$$\text{Fecundity} = \frac{\text{No. of eggs in sub sample}}{\text{Wt. of the sub sample}} \text{X Wt. of the ovary}$$

The relationships between fecundity (F) and total length (TL), fecundity and body weight (BW) and fecundity and ovary weight (OW) were worked out by the least square method after log transformation, and expressed as:

$$\log F = \log a + b \log X$$

where, F = Fecundity, a = constant, X = variable (total length, body weight or ovary weight) and b = correlation coefficient (the exponent).

The GSI for males and females of *T. lepturus* was found to be high during the month of December'06 (2.06 ± 0.22) and February'07 (1.54 ± 3.68) respectively, indicating that spawning activity takes place during these months. A fall in GSI values has been seen in the months of May'07 (0.05 ± 0.09; 0.03 ± 0.05) (Fig. 1). In *L. savala,* the GSI of males and females were high in the months of July'06 (1.94 ± 0.07) and March'07 (2.73 ± 0.16) respectively, and low in the month of September'06 (0.03 ± 0.027; 0.07 ± 0.05) (Fig. 1).

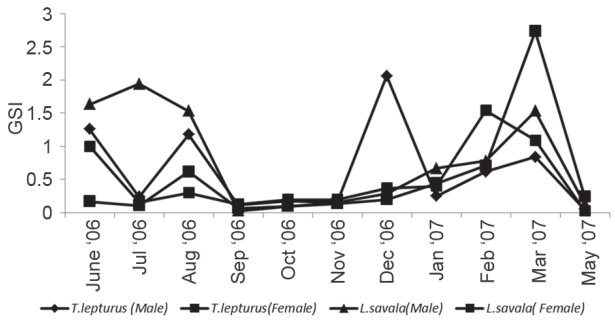

Fig. 1. Monthly mean GSI values of *T. lepturus* and *L. savala*

The relationship between ovary length and body length can be logarithmically expressed as:

T. lepturus: log OL = - 2.0662 + 1.0408 log TL (r = 0.709)
L. savala : log OL = - 1.2601 + 4.3212 log TL (r = 0.884)

In both the species, there was positive correlation between ovary weight and body weight. As the body weight increased, the ovary weight also increased. The linear equations obtained were:

T. lepturus : log OW = - 1.8448 + 1.3211 log BW (r = 0.284)
L. savala : log OW = - 5.6338 + 2.7603 log BW (r = 0.931)

The cyclical changes in the weight of the gonad in relation to body weight particularly in case of females are indicative of the spawning season (Qasim, 1973). Prabhu (1955) reported that in *T. lepturus* spawning takes place once in a year *i.e.,* in June but other observations indicate spawning in May-June and November-December (Tampi *et al.,* 1968; Narasimham, 1976). Similarly *L. savala* was also found to spawn twice a year. In females of *T. lepturus* peak GSI was observed in May and low in June and the spawning season coincides with the onset of south-west monsoon from the Arabian Sea coast of Oman (Al-Nahdi *et al*., 2009). The present observations are also similar to those of earlier reports.

The fecundity of *T. lepturus* ranged from 10,395 - 3,20,712 (SD : ± 53,063) where as in *L. savala* it was 9,566 - 7,20,862 (SD : ± 1,27,536). The fecundity of *T. lepturus* and *L. savala* increased with increase in length, weight and ovary weight of the fish. The minimum fecundity in *T. lepturus* (10,395) was estimated from a female measuring 23 cm TL, 185 g of BW, 0.85 g of OW and in case of *L. savala* (9,566) it was from 23 cm TL, 180 g of BW, 0.89 g of OW. The highest fecundity in *T. lepturus* (3,20,712) were recorded in an individual measuring 29.5 cm TL, 270 g of BW and 20 g of OW while in *L. savala* (7,20,862) it was recorded in fish measuring 40 cm TL, 950 g of BW and 65 g of OW.

The relationship between fecundity and total length of fish can be expressed by the equation:

T. lepturus : log F = - 4.3152 + 1.3756 log L (r = 0.536)

L. savala : log F = - 3.6080 + 1.1633 log L (r = 0.833)

The relationship between fecundity and body weight of fish was calculated as:

T. lepturus : log F = - 7.9951 + 2.375 log W (r = 0.286)

L. savala : log F = - 4.1972 + 2.6324 log W (r = 0.820)

The relationship between fecundity and ovary weight was found to be:

T. lepturus : log F = - 8.1336 + 1.9549 log OW (r = 0.774)

L. savala : log F = - 2.7629 + 3.7871 log OW (r = 0.926)

A linear relationship has been found between logarithmic form of fecundity and total length, fecundity and total weight, fecundity and ovary weight as well as fecundity and ovary length in both the species. Prabhu (1955) observed the fecundity in *Eupleurogrammus intermedius* varying from 2249 to 9950 in fish measuring 40.9 cm to 45 cm length. In *E. muticus* it varied from 1327 (49.5 cm) to 2087 (55.1 cm), in *L. savala* from 9178 (37.0 cm) to 17347 (54.0 cm) and in *T. lepturus* from 4000 (42.0 cm) to 5000 (60.0 cm). Tampi *et. al.* (1968) recorded

the fecundity of *T. lepturus* as 24,288 to 61,595. In *E. glossodon,* a fecundity of 2403 – 8429 has been reported (Narasimham, 1983). Abdussamad *et al.* (2006) have found the fecundity of *T. lepturus* in 63-82 cm size fish as 40,250 ova per fish or 100,628 per kg body weight from Kakinada waters. A fecundity range of 4,900 to 81,000 with a relative fecundity of 65 ova per g of body weight has been observed in *T. lepturus* by Khan (2006) along north-west coast of India. The present study indicates higher fecundity values in *T. lepturus* and *L. savala* than observed by earlier workers.

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