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Observations on the Fecundity and Gonadosomatic Index (GSI) of the Omani-Indian Oil Sardine *Sardinella longiceps* (Valenciennes 1847)

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Abstract: The Omani Indian oil sardine is considered among the most important fisheries in Oman. In this study we investigated the Fecundity (F) and Gonadosomatic (GSI) of a total of 70 mature Indian oil sardines collected from the coastal region of Muscat. The fecundity of the fish ranged between 5500 and 60000 with an average of 19000. A significant linear regression was found between F and fish Total Length (TL); Fish Weight (FW) and Gonad Weight (GW). The regression equations were found to be: $F = 2982.1TL - 28681$; $F = 927.02FW - 17214$ and $F = 15748GW - 3891.8$. The results of the correlation regression were 0.966437; 0.796241 and 0.877952, respectively. The GSI analysis indicated that Omani Indian oil sardines show two major spawning peaks; March-April and during August.

Key words: *Sardinella longiceps*, Oman, Fecundity, Gonadosomatic Index

INTRODUCTION

The Omani-Indian oil sardine, *Sardinella longiceps*, is one of the most abundant species of the small pelagic. During 1994-2003 sardine fisheries dominated the annual landings of the small pelagic (MAF, 2003) with a decline in the total landing from 60,000 to 17,000 mt and an annual average of 34,000 mt (Fig. 1). Sardines are considered to be the most targeted species among other small pelagic fishes and their total landings fluctuate from region to region along the coastal region. Alone, sardines

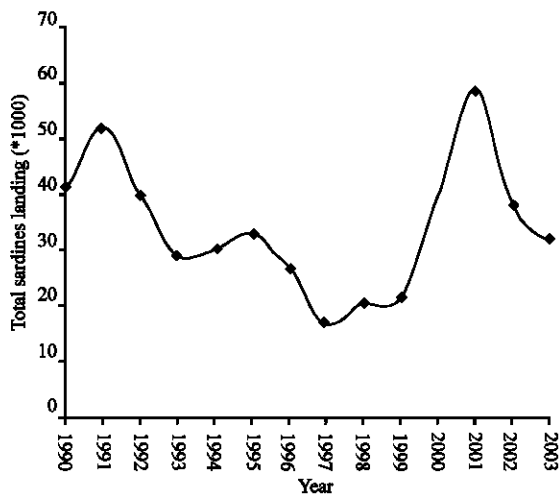


Fig. 1: Total sardines landings in the Sultanate of Oman

contribute annually an average of 84% to the total small pelagic traditional fishery landings and 62% in terms of values only in the Muscat region. Beach seines and gillnets fishing techniques are the main techniques used to catch sardines. Occasionally fishermen may use purse seines and cast nets. Sardines are dried in the sun and used as fertilizer, as food for cattle and humans, or as bait. The increase in demand of this important fishery in Oman necessitates a good management plan based on scientific outcome.

There are few studies conducted on the biology of the sardines in Oman basically all were focused on the sardines spawning seasons in Oman. No published studies so far on the fecundity of the Omani sardines. Therefore and due to the scarcity of the biological studies on the and due to economic importance of the Omani Indian Oil sardine; the current study aims to study the fecundity of the most abundant sardine species in Oman; *S. longiceps* hoping that the results of this study will contribute into the appraisal and assessment of the spawning stock, population study and create the basis for future intensive research and appropriate management for a sustainable development of the Omani sardine fishery.

MATERIALS AND METHODS

Female fish samples of the Omani-Indian oil sardine *Sardinella longiceps* were collected from the Muscat region during the period March-September 2005. The

samples were brought to the laboratory and examined immediately for the Total Length (TL) and Fish Weight (FW). The ovaries for each sampled fish were carefully removed and the Gonad Weight (GW) was also recorded. For each ovary 0.1 g from interior, posterior and middle sections were taken and preserved in labeled vials with 15 mL Gilson's fluid. The three sections for every fish were left for four days in Gilson's fluid. The samples were shaken continuously and vigorously to make sure that the connective tissues holding the eggs together would break. The connective tissues were then removed carefully from the vials. A 5 mL sub-sample was then taken and transferred into a petri dish. A slightly dark filter paper was put on the base of the petri dish to absorb the 5 mL Gilson's fluid so the eggs settle on the filter paper for easy and accurate count. With such method; error among readers of the same sub sample is minimized. The mean egg counting was obtained and multiplied by 15 mL which is assumed to equal 0.1 g. The mean number of eggs than was multiplied by the gonad weight and the total number of eggs per gonad was obtained; i.e., fish fecundity.

Gonadosomatic index was obtained by using the following formula:

$$GSI = \frac{\text{Gonad weight}}{\text{Total fish weight}} \times 100$$

RESULTS AND DISCUSSION

Fecundity: The highest fecundity was observed to be 60000 in a fish measured a total length of 18.4 cm with a fish total body weight of 57.4 g. The minimum fecundity was observed to be 5500 in a fish measured a total length of 14.1 cm with a fish total body weight of 27.4 g. The mean fecundity estimated was 19000. Al-Barwani *et al.* (1989) cited an unpublished data reporting a range of 8000 eggs to 108,000 eggs for the same species sampled in 1985-1986. This fecundity range, however, was a result from data collected from the Southern region of Oman as well as from the Capital area. The Southern region of Oman is considered to have better oceanographic conditions hence sardines samples from the Southern region are expected to be in better condition size-wise. The current study sardine samples were all from the Capital region. This variation in the fecundity of the Omani Indian oil sardine *S. longiceps* could suggest that the fecundity may vary with latitude. Fecundity of fishes may vary depending on many factors among them, population, species, size, age and environmental conditions (Lagler, 1956). Bigger sardines were found to be more fecund than smaller ones. The regression

Table 1: Fecundity in relation to different parameters

| Relationships | Regression equation | R |
|------------------------------------|----------------------|------|
| Fecundity (F) vs Total Length (TL) | F = 2982.1TL - 28681 | 0.97 |
| Fecundity (F) vs Fish Weight (FW) | F = 927.02FW - 17214 | 0.80 |
| Fecundity (F) vs Gonad Weight (GW) | F = 15748GW - 3891.8 | 0.88 |

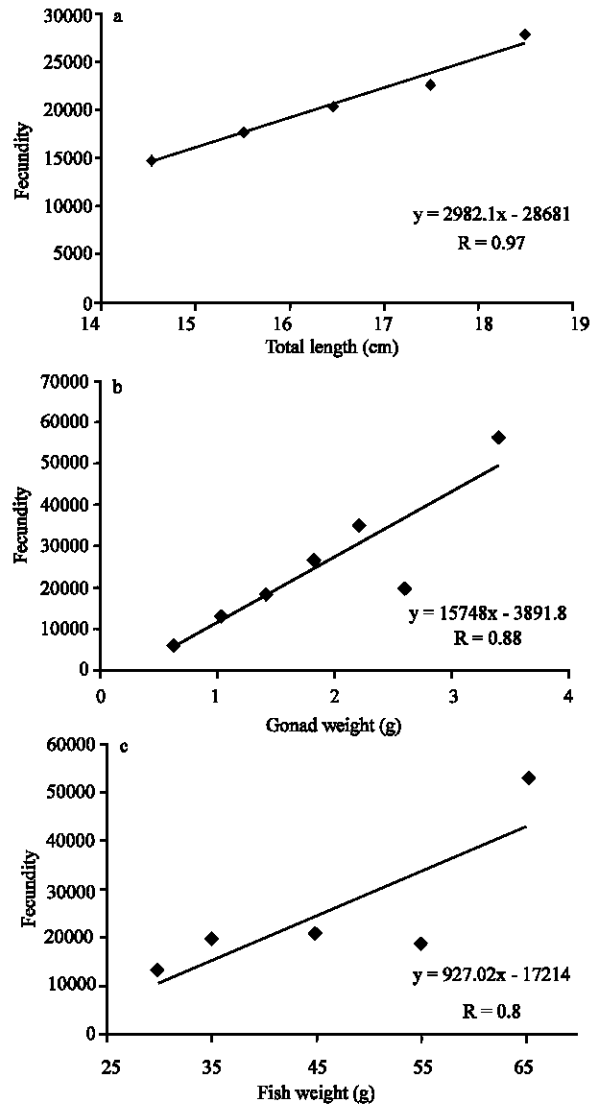


Fig. 2: Relationship between Fecundity and a) Total Length (cm), b) Gonad Weight (g) and c) Fish Weight (g)

equations and correlation of fecundity versus TL, FW and GW are shown in Table 1. Comparison of correlation coefficients reveals that the variation of fecundity with TL is highly correlated ($r = 0.97$) followed by the GW ($r = 0.88$); and finally FW ($r = 0.80$) (Fig. 2 a-c).

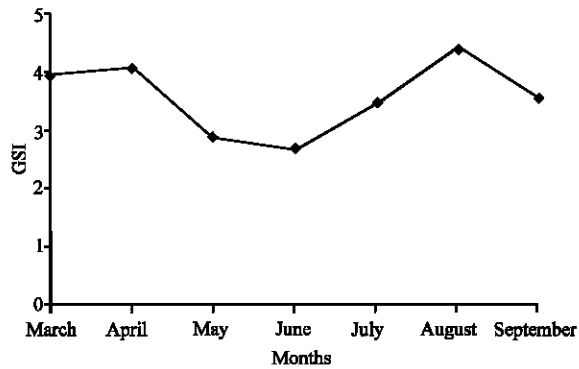


Fig. 3: Mean Gonadosomatic Index (GSI) of *Sardinella longiceps* against months

Gonadosomatic Index: The weight of the gonads ranged from 0.6 to 3.2 g with an average of 1.27 g. The GSI showed two peaks; March-April with GSI of 3.95 and 4.07, respectively and a peak in August with GSI of 4.41 (Fig. 3). The GSI values decreases during May to July which suggest a relation with temperature rise in spring and fall in autumn. These results are in agreement with (Al-Barwani *et al.*, 1989; Siddeek *et al.*, 1994; Dorr III, 1991) data for the Omani *Sardinella longiceps* and with the (Edwards and Shaher, 1987) for the Gulf of Aden *S. longiceps* stock. Sardines spawning activities are related to the oceanographic conditions, atmospheric conditions and the interaction between them. Therefore spawning peaks could very well change from one region to another as well as from one year to another.

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