LENGTH WEIGHT RELATIONSHIP AND CONDITION FACTOR OF LIZA MACROLEPIS (SMITH, 1946) IN CHILIKI LAGOON, ODISHA, INDIA

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Abstract

A total of 440 fish specimens were collected from artisanal fishers from two fish landing centres i.e., Kalupadaghat and Balugaon of the lagoon during pre-monsoon (February & March), monsoon (July & August) and post-monsoon (November & December) seasons of 2009. Sampling was done once during first week of the months and the specimens were transported to research laboratory in the polythene bags where total length (TL) and body weight (BW) was recorded. The relationship between the length (TL) and weight (BW) of fish was expressed by equation, \( W = aL^b \). The values obtained from LWR showed that the values were isometric in all the season. During all seasons, growth co-efficient (b value) was observed to be very nearer to 3 which proves an ideal condition for the species. However, the ‘b’ value was recorded higher during pre-monsoon seasons and gradually decreases. The Condition factor (K) of the experimental fish was estimated from the relationship, \( K = 100W/L^b \). Highest condition factor (0.7±0.01) was recorded during post-monsoon followed by monsoon (0.69±0.01) and the lowest (0.66±0.01) during post-monsoon seasons. The mean condition factor was registered as 0.7±0.01 in all the seasons of unsexed specimens.

Key words: Length Weight Relationship, Condition factor, Liza macrolepis, Chilika Lagoon.

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INTRODUCTION

Chilika Lagoon, the largest lagoon of India lies in the east coast of India, situated between latitudes 19°28'-19°54' North and longitude 85°05'-85°38' East. It is designated as an important Ramsar site (No.229) of India on October 1981. The water spread area of the lagoon varies between 906 km² to 1165 km² during summer and monsoon respectively. The estuarine lagoon is a unique assemblage of marine, brackish and fresh water eco-systems. The lagoon is divided into four ecological sectors namely, the southern sector, the central sector, the northern sector and the outer channel sector (figure-1). Basically, the northern sector is fresh water dominated zone, central sector is a brackish water zone and southern sector is a higher saline area. The outer channel sector is marine in nature with saline water but during monsoon, the water becomes fresh due to discharge of flood water to the sea.

Chilika lagoon is one of the main sources of capture fisheries of Orissa and supports food and livelihood security to more than 0.2 million fisher folk living in and around the lagoon. As one of the direct use benefits of Chilika ecosystem, fisheries output shares more than 71% of its economic value. Chilika Lake also supports the state economy to a large extent by earning valuable foreign exchange to the extent of about 200 million rupees. Fish production of the lagoon significantly increased after opening of the New Mouth on the east coast of the Lagoon in September 2000. However, the amount of the production has been showing a declining trend from the peak in the year. Again, the fisheries and biodiversity of the lagoon suffered the most, both due to natural and man-induced perturbations. The length-weight relationship of fish is an important fishery resource management tool and also useful for comparing life history and morphological aspects of populations inhabiting different
regions [1]. Its importance is pronounced in estimating the average weight at a given length group [2] and in assessing the relative well being of a fish population [3]. Condition factor compares the wellbeing of a fish and is based on the hypothesis that heavier fish of a given length are in better condition [4]. Condition factor has been used as an index of growth and feeding intensity [5]. Condition factor decrease with increase in length [5,6]; and also influences the reproductive cycle in fish [7]. Condition factors of different species of sciaenid fish have been reported by Jayasankar [8,9], Omogoriola et al. [10], Sharma and Ansari [11].

Many investigations has been done about LWR of fish and condition factor [12,13,14,15,16]. But no study is undertaken on *Liza macrolepis*, one of the most economically important fish species in the lagoon. So, the present investigation is an attempt to prepare documentation on the LWR and Condition factor of the species in the lagoon which will definitely help the fishery researchers, planning and policy makers for the sustainability and management of the species in the lagoon environment.

**MATERIAL AND METHODS**

A total of 440 fish specimens were collected from artisanal fishers from two fish landing centres i.e., Kalupadaghat (northern sector) and Balugaon (central sector) during pre-monsoon (February & March), monsoon (July & August) and post-monsoon (November & December) seasons of 2009. Sampling was done once during first week of the months and the specimens were transported to research laboratory in the polythene bags where total length (TL) and body weight (BW) was recorded. The fishermen used a wide range of fishing gears such as gill nets, khonda nets, drag nets etc to catch the fish.

The Total Length (TL) of the fish was measured from the tip of the anterior part of the month to the caudal fin using a measuring scale to the nearest millimeter. Fish weight was measured after blot drying with a piece of clean hand towel. Weighing was done with an electronic weighing balance, to the nearest gram.

The relationship between the length (TL) and weight (BW) of fish was expressed by equation:

![Figure-1: Chilika map showing four ecological sectors.](http://mutagens.co.in)
\[ W = aL^b \] [17]
Where, ‘W’ is Weight of fish in g
‘L’ is total length (TL) of fish in mm
‘a’ is Constant (intercept)
‘b’ is the length exponent (slope)

The condition factor (K) of the experimental fish was estimated from the relationship:
\[ K = \frac{100W}{L^b} \] [18]
Where, ‘K’ is condition factor
‘W’ is weight of fish
‘L’ is length of fish
And, ‘b’ is exponent from LWR.

RESULTS AND DISCUSSION
The regression equations from length and body weight were computed during three seasons. The values obtained from LWR showed that the values were isometric in all the season. Their growths were positively allometric. In all cases, growth co-efficient (b value) was observed to be very nearer to 3 (shown in table) which proves an ideal condition for the species [19]. Length-weight relationships give information on the condition and growth patterns of fish [4]. Fish are said to exhibit isometric growth when length increases in equal proportions with body weight for constant specific gravity. The regression co-efficient for isometric growth is ‘3’ and values greater or lesser than ‘3’ indicate allometric growth [20].

<table>
<thead>
<tr>
<th>Period</th>
<th>No of specimens (N)</th>
<th>TL range (min-max)</th>
<th>BW range (min-max)</th>
<th>Equation</th>
<th>b' value</th>
<th>R² value</th>
<th>K value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-monsoon</td>
<td>157</td>
<td>204-580</td>
<td>101-2410</td>
<td>( y = 5E-06x^{3.130} )</td>
<td>3.13</td>
<td>0.98</td>
<td>0.66±0.01</td>
</tr>
<tr>
<td>Monsoon</td>
<td>145</td>
<td>202-540</td>
<td>106-1691</td>
<td>( y = 5E-06x^{3.113} )</td>
<td>3.113</td>
<td>0.977</td>
<td>0.69±0.01</td>
</tr>
<tr>
<td>Post-monsoon</td>
<td>138</td>
<td>220-495</td>
<td>128-1363</td>
<td>( y = 6E-06x^{3.085} )</td>
<td>3.085</td>
<td>0.94</td>
<td>0.7±0.01</td>
</tr>
<tr>
<td>All seasons</td>
<td>440</td>
<td>202-580</td>
<td>101-2410</td>
<td>( y = 5E-06x^{3.110} )</td>
<td>2.992</td>
<td>0.968</td>
<td>0.7±0.01</td>
</tr>
</tbody>
</table>

However, the ‘b’ value was recorded higher during pre-monsoon seasons and gradually decreases. This higher value was recorded probably due to the higher gonadal development of the species. In the above periods, body weight registered was more as compared to other seasons among same length specimens. This is probably due to the higher body weight of the female specimens due to the higher gonadal development. Although, the females were slightly heavier than males of same length which is also agreed by Al-Ghais [21]. Even though, the variations in b-value primarily depends on the shape and fatness of the fish but may also depend upon various other factors like number of specimens examined, condition of the sampling area, food intake (stomach fullness), maturation stages, health condition etc. but all these factors were not accounted for the present study.

So far the condition factor (K) of the species is concerned; highest condition factor (0.7±0.01) was recorded during post-monsoon followed by monsoon (0.69±0.01) and the lowest (0.66±0.01) during post-monsoon seasons. The mean condition factor was registered as 0.7±0.01 in all the seasons of unsexed specimens. Here, lowest K value registered during pre-monsoon is also considered as the highest gonadal development. This was also agreed by Vazzoler [22], who confirmed that lowest K values during the more developed gonad stages might mean resource transfer to the gonads during the reproductive period. The values of the condition factor vary according to seasons and are influenced by environmental conditions. The condition factor of fish, gives information when comparing among populations living in certain feeding area, density, climate; when determining the period of gonad maturation; and when following up the degree of feeding activity of a species to verify whether it is making good use of its feeding source [23]. The K-value also reflects information on the physiological state of the fish in relation to its welfare. From a nutritional point of view, there is

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accumulation of fat and gonad development [24] and in reproductive point of view; highest K values are reached in some species.

REFERENCES