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### Assessment of Fecundity and Gonadosomatic Index of Lates calcalifer in West Godavari and Krishna Districts of Andhra Pradesh

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#### ABSTRACT

The paper deals with assessment of fecundity and Gonadosomatic index of Lates calcalifer collected from west Godavari and Krishna districts of Andhra Pradesh during 2009-2011. The maximum fecundity was 15, 05648 from a fish measuring 64 cm in total length (weight 2,880g) and minimum fecundity 516328 was observed in fish having a total length of 34.3 cm (weight 930) in the year of 2009 to 2010. The maximum fecundity was 1748296 from a fish measuring 65 cm in total length (weight 3700 g) and minimum fecundity 594322 was observed in fish having a total length of 43.2 cm (weight 1465 g) in the year of 2010 to 2011.

Key words: Lates Calcalifer, Fecundity, Gonadosomatic Index and Fish Culture.

#### INTRODUCTION

*Lates calcarifer* exhibits a complex life history and is a protandric hermaphrodite. It is one among the threatened brackish water fish species of India. Females are larger than males, are highly fecundity, and may be courted by one or more males at the same time. The fecundity of sea bass is related to the size and weight of the fish Spawning occurs between September and March, with peaks in November to December and again in Spawning occurs near river mouths, in the lower reaches of estuaries, or around coastal headlands. Musa and Abdus Salam Bhuiyan (2007) made observations on fecundity on *Mystus bleekeri* from the River Padma near Rajshahi city. Peter *et al.*, (2009) observed various methods for determining fecundity on some marine fishes.

Yoda and Yoneda (2009) made observations on reproductive potential in multiple-spawning fish with indeterminate fecundity with special reference to yellow sea bream *Dentex hypselosomus* in the East China Sea. Munoz *et al.*, (2010) have studied on female reproductive biology of the bluemouth *Helicolenus dactylopterus dactylopterus*. Bushnell *et al.*, (2010) elucidated lunar and seasonal patterns in fecundity of an indeterminate, multiple-spawning surgeonfish, the yellow tang *Zebrasoma flavescens*. Pepin and Myers (2011) made investigation on significance of egg and larval size to recruitment variability of temperate marine fish.

#### **MATERIAL AND METHODS**

Female *Lates calcarifer* were collected from brackish water ponds of Bhimavaram and kruthivennu of West Godavari and Krishna district of Andhra Pradesh respectively. Specimens were carried immediately to the laboratory in icebox. Fishes were identified, and total length of each fish was measured to the nearest millimeter and body weight in gram on a digital balance with .001 mg precision. Subsequently, they were scarified to obtain their gonads and the moisture was thoroughly wiped out from the ovaries with the help of blotting paper and weighed individually and fixed in 5 % formalin solution which helped in reserving the ovaries as well as made it much easier to separate the eggs from wall of ovary. Fecundity was determined by gravimetric method. According to the size of the eggs, three sub samples from the two lobes of each ovary were taken and then the eggs from each subsample were counted under a magnifying glass and mean value of eggs were computed. The average number of eggs in a sub sample is multiplied by the total weight of the ovary and fecundity was estimated by the following formula

F = n G/g where "F" is fecundity,

"n" is the average number of eggs, "G" is weight of the gonads and "g" is the weight of sub sample.(kiran *et .al* 2003)

#### RESULTS

#### GONADO SOMATIC INDEX (GSI)

The gonado somatic index of *Lates calcarifer* was very much variable though out the year. Maturity of *Lates calcarifer* calculated for berried female shows that it increases steadily from September, reaching peak in April and becomes least in February. Highest GSI values were encountered during the month of April 2010 and April 2011, while lowest indices existed in the month of February 2009 and March 2011. During May, August, October and November in the year of 2010, whereas, January, May, June and July in the year of 2011, no traces of development of gonads hence the GSI values are nil. In *Lates calcarifer* the development of gonads shows very fast rate of growth during breeding season (Graph: 1& 2)

#### FECUNDITY

From the investigation, it is observed that, fecundity was estimated from the total number of mature ova destined to be shed (0.3 mm and above) during a spawning season and was based on ovaries from fishes of the size range 34.3 to 64 cm.

The maximum fecundity was 15, 05648 from a fish measuring 64 cm in total length (weight 2,880g) and minimum fecundity 516328 was observed in fish having a total length of 34.3 cm (weight 930) in the year of 2009 to 2010 (Table:1). The maximum fecundity was 1748296 from a fish measuring 65 cm in total length (weight 3700 g) and minimum fecundity 594322 was observed in fish having a total length of 43.2 cm (weight 1465 g) in the year of 2010 to 2011 (Table: 1). The study revealed that although the older fish were more fecund, it is the younger fish that produces more ova per gram weight of ovary. There was an increase in fecundity with increases in size of the fish but the relationship with fecundity was stronger in case body weight than total length, whereas strongest relationship was found between fecundity and ovary weight (Graph 3&4).

	Length	Weight	Length of	Weight of gonads		
	(cm)	(gm)	gonads (cm)	(gm)	Fecundity	GSI
Mean	1809.786	13.78357	214.2	875328.8	51.27143	12.4
Min	930	8.16	132	516328	34.3	8.73
Max	3000	17.92	274	1505648	64	14.9
SD	620.7737	2.714666	44.39364	253924.9	8.580876	1.86
2010-2011						
Mean	2321.429	13.82429	206.0286	922202	54.91429	9.43
Min	1465	11.18	165	594322	43.2	6.7
Max	3700	16.9	248	1748296	65	11.9
SD	833.6702	1.987275	34.4152	379227.4	7.893337	2.21

 Table. 1 Descriptive statistics of data obtained on Fecundity in females of Lates calcarifer during 2009-2010.

The present results on the maturity stages, clearly indicates that in *Lates calcarifer* ripe gonads were observed during September to March which is said to be as breeding season for *Lates calcarifer*. The gonads observed during September to March were at maturing II and mature stages and contains ripe ova. This clearly indicates that fishes of size more than 40 cm alone can attain sexual maturity and contains gonads.

In *Lates calcarifer* the Gonado somatic index was maximum recorded as 14.87 April, 2010 when majority of fishes were found mature and after then its value felt rapidly, that might be for their spawning. From the observation GSI values were found to increase from September onwards reaching a peak in November followed by a gradual decrease up to January and again increase from February onwards reaching a peak in the month of April. These findings correlated with the findings of Grace Mathew, (2009) who reported in *Lates calcarifer*.

It is familiar that the gonado somatic index increases with the maturation of fish, being maximum during the period of peak maturity and declining abruptly thereafter. Increases in GSI values of females indicate development of the gonads and a sudden drop which indicates spent stage of fish (Sarker *et al.*, 2002). The monthly variations in GSI offer not only additional proof for the spawning season but also are indicative of the major phages of reproductive cycles. **Graph: 1 Month wise variation of Gonado Somatic Indices (GSI) in females of** *Lates calcarifer* **2009-2010** 



Graph: 2 Month wise variation of Gonado Somatic Indices (GSI) in females of *Lates* calcarifer 2010-2011



In the present study, it was found that the number of eggs increase linearly with the increase of body weight, body length, gonadal weight and gonadal length. All the relationships were found to be linear. Similar results were also reported in different fish (Shafi and Quddus, 1974). This is in similarity to many other perciform species, where the number of eggs per batch is positively correlated with size (Roumillat and Brouwer, 2004).



Graph. 3 Relation between fish length and fecundity in Lates calcarifer.

The lower estimate in the present study probably reflects the variability between the populations from different geographical areas, as no evidence of occurrence of multiple spawning activities has been encountered (Lai, 1992). Variations have been reported in *L. calcarifer* not only between different geographical areas but even within the same area for various biological parameters (Moore, 1982). Shaklee *et al.*, (1990) identified fourteen different genetic stock of *Lates calcarifer* from Western Australia, northern territory and Queensland. Since the same size classes can have a different age even within population of *Lates calcarifer* (Davis, 1987), it is quite probable that age may also contribute towards variability in fecundity for the same size classes. The variability in the fecundity may not make it possible to use the estimates from one population to another for fishery as well as for hatchery management. It appears that if the fish from one population is transplanted to a new area, it will be appropriate to reconfirm its biological characteristics in the new environment. Environmental factors and food supply might affect the fecundity of fish (Bagenal, 1957). Stress is known to cause a variety of physiological responses in fish, affecting fecundity, egg size and egg survival and spawning behaviour (Morgan *et al.*, 1999; Alexandre *et al.*, 2010).

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