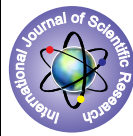


Studies on distribution and sex ratio of *Notopterus notopterus* in the aquatic bodies in and around Gulbarga.



Zoology

KEYWORDS : *Notopterus notopterus*, GSI, Aquatic Body, Sex ratio.

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ABSTRACT

*Distribution, frequency of various maturity stages and sex ratio were studied in freshwater fish *Notopterus notopterus* in the three selected aquatic bodies near Gulbarga. The percentage of fish catch and the frequency of fishes in different stages in the aquatic bodies (1 & 2) is slightly variable, no fishes were noticed in aquatic body 3, which is productive. The study reveals that male to female ratio was almost 1:1.1 in both aquatic bodies (aquatic body-1 and 2) indicating a slight domination of females. The analysis of chi-square values obtained for each month in both aquatic bodies revealed "no significant" departure from ratio 1:1. However some variation was noticed during the months of April and October in both aquatic bodies. Five maturity stages were identified on the basis of gonad condition. *N. notopterus* is supposed to be the fractional spawner, which is suggested by the relative availability of all the five stages during April and August.*

GSI values are drastically increased from January and reaching maximum during February-July. The gradual depletion was noticed from August. The OSI data indicates that vitellogenic oocytes are produced between January- February and June-July. The matured eggs are spawned in March and August respectively in both the aquatic bodies. No fishes were found in aquatic body-3.

Introduction:

The availability of fish species in some aquatic bodies of Gulbarga studied by Patil and Kulkarni (1993) indicate that a good number of fish species are available. In their study around 45 species of fish are available and amongst *N. notopterus* is predominantly available in addition to the other carps in the two aquatic bodies selected (Patil and Kulkarni, 1993). Sexual cycle will help us in understanding the relative abundance of sexes in the total stock of the fish in a given area. It also helps us to understand constituent length group and growth rate. Nikolski (1963), Padmaja and Rao (2001) were able to find sex ratio *Megalops cyprinoids* a fish from Vishakapatnam coast. The difference in both spawning time and sex ratio depends on the ecological characteristics of water systems, (Kartas and Toglaci, 1999).

Gonadosomatic index was studied to study the sexual cycle of the fish *N. notopterus*. Gonadosomatic index is an important tool in establishing the breeding period in animals and has been successfully employed in fish too (Saxena, 1986). Distribution, sex ratio, sexual maturity and gonadosomatic index in relation to three different aquatic bodies was studied, which is not available in fish *N. notopterus* in this area. However, studies have been made by Karatas and Toglaci (1999) in the fish *Salmo trutta* in Yesilirmak river.

Materials and Methods:

Three aquatic bodies were selected for the collection of the fishes. Aquatic body-1 is called as Farahathabad Nala which receives water source from Bheema river situated about 15 Km away from Gulbarga city. The aquatic body-2 called as Bhosga reservoir 20 Km away from Gulbarga and the aquatic body-3 situated is the centre of the city known as Jagath tank the fish from these aquatic bodies were collected monthly by gillnets with the help of professional fisherman. The collection of fish was made every month for a period of one year. The percentage of fish catches was calculated on the basis of number of *N. notopterus* in each catch (compared to the other fishes).

All the fishes were brought to laboratory, the body weight was recorded separately. Sexual condition was determined by means of the monthly changes in the gonadosomatic Index (GSI). It was calculated using the following equation:

$$GSI = \frac{W1}{W2} \times 100$$

Where,

W1 = Weight of gonad ,

W2 = Total weight of fish.

The gonadosomatic Index in males and female of similar size (18-24 cm) were considered for the study. Morphology of gonads was identified in accordance with the classification recommended by international council for the exploration of sea (Dharmamba, 1959). These stages were further grouped into a sequence of five phases (Qasim, 1957; Crossland, 1977).

The sex of fish was determined after dissecting the body cavity. The pooled fishes during different months were separated as males and females after dissection of body cavity. Sex ratio in different months was calculated.

Chi-square test was applied to test the occurrence of homogeneity of sex ratio in the aquatic bodies. Homogeneity was tested for its significance at 5% level.

Results:

The percentage abundance of various maturity stages during different months of one year period indicates that, in both male and female fish have 5 maturity stages identified based on the Morphology of gonads. During January and June month, the percentage of immature was higher in both aquatic bodies 1 & 2. In February and July fishes having ripe gonads were available. During May-September, good percentage of immature to ripening stages were available. The occurrence of some partially spent fishes during August and also many during April in both the aquatic bodies was noticed. This indicates that the fish have spawned in August and majority spawned during April suggesting that the fish *N. notopterus* is a fractional spawner.

The fall of TSI during April and August 0.19 ± 0.075 and 0.19 ± 0.09 respectively indicates the discharge of gametes indicating spawning in aquatic body-1.

Similar decrease in the TSI values in April and August 16 ± 0.06 and 0.18 ± 0.06 was observed in the aquatic body-2 indicating spawning.

Similar observations are seen with OSI of females i.e. In April, it

is 0.39 ± 0.43 , It is 1.0 ± 0.01 in August in aquatic body-1.

The OSI values in April and August are 0.58 ± 0.03 and 0.93 ± 0.03 respectively in the aquatic body-2.

Sex ratio:

The data of sex ratio indicates that in most of the months males to females ratio was 1:1.1 indicating a slight domination of females. Only during October there is slight increase in population. The chi-square test shows significantly equal number of either sex. However, females outnumbered males in most of the months in both aquatic bodies.

Discussion:

In the present study three aquatic bodies are selected. The aquatic body- 1 is flowing and the aquatic body -2 is large standing water body, whereas aquatic body 3 is sewage fed productive (Nimbargi et.al. 1989). *N. notopterus* is available only in two aquatic bodies, in aquatic body -3 they are completely absent. It is suggested that the environmental factors such as temperature, thermoperiod, photoperiod, water quality, food availability etc., effecting one or more regulatory systems can adversely affect reproductive viability (Billard et. al. 1998) resulting in fish population and distribution. Some of the investigations have been carried out on the comparative account of stock assessment in different water systems using individual fish species such as *Barbus lutens* (Ali,1985), *Nemopterus obescus* (Rao and Rao, 1983), *Puntiplites* (Zakaria and Malay,1988), *Neomachelins montanus* (Dobriyal and Bahuguna,1987) and on *Catla catla* (Singh,1990).

The availability of *N.notopterus* in a catch increases and highest in the month of April (56%). It also increases in the month of August (66%) in aquatic body -1. Their availability increases to 46% in April and reaches the peak in September (48%) in aquatic body-2. This increase in the percentage of catch may be due to the increasing favourable conditions for breeding. Manohar and Qureshi (1994) have made similar observations.

In the collections made during different months from the aquatic body-1 the fish belonging to both male and female were found to be available. The overall study reveals that male to female ratio was almost 1:1.1 indicating a slight domination of females. The analysis of Chi square values obtained for each month revealed that there was no significant departure from 1:1 ratio. However some variation was noticed during the months of April and May. Similar observations have been made for the fish *Megalops cyprinoides* from Vishakapatnam coast in their comparative studies on the sex ratios between polluted and unpolluted waters. The fish *Channa punctatus* also exhibited similar sex ratio reported by Balasundra Reddy (1979). Five maturity stages were identified on the basis of gonad condition ob-

served during one-year period. The matured fish ovary had large vitellogenic oocytes, which were oozed out by a gentle pressing the abdomen with the thumb. Similar response of milt ejection by applying pressure on the abdomen of the male fishes is observed. The record of sex composition and calculations of male and female ratio has been determined for several Indian fishes (Neelakantan et al., 1989). The male-female in marine catfishes such as *Tachysurus dussumeri*, *T. maculatus*, *T.tenuispinis* and *T.thalassinus* were 1:1.10,1:1.60,1:1.79 and 1:1 respectively (Dan, 1977; Mojumdar, 1978). In the Yellow stripe scud, *S.leptolepis* the two sexes are almost equal in number during spawning seasons while variations in their number occur before and after spawning (Tandon, 1962). The variation in the sex ratio of *N notopterus* is not of greater magnitude and if at all it exists it can be attributed to the differential growth rate.

Gonadosomatic index (GSI-TSI/OSI)

Gonads undergo regular seasonal cyclical changes in weight especially in females (Neelakantan, et al., 1989). Such changes are indicative of the spawning season (Qasim, 1973). The gonadosomatic index indicates the state of gonadal development and maturity. The period of main spawning season of *Salmo trutta* in Yasilimark River was studied based on the gonadosomatic index (GSI) (Karatas and Toglaci, 1999). A number of workers have used the GSI for variety of fishes (Gonad weight expressed as a percentage of total body weight) as a tool to establish the breeding period and reliable measure of gonadal state (Saxena, 1986; Karatas and Toglaci, 1999). The present data on the GSI of both male and female fish *N. notopterus* studied shows an increase over a period five months and fell in two months i.e., March and August. Thus pattern of change in GSI is similar to that reported in other Indian fishes such as *H. fossilis* (Verma et al., 1985). Wallago Attu, *Mastacembelus armatus* (Saxena, 1986), *P. sarana* (Gopaldutt, 1989) *Megalops cyprinoides* (Padmaja and Rao, 2001). The GSI computations of both male and female *N. notopterus* shows that there was some amount of difference in the pattern of GSI increase and decrease during the months of active gonadal activity.

In case of male fish the GSI (TSI) increased gradually from December reaching maximum during March and it maintains more or less steady state of increase in GSI during June and July. It states declining from August gradually and reduction continuous to September and October months. In case of females also similar observations were made. Thus indicating that both testis and ovary maintains maturity for about 3-4 months indicating serial/ fractional spawning activity. These changes in GSI were observed in a number of other fish species and more recently in *Megalops cyprinoides* from Vishakapatnam (Padmaja and Rao, 2001).

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