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## Nucleic acid content in different tissues of male fresh water fish *N. notopterus*

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**Abstract**

Nucleic acid content in different tissues in the male freshwater fish *N. notopterus* were studied during 2011-12, 2012-13, 2013-14 for 3 years Pre-spawning phase of the reproductive cycle. The fishes were scarified and the tissues such as brain, liver, kidney and the gonads (testis) removed and processed for determination of nucleic acids. The present results showing testis has higher in comparison to other tissues testis>liver>brain>kidney. Nucleic acid contents gradually increased from Pre-spawning to spawning phase in most of the tissues. The increase may be because of increasing gonadal activity for spermatogenesis in male fish.

**Keywords:** *N. notopterus*, fish DNA, RNA, male fish

**Introduction**

Reproduction is one of the fundamental characters of living things. It is the ability of an organism to produce copies of it to perpetuate the species. It has provided the means and has contributed in no small measure to the evolution of life on earth. Reproduction is also a record of harmony established between the organism and the environmental in which lives. If the sexes are fundamental to sexual reproduction in all the organisms, it is a fortunate innovation that has contributed materials and means to the success of organic evolutions, this seems to be the main reason for most organisms adapting sexual reproduction need not be taken to imply the existences of clear male and female sexes.

Sex of the *N. notopterus* fish cannot be identified based on the morphological characters. However, they are differentiated after observing their gonads as male and female it is know that intrinsic factors like sex and size greatly influence various physiological processes in a variety of animals. Such variations might be in all possibility due to difference in the biochemical construction of tissues. The tissues are structurally and functionally different it is possible that they have different organic composition and such studies pertaining to different types of fish are few (Lockwood, 1968)<sup>[5]</sup>.

Biochemical composition of fish tissues is considerable interest for their specificity in relation to food values of fish and evaluating their physiological needs at different periods of lie as fish exhibit large variation in their biochemical composition form species. Hence the knowledge of proximate compositions of fish is of paramount importance to evaluate it in regards to nutrient value and physiological conditions (Gershamovich *et al.*, 1984)<sup>[3]</sup>.

The values of the different nucleic acid content are significantly influence the physiological factors and sex of the fish. In the assessment of the biochemical content it was revealed that the sex and period of acclimation may exert some degree of influence on some of the biochemical characteristics of *C. garipepnus* (Gabriel *et al.*, 2004)<sup>[2]</sup>. and hence, the need to reckon with these factors in the assessment and reporting of the indices of fish species.

**Materials and Methods**

The live specimens of Indian fresh water fish *N. notopterus* were obtained from aquatic bodies situated in a local area in kalaburgi, Karnataka state, India the fish were brought to the laboratory every month for January to December and kept in plastic pool tanks having size 90 cm in diameter and 70 cm in height. These fish were fed with earthworms and boiled eggs. In every phase ten fishes were sacrificed dissected to know the sex because the fish don't exhibit sexual dimorphism

Freshwater fish *N. notopterus* is selected for the present study. The fish is locally available in large number in ponds lakes, tanks and rivers, in and around kalaburgi district.

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Fish were collected from Bheema River which is situated at about 40kms away from kalaburgi city. During four reproductive phase such as Preparatory, Pre-spawning, Spawning and Post spawning phase of the reproductive cycle, about 10 fishes were scarified and out of which 6 male fish were used separately for estimations. Before the sacrifice in each phase, the weight of the tissues was recorded on Decobal Brawn balance and he size of the fish, were measured with the help of the foot rule bandy and then scarified by decapitation and the sexes are identified after dissections then. The tissues like Brain, Liver, Kidney, Gonads (Testis) were dissected out and carefully weighted in Anamad electronic balance. The Nucleic acid (DNA and RNA) content of the tissues was estimated by following the Diphenylamine method Schneider (1940) using DNA as Standard. The RNA content of the tissues was also estimated by Schneider (1940) using RNA Standard. in all the cases six observation were made and the results was expressed as arithmetic mean, their standard deviation, standard error and student "t" test were made described by Suedecur (1946)<sup>[9]</sup> and Fisher (1943).

### Results and Discussion

The reproductive cycle in *N. notopterus* consists of following four phases during one-year period is as follows Preparatory phase (January to march); Pre-spawning phase (April to July); Spawning phase (August to October); Post spawning phase (November to December). Based on the local availability of the fish *N. notopterus* male fish nucleic acid content such as DNA, RNA were estimated in the different tissues such as brain, liver, kidney, testis of male freshwater fish *N. notopterus* studied separately during Pre-spawning period of reproductive cycle.

The studies have been carried out to know the nucleic acid content in the fish and measurements were compared with regard to the sex of the fish. The observations of nucleic acids were determined for three-year period i.e., during 2011-12, 2012-13, 2013-14 and the data presented in Tables 1.

#### I-year 2011-12 DNA and RNA content in different tissues of male freshwater fish *N. notopterus* (Preparatory Phases):

Brain DNA  $105 \pm 1.7$ , Liver  $115 \pm 2$ , Kidney  $52 \pm 1.2$  Gonads (testis)  $116 \pm 1.2$ .

Brain RNA  $40 \pm 1.3$ , Liver  $46 \pm 1.9$ , Kidney  $43 \pm 1.1$  Gonads (testis)  $47 \pm 1.2$ .

In the year 2011-12 male fish gonads (testis) contain higher amount of DNA then other tissues. The degree of DNA content is Testis>Liver>Brain > Kidney. The RNA content also exhibited similar to that of DNA having higher in gonads, testis > liver > brain > kidney. The ratio of DNA/RNA between the tissues of male fishes indicates indicates the Brain has 2:1, Liver2:1, Testis 2:1 and only in Kidney it is 1:1.

#### II-year 2012-13 DNA and RNA content in different tissues of male freshwater fish *N. notopterus* (Preparatory Phases):

Brain DNA  $106 \pm 1.2$ , Liver  $115 \pm 1.8$ , Kidney  $53 \pm 1$ , Gonads (testis)  $117 \pm 1.5$ .

Brain RNA  $40 \pm 1$ , Liver  $47 \pm 1$ , Kidney  $44 \pm 1$  Gonads (testis)  $48 \pm 1.8$ .

In the year 2012-13 male fish gonads (testis) contain higher amount of DNA then other tissues. The degree of DNA

content is Testis>Liver>Brain > Kidney. The RNA content also exhibited similar to DNA having higher in gonads testis > liver > Brain > Kidney. The ratio of DNA/RNA between the tissues of male fishes indicates indicates the Brain has 2:1, Liver 2:1, Testis 2:1 and only in Kidney it is 1:1.

#### III-year 2013-14 DNA and RNA content in different tissues of male freshwater fish *N. notopterus* (Preparatory Phases):

Brain DNA  $106 \pm 1$ , Liver  $116 \pm 1.8$ , Kidney  $54 \pm 1.3$ , Gonads (testis)  $118 \pm 1$ .

Brain RNA  $41 \pm 1.3$ , Liver  $47 \pm 1.2$ , Kidney  $45 \pm 2$ , Gonads (testis)  $49 \pm 1.5$ .

In the year 2013-14 male fish gonads (testis) contain higher amount of DNA then other tissues. The degree of DNA content is Testis>Liver>Brain > Kidney. The RNA content also exhibited similar to DNA having higher in gonads testis > liver > Brain > Kidney. The ratio of DNA/RNA between the tissues of male fishes indicates indicates the Brain has 2:1, Liver2:1, Testis 2:1 and only in Kidney it is 1:1.

Studies describing variation aspects of reproductive biology have been established for many species of teleost's. most of these studies have focused on the biological changes that occur during annual cycles and also in the fish *N. notopterus* (Shankar and Kulkarni, 2005)<sup>[7]</sup>. It is felt that comprehensive account of tropical environment and the reproductive seasonality in tropical fresh water teleost' s makes us to establish the time course of reproductive cycle in wild and relationship of these to environmental cycle (Shankar and Kulkarni, 2005)<sup>[7]</sup>.

Seasonal variation in the concentrations of proteins, RNA and DNA and the DNA/RNA ratios were studied in the liver of major carps, *Catla*, *Catla*, *Labeo Rohita* *Nad Cirrhina Mrigalal* during their prematurity phase. The biochemical parameters maintained strikingly similar patterns of change in the three species. Alternations in nucleic acids were reciprocal to that of protein. Magnitude of the such interrelation, however, varied with the season. Protein level was generally low during winter and high in the summer months, attaining peak value in March and June, higher concentration of DNA and RNA were registered in December and June and a sharp decline was evident in January as well as in July. During the remaining months, protein, RNA and DNA varied intermittently but not profoundly (Mustafa and Zofair, 1985)<sup>[6]</sup>.

Sex of the fish may also influence the blood parameters and nucleic acid content. Studies on sexually mature gold fish (*Carassius auratus*) (Summerfelt, 1967)<sup>[10]</sup>. brook trout (*Salvelinus fontinalis*) and brown trout (*Salmo gairdneri*) (Sniezsko, 1960)<sup>[8]</sup>. showed that males consistently had higher hematocrit values then the females and this has been proposed as means of sexing fish. In the present study, males exhibited higher level of tissues DNA and RNA than female. Similarly, Lane (1979)<sup>[4]</sup>. observed significantly higher hematocrit and hemoglobin levels in male versus female in the fish rainbow trout. These differences in hematology with regard to males

The present results revels that nucleic acid content in different tissues in male fish gonads (testis) has higher values then compared to other tissues, the increase in testis may be for breeding phase indicating increased protein synthesis and improvement in health condition of the fish for spermatogenesis in all the 3 years.

**Table 1:** Showing DNA RNA content (mg/gm) in different tissues of the male freshwater fish *N. notopterus*.

Organ/Year	Brain		Liver		Kidney		Gonads (Testis)	
	DNA	RNA	DNA	RNA	DNA	RNA	DNA	RNA
2011-2012	105.1±1.70*** SE±0.72	40 ±1.3*** SE±0.54	115 ±2NS SE ± 0.86	46 ±1.9*** SE ± 0.77	52 ±1.24 SE ±0.50	43±1.10* SE ± 0.45	116±1.2*** SE±0.49	47±1.2*** SE±0.49
2012-2013	106 ±1.2*** SE±0.70	40 ±1*** SE ± 0.65	115 ±1.8 <sup>NS</sup> SE ± 0.50	47±1*** SE± 0.80	53± 1*** SE± 0.25	44±1* SE±0.80	117 ± 1.50*** SE±0.25	47 ±1.8* SE ± 0.50
2013-2014	106 ± 1*** SE ± 0.25	41 ± 1.3** SE ± 0.75	116 ±1.3** SE ± 0.75	47±1.2*** SE±0.68	54±2 <sup>NS</sup> SE±0.68	45±2 <sup>NS</sup> SE±0.68	118±1 <sup>NS</sup> SE±0.90	49±1.5 <sup>NS</sup> SE±0.65

Each value is expressed as Mean, Standard Deviation and Standard Error of sex observation.

Turkey methods used:

\* =  $P < 0.05$

\*\* =  $P < 0.01$

\*\*\* =  $P < 0.001$

NS = No significant.

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