Evaluation of proximate compositionand seasonal variations of the muscle tissueof mouth-brooding Tilapia *Oreochromismossambica* from Meghadrigedda Reservoir, Visakhapatnam, Andhra Pradesh, India

ABSTRACT

This study aimed to investigate the proximatecompositionand seasonal variations in the muscle of mouth-brooding tilapia*O.mossambica*fromMeghadrigedda reservoir,Visakhapatnam.The bio-chemical analysis such as total protein, total fat, total carbohydrates, ash and moisture content in the muscleoffishwas taken forseasonal variations in relation to reproductive characters during 2021-22.The total protein percent of the fish *O.mossambica* ranged from 24.5 to 36.8 in females and males was 24.5 and 37.5. The total fat percentage ranged from 5.4 to8.6 in females and males was 6.4to8.7. Total Carbohydrates percentage was 4.1to 5.5 in females and males was4.8 and 5.9. Moisture percentage was 80.2 to 84.5 in females and males was 75.5to 85.5. Ashpercentage was4.1 to 4.9 in females and males was4.1 to4.8. The results of the present clearly indicate that there wasdifferences in the proximate composition of the male and female species.

Keywords:*O.mossambica,proximate*composition*, maturation and spawning.*

INTRODUCTION:

"Fish and fishery products are dynamic source of food items for mankind all over the globe due to its high-qualityproximatecomposition.Itcontains the most important protein and low fat components serve as a vital energy for human beings and their domestic animals"[1].FAO [2] estimated that nearly 11% of the total population of the world is suffering from poverty and do not have access to enough nutritious food for proper growth and human health.WHO [3] has reported tripled number of obese people since 1975 which accounts for 13% of the total adult population of the world. Also, the occurrence of cardiovascular diseases related ailment to obesity and malnutrition has increased globally to 17.8 million deaths every year by 2017. It has been predicted that the population will rise by 2.4 billion people in developing countries of Sub-Saharan Africa and South Asia by 2050[3].The four major biological constituents of muscle are protein, fat, moisture and ash, also called the proximate composition of fish. Fish is a particularly important part of the traditional food, and its consumption has been proven to have many health benefits [4]. Nutritional and economic factors were taken into account in the selection of the fish types. According to our findings, dry fish has high-protein content and low-fat which can contribute greatly to children's as well as adult's recommended protein intake. Fish nutritional value varies significantly depending on the species, size, and age of the fish, but understanding the proximate analysis of the fish can provide us with a general idea of its nutritional profile [4].

"Fish is a supreme quality food due to its great nutritional value. Proximate analysis of different fish is carried out by many different researchers worldwide reporting minor discrepancies in them because of the differences in their feeding habits, surrounding temperature, age, season and sex. It is reported that fish provides high quality protein containing all essential amino acids, polyunsaturated omega-3 fatty acids and several micronutrients, including vitamins and minerals"[5, 6]. Fish or fish based products are a very rich source of high quality protein and there are many evidences suggesting their beneficial effects on human health [5].

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The consumption of fishery products are preventing cardiovascular and other diseases [6] due to their low fat [5]."Regularly eating of fish can reduce the risk of cancer and other nutrition related diseases" [7]. "And also lesser risk of Alzheimer's diseases and prevent the cardiovascular diseases"[8] .According to Love[9] "the fish containing 70 to 80% of water, 20 to 30% of protein and 2 to 12% of lipid". "In different environmental conditions, the fish biochemical composition may influencefood and feeding conditions and size &sex of the fish"[10].The present study deals with the monthly variations oftotal carbohydrates, total protein, fat, moisture and ash contents inmuscle ofthe proximate composition of*O.mosambica* tissue was investigated with respect to different seasons.

MATERIALS AND METHODS:

Fish sampleswere collected from Meghadrigedda reservoir, Visakhapatnam district of Andhra Pradesh and geographical coordinates of 17°45'54"N; 83°11'27"E. And samples were washed with running tap water and the then length and weight was recorded. Non-edibleportions of fish were removed immediately to avoid decomposition. The muscles washed, dried and powder for various analyses.To find out the concentrations of the total proteins, total carbohydrates, total fats, moisture and ash in *O.mossambica samples* were collected at regular monthly intervals for a period of one year (June, 2021- May, 2022) at Meghadrigedda reservoir in Visakhapatnam District.

Total Proteins: The protein content of the muscles was estimated by following method ofLowry's [11]. Total Carbohydrates:Anthrone in Sulphuric acid can be used for colorimetric determination of sugar; methylated sugars and polysaccharides [12]. TotalFats: The total lipids were extracted from the dry tissues, by following the method of Floch*et al.,* [13]. Moisture and Ash: Moisture and Ash was determined by AOAC methods [14].

RESULTS AND DISCUSSION

The proximate composition of the *O.mossambica we*re presented Fig.1 to 5.

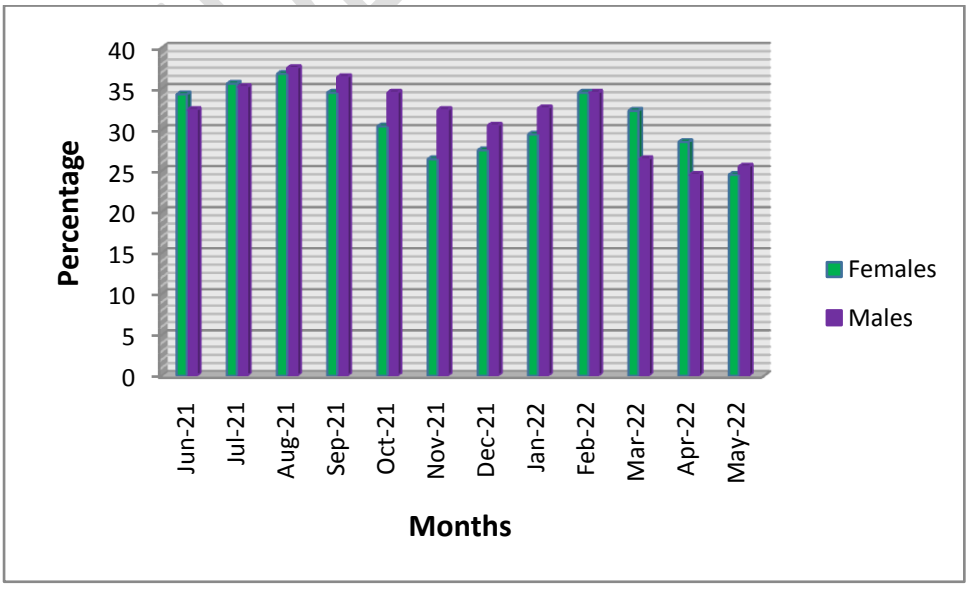

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Fig-1:Monthly variations of total protein content in muscle of male and female *O.mossambica*

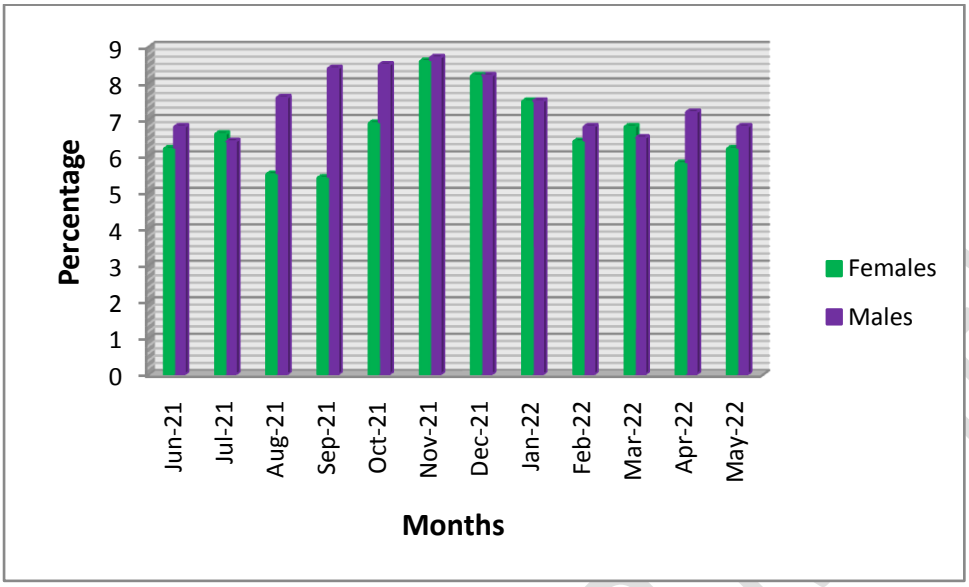

Fig-2:Monthly variations of total Fats content in muscle of male and female *O.mossambica*.

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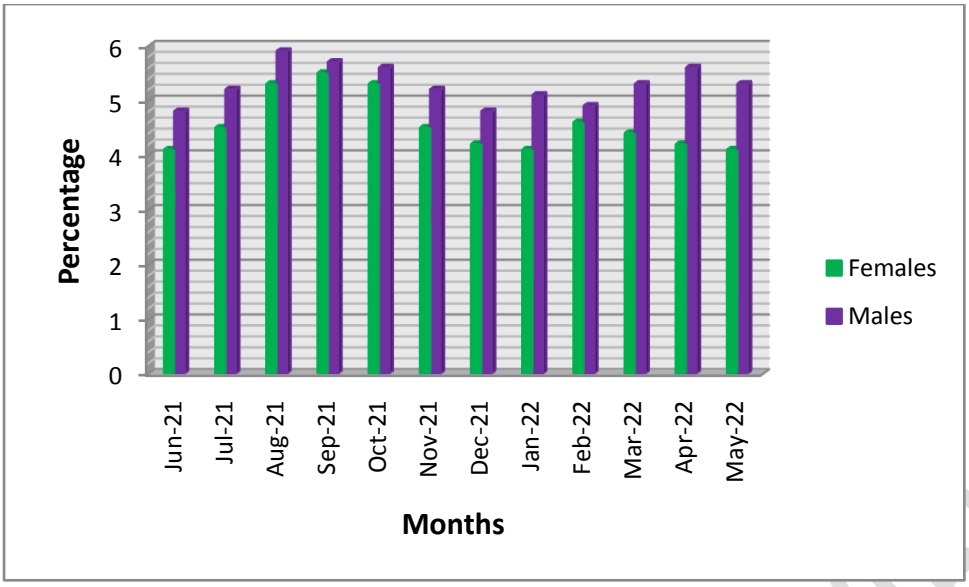

Fig-3: Monthly variations of total Carbohydrates content in muscle of male and female *O.mossambica*.

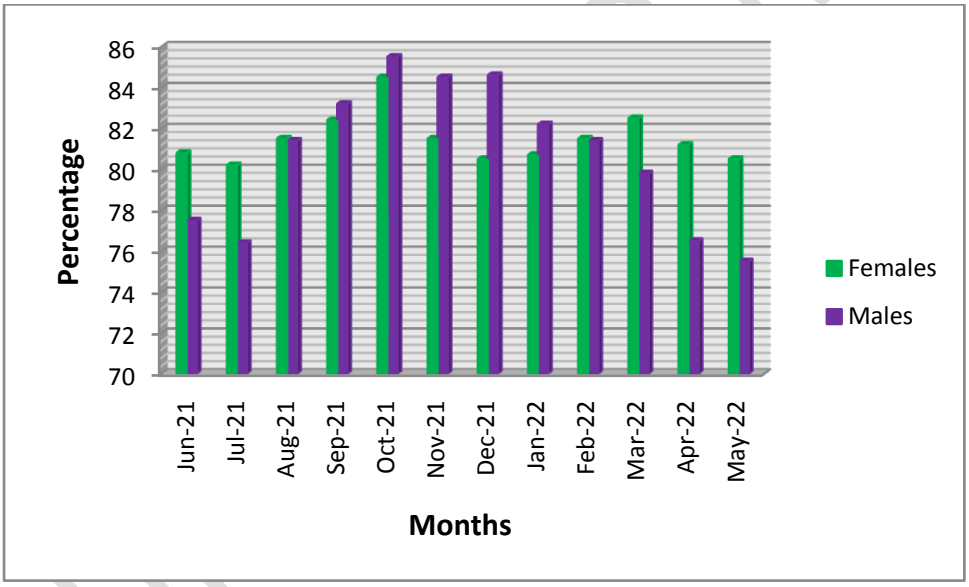

Fig-4:Monthly variations of Moisture content in muscle of male and female *O.mossambica*.

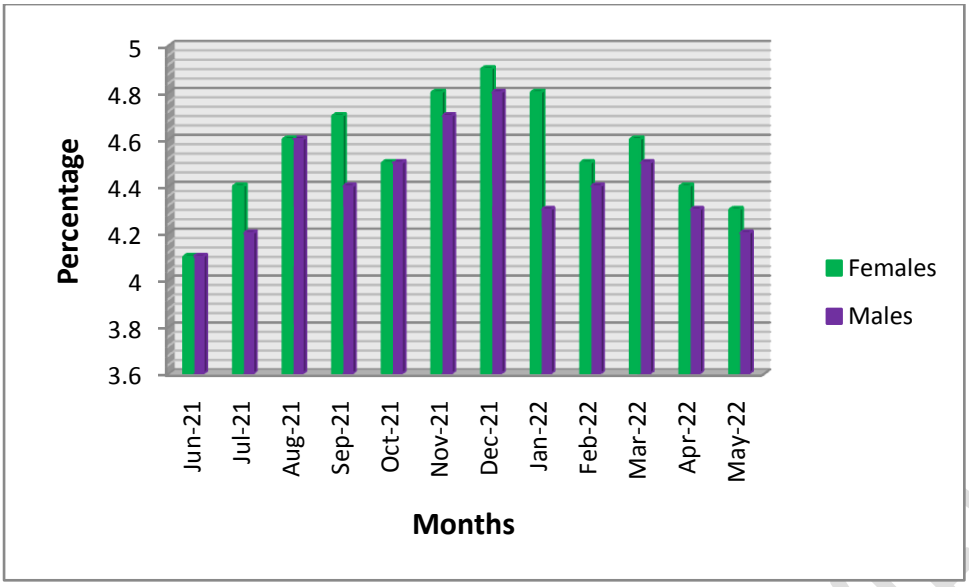

Fig-5:Monthly variations of Total Ash content in muscle of male and female *O.mossambica*

"The muscle composition of total protein, total fat, total carbohydrates, moisture and ash contents showed variations in their different seasons in both females and males". [49] The highest protein 36.8±3.4 in the month of August in South west monsoon and lowest 24.5±3.2 recorded in May in summer in females and the highest in males was 37.5±3.4 in the month of August in South west monsoon and lowest 24.5±2.9 in the month of April in summer. The highest content of fat was 8.6±1.4 was recorded in Post monsoon in the month of November and the lowest 5.4±1.9 in South west monsoon in the month of September in case of females and the highest in males was 8.7±1.8 in post monsoon in the month of November and lowest 6.4±0.9 in south west monsoon in the month of July. Total carbohydrates was observed highest 5.5±1.2 in South west monsoon in the month of September and lowest 4.1±0.6 recorded in the North east monsoon in the month of January in case of females. In males, highest 5.9±1.2 was recorded in the South west monsoon in the month of August and the lowest 4.8±1.1 was recorded in North east monsoon in the month of February. The highest moisture 84.5±6.5 was observed in Post monsoon in the month of October and minimum 80.2±5.9 was recorded in South west monsoon in the month of July in case of females and in males the highest moisture 85.5±6.9 was recorded in post monsoon in the month of October and the lowest recorded 75.5±5.6 in summer in the month of May. The ash content was highest 4.9±1.5 in North east monsoon and the lowest 4.1±1.2 in South west monsoon in the month of June in females and also males was highest 4.8±1.6 in North East monsoon in the month of December and lowest 4.1±1.7 in South west monsoon in the month of June.The musclecomposition of the different fish species showed variation depending on water quality, sexual, feeding habit and these factors are responsible for fish proximatecomposition [15]. Fishes of various species do not provide the same nutrient profile [16] andthe nutritive quality of a fish varies with season to season [17]. The protein content of the fish is considered as an important toolfor evaluation of the physiological statusof fishes [18].

Total Protein:

Proteins are high molecular weight polypeptides and fundamental compounds of living things. Itcontains in addition, non-amino acid materials, lipid or carbohydrate. Proteins play a major role in cell function and cell structure.Amino acids are fundamental bio-molecules in all aspects of cell structure and function [19]. Fish protein is highly digestible and contains a good number of essential amino acids, thereby having a high biological value. In the present study highest protein recordedin South west monsoon in males and females. The protein content in showed variations and ranged between 24.5 and 36.8%female*O.mossambica*.The nutrient composition of selected food fishes and

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their protein and fat values studied byAhmed *et al*.,[20]. Mustafa *et al*.,[21]observed protein content in muscle of *P.sophore and he stated that* protein showed a correlate with spawning period. Banik and Saha, [22] explained a sharp decline in the weight of the gonad after spawning.

Total Fats:

Fats are heterogeneous group of compounds and important dietary constituents with high energy value. Theyare essential nutrientfor the supply of energy for the body. Fatty acids are the building blocks and essential fatty acids likelinolenic acid. Nahid*et al*., [23]recorded that the fat value in muscle of *X. cancila*. Bogard*et al*.,[24] reported that the nutrient analysis ofdifferent food fishes. Siddique *et al*., [25] also reported "the fat values of *Puntiussarana*and *Puntiussophore"*. Mustafa *et al*., [26] studied on"fat levels of *Hilsailisha* and*P. sarana during different processing method".* Begum *et al*., [27] reported"the muscle fat high value in*P. sarana".* Maria Zaman*et al*.,[28] recorded"the nutrient levels of selected fish species" and Sarojnalini and Sarjubala Devi [29] studied on "nutritive values of *Puntiussophore".* Bijayalakshmi*et al*., [30] recorded "low values of total lipid of *Puntiussophore"*. Prabhakara Rao *et al*., [31], recorded "fat levels in high commercial fishes like r*ohu*(*Labeorohita*) and *channa*(*Channa striata*)*". "*Ecologicalfactors and water conditionare influence on theproximate composition particularly fat content of selected fishes" was studied by Iverson, et al., [32].

Total Carbohydrates:

Total Carbohydrates are a group of organic compounds including sugars, starches and fibre, which is a major source of energy for animals. Carbohydrates regarding fishery products are not dietary fibre but only glucides, the majority consist of glycogen. They contain traces of glucose, fructose, sucrose and other mono and disaccharides [33]. The carbohydrate in the muscle of P. vigil, was varied from 0.3 to 0.63% [34], 2.4 to 3.4% in C.smithii[39], 0.24% in claw meat of S. serrata[36] and other crab was studied byBalasubramanian et al.,[35]. In the present study the highest (5.9) percentage carbohydrate recorded inSouth west monsoon in the month of Augustin males and females was highest 5.5in South west monsoon in the month of September in O. mossambica

Moisture:

Moisture forms the major component of proximate composition.The moisture values are ranged from 73.43 to 78.86%. Mustafa *et al*., [26,] find out "moisture values in *P. sophore*and*Hilsa sps".* Maria Zaman*et al*.,[28] recorded"moisture content of*P. sophore was* 75.71".Bijayalakahmi*et al*., [30] studied "themoisture value of *P.sophore*is 78.95 to 81.34%. In the present studyhighest moisture values were observed in August 2021 duringspawning seasonof south west monsoon season. The results of the present study revealed that changes in moisture content in the muscles ofO. mossambica *could* beattributed to changes in moisture level in spawning period".

Ash:

The concentrationsof minerals and trace elements that are contribute to the total ash composition in fishes. Its depending on their food availability and feeding habits, water quality and sex& size of the fish [15]and also season, environment andecosystem [37,38]."The ash content in the muscle of marine fisheswas little bit higher than that of the freshwater fishes"[39].Panchaksharie*t al.,*[39]observed "biochemical observations of *Latescalcarifer"*."Sometimes storage is also influence the ash content changesin the muscle tissue of fishes"[40].

"The intensity of feeding, quality and quantity of naturalfood,temperature may impact on the protein and fat content in the muscles of the fishes"[41]. Luzia*et al.,*[42] stated that "differences was observe in fat content in the muscle of fish collected in different seasons"."Seasons and food quality may also

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impact on the muscle of rainbow trout"[43]. Skałecki*et al.,*[44] studied "the effect of the season on fat content in muscle tissue in perch". "In the autumn season contained significantly more fat (0.29%) than those caught in the spring (0.11%)"[45].

"The protein content of muscle has beenshowed to fluctuate in relation to the maturation and spawning was explained" by Jafri and Khawaja [46]. Piska and Warghray[47] stated that "the seasonal variations in the protein content are well markedand striking correlation with maturation, spawning and feeding activity in *fishes*.""The high content of protein in pre-spawning may due to the fundamental nitrogenrequired for the maturation". [49]Piska*et al.,*[48], reported that muscles protein was highest in pre- spawning of *S. bacaila*.The result obtained in this study has provided the detailed knowledge of the proximate composition of the fish O. mossambica in relation to spawning season.

CONCLUSION:

The present study revealed that the seasonal changes in proximate analysis of the muscle of *O.mossambica* regarding the reproductive cycle, storage and utilization of reserves. It's observed that the protein was used for body building and gonodal development during different phases of maturation and fats has been used for energy. From the current study it can be concluded that due to the presence of appreciable amount of protein, fat and carbohydrates and also suitable moisture this fish used for feeds. Hence the fish is suitable as potential industrial material for possible utilization for different products.

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