There is a mammoth possibility for the progress of freshwater, marine and estuarine fish in India. It has about 7,516.6 km long coastline with about 24,372,424 km^2 continental shelf, 193,834 km^2 of territorial water and with 2.02 million km^2 exclusive economic zones. Moreover, the overall effective water surface of India is 3,14,400 km^2 which comprises of resources of water like of plentiful streams, rivers, lakes, wetlands etc. and receives 1,100 millimetre of average rainfall annually. The huge network of inland water bodies provides great potential for economic capture fishery. Inland fisheries on capture basis offer up to 30% of the overall fish production. Above half the number of thirty eight thousand known vertebrates of the world is constituted of fish. 24,618 numbers of valid fish species of legitimate species of fish are assembled 482 families and 4258 genera. Out of them two thousand and five hundred species are noticed alone in Indian region, of which nine hundred and thirty are indwellers of fresh waters and the rest in seas as reported by Jayaram (1999) and Jacob (2005).

The fisheries area supports occupation, dietary safety, employment creation and income from export, thus performs a crucial role in country's socio-economic upliftment. In the view of Bronmark and Hansson (2005), a great boost in the demand of fish and its products due to increasing population pressure has lead aquaculture as the most commercially gainful crop in various areas of the globe. In last thirty years the world-wide yields of pisciculture has been expanded at an average rate of more than 8 percent annually , from 5.2 to 62.7 million tons in 1981 and 2011 respectively (Fishery statistics). Input of aquaculture to total fish food supply enhanced from 25.7 to 46.8 percent in the period of 2000 - 2016 (FAO, 2018). A growth of anticipated fish farmer's population of 3.9 million (1990) has also reached 16.6million (2010) (World Bank Report, 2013).

A rate of yearly growth of 4.7%, with 3.2% growth in marine sector and 6.2% in inland sector has offered Indian fisheries second position in world-wide pisciculture and second in universal aquaculture. This sector has provided employment to more than 14.5 million people and it grew out as the largest single employer (DAHDF, 2015-16). Present global per head fish intake is over 20 kg where as it is 9.8 kg for India, as 35% of population of India consumes fish (FAO, 2016). Major part of overall Indian pisciculture is contributed by inland fisheries with a present contribution of 64.07 % in overall production of fish. India has earned the export value of Rs.37870.90 crore in fishery sector during the financial year 2016-17, which is about 0.92% of the National Gross Value Added (GVA) and 5.23% to agriculture (GVA) (DAHDF,2027-18). Production of fish has increased to 114.10 lakh tons in 2016-17 from 41.57 lakh tons in 1991-92. The projected estimation is 5.8 million tons during initial half of 2017-2018 (Provisional) (DAHDF, 2017-18).

According to PIB (2017), the overall fish production in the country including the production of both capture fisheries and culture fisheries, increases up to 11.41 million tons in 2016-17. In India the 'Blue Revolution' scheme has been commenced with the expenditure of Rs. 3000 crore for the overall expansion of the Fishing industry for a period of 5 years (2015-16 to 2019-20). Fishing industry has provided employment to about an Indian population of 1.5 crore for their livelihood. Blue Revolution Scheme mainly aims at the production of 15 million ton of fish and to increase the pisciculture and its outcome to an annual growth rate of 8% by 2020. The aim of this scheme is to amplify the earnings of cultivators and fishermen twofold by 2022 (PIB, 2017). Keeping a view on biological security and ecological alarms, Hon'ble prime minister has a venture to bring “Blue revolution - NEEL KRANTI MISSION” in India for the attainment of foodstuff, dietary safety and economic expansion through full utilization of aquatic resources for endurable progress of fisheries. Fish protein takes up a major position in human nutrition (Nargis, 2006 and Singh, 2017). Highly digestible proteins of fish with their excellent source of amino acids, have great nutritional value (Sanchez-Alonso et al., 2007). According to Marcu et al. (2010) fish meat with its low quantity of carbohydrates and high proportion of protein, vitamin, minerals and healthy-fats is a healthy diet which is easily digested by human body. Low quantity of carbohydrate and high amount of long chain unsaturated fat, especially ω3 fatty acids are found in fish (Sargent, 1997). Cehu et al.

in 2004 found that cardiovascular and some other diseases can be avoided by the intake of fish and its products and it is supported by Singh (2017).

Severe problems to be faced for the global food and cultivation sector are summed up by the World Bank Group (WBG) Agriculture Action Plan 2013-15. According to WBG Agriculture Action Plan (2013), providing food to an anticipated total of 9 billion people of world by 2050 is an overwhelming challenge for the leaders, researchers and technologists of the whole world. It is a relatively promising fact that fish can exhibit a foremost role in fulfilling the hunger of the world's growing population having middle income while also can meet the dietary needs of poor people. Moreover, there is rapid increase in fish supply as protein source of animal origin for food requirement of man along with intensifying aquaculture production around the world. Fishery statistics (2017) revealed that the yield of fisheries in captured basis, has amplified from 69 to 93 million tons in past thirty years along with an enhancement of aquaculture production of the globe from 5 to 63 million tons. Fish not only provides protein of high-value along with a vast range of useful micronutrients, including multiple numbers of minerals, vitamins and polyunsaturated omega-3 fatty acids, but it has low amount of saturated fats, carbohydrates, and cholesterol (FAO 2012). Thus, although in a small amount, provision of fish can meet food and nutritional security among the underprivileged and susceptible populations around the globe (World Bank Report, 2013).

Biology of fish is a subject of relevance to a wide audience for its considerable applied importance to mankind and to biologists for interesting research (Chonder, 1999; Keivany and Soofiani, 2004). Fish have some unique anatomical and physiological characteristics that are different from mammals. However, they even possess the same systems of organ that are present in other animals. Scientists concerned with any activities of fish should understand fish feeding activity which is the dominant activity in any animal's entire life. Investigation of all the problems in respect of nutrition, growth, reproduction and population analysis in fish; call for an appropriate methodology and understanding of the biological parameters. Food in fish is of immense importance which will provide an effective opportunity to determine the developing requirements of fish in culture system (Kar, 2007). The feeding intensity is linked with the season, stage of maturity, spawning activity and food availability (Wang et al. 2006). Through observations in the field and experimentation of the contents of the digestive tract, researchers have learnt much concerning feeding behaviour and the kinds of organisms that are developed for digestion (Zakaria and Videllar, 2003).

It is a matter of fact that information on biology of fish particularly on morphometry, relationship of length with weight, condition factors, gastrosomatic index, gonadosomatic index, breeding activities, diet and dietary habit are of greatest importance in increasing the technological competence of the fishery capitalists for well judged management of pisciculture. Indian major carp is highly nourishing as well as tasty and a leading culturable fresh water fish of India. Amongst the group of cyprinids, they are of maximum monetary significance. They are: catla (*Catla catla*), rohu (*Labeo rohita*), and mrigal (*Cirrhinus mrigala*). Owing to their hasty intensification and flavour they are uniquely placed in Indian aquaculture set up (Welcomme, 1988). The rivers and boondocks of Northern parts of India, Pakistan and Burma are the native areas of these carps. In addition, rohu populates the rivers of Central India and the south of Nepal (Terrai). Many other areas and countries have also been inhabited by them. Inspite of the truth that these carps are more flexible and persistent to broad selection of temperature and are the most significant cultivated fish species in India, Pakistan and Burma; they have not achieved such extensive worldwide recognition as the common and Chinese carps. (Mohanty et al., 2017) reported that the carps are rich source of glutamic acid and glycine.

The food and feeding habits of three species of Indian major carp are different. Though catla is called surface feeder, it collects the zooplankton at all depths. They intermittently also feed on the bottom, making use of organic detritus, remnants of aquatic plants and mud enriched with organic matter. Thus, catla and bighead carp can become opponents for the natural captive food supply, when stocked together. Rohu prefers vegetable matters including decomposing vegetation and acts as column feeder and sometimes bottom feeder. Rohu shows a smaller amount of resemblance with Indian major carps than with other cultured cyprinids regarding food preferences. Mrigals are exceptionally bottom feeders living mainly on decaying vegetation thus they have a narrow range of acceptable foods. So, they show alike nutritional practice with the Chinese mud carp. Due to the lack of struggle for food and fear for predators, a cultured fish population experiences different kinds of selection system unmatched to natural water (Soranganba and Saxena, 2007).

ODISHA is one of the major nautical states of India, offering vast possibility for development of Inland fisheries, brackish water fisheries and marine. The state is provided with 6.83 and 4.18 lakh ha. of freshwater and brackish water resources along with 480 km. of seashore for the development of fisheries of the state. Government have planned to double the inland fish production and increase the present export to Rs.20,000 crores in order to improve these abundant resources, along with generation of employment and income for overall socioeconomic prosperity. The fisheries resources of the State are very extensive, so amplification of fish production is the main target area for development of freshwater aquaculture. The fresh water resources of Odisha include 1.22, 1.97, 1.80 and 1.71 lakhs ha of Culture fisheries (ponds and tanks), Culture base Capture Fisheries (reservoirs), Capture Fisheries (Lake, Bheels, and Swamp) and rest (river & canals respectively. During 2017-18 a total of 6.08 lakh MTs is produced and through its export the state has earned around Rs.2204.78 crores. Accordingly, the Department proposes to implement massive horizontal spreading out of culture areas and to enhance yield to 5.00 ton/ha. On taking annual per head fish intake of 13.49 Kg in to view, Government of Odisha has started Odisha Fisheries Policy, 2015 during September 2015 to achieve this go-getting target (Annual Activity report 2017-2018).

Out of 393730 million ton of fresh water fish produced in year 2016-17, 331187 million ton is from ponds and tanks and rest are from other fresh water resources (Fishery statistics,2017) .The annual fish production in the state has increased from 2.6 lakh ton to more than six lakh tones . The annual fish production of the state of Odisha is around 6 lakh MT (both marine and freshwater) in which the share of fresh water production is 3.93 lakh MT whereas the consumption of freshwater fish in the state exceeds seafood. So, 40,000 matric ton of fresh water fish is imported every year from neighbouring states. The Odisha government launched a state sponsor scheme, 'Fish Pond Yojana' in November 2017, for construction of additional water bodies for freshwater aquaculture in 2,200 hectares of land with 50 percent economic support to farmers (TNN, 2017).

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The climate of Odisha is subtropical monsoon type that is represented by tyrannical hot summer, mild cold in winter and high humid rainy season. The topography of the climate has been altered by higher percentage of humidity right through the year and well distributed rainfall during monsoon. Summer extends from February to May that shows highest temperature of 35 degree to 44 degree. Rain starts on June and lengthens till September which is a hot and moist wet season.

The enormity of fish population in a region is the dependant on food potentialities and it fluctuates with the species, season, availability of food, food item preference, stage of maturity and spawning season of the fish as suggested by Krishna et al. (2016). Fish are highly adopted in their feeding habits with utilizing a large part of the readily obtainable food components to perform their various physiological activities like growth, breeding, restoration etc. with the help of energy generated from the food. The understanding of the growth, abundance, productivity of water body can be enhanced by the qualitative and quantitative dietary analysis of fish in their natural habitats as viewed by Nansimole et al. (2014) and those are also applied to describe food habit, nutritional patterns of fish, as suggested by Ekpo et al., (2014). The nutritional habits and feeding patterns of fish can be explained using their qualitative and quantitative dietary analysis in their native habitats as explained by Ekpo et al. (2014). During the breeding season the feeding intensity of mature fish decreases, in comparison to the non-spawning season (Ujjania, 2003). It is vital to have a relationship between the fish and food components for the production and exploitation stocks of the fish (Panicker, 2000).

In last thirty years the interventions in technological field have induced the mean national production levels in ponds and reservoirs from nearly 600 to 2,000 kg/ha. Numerous agriculturists and entrepreneurs in states like Andhra Pradesh, West

Bengal, Punjab and Haryana have gained higher levels of production i.e. of 8 ton/ha/year. India has achieved highest production per unit of area in the polyculture of carp (Soranganba and Saxena, 2007). But these sizable expansions of aquaculture in freshwater for many decades, are centralized in small number of states. Often less access to technologies in aquaculture, the far-off, unreachable and rearward areas are often not in pace with aquaculture development (Mohapatra et al, 2018).

Fish grows tri-dimensionally and in the growth phase, it normally retains the same shape of the body throughout its life. Hence, shape of the fish considered a good indicator to calculate approximately its growth and also to find out if there are any variations in growth in relation to environmental variations. Shape of a fish could be known by measurement of so many morphometric features *viz.* total length, standard length, body girth, body height, head length, eye diameter and length of operculum etc. (Ujjania, 2003).

Rising temperature in the pond and better availability of natural food of summer season helps the fish to recuperate from the growth retardation phase of winter. Hence, aquaculture and inland fisheries takes the benefit of commencement of summer for fish production. In the open water fisheries, fish growth is increased with a parallel increase in plankton, periphyton and benthos which leads to decrease in water level. Reduced temperature further increases the catching per single effort in the capture fisheries of inland areas. On the other hand, low water levels along with very high temperature not only reduce the buffering power of water, but also subject the fish stocks under stress in through high temperature, oxygen reduction and toxicity due to algal blooms. The fish growth and biomass production can be disturbed by these stresses which even result in mass mortality.

Achievement of reproduction is dependent on usual development of gonad which is energised by favourable conditions of environment. Photoperiod as well as temperature, act as prime factors to control the reproductive actions in majority of the teleosts as suggested by Lam (1983); Shankar et al. (2007) and similar control in cyprinids by Hontela and Stacey (1990) those breed seasonally.

Labeo rohita (rohu) breed annually but its wild variety reaches its maturity on the completion of second year (Alikunhi, 1957; Jhingran and Pullin, 1985). However, as per the study of Jhingran and Pullin (1985) in Indian and under pond culture conditions, some fish may reach maturity at the end of first year of life in sub-tropical environment and in cultured pond condition of India. In another study spanning over 18 months, Khan (1972) based on wild fish collected from area around Aligarh (North India) reported that at first maturity was attained at the minimum age of two years, while females matured later than males.

Condition of fish is expressed by the ratio of length to weight of a fish at any given moment. Large value of this ratio reveals that the fish is in better condition. One simple way of estimating the condition of fish is the degree of its fatness (fat quantity of the body). Condition is variable and dynamic measure of well being of an individual fish and indicated tri-dimensional growth of fish. An average condition of each fish population varies on seasonal as well on yearly basis in between males and females, in developmental stage of gonads and age. Age of fish, sex, season, maturity stage, fullness of gut, type of food, quantity of fat reserve and level of development of muscle manipulate the value of condition factor 'K'. All organisms need food for their survival. The gastrosomatic index was related to feeding intensity that means the fullness of stomach. Condition factor (K) of fish offers valuable data related to maturity, breeding, accessibility of food and conditions of environment (Brown, 1957). The diet and nutritional habit of fish was correlated with its condition factor that was observed by Hart (1946). The prime aim of this communication is to collect information about the growth, well being or goodness of this fish species which is mainly consumed by common people (Chaturvedi and Saksena, 2013).

AIMS AND OBJECTIVES

- To study the seasonal biology (i.e. habit and habitat) of Indian major carps.
- To display the seasonal variation of the morphological and anatomical features of the body and internal organ systems such as stomach, liver and gonad of Indian major carps.
- To evaluate the seasonal variation of the gastrosomatic (GaSI) and gonadosomatic (GSI) indices as well as condition factor of the above fish to reveal their growth pattern, maturity status and environmental moiety.
- To analyse certain biochemical factors in order to relate them to their growth and maturity pattern.