**INTRODUCTION**

Bangladesh, with a total production of 42.77 lakh MT in FY 2017-18, is one of the world's leading fish producing countries, where aquaculture production accounts for 56.24 percent of total fish production. The average growth performance of this sector is 5.26 percent for the last ten years. Aquaculture shows sturdy and consistent growth, and the average growth rate is almost 10 percent during the same timeframe. It is believed that if the increasing trend of fish production continues, it will be possible to achieve the projected production target of 45.52 lakh MT by 2021 in conformity with the targets of Vision-2021 of the present Government. After 46 years of independence, Bangladesh becomes a self-sufficient country in fish production, with a per capita fish consumption of 62.58 g/day against the set target of 60 g/day (FRSS,2017).

Fish is a critical source of high-quality protein, supplying about 16% of the animal protein consumed by the world's population (FAO,1997). It is a significant protein source in regions where livestock is relatively scarce. In 2017-18, this sector contributes 3.57 percent to the national GDP and more than one-fourth (25.30 %) to the agricultural GDP. More than 11 percent of Bangladesh's total population is engaged in this sector on a full-time and part-time basis for their livelihoods. This sector also has a high potential for the perspective of the economic development of the country. Fish regarded as highly nutritious food source due to presence of protein and many essential nutrients in Bangladesh (Thilsted *et al.,* 1997). Fish is a popular complement to rice in the national diet, giving rise to the adage Maache-Bhate-Bangali ("a Bengali is made of fish and rice") (Ghose, 2014). Bangladesh has the third most incredible aquatic fish biodiversity in Asia. Due to the three main river systems' contribution that flow from the Himalayas into the Bay of Bengal and the world's largest flooded wetland, the Bengal Delta (Hussain, 2010). Bangladesh wild fisheries represent almost 7% of the world's inland fish production and account for 52% of the country's fish production (DoF, 2015). Bangladesh, with its rich inland waters and river systems, has significant capture fishery and aquaculture potential. The favorable geographic position of Bangladesh comes with a large number of aquatic species and provides plenty of resources to support fisheries potential. One-fourth of the world's food demand is met by aquaculture, demanding the aquaculture industry to increase its production in a sustainable way to satiate increasing food demand of the ever-growing human population. Fish culture is one of the fastest-growing sectors of the world's animal production, with an annual increase of about 10% (FAO, 1997).

Apart from providing food, aquaculture also contributes widely in pleasing the aesthetic sense by displaying various forms and colors of ornamental fishes apart from aiding financially. Viviparous fishes such as Molly, Guppy and Oviparous fishes like Koi carp, Zebra fish etc. contribute to the piscine diversity and are the most sought after ornamental fishes all over the world. Bangladesh has the third greatest aquatic fish biodiversity in Asia due to the contributions of the three main river systems that flow from the Himalayas into the Bay of Bengal along with the world's largest flooded wetland, the Bengal Delta (Hussain, 2010). Bangladesh wild fisheries represent almost 7% of the world's inland fish production and account for 52% of the country's fish production (DoF, 2015). With its productive inland waters and river systems, Bangladesh has tremendous potential for catching fisheries and aquaculture. Bangladesh's favorable geographical location includes a large number of aquatic species and offers plenty of opportunities to sustain the potential for fisheries.

Nowadays, farmers and investors are very much interested to move their business to more diversified fields such as crocodile culture, pearl culture, aquarium fish trades, etc. (Mostafizur et al., 2009). The aquarium fish business is becoming very popular throughout the world as it's an easy operating system and less operating costs. Beyond sales of aquariam, air pumps, food, medications, and other supplies, the primary product of the aquarium industry is fish. The aquarium fish trade is an expanding multi-million dollar market with considerable growth in the last two decades (Cheong, 1996). The approximate global import value of aquarium fishes is US$ 321 million (Dawes, 2001), from which US$ 21–48 million belong to the marine aquarium fish trade (Wood, 2001). The global wholesale value of live aquarium fish in 2000 was estimated by FAO of the United Nations to be US$ 900 million with a retail value of US$3 billion (Whittington et al., 2007). The fact is that the USA, Europe, and Japan are the largest markets for aquarium fish, but more than 65% of the exports come from Asia. It is encouraging news for the developing countries that more than 60% of the total world trade goes to their economies (Ghosh et al., 2003). Although Bangladesh is still in a marginal position, its trade is currently developing. The majority of the shops of aquarium fish are located in Dhaka city (Galib, 2008). The culture of aquarium fish can result in rapid cash production and is relatively easy to start as many of the current growers were able to begin their businesses as a hobby or small scale farming enterprises. Bangladesh has a richness of natural resources such as suitable climate, natural rivers, and traditional experience in the fish culture so that the Bangladeshi farmer can readily culture aquarium fish.

According to the Britannica Encyclopaedia, carotenoids refer to any group of non-nitrogenous and bio-chromes yellow, orange or red pigments that are almost universally distributed in living organisms. Carotenoids can be synthesized by bacteria, fungi, lower algae, and green plants. They are most conspicuous in the petals, pollen, and fruit (e.g., carrots, tomatoes, sweet potatoes, and citrus fruits) of the flowering plants. Carotenoids can also be seen in the autumn foliage of deciduous shrubs and trees. Carotenoids in the leaves of green plants are serving as accessory pigments in photosynthesis. They trap the solar energy and pass it to the primary photosynthetic pigment, chlorophyll. Carotenoids play a significant role in the biological coloration of animals.

Ornamental fishes are attractive and colorful species that can be kept as pets in confined spaces like an aquarium or garden pool with the purpose of enjoying their beauty (Mukherjee et al., 2000). In Bangladesh, there are only a few native fish species that are considered ornamental fish species e.g., Rani fish (*Botia sp*.). Among the available ornamental fishes, most of the species are exotic. Our ornamental fish sector is mostly import oriented. We have a great variety of colorful indigenous fish species that may be used for ornamental purposes and can save this money and apparently can be regarded as a very potential means of export earnings. Ornamental fishes are in demand due to their attractive color. Carotenoids are the primary source of color in the skin of the ornamental fishes (Sinha and Asimi, 2007). Maintenance of the water quality parameter is one of the important factors for the fish coloration. Coloration may be improve in several ways in case of ornamental fishes such as feed, background color, light, maintenance of favorable water pH and temperature etc. The enhancement of coloration can be done by administrating pigment enriched feed; it will definitely improve the quality and cost of the fish. Attractive coloration determines the commercial value of ornamental fish. (Kaur and Shah, 2017).

The carotenoid pigmentation pattern of fish is the result of the pigments present in the diet, and that fish metabolizes. Different sources of carotenoid pigments like pure carotenoid pigments, animal sources, and plant sources are included in the fish diet. The use of a plant source in fish feed presents a double advantage: besides being rich in carotenoid pigments, they are a direct source of nutrients like protein, lipids and vitamins. Many studies have emphasized the interest in the utilization of plant sources of carotenoid pigments such as paparika, *Capsicum annum* L. (Bitzer 1963). The various colors are produced by the presence of specific carotenoids and carotenoid protein complexes. Because carotenoids are only synthesized by plants and modified in animal tissues, fish must obtain them from their diet (Boonyaratpalin & Lovell 1977).

In the ornamental fish industry, replicating the precise natural color of the fish in the captivity system is one of the biggest challenges. Numerous operations that have been propagated failed to successfully market fish due to faded colors. Various products have been introduced to alleviate this problem, but none has performed so effectively and consistently as a carotenoid pigment. Varieties of carotenoids pigments are used in the fish diet for color enhancement. The most promising carotenoids proved to be successful in enhancing color is astaxanthin, which shows marked improvement in color on most species of brightly colored ornamental fishes like, Tetras, Cichlids, Gouramis, Goldfish, Koi, Danios, and many other species. The ornamental gourami, sometimes known as the labyrinth fish, belongs to the suborder Anabantoidei. An air-breathing accessory organ called the "labyrinth organ" characterizes this fish. *Trichopodus trichopterus* is the most common fish species found in rice field areas and is sometimes used as human food in some regions of Asia and Africa (Cole, Tamura, & Baile, 1999). . The main active ingredients in marigold extract is lutein. Lutein--one of the most common Carotenoids widely presented in plants especially dark green leafy vegetables. Blue gourami (*Trichogaster trichopterus*) is a new fish in aquaculture, used in hobbies and marketed all over the world (Degani, 2013). In this study, we tried to supplement the diet with marigold, China rose, Carrot to change the color of blue gourami (*Trichogaster trichopterus*) to red or bluer to attract buyers and increase its value in aquaculture. We also wanted to measure the effect of marigold (*Tegetes eracta*), China Rose (*Hibiscus rosa-sinensis*) carrot(*Daucus carota*) powder mixed feed on growth, and accumulation of skin, muscle, and caudal fin carotenoids.

**Species Profile:**

Blue gouramis are hardiest among the aquarium fish on the market. A color variation of the three spot gourami, but they shows only two spots, one in the center of the body and a second at the caudal pentacle (beginning of the tail). Usually silvery blue eye is considered as third spot, their colors change considerably with their moods. During spawning, they acquire a much deeper blue hue. The hybrid variation of opaline or cosby lacks spots, has a darker blue marbling, and is rarely available for sale. This widespread species occurs naturally throughout southeast Asia. It may be found in the Mekong River basin in southern China, Vietnam, Laos, Cambodia, Thailand, Myanmar, Malaysia, Sumatra, Java, and Kalimantan. Outside of its native range, it has been introduced in Sulawesi, Philippines, Taiwan, Papua New Guinea, and the islands of Reunion, Seychelles, Namibia, the Dominican Republic, Puerto Rico, and Colombia. The blue gourami frequents shallow lowland marshes, swamps, and peatlands but may also be found in streams and canals or, during flood season, in flooded forests (Shirlie,2015).

Kingdom: Animalia

Phylum: Chordata

Class: Actinopterygii

Order: [Perciformes](https://animaldiversity.org/accounts/Perciformes/classification/" \l "Perciformes)

Family: Osphronemidae

Genus: *[Trichogaster](https://animaldiversity.org/accounts/Trichogaster/classification/" \l "Trichogaster)*

Species: *T. trichopterus*

Binomial name: *Trichogaster trichopterus* (Bloch and Schneider, 1801)



Plate 01 : Blue Gourami (*Trichogaster trichopterus).*

Therefore, this study investigates the coloration performance, and growing utilization of blue gourami fed at varying levels of a natural carotenoid mixedmeal.

This research will generate a conclusion of the effects of natural carotenoids on the body coloration of blue gourami .This will help to improve the market value of target fish as well.

**Objectives:**

* To improve coloration of the blue gourami fishes.
* To increase market and aesthetic value of blue gourami fishes.