GENERAL INTRODUCTION

Food is one of the most important basic needs for the survival of the living beings on the earth. Whenever Food is not available in sufficient quantities, there arises the problem of competition. It is quite evident that production food is not keeping pace with the increase in population of the world. The shortage of food material could be overcome either by controlling the population explosion or by increasing the food production. As the population control could not be done effectively the only alternative left was to find out the ways and means to increase the production of food.

In recent years, the terrestrial, aquatic and atmospheric environments are put to an immense stress due to increased human activities. Aquatic environment provides numerous resources that support human life in different ways. Organisms of all the trophic levels are available in aquatic system. Those organisms of second, third and higher trophic levels are known to be rich in protein in terms of quantity and quality, particularly in the essential amino acids required by man (Burton, 1965). Ever since man realized the ways and means to obtain his food from sea, the importance of the seafood increased significantly. Traditionally fish is cheaper than meat, highly nutritious and is a source of cheap protein besides being a major foreign exchange earner. Approximately 3, 63,000 million tons of organic material is produced in the Oceans of the world each year (Weihaupt, 1979) but only a small fraction of this is recovered by way of fisheries for direct consumption.

Aquatic environment in turn is always influenced by both the terrestrial environment surrounding it and the atmosphere which is in close contact with the water at the surface. Various pollutants cause diverse effect on morphology, physiology and biochemistry of the aquatic species. The seas around the globe hold rich and varied floristic and faunistic diversity with great potentials to feed the ever growing human population. Pollution is mainly caused by the introduction of
technological products and by-products into the water systems. Since a long time the disposal of industrial wastes is conducted into water bodies without critical appraisal of the losses. Usually no consideration was given to the deleterious environmental impact upon the receiving water body. Because of this 80% of our rivers, lakes and estuaries are polluted with organic and inorganic toxic chemicals and pathogens.

Out of the entire aquatic organisms that are used as a food, man is interested in the tertiary production, fish in particular, for several reasons. Fish are an important part of a healthy diet since they are considered to be an excellent source of high value protein and essential nutrients. Fish are low in saturated fat and contain polyunsaturated fatty acids such as omega-3, where a well-balanced diet can contribute to reduced heart disease and promotes the proper growth and development in fetuses and children (Burger and Gochfeld, 2004; National Research Council, 2000; Hunter et al., 1988; Kimbrough, 1991; Horn, 1992; Anderson and Wiener, 1995). During the last decade, the importance of omega-3 fatty acids in the diet has been recognized. Such acids are believed to play an important role in protecting against heart disease by various ways including preventing blood cells from clotting and adhering to artery walls or decreasing triglycerides and low density lipoproteins (LDL) (Connor, 2000; Sidhu, 2003) in addition to having anti-arrhythmic effects (De Caterina et al., 2003). Fish consumption has been associated with improved pregnancy outcomes, including fewer preterm and low-birth-weight deliveries (Olsen and Secher, 2002) attributed in part, at least, to n-3 fatty acids (Allen and Harris, 2001). Fish are also thought to reduce the risk of stroke caused by blood clots (Kris-Etherton et al., 2002), and to play a role in decreasing inflammation while benefiting people with autoimmune diseases (Simopoulos, 2002). In addition, fish are believed to have beneficial effects on brain and retina development in children (Connor, 2000; Sidhu, 2003; Broadhurst et. al., 2002).

Hence, fish has a very special consideration in human civilization from time immemorial. Growing of the awareness of the fish nutritional values brought it to the fore to be one of the most important diets to be served on table.
Modern fisheries science has emerged as a result of a very beautiful blending of many basic sciences such as biology, ecology, hydrology, meteorology, pathology, economics, commerce etc. The common aim of all these sciences is to project the fish as food for humankind (Srivastava, 1999). This need was felt only in the last few decades of the nineteenth century when we started understanding our limitations in the exploitation of the available natural fish resources. Keeping in view the pressure of unemployment currently faced by many countries of the world, fishery can play an important role in the rural economy. It can provide immense job-potential to unskilled rural population. Indian fisheries sector today provides employment to over 11 million people, directly or indirectly. Another great role is in the alleviation of the suffering of the malnutrition among the poor countries of the world. Fisheries can play an important role in this case as well.

India is very rich in fish potentialities. The marine fishery resources of India include an area of 8,129 km of coastline, 51.20 sq.km of continental shelf and 2.02 million sq.km of Exclusive Economic zone. Inland fisheries resource are supported by 113 major and minor rivers; myriad’s of streams and canals of about 1,64,000 km: 2.05 million hectares of reservoir and 2.7 million hectares of estuaries and backwaters. The marine environment in the state, which has a long coastal line, includes both the coastal zones (terrestrial) as well as the seas of Bay of Bengal. The Bay of Bengal is full of biological diversity, diverging amongst coral reefs, estuaries, fish spawning and nursery areas and mangroves. The unique feature of the Bay of Bengal is its water balance. The total precipitation over the bay exceeds the evaporation by about 1500 cubic meters and the discharge from major river systems of the adjoining countries amounts over 2000 cubic meters of fresh water per annum. Fisheries are of major socio economic importance to all countries bordering the Bay of Bengal, as the Industry provides direct employment to over 2 million fishermen. In Andhra Pradesh, the coastal zone has been demarcated with CRZ development maps. While the CRZ-1 comprises of ecologically sensitive area,
CRZ-2 covers the already developed areas and CRZ-3 constitutes the comparatively little developed areas, where restrictions are applied up to 500 meters zone.

In the coastal zone there are several areas, especially the urban settlements like Visakhapatnam and Kakinada, where development has taken place even before 1991. In 1991, the Coastal Zone Regulation notification was issued by the union Ministry of Environment and Forests to protect the 500 meters zone from the high tide line and along rivers and creeks up to the area of the tidal action.

Considering the optimum per capita nutritional requirement of fish as 11 kg/year, it was estimated that, the total quantity of fish required in India by 2020 would be around 7.2 million tons against the present total fish production of 4.95 million tons (1995-96). Around 3.9 million tons of fish are available in Visakhapatnam (2008). It is a pointer to the unsound fishing practices. Elasmobranchs and Mackerels form the major catches up to a depth of 50m along the coast of Andhra Pradesh. In the depth zone of 100 m Elasmobranchs, Mackerels, cat fishes and Upeneids form the major catch. To meet this demand it is not only required to increase food production but also use the same in sustainable manner. The fish production has reached a plateau and no further increase from coastal waters is possible. The scope of increasing the fish production from marine sources now lies in the deep sea fishery and near shore aquaculture. This literature therefore provides information on different aspects of ecology, biology of the species *Upeneus vittatus* and *Upeneus moluccensis* from coastal waters of Visakhapatnam, India for fish catch improvement and culture possibilities.

Eco biology is the discipline which provides the strongest foundation and is the study of the relationship of organism to their natural environment. For any scientist concerned with any aspect of the fisheries should understand the fish feeding activity, which is the dominant activity of any animal’s entire life. This understanding would help to improve the fish catch. Furthermore knowing how food is a limiting factor and how it may be divided among competing animals for culture
help to develop a rational method of exploiting a population. Study on the nutritional requirements is also helpful in aquaculture in order to obtain the best growth at least period (Royce, 1972).

Many aspects of the reproductive process are commonly used either to catch the fish easily or to protect them if they are unduly vulnerable. The great fluctuation in the abundance of fish due to failure of the young to survival can also be explained. It is essential and needed prior to the measures adopted for conservation and propagation of a particular fish species. Knowledge of spawning period is one of the most important requisites in fishery management and its rational exploitation.

Length-weight relationship and condition factor data are valuable in describing the general life history of fish. They are more valuable from a management viewpoint, when they can be compared with similar data from other population (Carlander, 1969). Growth varies with sex, age, condition factor and number of biotic and abiotic factors.

The biochemical constituents of any fish species denote its nutritional and energy status. The biochemical composition varies from species to species, within the same species and within the same individual. Knowledge on the biochemical changes of the fish is essential for understanding of the metabolism of different populations for providing an estimation of the energy content and for understanding the biochemical circulation of elements.

The fishes of the family Mullidae, occurring widely in tropical, sub tropical and temperate habitats from the upper littoral down to the upper slope of coastal regions are popularly called as goat fishes. Some species are more restricted to hard bottoms, others separate mainly by depth. Goatfishes respond to human-induced factors such as fisheries and habitat modification, as reflected by abundance, size, or weight changes, or changes in their distributional ranges. Temperature increase may lead to increased reproductive of growth rates and longer warming periods may induce goatfishes to migrate to higher latitudes, as exemplified by striped red mullet (*Mullus surmuletus*) in the North Sea. Goatfishes may act as ecosystem engineers through their vigorous foraging behavior with barbells and mouth, which leads to the stirring up of sediments and associated detritus particles high into the water column. Goatfishes play a key role in the formation of multi species foraging associations as nuclear species that are followed by many other species The role of goatfishes in food webs has been rarely evaluated and the many interactions goatfishes may be involved in have not yet been sufficiently considered.

These Mullets contribute to an important demersal fishery in Visakhapatnam fishing harbour. Goatfishes clearly deserve more attention in future costal habitat exploration, monitoring and management efforts. Studies on the Eco-Biological aspects of this fish help in understanding the food and feeding habits, growth rate, gonadal maturity etc. Among the goatfishes *Upeneus vittatus* and *Upeneus moluccensis* occupies an important position in the trawl Catches at Visakhapatnam harbor.

The present study is aimed at understanding the Ecobiology, including the food and feeding habits, age and growth, breeding habits and biochemical composition of two species of goatfishes, viz., *Upeneus vittatus* and *Upeneus moluccensis*, which occur in considerable numbers at the study area i.e., Visakhapatnam outer Harbour, to elicit information on the differences, if any, in between the two species.