PREFACE
The bivalve molluscs like oysters, mussels, clams, cockles, scallops etc. are food mollusks which are produced through aquaculture in several parts of the world, like U.S.A., Canada, France, Europe and Asia. Amongst these mollusks, several species are abundantly found in the Indian waters. The oysters and mussels, particularly along the coastal regions, are relished. The need for popularizing the shellfishes as food is great, particularly in the country like ours where provision of nutritious food is a long standing problem and only the means to tackle it should be tried and if successful, popularized. The role that shellfishes can play in meeting the country quest for balanced nutritious diet has to be more widely recognized. In several parts of the world and India, the shellfishes are exploited for various purposes. The bivalves both fresh water and marine are extensively fished for multiple uses. The bivalves from the coastal areas are much favored for human consumption but they are not so from the freshwater regions. The shells are used in lime, cement and paint industries, and for preparation of ornaments, toys and other utility articles. These shellfishes are playing a living role yet, shedding many of their past association and reported miraculous properties (the impact, no doubt of the so called ungodly present
day generation), but assuming newer and vastly more utilitarian roles. The significance of the shellfishes in future would be greater as a potential source for human consumption and human welfare. Many of the shellfishes have not yet attended their place on the gourmet’s table that they could.

Considering the immense scope and the necessity of the production of food shellfishes through adaption of the aquaculture, it has been brought to the attention of planners and practitioners through the studies carried out in the National Institute of Oceanography and Central Marine Fisheries Research Institute, Central Institute of Fisheries Technology, Central Institute of Fisheries Education and several Laboratories from all the university and colleges knowledge on ecology, biology and culture techniques. According to the report of Gulland, F.A.O. of the UN, that problems of stock and recruitment, interaction between species and inherent variability of natural systems have to be solved in order to the base management of fisheries on a broader concept than the simple maximum substantial yield. Chapmen from U.S.A. stated that as important as this type of research is, in fact, for scientific basis of management decision in fisheries the application of research data for the benefit of fisheries should also be considered worth while.
There are representatives of about 19 families that have at least one representative living in freshwater. At least nine families have small to large radiations in the freshwater environment: Corbiculidae, Sphaeriidae, Dreissenidae, Hyriidae, Margaritiferidae, Unionidae, Etheriidae, Iridinidae, and Mycetopodidae. The last six families comprise the Order Unionoida that contains at least 160 genera and 1000 species. This order is characterized by the unique parasitic larval stage on the gills or fins of particular host fish. The Hyriidae, Margaritiferidae, and Unionidae are all characterized by having glochidial larvae. The Margaritiferidae and Unionidae have no mantle fusion resulting in incurrent and excurrent apertures while the other four families have some degree of fusion resulting in at least a fused, complete excurrent siphon and often a completely fused incurrent siphon.

Many species of bivalve molluscs abundantly occur in various Indian water systems, clams, mussels oysters, cockles, scallopes etc. are found along the coastal areas, while freshwater mussels are abundant in lotic and lentic waters. The living freshwater bivalve molluscan fauna is represented by super family, the Unionaceae, according to classification of Vokes (1980), primarily by three Corbiculaceae, and Unionaceae, Dreissenaceae. The Unionaceae (in which freshwater mussels belong) is
dominated by the families *Margaritiferidae* and *Unionidae*. The family *Unionidae* includes a large number of genera and species of bivalve shellfishes. Among these freshwater bivalves, (The unionids genera) occurs. In Maharashtra State are *Lamellidens*, Parreysia, Corbicula and *Indonaia*. In the genera *Lamellidens*, *Lamellidens marginalis* is a common species, abundantly occurs in (Godavari River) lotic water system at Kaigaon Taluka Gangapur and (Landlocked water) lentic water system of Nandrabad dam at Nandrabad Taluka Kuldabad dist. Aurangabad. This species will firstly reported by Lamark. The present work deals with this species.

Considering the importance of the several aspects of biology, considerable work has been done on the bivalve species from coastal areas of India. The notable contribution is those of Virabhadra Rao, Bal, Algaraswami, Narasimham, Nagabhushnam Durve, Mane and few others. Comparatively very little attention has been paid on the freshwater species. In Maharashtra state, several bivalve shell fishes are found in freshwater bodies; hence this study was undertaken on *Lamellidens marginalis*.

The freshwater bivalves are suspension feeders on the primary stage of food chains hence they notably influences the organization and
functioning of the ecosystems. Also, they perform efficient role in transformation of energy in food chains coupled with their sessile mode of life. The significance of the shellfishes, in future will be greater as a potential source of food for human beings. Many of the bivalve mollusks have not yet attended their place on the Governments table that they could. The oysters and mussels particularly along the coastal regions are much relished. The need for popularizing the shell fishes as food is great particularly in our country, where the provision of nutritious food is a long standing problem and only means to tackle; it should be tried and if successful, popularized. In several parts of the world, including our India, the shellfishes are exploited for various purposes, apart from food. The are used as bait for fishing and their shells for multiple uses like preparation, of toys, ornaments, utility articles and in lime and paint industries.

Both marine and freshwater bivalves play important role as bioindicator to detect various environmental fluctuations and aquatic characteristic changes due to natural and man-made disturbances. The Juvenile bivalve becomes a source of food, for many fishes, birds and mammals, hence they become important component of lower level of aquatic food chain. (Braber and De Groot 1973, Hulscher 1982, Phil and
Rosenberg 1984, Fréchette and Bourget 1985, Offringa 1993, Zwarts and Blomert 1992, Leopold 1996, Zwarts et al. 1996, Van der Veer et al. 1998, Mascaró and Seed 2000, Hiddink et al. 2002, Fox 2003, Beukema and Dekker 2005). The bivalve species are found in all around the aquatic water bodies in a variety of environments, from the poles to the tropics (Tebble 1966, Hayward and Ryland 1995, Dance and Ward 2002). Freshwater mussels provide food for a number of terrestrial and aquatic species. Raccoons, muskrats, otters, fishes, turtles, and birds all feed on mussels. The cracked valves and weathered remains of unionids often litter gravel bars and floodplains, a testament to the efficiency of terrestrial predators. The spent valves of freshwater mussels play a role in aquatic ecosystems as well. Shells provide habitat for a variety of life, including fish periphyton crustaceans, mollusks, and macro invertebrates additionally, the weathering and eventual erosion of shell material recycles calcium carbonate back to aquatic ecosystems. Over such a range, differences in environmental conditions such as in water temperature, salinity, food availability and water current occur also have much impact on bivalves these differences are known to influence growth, survival and reproduction and, ultimately, they limit and determine the distribution of species.
The freshwater bivalves are filter-feeders or collector filters capable of collecting and filtering huge quantity of the water and they are able to detoxifying hazardous substances in aquatic systems. By removing organic materials bivalves can significantly reduces turbidity level and they are capable of cycling significant quantities of nutrients. The freshwater mussels are fed on fine particulate organic matter suspended in to the water columns. Nutrients assimilated are used by bivalves for growth, reproduction, respiration and metabolism; they are excreted in dissolved inorganic forms. The significant role of freshwater mussel in stream system is release of nutrients via excretion, settled on suitable substratum. Being burrowing in the substratum these animals are not able to migrate from one place to another place, and hence they remain under severe environmental stress.

Many Scientist have shown much interested to study the ecology and physiological aspects of bivalve molluscs. The research work on the biology and fisheries of commercially important bivalves have been studied in some detail and the results obtained are help full to make effective attempt in advancing the research on various aspects of physiology and eco-physiology. Some notable contributions on bivalves from Maharashtra State are from Mumbai, Raigad Ratnagiri and
Sindhudurg, coasts in Maharashtra, while fresh mussels from Thane, Kolhapur, Ahemdnagar, Nanded, Beed, Jalna and Aurangabad districts. Freshwater bivalves mollusks like *Parreysia corrugate*, *Indonaia caeruleus*, *Lammellidens corrianus*, *Lammellidens marginalis* are abundantly found in both lotic and lentic water systems of Maharashtra state.

The studies have been made on freshwater bivalves is based on taxonomy with information on habitats, communities composition, abundance and distribution, life cycles, growth, reproduction, population dynamics and energetic (Burky, 1983) and modern trends in approach to physiology ecology of fresh water bivalves.

The studies on hepatopancreas and gonad of bivalve molluscs have been made by a few workers because the knowledge on these organs bivalves can give an insight on role of these organs in adaptation to particular environment parallel with oxygen consumption which is affected by several factors in the environments as well as the physiological event taking place in these animals.

Freshwater mussels play a number of important roles in aquatic ecosystems. As sedentary suspension feeders, unionoids remove a variety of materials from the water column, including sediment, organic matter,
bacteria, and phytoplankton. Siphoned material is either transferred to the mouth for digestion or sloughs off the gills and exits via the ventral matter removed from the water column and subsequent deposition of waste is largely dependent on temperature, particle margin of the shell (psuedofeces). Digested material is either used as fuel for various life processes or excreted as feces. The amount and rate of particulate concentration, flow regime, mussel size, and species (Vaughn and Hakenkamp2001). While the siphoning activities of mussels are often overlooked, they provide an integral resource link between pelagic and benthic habitats (Nelepa et al., 1991; Howard and Cuffey 2006). Bivalve beds have an important role in the ecology of the habitat in which they live (De Jonge et al. 1993, Dankers et al. 1999, De Vlas et al. 2005). The large filter-feeding activity of the bivalves results in the deposition of large amounts of suspended matter in the form of faeces and pseudofaeces (Dankers et al. 1999). The breakdown of organic matter produces ammonia and silicates which may stimulate primary production (Asmus and Asmus 1991), while pseudofaeces provide a food source for various species, such as deposit-feeding worms (Dankers and Koelemaij 1989, Dankers et al. 1999).
Biological literature records many values of oxygen consumption reported in various environmental conditions such as salinity, oxygen tension, carbon dioxide, temperature, pH, etc. (Davis, 1975). Rate of oxygen consumption in these animals is also influenced by activity, body size, and step in the life cycle and time of day, as well as by previous oxygen experience and back (Prosser, 1973). Indeed, a considerable on the interaction of ground availability, oxygen uptake and ventilation rates for many freshwater, marine and estuarine organisms. Bodies of freshwater often show large variations in the dissolved oxygen, both seasonal and geographically. This point was studied by Muley (1985), Akarte (1985), Muley (1988), Nagawanshi (1997) and Dongre (2002), and a few others workers. To get additional information on some physiological aspects, the experiments were conducted to study the habitat or site specific changes in ammonia excretion and changes in oxygen: nitrogen (O:N) ratio. The biochemical analysis was done to know the amount of the organic constituents channelized and in the whole body. This thesis focuses on reproduction of bivalve species in different habitats of the lotic and lentic in relation to environmental conditions. This approach allows a further analysis of intra- and inter specific
interactions (such as competition for food) between those bivalve species.

The entire collected data framed under six sections viz:

1. Changes in oxygen consumption
2. Changes in ammonia excretion
3. Changes in O:N ratio
4. Changes in biochemical constituents
5. Histology of the digestive tubules
6. Histology of the gonad (Reproduction)

Introduction and material methods are given in the beginning of the results as sectioned above, where as discussion and bibliography is given at the end of the results. Finally general summary and conclusions have been given.