PREFACE

The marine and freshwater bivalve shellfishes both play an important role as bioindicator to detect various environmental fluctuations and aquatic characteristic changes due to natural and man-made calamities. The juvenile bivalve becomes a source of food. For many fishes, birds and mammals, hence they become important component lower level of aquatic food chain. The freshwater bivalves are filter-feeders or collector filters capable of collecting and filtering huge quantity of water and they are able to detoxifying hazardous substances in aquatic system. 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 mussels in stream system is release of nutrients via excretion, finally which settled on suitable substratum. Being a component of ecological food chain, bivalves are not able to migrate from one place to another, and hence they remain under severe environmental stress.

Many scientists have been shown much interest to study the ecological and physiological aspects of bivalve molluscs, since past few decades. Though the research work on the biology and fisheries of commercially important shell fishes contributing to the substantial catches was started, comparatively recently in India. There have been considerable preliminary and some detailed investigations on various species of local importance and the result obtained from it are much
helpful to make effective attempt in advancing the modern trends of research in various aspects of physiology and eco-physiology. Notable contribution on clams, mussels, and oyster are from Mumbai, Sindhudurg, Ratnagiri and Raigad coasts in Maharashtra, while freshwater mussels are from only Thane, Kolhapur, Ahmednagar, Nanded, Jalgaon and Aurangabad districts.

Freshwater bivalves like *Lamellidens corrianus, Lamellidens marginalis* and *Indonaia caeruleus, Parreysia corrugata, Parreysia cylindrica* are abundantly found in both lotic and lentic water systems of Maharashtra state.

Historically, physiological ecology of freshwater bivalves is based on taxonomy which gives on insight habitat, community composition, abundance and distribution on the basis of life cycles, growth, reproduction, population dynamics and energetics (Burky, 1983). Modern physiological ecology of freshwater bivalves has more recently involved both in field as well as laboratory studies.

Biological literature records many values of oxygen consumption reported in various aquatic invertebrates under various environmental conditions such as temperature, salinity, pH, carbon dioxide, oxygen tension, etc. (Davis, 1975). The rate of oxygen consumption in these animals is also influenced by activity, body size, stage in the life cycle and time of day, as well as by previous oxygen experience and genetic background (Prosser, 1973). Indeed a considerable knowledge is available on the interaction of oxygen availability, oxygen uptake and ventilation rates for many freshwater, marine and estuarine bivalves.
Freshwater bodies often show large variations in the dissolved oxygen, both seasonally and geographically. This point was elaborated by Akarte (1985), Muley (1988) and Vedpathak (1989) while working on the freshwater bivalves from Godavari river at Paithan near Aurangabad.

The physiological-ecology and energy metabolism, during the reproduction in bivalve molluscs have been studied and reviewed by many investigators, because the physiological ecology of bivalves can give an insight on adaptation of animal to function in its particular environment. Oxygen consumption can be chemically affected by biological factors in the environment as well as the physiological events in the animals. 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 channalized and utilized in the whole body. Aquaculture of shell-fishes has been started in India through the use of various experimental trials carried out in the National Institute of Oceanography, Goa and Central, Marine Fisheries Research Institute, Cochin. Yet many experiments are still to be done in obtaining the seeds of the shell-fishes. While reproduction of marine and freshwater shell-fishes has been studied for long time, more data are desirable on their annual reproductive cycles with environmental stress in aquatic systems to determine their effects on gonads and the accompanying change in the animal body at this time, culminating in release of gametes and energy storage. A number of studies on the gonad development of marine and freshwater bivalve molluscs have been carried out. The work like Virbhadrarao, Algaraswami, Bal and
Durves, Nagabhushanam and Mane, Patil, Joshi have contributed much in this field. Considering the endogenous regulations during reproductive cycle of the bivalve mollusc few workers, like Nagabhusham, Mane and co-workers have shown that the neurosecretory materials from the neurosecretory cells of cerebral ganglia play an important role during maturation and spawning of marine and freshwater bivalves. The literature shows paucity of information on the stress effects on reproductive cycle and endogenous regulation in bivalve molluscs.

The toxic effects of polluting substances on reproduction also occurring different ways. Teratological development of embryos may results in deformed or malfunctioning larvae which do not survive hatching. Reproduction may be influenced by behavioral changes of the adults during spawning seasons. Davis stated that animal’s behavior, the production of egg and sperms, the secretion of eggs membranes, and production of nutrients may all be affected by changes in hormonal functions and enzyme activities. All these may be considerably affected in presence of environmental stress like pollutants. The workers like Kinne, Cohen and Pinkerton, Keith, Loosanoff, Galtssoss, and Chipman, Brease and Coworkers have shown that environmental stress like temperature, pH, desiccation, salinity changes, insecticides, oils and detergents and in organic pollutants considerably affect the animals in aquatic system. Many workers have used histological and physiological aspects as a tool for determining the stress effects on the animal body.

The oysters, mussels, clams, cockles, scallops, and abalone are the food molluscs, which are produced through aquaculture in several
parts of the world. Amongst these molluscs, many species abundantly found in Indian water systems. Oysters and mussels particularly along the coastal regions are much relished. The need for popularizing the shell-fishes as food is great, particularly the country like ours where provision of nutritive 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 India, the shell-fishes are exploited for various purposes. Apart from food, they are used as bait for fishing and shells for multiple uses like preparation of toys, ornaments, utility articles, and also in lime and point industries.

The reproductive physiology of molluscs is of special interest due to their importance as food for man. Besides this, human activities tend to concentrate along marine shores and cause considerable toxic stress in addition to these some stresses caused naturally during summer and monsoon due to sudden fluctuations in environment. In the laboratory of molluscan endocrinology and physiology of Department of Zoology, Dr. Babasaheb Ambedkar Marathwada University, the research work carried out on freshwater and marine shell-fishes revealed that the polluting substances like pesticides and heavy metals bring about differential effects on reproductive physiological aspects including biochemical, during summer, monsoon and winter seasons. However knowledge on the effects of fluctuations in environmental parameter, like temperature, desiccation, pH, oxygen tension, on the bivalves is lacking from the above laboratory. The perusal of literature also reveals that comparatively little attention in the direction of the above mentioned aspects has been paid on the freshwater bivalve mollusc. Along the banks of Girna river at Jamda, Dist. Jalgaon, there is abundant distribution of freshwater bivalve mollusc, like *Parreysia*
*cylindrica* and *Indonaia caeruleus*. Considering the importance of natural fluctuations in the environmental parameter, temperature desiccation and pH, oxygen tension, the present study has been directed on *Purreysia cylindrica* from the banks of the Girna river at Jamda(Jalgaon). The aspects covered are (1) effect of rise in temperature (2) effect of desiccation and (3) effect of changes in pH, the experiments were conducted on the freshly collected adult freshwater bivalves (40-45mm in shell-length) during summer (April-May), monsoon (July-August) and winter (December-January). The experiments on the effect on rise in temperature were carried out for 12 days, where as in desiccation for 8 days and on pH for 12 days. For the temperature animals were exposed to 30°C during summer, 30°C during monsoon and 27°C during winter which occurs naturally along the habitat of the above animals. The changes in pH were little above and below the naturally occurring values (6.8 – 7.9) the changes in pH during the experiments were in the range of 5.00 – 9.00 pH. For desiccation experiments the naturally occurring effects along the habitat (in summer) was matched in the laboratory by exposing the animals in the mixture of mud with fine sand. Periodically the animal behavior and mortality were recorded, rate of respiration and mortality were recorded on 2nd, 7th and 12th day for temperature and pH and on 2nd and 8th day for desiccation, biochemical analysis from mantle, hepatopancreas, gonad and foot were done on the periods as stated above the gonads were fixed on the above periods for histological study of gonad. The histological study of the gonads were made for understanding the effect of rise in temperature. The entire data collected are framed under five sections.
(1) Behavior and mortality, (2) Respiration (3) Excretion (4) O:N ratio (5) Biochemical changes and (6) Histology of gonads and (7) Neurosecretion

Introduction and Materials and Methods are given in the beginning of the Results as sectioned above, whereas Discussion and References are given at the end of the Results. Finally, general Summary and Conclusion have been given.