General Summary and Conclusions

The bivalve shellfishes in India are exploited for various purposes. The need for popularizing this shellfishes as food is great. Apart from their edibility value they are used as bait for fishing, and shell for multiple use like preparation of toys, ornaments, utility articles’, and also in lime, cement and paint industries. Persual of literature reveals that considerable attention has been paid on shellfishes form the coastal areas in understanding their eco-physiological and biological aspects. Comparatively the work in the similar direction on the shell-fishes from the areas are less. In fact this freshwater shellfishes are harvested in our country for multiple use but they have less edibility value. For scientific basis of management decision, the application of research data for benefit of fisheries should be considerable worth while. Thus, development of any fisheries in those dependants upon the physiological and ecological status of the animal in its local environment. Amongst the several aspect studied by many investigators, the subject of reproduction has been received considerable research interest. Studies on reproduction are important in ecological investigations, since they provide important data related to distribution and population structure and also enable for accurate the predictions to be made concerning the recruitment to the population.

Amongst the freshwater bivalves Parreysia cylindrica is abundantly distributed along the banks of the many rivers systems in Maharashtra state. This species has received comparatively little attention in understanding the effect of environmental variables on the reproductive Physiology. Hence, the presence study was directed to in understanding the effect of some environmental factors i.e. rise temperature, desiccation and changes in the pH on metabolic processes.
during different seasons. The behavior, aerobic respiration and changes in the biochemical constituents from different body part were studied during different season, while histological changes in the gonads and neurosecretory material from different ganglia were shaled for understand the effect of rise in temperature. These studies were made during, summer, (April-may), monsoon (August-sptember) and winter (Decmber-january) on freshly collected sample of Parreysia cylindrica from the bank of Girna river at Jamda dist. Jalgoan.

The physicochemical characters of water during the stocking of the animals during different seasons showed that at the time of high temperature in summer, there was low level of oxygen content and also total carbonate of water increased at the high temperature in summer. There was no much fluctuation in pH. Behavior and mortality due to the exposure of Parreysia cylindrica to rise in temperature, desiccation and changes in pH showed differential responses, in different seasons. These changes were conditioned under different categories for the control group as well as on the experimental group in different seasons. The control groups were conditioned from a to c and the experimental for the rise in temperature and changes in pH from a to c and for desiccation from a to d.

The rate of respiration was measured during rise in temperature and changes in pH on 2nd, 7th and 12th day, while during desiccation it was measured on 2nd and 8th day. The rate of respiration in rise in temperature, low pH and desiccation groups showed increase during summer monsoon and winter. In all the seasons the rate tended to decreased as the exposure period increased. Rise in temperature resulted in increased in the respiration in all the seasons, particularly
more increase in summer, while changes in pH generally resulted in
increased rate of respiration at low pH and decreased rate at high pH. Desiccation caused increased the rate of respiration.

Estimations were made for glycogen, protein lipid and ascorbic acid from mantle, hepatopancreas, gonad and foot on 2nd, 7th and 12th day during rise in temperature and changes in pH, while during desiccation the estimations were made on 2nd and 8th day.

Gonad growth and gametogenesis are found to be dependent
upon direct intake of food materials during monsoon at which time protein and lipid contents increased in gonad and hepatopancreas. Due to rise in temperature at34°C during summer, more metabolic shifts in glycogen, protein and lipids occur. During winter rise in temperature to 27°C caused more effects on metabolic shifts than at the same temperature in monsoon. Due to desiccation more changes in glycogen, protein and lipid occurred during summer than in monsoon and winter. Foot and gonad were comparatively more affected. Due to changes pH gonad and foot were more affected in summer and monsoon. At pH 5.0 the effect on biochemical constituents was more pronounced in winter than summer and monsoon. But it differed in all the seasons on 2nd, 7th and 12th day. Ascorbic acid content decreased from mantle at 30°C during monsoon and 27°C winter, while at 34°C from gonad. However, mantle tissue was more affected in all the seasons due to changes in temperature. During summer due to desicication the content decreased from mantle, hepatopancreas and gonad is more affected. Changes in pH also caused pronounced effect on the content from mantle, hepatopancreas, gonad and foot during summer than monsoon.
Gonads showed short gametogenic phase during summer developmental stages in monsoon, and maturation and released of gametes during winter. Due to rise in temperature in different season after 12\(^{th}\) days the enhanced gametes growth was observed. In both males and females the follicles expanded more and interfolicular connective tissue reduced; this was more pronounced at 34\(^{o}\)C during summer than at 30\(^{o}\)C monsoon and 27\(^{o}\)C Winter. Lysis of mature gametes were also more pronounced during summer than in monsoon and winter, however normal developments of gametes occurred in monsoon and winter. Due to rise in temperature more released of gametes takes place during winter than monsoon.

The neurosecretory cells from cerebral ganglia of control group showed more release of the material during winter, followed by the synthesis material during summer and accumulation during monsoon in type I cells. On the other hand, type II and III cells did not show distinct seasonal changes. In visceral ganglia type I cells also showed more release of neurosecretory material during and summer but during monsoon synthesis of the material takes place. Type II and III cells showed synthesis of material partially during monsoon. In pedal ganglia type I cells showed little neurosecretory material during winter but during summer and monsoon synthesis of the material takes place. Type II and III cells showed scattered neurosecretory material in the cytoplasm and also around the nuclei, particularly during summer. Due to rise in temperature considerable changes in the neurosecretory occurred in all the three type of cells, particularly in type I and II cells. In type I cells of cerebral and visceral ganglia the changes in the neurosecretory material could be correlated with the gonad development in different seasons due to rise in temperature. During
winter type I cells of cerebral ganglia showed release of neurosecretory material into axons at 27°C, while in visceral ganglia at 27°C it was in the periphery and axon; and it was around the nucleus. During summer at 34°C, type I cells of the cerebral ganglia showed scattered neurosecretory material in cytoplasm and in axons, while in visceral ganglia it was more in the axonal region. From pedal ganglia the neurosecretory cells showed no pronounced change as from cerebral and visceral, however type I cells were more affected than type II and type III.

It is concluded that the environmental stress factors, like temperature, desiccation and pH values cause the pronounced alterations in respiration, biochemical diversions, reproduction and neurosecretion in the freshwater mussel *Parreysia cylindrica*. These stress factors caused more mortality during summer followed by monsoon and winter. Rise in temperature resulted in the enhanced growth of the gametes and pronounced changes in the neurosecretory cells of the cerebral ganglia and visceral ganglia, particularly the type I cells. From the study it can be suggested that amongst these stress factors changes in temperature within the limits of naturally existing range could be favorably utilized from the aquaculture point of view.