Chapter 2 STATEMENT OF THE PROBLEM

Oxidative stress is considered as an important biomarker of the health status of organisms (Halliwell and Gutteridge, 2001). Mud crab (S. serrata) is an important commercial arthropod belonging to estuarine ecosystem. It generally inhabits intertidal zones of estuaries through out Indo-Pacific regions including Chilika lagoon of India. It is a well known fact that fluctuations in both biotic and abiotic components of the marine environment with relation to seasons have considerable impact on the metabolic activities of its inhabitants particularly of the invertebrates (Abele and Puntarulo, 2004; Lesser, 2006; Almeida et al., 2007). Oxidative stress of an organism is a reflection of its metabolic state. Although several studies have clearly demonstrated a strong correlation between seasonal changes and oxidative stress status of marine invertebrates such as molluscs (Viarengo et al., 1991; Sheehan and Power, 1996; Filho et al., 2001; Manduzio et al., 2004; Verlecar et al., 2008b) and cephalopods (Zielinski, and Portner, 2000), not much information is available on arthropods in general and mud crabs in particular. Out of all abiotic factors of marine or estuarine environments, salinity deserves special attention. Salinity of marine or estuarine habitat significantly changes with seasons (Verlecar, 1987). It is here to note that salinity of Chilika lagoon varies throughout the year ranging from nearly 10 ppt in rainy season to 35 ppt during summer with a temperature variation from 18 °C (winter) to 32 °C (summer) (Mohapatra et al., 2007a; Panigrahi et al., 2007). Although several aspects of S. serrata are reported to be modulated by environmental salinity (Hill, 1974; Chen and Chia, 1996a and 1996b; Hai et al., 1998; Ruscoe et al., 2004), effect of salinity on oxidative stress parameters and antioxidant defence system of mud crabs is lacking.

In aerobes, oxygen is reduced tetra-electronically to water in mitochondria during oxidative phosphorylation. In the process, role of the respiratory enzymes are vital in transferring electrons successfully from one complex to another. Leaking of electrons from mitochondrial complexes leads to production of reactive oxygen species (Halliwell and Gutteridge, 2001) which if not efficiently neutralized lead to oxidative stress. Therefore,
functional aspects of the respiratory enzymes with respect to altered environmental factors such as salinity or temperature are of paramount importance in understanding mitochondrial energetic and oxidative metabolism of an organism. Effect of environmental factors on mitochondrial physiology of mud crabs is very limited and needs further studies.

The broad objective of the present study is to investigate the effects of salinity and seasons on oxidative stress parameters and antioxidant defences of mud crabs.

The specific objectives of the present study are as follows:
1. To find out the effect of seasons on oxidative stress parameters and antioxidant defence status in different tissues of mud crab *S. serrata*,
2. To evaluate the effect of different salinity on rate of respiration and excretion of mud crabs,
3. To study the effect of different salinity on oxidative stress and antioxidant defence status in different tissues of mud crabs,
4. To evaluate the effect of different salinity on oxygen consumption by gill mitochondria of mud crabs,
5. To evaluate the effect of different salinity on activities mitochondrial complex enzymes of gill tissue of mud crabs.