Summary and Conclusion

The dissertation deals with the distribution and community structure of mesozooplankton in the context of water quality parameters in the coastal regions of Indian Sundarban during the period of February 2007 to September 2009. Sundarban is a prograding, tide-dominated and vulnerable deltaic region which offers a unique and excellent platform for studying secondary productivity in terms of mesozooplankton. The purpose of the research is to evaluate the importance of variability in physicochemical conditions of these coastal waters as a factor controlling the distribution and diversity of mesozooplankton and to establish how season and location in the estuary influence the community structure. The major findings of the study are listed below:

1. The hydrology of the Sundarban coastal regions is highly dynamic and presents a cyclic pattern, characterized by large amount of annual precipitation, surface drainage as well as interaction of sea and riverine freshwater freshets. A marked seasonal difference in the hydrological parameters was noticed at all the stations. The fluctuation of surface water salinity was large, varied between 6.50 °/m in July and 33.67 °/m in May. Decrease in salinity levels was observed during monsoon season in all the stations except the two offshore stations (S1 and S2).

2. Surface water temperature acts as the second most important water quality parameter governing every biochemical interaction taking place in the body tissues of organisms and their distribution. The surface water temperature in the coastal waters of Sundarban coastal regions varied between 20.0 °C to 31.5 °C. Less variation in salinity coupled with temperature condition seemed to have supported good plankton growth in the offshore stations. Dissolved oxygen (DO) in coastal waters of Indian Sundarban exhibited well marked spatial variations (ranging from 4.84 to 6.60 mg l⁻¹). Relatively high surface values of DO could be ascribed to their addition by phytoplankton photosynthesis. Occurrence of diatom bloom during June has been described as it had a great impact on the distribution and community structure of the mesozooplankton.
3. The Secchi disc depth exhibited conspicuous spatial and temporal variations ranging from 8.75 cm to 134 cm. The transparency of estuarine water is governed by several factors, more importantly by the presence of light scattering suspended particles including phytoplankton and yellow substances. The cloud coverage on the sky also retards the light penetration in the water, since the intensity of light reaching on water surface shall be low. In this study, high values of transparency are coincided with high numerical density of mesozooplankton. Lower values of transpatency were obtained at S7, where mesozooplankton density was lowest.

4. Mesozooplankton biomass (ml m⁻³) showed significant variations (ranging from 0.42 to 3.35 ml m⁻³) between different stations as well as different months. In general, high zooplankton volumes were encountered during March to May, which could be ascribed to the presence of larger organisms like chaetognaths, ctenophores, lucifers and crustacean larvae such as decapod larvae.

5. Copepods constitute the richest group represented by 52 species. Calanoid copepods were more dominant being represented by 39 species, while cyclopoids with 9 species and harpacticoids with 4 species. Among the copepods *P. parvus, B. similis, A. trotoniformis, C. panper* and *E. subcrassus* were common in almost all the collections. Herbivores found to be dominating over omnivores and carnivores. Traces of detritivores were found only at the offshore stations (S1, S2). Out of two species of chaetognaths *S. bedoti* was the dominant form. Meroplankton components included the larvae of crustaceans, polychaetes, echinoderms and fish-eggs and fish larvae. The larvae of crustaceans consisted of nauplius, zoea, megalopa, alma and mysis. The species composition of mesozooplankton assemblages showed that they are more or less similar to those reported earlier from the Indian coasts.

6. The numerical density of mesozooplankton taxa ranged from 124 ind. m⁻³ to 2459 ind. m⁻³ in which the population size of copepods ranged from 102 ind. m⁻³ to 2064 ind. m⁻³. The exclusive carnivore chaetognaths formed the second dominant group contributing 3.92 – 11.93% of the total zooplankton. Study of the maturity stages of the epipelagic chaetognath *S. bedoti* showed predominance of the Stage I followed by Stage II. It is evident from the present observation that, like in many tropical estuaries, the breeding of chaetognaths is
continuous in Hugli estuary also. The higher percentage contribution of juveniles and
developing stages of *S. bedoti* is suggestive of the fact that, they prefer estuarine
environments for their development. Along with this gravid female of different copepod
species like *O. brevicornis, P. serricaudatus, H. cinctus, E. acutifrons, M. rosea* were recorded
revealing this estuarine water is acting as the nursery ground for these respective copepod
species. The most successful copepod species in this coastal water is *B. similis*.

7. Bloom of a centric diatom *Halidioiptomus* sp. was observed during June 2007, which
affected the distribution and community structure of mesozooplankton largely. Still this
diatom has no poisonous effect recorded but it arrested the copepod as well as other
mesozooplankton components from the water.

8. An abrupt, site-specific decrease of biomass, numerical density and species diversity of
mesozooplankters especially copepods was very pronounced during a cyclonic storm event
‘Aila’. This occurred on 25th May 2009, which temporarily altered the community structure as
well as water quality parameters. Surprisingly, there was extreme dominance of two
copepods namely, *Bestiolina similis* and *Oithona brevicornis* associated with high nutrient load
and turbidity in the studied stations during post-cyclone period.

9. A decadal change in the copepod community structure was observed which might have
altered the pelagic food-web dynamics in the coastal waters. These long-term changes in the
community structure deserve greater research attention than they currently receive.

10. The wetland sustains a potential zooplankton production and the community structure
of mesozooplankton is composed of several taxonomic groups of holoplanktons and
meroplanktons denoting sustainable fisheries. Presence of different types of crustacean
larvae and ichthyoplanktons almost throughout the year lead to infer that the environmental
conditions are conducive for the reproduction of various pelagic and benthic communities.
This also accentuates the importance of the estuary as the breeding and nursery ground
especially for these groups.
11. A long-term multi-compartmental research program covering both pelagic and benthic fauna of these coastal regions together with the ambient environmental characteristics is strongly recommended to get sufficient data for ecological modeling as an approach toward environmental management.