CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

Documentation on the distribution of species and habitat preference of marine invertebrates is the fundamental requirement for understanding the role of distinct organisms in benthic ecosystems, which also provides basic line data for productive habitat and benthic fauna conservation. The intertidal zone is considered to be most diverse and productive in coastal areas, because different types of flora and fauna are observed in the area of few meters (Underwood, 2000). The study on the Actiniarians has been very important in ascertaining the diversity and distribution of the class Anthozoans. In the current study, different sites along the Saurashtra coast have varying degrees of similarity and difference studied with respect to their ecological properties. The major highlights and recommendation for the future studies are listed below:

- In the present study, total 21 species of Sea anemone belonging to 12 genera and 5 families are recorded from the intertidal zone of Saurashtra coast, Gujarat.
- Amongst all the families recorded, family Actinidae and Family Stichodactylidae were observed to be dominant in study area Vadodra jhala and Okha respectively.
- In the present study, 13 species are first time recorded from coastal zones of Gujarat. Geographical range extension of some of the sea anemone species has been also documented from this study.
- Total 12 sites have been surveyed from northern side of the Saurashtra, Okha to Bhavnagar (Alang) and spatial distribution patterns of 21 sea anemone species have been studied through point scale location maps using GIS technique.
- The habitat preferences at microhabitat level were documented on the basis of sea anemone occurrence at particular sub habitat types. *Urticina clandenstina* belongs to family Actinidae founds only species of this family, which is distributed all over the coastal area of Saurashtra. However, this species mostly preferred the microhabitat

such as hanging on rock under shelter, dry hole at the base, micro pool, tide pool and crevices of South coast; while most dominantly preferred the micro pool, tide pool and on dry hole of vertical surface situated at Dwarka rocky coast having wide and deep caves on outer intertidal zone, highly elevated due to heavy wave action.

This study evaluates the chosen marine biodiversity of life form, Actiniarians in a study area comprising of rocky and sandy intertidal habitats. Both, taxonomic and molecular approaches have been employed to overcome the identification conflict of collected specimen.

- Sequencing of total 18 Actiniarian species were successfully submitted to NCBI and obtained Accession number for each of the species.
- In NCBI, sequences of few species has been submitted for Actiniarian species from India for antimicrobial and antifungal properties and surprisingly it was found that not a single sequence has been submitted for Actiniarian species for identification from the Gujarat coast.

It is noteworthy to mention that many other significant observations besides the diversity and distribution studies has been observed:

- However, in present report, sedentary sea anemone *Urticina cledenstina* (Sanamyan, 2013) (Family: Actinidae, Genus: *Urticina*) found attached empty gastropods shells and gravel which thus showing both camouflage and as a deterrent to possible predators. Distinct adaptation strategy of a sea anemone was observed at coastal region of Vadodara Jhala village of Saurashtra Coast, Gujarat. This is the preliminary study which accounts behavioural study of anemone.
- The exclusively solitary growth of sea anemones is well established and had been assumed both in major reference works (Dunn 1982, Shick 1991, Fautin 1999). Herein, we have observed colonial sea anemone at coastal region of Vadodara Jhala and reported for the first time from Gujarat coast.

The impact of increased sea surface temperature was clearly evident at the North-eastern Saurashtra coast in the form of coral and sea anemone bleaching.

- During the sea anemone diversity survey work from Saurashtra coast, four bleached sea anemone species belong to two genera *Heteractis* and *stichodactyla* were recorded during summer, 2016.
- On computing this field data with SST and SST anomalies, supports the possible impact of increased temperature on sea anemone in the form of bleaching.

The physiology of intertidal species and their distribution are strongly influenced by various types of physical stress. Temperature and desiccation in low tide conditions are usually considered the most important physical stresses.

- In this study, we examined the ability of the sea anemone *Urticina clandenstina* abundant along the Saurashtra coastal shores, to express a HSP60 and HSP70 as a phenotypic adaptation (acclimatization) to changes in seawater temperature from the same tide pool where temperature layers appear.
- A highly significant level of HSP60 was recorded in specimens collected when the subtidal SWT reached 31°C, compared with the levels of expression when SWT ranged between 20°C and 25°C
- HSP70 shows higher expression with increase in temperature but bit lesser expression with compare to HSP60 when temperature reaches to 31 °C.
- This study suggests the use of HSP expression as a tool for stress detection in marine invertebrates.

Future recommendations:

- The Saurashtra coastal areas support various types of marine habitats, such as rocky shores, muddy with rocky bottom and mudflat habitat. In the present study, Actiniarian diversity was documented for only twelve study sites supporting rocky and sandy shore but future studies can be carried to explore the presence of Actiniarians in other marine habitat available at other sites.
- In the present study, intertidal distribution and habitat preference of Actiniarian was studied on sandy and rocky habitat. Similar kind of study should be carried out on the mudflat habitat available on the Saurashtra coast.
- Total 21 species of Sea anemones including few new records of for the state and western coast of India are reported. The results suggested that the Saurashtra coast has enormous potential and scope for taxonomical studies on Sea anemones and remaining areas of Saurashtra coast should be explored for such studies.
- In the present study, total 18 species have been confirmed through molecular marker i.e 18S. For the future aspect, other suitable markers should be performing to study the genus level relationship of Actiniarians.
- Among marine benthic cnidarians, the usual symbiotic algae are dino£agellates of the genus *Symbiodinium*. The molecular diversity of genus *Symbiodinium* present within sea anemone should be investigate using molecular study.
- In the present study, the possible impact of increased temperature on sea anemone in the form of bleaching was reported in sea anemone fauna in 2016. It is important to continuously monitor these changes to understand the phenomenon and the extent of the impact. These inputs are useful for further research and management of coastal areas.