CONCLUSIONS

A large number of trace-making organisms inhabit in intertidal zone of the Mandvi area. Many of these organisms occupy particular niches, thus the biogenic structures they produce are characteristics of particular depositional environments. Further more this intertidal zone is composed of dynamic spacio-temporal landform units. Each landform is constantly modified and provides temporal hospitality to the crustaceans and polychaetes with some opportunistic animals. In constantly changing environmental conditions the biogenic sedimentary structures of these animals in the intertidal zone helps in understanding distribution of the different kind of population of crustaceans and polychaetes. In intertidal zone, within an assemblages of biogenic structures is often more important environmentally rather than presence of a single kind of biogenic structures. Certain types of biogenic sedimentary structures are found on more than one habitat because stress tolerant animals adapts wide range of variation (i.e. geomorphic settings, substrate preference, food resources and fluctuation in temperature, salinity and oxygen contents) in subaerially exposed.

The important observations are as follows.

⇒ The study area is situated on junction of the open sea and gulf sea, for convenience it is laterally divided in to three units: Wind Farm, Rawal Pir and Modwa Spit sites.

⇒ This intertidal zone experiences moderate wave and current energy, which progressively decreases from Wind Farm site to Modwa Spit site. Intertidal zone is narrow, sloping $>10^0$ at Wind Farm sites and broadens (>1 km) with gentle slope at Modwa Spit.

⇒ The intertidal animals, sediments and biogenic structures have been subjected to grain size analysis, relief peels, coring, x-ray radiography, burrow cast, collecting and, preserving animals, water and substrate analysis and photographic documentation.

⇒ Various micro-geomorphic landforms identified in the Mandvi intertidal zone are beaches, berms, ridge-runnel systems, cuspate foreland, spits, lagoons, shore platforms, dunes, tidal flats and coastal plains.

⇒ Raised beaches and raised tidal mud flats of Holocene time are the tectonically influenced landforms.

⇒ The grain size analysis reveals well sorted, mature, clean, medium to coarse grain sand size particles at Wind Farm site, whereas Modwa Spit shows poorly sorted fine-grained sediments.

⇒ Each landform is characterised by distinct sedimentary structures.

⇒ Different intertidal sub-facies has been recognised: Beach sub facies, Ridge sub facies, Runnel sub facies, Supratidal sub facies, and Lagoonal facies.

⇒ Four different types of ground are identified based on substrate consistency includes Soup ground substrate, Soft ground substrate, Firm ground substrate and Hard ground substrate.

⇒ Crustacean and Polychaetes under study have shown preference of habitation implying responses to changing physical, chemical and biological conditions.

⇒ 19 species of crustaceans, 15 species of polychaetes and 2 species of unsegmented worm Nemertea have been identified and documented.

⇒ Crustacean *Ocypode platyrsis* and *Portunus tenuipes* are recorded for the first time from the Western Indian coast. Abnormal behaviour (Trauma condition) of the Stomatopod species *Oratosquilla striata* have been recorded in relation to the 26th January 2001 Kachchh earthquake. These observations have potential of relating biogenic sedimentary structures with paleoseismicity.

⇒ Crustacean and polychaetes activities were observed in the form of pellet making, burrowing, feeding and crawling traces.

⇒ Dune and beach zone have favoured the adult *Ocypode* species, visible high proportion is observable in the in the beach zone as compared to dunal zone. While, high level fluctuation of water levels created harsh environmental conditions for polychaetes.

⇒ Young and juvenile species of crabs are found on the ridges and runnels, their proportion increase in seaward direction. Stomatopodean species *Oratosquilla striata* are found in runnels and lower reaches of the ridges.

⇒ Motile deposit feeder polychaetes are abundant on the ridges and occasionally found on lower reaches of the beaches, while suspension and filter feeders are abundant in the runnels. The sessile filter feeder polychaetes are abundant on the rocky shore platforms. Rawal Pir lagoon consist of suspension feeders *Chloeia flava* and *Onuphis*, while Modwa Spit lagoon consist of unsegmented worms *Cerebratulus marginatus*.

⇒ Five burrows and six boring structures have been identified in raised beach and paleo tidal mud flats sections.

⇒ Dunes and beaches are characterised by I, Y, J shaped dwelling burrows of adult *Ocypodes*. The crustacean burrows of the dunes are characteristically large, widely spaced and occur as mono-dominant, while on the beaches burrows are large but densely populated and often marking their territory with sand mound. The opening of burrows on the beach markedly oriented towards the sea, while it is randomly oriented in the dunal area. They are identical to ichnogenus *Psilonichnus*.

⇒ Ridges represent deposit-feeding burrows of young and juvenile crustaceans while the surfaces are completely studded with feeding, burrowing and faecal pellets. The pellet making activity leads to complete obscuring of the freshly deposited sediment layer. *Nephtys inermis* and *Nephtys diabranchis* make characteristic multi-ramifying tunnel system in the lower part of the ridges identical to ichnogenus *Chondrites*.

⇒ Runnels consist of three dimensional pelleted walled burrow system of *Oratosquilla striata*, which is identical to ichnogenus *Ophiomorpha*. Flow oriented structures of polychaetes are dominated in the runnels they includes agglutinated tubes of *Diopatra*. U-shaped tubes of *Arenicola* and mucus bound dwelling burrows of *Heteromastus* and multi-ramifying tunnel system of *Nephtys* are also abundant.

⇒ Lagoons consist of mainly grouped funnel systems, branched burrows of *Oniphus* and *Chloeia flava*, identical to ichnogenus *Balanoglossites*. U-shaped burrows with funnel opening of *Arenicola* and straight simple dwelling burrow of Nemertea. These are opportunistic and have exploited restricted neiches for dwelling-feeding purposes.

⇒ The shore platform consists of cemented calcareous tubes of filter feeding *Serpula* along with symbiotic encrusters like *Oystrea* and Barnacles.

⇒ Trophic categories (Deposit feeders, Interface feeders, Surface deposit feeders, Shallow tier deposit feeders, Middle tier deposit feeders, Deep tier deposit feeders and Suspension feeders) are characterised by considering the functional groups, feeding guilds and location of food resources.

⇒ For ecological interpretation of the intertidal zone seven ichnocoenoses (*Faecichnia* ichnocoenosis, *Entobia-Meandropolydora* ichnocoenosis, *Chondrite* ichnocoenosis, *Skolithos* Ichnocoenosis, *Psilonichnus* ichnocoenosis, *Ophiomorpha* ichnocoenosis, *Balanoglossites* ichnocoenosis) have been described and interpreted.

⇒ For paleoecological interpretation three ichnocoenses (*Glossifunguites* ichnocoenosis, *Skolithos* ichnocoenosis, *and Ophiomorpha* ichnocoenosis) have been described and interpreted.

⇒ Based on data of the Mandvi intertidal zone, three-dimensional ichno-sedimentologic model of the Beach, Ridge, Runnel, and Lagoon were reconstructed, indicates that it experiences low to moderate wave and current energy.