RECOMMENDATIONS

Diu Island is a piece of beautiful isle near Kathiawar peninsula. This island has six beautiful beaches of cliffs and bays. Diu is union territory separated by a narrow canal/creek from Saurashtra region. One-third portion of Diu Island surrounded by Arabian Ocean due to this it is more unique than other coast of Gujarat. Diu is a main junction between Saurashtra peninsula and Gulf of Khambhat (Giardino et al., 2014) where looking to northern-west side Saurashtra peninsula and Gulf of Kutch have different coastal nature and species diversity while going to east-side Gulf of Khambhat has different coast nature and species diversity.

The coastal area of Diu Island comprises natural habitats vary from area to area such as rocky, muddy, sandy, gravel, cobbles and sandy beaches. Each site of Diu is different due to convex uneven crescentic shaped coast or somewhere elevated coast substratum found. This Island protrude more to Arabian ocean, current and geographical structure causes it’s mix type of habitat reveals unique species diversity and habitat compare to other region of Gujarat.

In the present study marine crabs were surveyed for diversity, distribution and population ecology on spatial and temporal distribution with habitat characteristics. The major portion have been covered but further study need to be carried out for marine crabs ecology and other associated marine fauna which can provide baseline data base for this unique ecosystem of Diu Island. The coastal characteristics of Diu Island more or less resemble to Gulf of Kutch, Saurashtra peninsula and Gulf of Khambhat so this kind of study can be carried out in the various coastal areas of Gujarat.

Poriya et al., (2014) reported unique diversity of corals in Diu Island where they recorded high (07) species diversity of coral which are not found in Saurashtra peninsula and Gulf of Khambhat. This is due to its clear water and unpolluted rocky coast, it also interact with open to Arabian Sea and separation from Saurashtra coast. Ecology of many other marine species can be studied on Diu coast due to unique ecosystem.
Present study reported and describe 33 species of marine crabs with taxonomy, distribution with their habitat preference in Diu coast. In the present study author did DNA sequencing of family Porcellanidae (Haworth, 1825) to prepare phylogenetic analysis to represent the history of species evolution of an area. Since, this kind of sequencing need to be done for each families of marine crab to create phylogenetic hierarchy to denote history of species evolution of an area. Still, there is need to do extensive field survey to find out more marine crab species to complete the checklist of Marine crab. There are many untouched area which need to be survey such as mangrove areas near Ghoghla beach, Gomti beach, Simar coast and Vanakbara fish landing center to accomplish total marine crab diversity of Diu, Island.

In the present study, a comprehensive checklist of 156 species of marine crabs belonging to 88 genera in 31 families have been compiled based on recent and past literature survey. Hence there is need to do more survey in deep sea and other untouched coastal area of Gujarat to make the list enrich. Based on frequent occurrence 07 species of marine crabs were investigated for their population ecological survey from four selected sites of Diu. Although, there are many species remain to be identified such as hermit crab and other Xanthid crabs to assess population ecological survey of this unique habitat.

Author studied the microhabitat and spatio-temporal variation of marine crabs to demonstrate the habitat preference and ecology at selected location of Diu coast. Similar kind of studies can be done in other coastal areas of Gujarat. In present study, macrofaunal diversity shows steep changes in distribution and occurrence compare to both the region of Saurashtra and Gulf of Khambhat. Fishermen awareness program should be conducted for fishes and crustaceans. Fishermen should be aware of poisonous, non-poisonous crabs, hermit crabs, porcelain crabs and their value added services to coast and human. Fishermen should be given training of crab culture, capture, handling methods, transport, store and to kill humanely.
REFERENCES


during the surveying season of 1897–1898. The Annals and magazine of natural history series 7, 3 (1), 27.


Baeza, JA. (2016). Molecular phylogeny of porcelain crabs (Porcellanidae: Petrolisthes and allies) from the south eastern Pacific: the genera
Allopetrolisthes and Liopetrolisthes are not natural entities. PeerJ, 4:e1805, https://doi.org/10.7717-peerj.1805


Devi, SS. & Kumar, BA. (2017). On Two Species of Crabs (Decapoda, Brachyura): Cycloes Marisrubri Galil & Clark, 1996 (Calappidae) and Dorippoides Nudipes Manning & Holthuis, 1986 (Dorippidae) from India. Crustaceana 90(5), 625-630. DOI: http://dx.doi.org/10.1163/15685403-0003670


Khaleel, KM. (2005). Diversity, indigenous traditional knowledge and consequences of destruction of mangroves on the banks of Valapatanam River. 89-96, Kerala Environment Congress Centre for Environment and Development. Kerala, India


Komai, T. (1998a). The taxonomic position of *Pagurus gracilipes* (Stimpson, 1858) and *Pagurus nipponensis* (Yokoya, 1933), and description of a new species of *Pagurus* (Decapoda, Anomura, Paguridae) from Japan. *Zoosystema*, 20(2), 265-288.


Anomura: Porcellanidae) from India. *Marine Biodiversity Records* 8; e90; 201, 1-3.


the Pearl Oyster Fisheries of the Gulf of Manaar with Supplementary Reports upon the Marine Biology of Ceylon by other Naturalists, Part 5, Supplementary Report, 40: 349–432.


Ng, N.K., Jeng, M.S. & Ng, P.K.L. (2002). On the taxonomy of *Pseudograpsus setosus* (Fabricius, 1798) (Decapoda, Brachyura, Grapsidae). *Crustaceana*, 75(6), 759-775.


Ng, PKL., & Kumar, AB. (2015b). A new species of *Afropinnothere* Manning, 1993 (Crustacea, Brachyura, Pinnotheridae) from southwestern India, the first
record of the genus from the Indian Ocean, with a review of the Pinnotheridae of India and adjacent seas. *Zootaxa*. 3947 (2), 264–274, http://dx.doi.org/10.11646/zootaxa.3947.2.8


Odiете, W. O., (1999). Environmental Physiology of Animals and Pollution, Diversified Resources, Lagos, Nigeria,


Pillai, NK. (1951). Decapoda (Brachyura) from Travancore. Bulletin of the Central Research Institute, University of Travancore, Trivandrum, (series C, Natural Sciences) 2(l), 1-46.


Serebiah, JS., Stella, C., & Kadhar, AA. (2008). Assessment of benthos in the subtidal area of Thondi (Palk Bay), southeast Tamilnadu - GIS based explication. 27-
29, Proceedings of National Symposium on Marine and Coastal Ecosystems, India


Trivedi, JN. & Vachhrajani, KD. (2013b). First record of *Cryptopodia angulata* H. Milne Edwards and Lucas, 1841 from Saurashtra coast, Gujarat, India


Trivedi, JN., Soni, GM., & Vachhrajani, KD. (2015b). First record of brachyuran crab Heteropanope glabra Stimpson, 1858 (Crustacea, Decapoda, Pilumnidae)


Urita, T., (1926). A check-list of Brachyura found in Kagoshima Prefecture, Japan. Tshingtao Times: i-iii, 1-41, 1 map.


Figure 17. Study area at Jalandhar (a) Circuit house, (b) rocky habitat, (c) sandy habitat, (d) Jalandhar dada temple, (e) crab collection from rock crevices and cliff holes and (f) rocky pools and puddles
Figure 18. Study area at Khukri (a) sandy zone (b & c) sandy-mud habitat with gravels, cobbles and boulders, (d) rock pools and puddles, (e) rocky patch and (f) zone with pools and puddles with square cement artificial blocks
Figure 19. Study area at Fudam (a) water logged area, (b) rocky zone with crevices, (c & d) sandy zone, (e) rocky zone with sharp edges and (f) water logged area with square cement blocks
Figure 20. Study area at Nagoa (a) sandy beach, (b, c, d & e) rocky intertidal zone with or without algae and (f) rock pools and puddles
Figure 21. (a, b, c) aggressive behavior of brachyuran crab, (d) hide in rock pools, (e) camouflage of *Grapsus albolineatus* and (f) *Leptodius affinis* predated by *Ocypode ceratophthalma*
Figure 22. (a) *Grapsus albolineatus* in crevices of sea-cliff, (b) *Ocypode Ceratophthalma* on sandy zone, (c) *Atergatis ocyroe* in association with Zoanthids, (d) *Epixanthus frontalis* in brown algae in crevices of sea-cliff, (e) Colony of *Clibanarius zebra*, (f) Colony of *Pagurus kulkarni*
Figure 23. (a) *Petrolisthes lamarckii* under humid boulder, (b) Juvenile of *Petrolisthes boscii*, (c) aggressive behavior of *Charybdis (Charybdis) annulata*, (d) *Ryphila cancellus* in habitat, (e) berried female *Eriphia smithii* entangled in fishing net and (f) aggressive behavior of *Portunus segnis*
Figure 24. Fishing methods, (a, b, c, d) marine crab fishing activities on intertidal zone of Diu and (e, f) net fishing of marine crab
Figure 25. (a, b, c) Waste disposal at intertidal zone, (d) monitor lizard (*Varanus* sp.) predate on marine crabs, (e) white breasted king-fisher and (f) common king fisher
Figure 26. Dorsal view of hermit crab (a) Clibanarius infraspinatus, (b) Clibanarius longitarsus, (c) Clibanarius virescens, (d) Clibanarius zebra and (e) Pagurus kulkarnii (Scale bar represents 1 cm)
Figure 27. Dorsal view of porcelain crabs (a) Ancylocheles gravelei, (b) Petrolisthes boscii, (c) Petrolisthes lamarckii, (c1) same, carapace branchial region showing epibranhcial spine, (d) Petrolisthes rufescens and (d1) same, no epibranhcial spine
Figure 28. Dorsal view of brachyuran crabs (a) *Eriphia smithii*, (b) *Metopograpsus thukuhar* and (c) *Grapsus albolineatus* (Scale bar represents 1cm)
Figure 29. Dorsal view of brachyuran crabs (a) Arcania heptacantha, (b) Leucosia sima and (c) Ryphila cancellus (Scale bar represents 1cm)
Figure 30. Dorsal view of brachyuran crabs (a) *Matuta victor*, (b) *Menippe rumphii* and (c) *Ocypode ceratopphalma*, (Scale bar represents 1cm)
Figure 31. Dorsal view of brachyuran crabs (a) *Pilumnus vespertilio*, (b) *Plagusia squamosa* and (c) *Charybdis (Charybdis) annulata*, (Scale bar represents 1cm)
Figure 32. Dorsal view of brachyuran crabs (a) Charybdis (Charybdis) feriata, (b) Portunus (Portunus) sanguinolentus and (c) Portunus (Portunus) segnis, (Scale bar represents 1cm)
Figure 33. Dorsal view of brachyuran crabs (a) *Scylla serrata*, (b) *Thalamita prymna*, (c) *Atergatis roseus*, (adult) and (c1) same, juvenile (Scale bar represents 1cm)
Figure 34. Dorsal view of brachyuran crabs (a) *Atergatis integerrimus*, (b) *Atergatis ocyroe*, and (c) *Epixanthus frontalis*, (Scale bar represents 1cm)
Figure 35. Dorsal view of brachyuran crabs (a) *Etisus laevimanus*, (b) *Leptodius affinis* and (c) *Leptodius exaratus*, (Scale bar represents 1cm)
Fellowships/Scholarship: 02
1. Maulana Azad Fellowship for Minority students-University Grant Commission New Delhi for Doctoral degree.
2. WCMB scholarship to attend 4th World conference on Marine Biodiversity held at Montreal’s Palais des congrès, Canada

List of Publications: 07

Conference/Seminar/Workshop (poster/paper) Presented: 04

Conference/Workshop attended/participated: 10

1. One day state workshop on Mariculture as tool for coastal livelihood option for fisher folk of Gujarat organized by Department of Marine Science and Zoology Department of Sir P.P. Institute of Science and Gujarat Ecology Commission, Gandhinagar held on 29th January, 2018
2. Two days training workshop on Statistical basics & their application to Ecology using ‘R’ Software (with emphasis on Wetland Ecosystem) on 17th-18th March 2017 at GEER foundation, Gandhinagar.
3. Attended a 1-day wetland seminar & 4-day wetland techniques training workshop (12-16 December-2016) sponsored by the Forest and Environment Department, Government of Gujarat and organized by Gujarat Education and Research (GEER) foundation, Gandhinagar.
4. Attended an International Training Workshop on Taxonomy of Crustacea held on 20th to 23rd September 2016, at Department of Aquatic Biology & Fisheries, University of Kerala, Kariyavattom, Thiruvananthpuram, Kerala, India.
5. Attended a state level workshop on Importance and conservation of Mangrove Ecosystem on 26th July 2016 organized by Department of Marine Science, Zoology Department- Sir. P. P. Institute of Science, Maharaja Krishakumarsinhji Bhavnagar University, Bhavnagar.
6. Two days National workshop on Applied statistics for Bioinformatics using R 19th and 20th February-2016 organized by Department of Computer science and Engineering Bannari Amman Institute of Technology, Sathyamangalam.
7. Two days National workshop on **DNA Barcoding** organized by center for DNA taxonomy (MSD) & Training and Extension Division, Zoological Survey of India, Kolkata on 7th & 8th March, 2016.

8. A workshop on **“Marine Ecology of Gujarat”** on 28th October 2015 organized by ESTC, Department of Life Sciences, M K Bhavnagar University, Bhavnagar.


**Additional work for research**

**Training Attended**