
SUMMARY

The Western State of Gujarat in India faces the Arabian Sea. What appears to be its open mouth holds the waters of the Gulf of Kutch, and at its neck is the State's other Gulf - the Gulf of Khambhat. The waters of the Arabian Sea wash 1,650 km of Gujarat - giving it the longest coastline among all Indian Maritime States. About 60 per cent of the coastline comprises the indentations of the two Gulfs. The Gulf of Kutch separates the landmass of Saurashtra from the northern landmass of Kutch.

The present study was carried out with the overall aim to contribute new knowledge and understanding of the population ecology of these often neglected intertidal organisms. Despite the ubiquitous presence of diogenids, detailed ecological studies on hermit crabs in Indo-west Pacific and adjacent regions are scarce. The aims of the study were therefore, to study the diversity, distribution and spatio-temporal variations in the population ecology of few hermit crab species in a rocky-muddy shore off South Saurashtra coastline, Kathiawar Peninsula, India off the Arabian Sea. Taking into consideration the absence of literature pertaining to the ecology of hermit crabs in South Saurashtra coastline, Kathiawar Peninsula waters the study was further motivated by the abundance and wide distribution of hermit crabs in these waters.

Keeping in mind the aforementioned aims, the following broad objectives have been set forth, (a) To study the diversity of hermit crabs in the selected area, (b) To understand the distributional pattern of the hermit crab species in the intertidal areas (habitat) at the research site, (c) To estimate the attributes of population ecology like abundance, density and frequency of some prominent intertidal hermit crab species of that area in order to understand the present ecological status in terms of space and time.

The principal hypotheses tested in this work which is designed in null form. These are (a) There will not be any significant variations in the spatio-temporal diversity and distribution pattern of the hermit crabs in the selected coast. (b) The hermit crab species will not exhibit any kind of shell type utilization in the selected shore areas. (c) There will not be any significant spatio-temporal variations in the shell preference of the hermit crabs in the selected coast. (d) There will not be any significant spatio-temporal variations in the population of the selected hermit crab species in the selected shore areas.

The study site was chosen on the basis of exploration surveys and ecological studies carried out on the site. The following were the reasons for finalizing the research sampling site. Huge tidal exposure (in highest high tide it is one to one and half kilometers), species diversity of the hermit crabs, muddy substratum, pilgrim rush and its effects, tourism perspective, construction of a nuclear power plant, nearby Ro-Ro ferry service, ever changing substratum, more interesting than other surveyed sites, feasibility to reach, having small scale fishery, and most important no previous in depth study on the site. The study was conducted in the intertidal muddy coast of Koliyak (N 21° 35' 51. 226'' E 72° 17' 33. 259'') which is 30 kilometers away from Bhavnagar city, Gujarat state on the bank of Gulf of Khambhat, West Coast of India.

Before starting the regular study, the entire intertidal zone of this area was surveyed regularly for eight months to know about the biological nature and then divided into two micro sites. The micro site A is not having anthropogenic pressure and micro site B is baring anthropogenic pressure in the form of pilgrim visit. Because the site B is the way to reach a famous temple 900 m into the sea and can only be visited during the low tide. The studied coast has a tidal exposure of about 900-1200 m. The site is having rocky-muddy substratum, with majority muddy which is also very dynamic and having drastic seasonal changes in the cost characteristics throughout the year. Every month there were minor visible changes are observed in the substratum of the study site.

The whole intertidal coast is divided into two micro sites according to the presence of anthropogenic pressure. The anthropogenic pressure in the present research is the pressure caused by human activities at the site. Every year around the month of September more than two lac people visits the place in just two days. On these days to control the crowd all vehicles from the radius of five kilometers away are blocked and only pedestrians are allowed to enter. The distance between site A and site B is one kilometer. The total area of the study is about two square kilometers. The two micro sites are not remote to each other, the abiotic parameters; those determine their biological counterpart in the aquatic community does not differ to a considerable level.

The entire intertidal zone of the selected coastline was surveyed on monthly basis for two years from January 2013 to December 2014. The weather condition of this part of the peninsular India typically represents the periods of winter (December to

February), summer (March to May), monsoon (June to August) and post-monsoon (September to November). During this time span, baseline database of the hermit crab diversity and distribution in different intertidal zones of the rocky-muddy shore were observed. 10 m wide vertical transects, running from high shore to low-shore were sampled. 50 x 50cm (0.25 m²) sized quadrat was placed randomly within the transect, at almost regular interval of 20 m. The same method was employed for micro site A and B. Belt transects were laid parallel to each other for both the sites. Total 100 quadrates were laid per visit, fifty for site A and fifty for site B. Quadrates were laid by following oblique direction to cover maximum area on the intertidal zones. Quadrates were laid every month starting from spray zone to lowest low tide mark. *In situ* photographs of live specimens were taken and initially voucher specimens of the species were collected for further identification.

Hermit crabs were collected by hand. Shell preferences of the selected hermit crabs were studied. Among the ecological attributes, seasonal variations in the population density abundance and frequency of major prominent molluscan species in each sampling stations were calculated. From the collected data, population ecological attributes like density, abundance and frequency values were calculated.

In the present study, the micro sampling site A, i.e., without anthropogenic pressure shows high population of hermit crabs indicate as to the observed spatial variations between two micro sampling sites might be due to anthropogenic pressure as the coastal shallow areas generally face the greatest anthropogenic threats due to the impacts of accelerated human activities. At the non-anthropogenic micro sampling site, less seasonal fluctuations were observed in the density and abundance values for size group - 3 which was having 16-30 mm total body length. As the animals of this size group grew to a larger size, it was comparatively less vulnerable and possibly would endure seasonal alterations to some extent. At the same time, shells of their choice were more frequently available compared to the other two smaller size groups. Populations of Size group 2 hermit crabs remain constant which are sub adults and maintain population of the next size group 3. This may be a reason for fluctuations in the population of size group 1 and 2. Population of size group 1 found highly fluctuated when compared to the other two size groups. It may be because of vulnerability of these

hermit crabs as they are juveniles. Limited availability of small sized gastropod shells may be a reason for this. Population of size group 2 and 3 was found almost constant throughout the year. However, population of size group 2 was always high if compared to size group 3. In case of *D. avarus*, comparative results of population density, abundance and frequency indicated noticeable variations for both the selected sites.

The present study concludes that both *C. infraspinatus* and *D. avarus* shows marked shell preference in the rocky-muddy shoreline of the west coast of India depending on their body size and the availability of preferred shell. However, the results showed that *C. infraspinatus* was rather choosy in the selection of the shell as it was found residing in the shell of fewer molluscan species compared to that of the *D. avarus*. It may be possible that since the *D. avarus* was the dominant species of this coastline, the interspecific competition restricted *C. infraspinatus* from occupying greater varieties of shells. Various other factors like availability of appropriate shell, shell morphology, intra species and inter species competition, seasonal effect and prior experience of the shell species may also be responsible for shell preference by the hermit crab species.

REFERENCES

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