Ecosystems dynamic change especially when they are affected by environmental and several anthropogenic activities. These changes can be seen in the faunas of marine gastropods and the types of habitats occupied by the gastropods are also extremely diversified. In order to study these changes it is necessary to monitor gastropod mollusk populations. Although most gastropods are motile, their comparatively slow locomotion prohibits movement into and out of the intertidal zone over the relatively short period of tidal range. As a result they constitute one of the many groups whose spatial distribution typically consists of well defined portion of the intertidal zones.

Therefore the present investigation was conducted to study the distribution of the Turboid Gastropod at Port Okha reef. The Gulf of Kachchh is an inlet of Arabian Sea in the state of Gujarat, India and Port Okha is situated at the mouth of this Gulf. Here the high diversity is due to availability of different types of habitats like sandy, muddy and rocky shores in the relatively sheltered waters of the Gulf.

RESULTS AND DISCUSSION

In the present investigation following three major species of gastropod were identified during the study period *Turbo intercostalis*, *T. coronatus* and *Astraea semicostata*.

**Order Archaeogastropoda**
**Family : Turbinidae**
*Turbo intercostalis*
Common name. Ribbed turban
Habitat: Found in Reef Associated, Demersal, Rocky and Sandy intertidal area of sea
Distribution: Found in all the three intertidal zones, mainly in middle and lower littoral zones. Moreover, Coral reef areas, in moderately exposed habitats and in lagoons of atolls. In India mostly found in Okha Reef, Dwarka reef, Jalleshwar shore (Gujarat), Andra Predesh, Mandapam (Tamil Nadu).
Description: *Turbo intercostalis* found mostly in large Shell,
the maximum shell length 3-5cm. The shell is solid and heavy, length about equal to or slightly greater than width. Shell thick with ribbed spiral cords. Colour of shell brown with some greenish patches. *Turbo intercostalis* takes shelter in deeper areas in the intertidal areas in the intertidal pools and puddles, avoiding direct sunlight. The animals are equipped with well-developed shell system and that helps them to sustain quite easily at changing condition of the atmosphere.

**Measurements. Length:** 30 mm and 55 mm  
**Economic importance:** It is used as food usually eaten by local fisherman, but also the shell locally serves also for craft industry and making buttons.

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**Order Archaeogastropoda**  
**Family: Turbinidae**  
*Turbo coronatus*  
**Common name:** Crowned turban shell or the coronate moon turban  
**Habitat:** present in Intertidal zone, in pools or under stones.  
**Distribution:** Mainly found in shallow waters of warm temperate and tropical seas, especially on rocky and coral reef habitats of Indo-Pacific region.  
**Description:** This turbinid is equipped with a very hard, thick shell and maximum shell length up to 4 cm, with conspicuous flattened, cup-like scales interspersed by small, regular rows of nodules. Foot opening is very small, thus can attach itself within a very small area. Colour pale to greenish flecked with purplish-brown markings (often encrusted with light pink coralline algae). Smooth to faintly granular operculum with pale green centre.  
**Measurements. Length:** 35 mm and 45 mm  
**Economic importance:** Collected locally for food and shell craft.

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**Order Archaeogastropoda**  
**Family: Turbinidae**  
*Astraea semicostata*  
**Common name:** Half-ribbed star shell  
**Habitat:** Mainly found in shallow waters of warm temperate and tropical seas, especially live in Reef associated rocky intertidal area of sea.  
**Distribution:** Found in Gulf of Kachchh (Gujarat), Lakshadweep and Maharashtra.  
**Description:** It is conical in shape and short nodules are present along the periphery of the shell. The average shell length of this species is about 2-3 cm. Shell is sculptured with oblique axial ribs on the whorls. Colour of the shell is yellowish or creamy white.  
**Measurements. Length:** 35 mm and 45 mm  
**Economic importance:** Mostly it is traditionally used as food by coastal populations and shells are utilized by the shell craft industries.

It is clear from all figures that the richness of species was higher at the middle littoral than in the upper and lower littoral zone. The reason for this difference is the rigorous environmental conditions during the period of emergence and the availability of food. Due to the fact that the mollusk mainly feeds on the marine algae and thus, always remains associated with intertidal seaweeds. During December and January when algal vegetation is found very high, associated molluscan species also increased because many molluscan species are associated with algae. In present investigation *Turbo coronatus* was found mostly on the upper and middle littoral zone of the rocky intertidal substratum and preferred a smooth surface to move on. They lived in the walls of the pools or creeks where water accumulated for a longer duration. This habitat provided protection from waves and also from desiccation, and thereby increasing species richness and abundance on the shore. This species is well protected with a very hard and thick solid shell. Fluctuations of physical conditions hardly brought any change on their distribution.

The distribution of *Turbo intercostalis* in the intertidal belt of Okha reef revealed that they were mostly found in middle and lower littoral zone as compare to upper littoral zone. They prefer small but deep rock pores or openings where they can fix themselves singly either with the base or within the rock fold. The intertidal zone of Okha reef is rocky, which provides sufficient holes for hiding to this animal. The animals are equipped with well-developed shell system, which helps them to sustain quite easily at changing conditions of the atmosphere. Misra and Kundu reported the marine animals along the intertidal have to protect themselves against high salinity, desiccation and against the predators. This they achieve through taking shelter under the thick cover of the seaweeds which grow better on the middle and lower littoral zone.

The results of density of *Astraea semicosata* was fluctuated in all the three zones. However, it was found more in upper
DISTRIBUTION OF TURBINID GASTROPOD ON THE INTERTIDAL ZONE

Fig. 1. Mean density (no/m²) of *Turbo intercostalis* at upper, middle and lower littoral zone.

Fig. 2. Mean density (no/m²) of *Turbo coronatus* at upper, middle and lower littoral zone.

Fig. 3. Mean density (no/m²) of *Astraea semicostata* at upper, middle and lower littoral zone.

Fig. 4. Frequency (%) of *Turbo intercostalis* at upper, middle and lower littoral zone.

Fig. 5. Frequency (%) of *Turbo coronatus* at upper, middle and lower littoral zone.

Fig. 6. Frequency (%) of *Astraea semicostata* at upper, middle and lower littoral zone.
and middle littoral zones during the study. The rocky shore belt of Okha reef has many rock pools which serve as suitable habitat for *A. semicostata*. This indicated that this species migrated between these two zones most probably due to the environmental change and/or availability of food\(^{13}\). The lower littoral zone of the entire Saurashtra coastline is quite different in nature from those other coasts. The rough edge of the lower littoral zone creates very strong wave force, generating powerful tearing force. This may be a possible reason for the lower density, biomass and frequency of this species at lower littoral zone of Okha reef.

**CONCLUSION**

From present study it is concluded that *Turbo coronatus* was the most dominant species. A clear dominance was observed in the middle littoral zone as compared to other two zones i.e. upper and lower littoral zone. All the three species were found more in the deep pools and crevices. Thus it can also be concluded that the presence of rock pools increases the species richness of the shores so the marine environment will be given the same priority and the requirement to minimize impacts on existing users will be applied equally regardless of the activity.

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