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MICRO AND MACRO ALGAL GUT CONTENT ASSESSMENTS OF TWO LIMPET SPECIES FROM BULEJI AND MANORA, THE ROCKY COASTS OF KARACHI, PAKISTAN

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ABSTRACT

Micro and Macroalgal gut content assessments of two commonest limpets*: Cellana radiata* and *Acmaea sp*. disclosed that both species are basically microphagous algal grazers but *Cellana radiata* also grazes upon the macroalga *Ulva sp*. Main food items investigated in the gut of these two limpet species were diatoms, although some Cyanobacterial species were also recorded occasionally.

Key words: Gut contents, Limpets, Algal grazers, Diatoms.

INTRODUCTION

The coastline of Karachi furnished with rocky and sandy beaches. There are luxuriant algal growth on Manora and Buleji and other areas of the Karachi coast (Shameel and Tanaka, 1992). Intertidal limpets *Cellana radiate*) and (*Acmaea* sp.) (Mollusca: Gastropoda) are the commonest rock clingers. They live in readily accessible habitat, often occur in large numbers, and are easy to sample, mark and relocate. Limpets are the dominant grazers of many intertidal coasts (Dunmore and Schiel, 2000). Prosobranch molluscs feed upon benthic algae as a food resource (Sutherland, 1970). Some limpets maintain their algal food assemblages and are termed as territorial or algal gardners. These limpets leave a significant biomass behind them after grazing (Alan, 2002).

Feeding preference among limpets is variable (Craig, 1968). Usually the food preference of an organism is monitored through direct observations on its feeding regime. But under specific conditions like feeding in remote areas, irregular nocturnal feeding, direct monitoring of feeding excursions reflects an incomplete picture. In such situations gut analyses may be used to determine what foods are consumed (Santina *et al*., 1993; Raffaelli, 1985). Numerous studies have documented that limpets regulate the abundance and distribution of algae in the intertidal ecosystem (Lubchenko and Gaines,1981; Jara and Moreno,1984). In Pakistan extensive studies have been made on various aspects of intertidal mollusks, but micro and macroalgal food assessment in the gut of limpets is totally neglected . The present study is perhaps the first of its kind in the area.

MATERIALS AND METHODS:

The Present investigations are based upon samples of intertidal populations of the limpets *Cellana radiata* and *Acmaea* sp., collected from two different rocky shores: Buleji (24^0 51 N, 66^0 48E) and Manora (24^0 48 , 67^0 5E) of the Karachi coast (Fig.1) . Sampling is done by hand picking with the help of small hammer and chisel. For gut analyses 50 animals were subjected to the dissection. Twenty specimens of animals belonging to *Cellana radiata* , 10 from each shore, i.e., Manora and Buleji are dissected. Likewise, twenty specimens of animals belonging to *Acmaea* sp., 10 from each shore, i.e Manora and Buleji are dissected to investigate their food items consumed by these animals (Fig.2a.b). During this study 20 living animals belonging to *Cellana radiata* and *Acmaea sp*. collected from Manora and Buleiji were kept in glass aquaria of (8x12) in the CEMB aquarium for 4 weeks to investigate their feeding habits. Here 12 out of 20 animals are able to survive. These animals were exposed to a variety of algae to observe that if they could eat them which exist outside their normal feeding range or algae which is not found in gut samples could be eaten up by these animals in case of availibity in their feeding territory.

Identification of gut contents was made according to Desikachary (1959), Saifullah and Chaghtai (1993), Navarro (1983), Anand (1940) and Qari and Qasim (1994) .

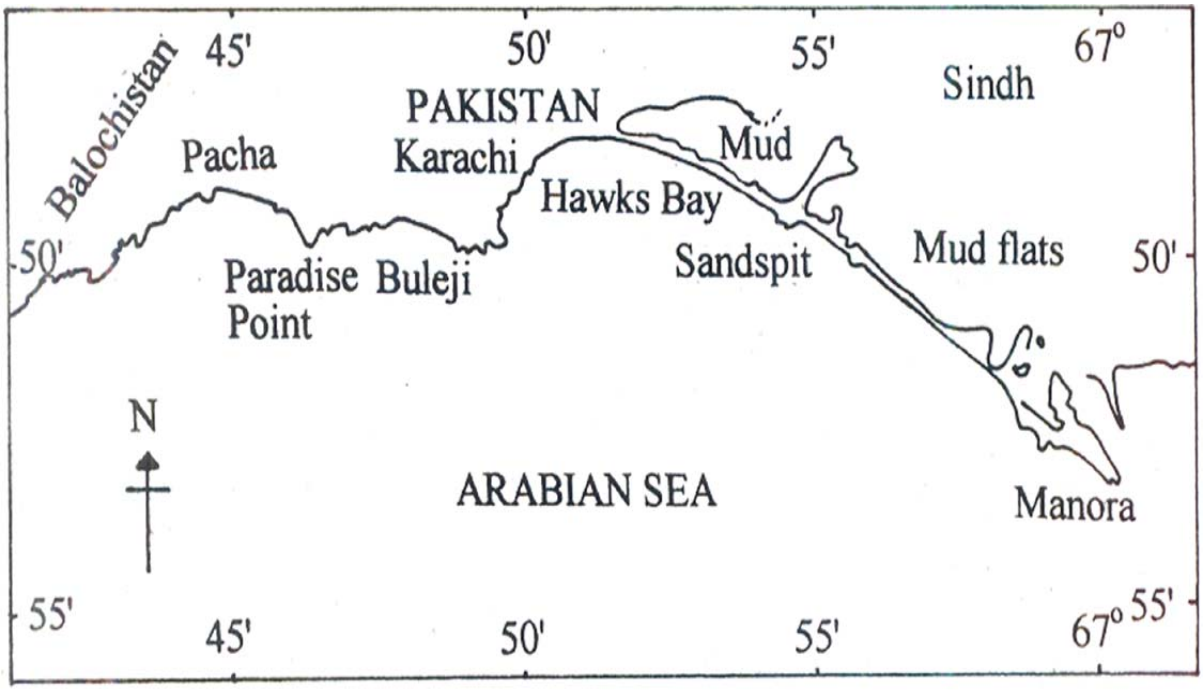

Fig.1-Map showing the location of collection sites of Buleji and Manora .

RESULTS

The micro and macroalgal food investigations in the gut of the limpets *Cellana radiata* at Buleji and Manora revealed the presence of diatoms like *Gryosigma sp.*; *Navicula sp. Nitzschia sp., Synedra sp.* and *Cymbella* species, including Cyanobacteria like *Snechocystis sp.* and *Lyngbya sp.* There were also present pieces of macroalga *Ulva sp.* in the gut. Sand grains were also observed. (Table 1). Gut contents of *Acmaea sp.* investigated from Buleji and Manora reveal that is only microalgal grazer with diatoms being the dominant form including ; *Nitzschia sp.; Navicula sp; Rhizosolenia sp.*; *Synedra sp.*; *Melosira sp.*; *Cymbella sp.*and *Surriella sp.* The macro algal species and Cyanobacteria were not observed but traces of sand grains are also noted (Table 2) . Gut contents also remained unchanged in aquarium in the laboratory when *Cellana radiata* and *Acmaea sp.* were subjected to a variety of algae not found in gut of the field samples.(Table,3&4). In addition to these gut contents some tissues which were in poor physical state and therefore , could not be identified in both, *Acmaea sp.* and *Cellana radiata* .

Table 1. Gut contents analyses of *Cellana radiata* in field specimens.

Station	**Micro Algae**	**Macro Algae**	**Un identified Materials**	**Sand Grains**
Manora	*Gryosigma sp.* *Navicula sp* *Nitzschia sp.* *Cymbella sp.* *Synedra sp.* *Lyngbya sp.*	*Ulva sp.*	Materials having poor physical state are not identified .	present
Buleji	*Gryosigma sp.* *Navicula sp* *Nitzschia sp.* *Lyngbya sp.* *Synechocystis sp.*	*Ulva sp.*	Materials having poor physical state are not identified .	present

Table 2. Gut content analyses of *Acmaea sp.* in field specimens

Station	Micro Algae	Macro Algae	Un identified Materials	Sand Grains
Manora	*Synedra sp* *Nitzschia sp.* *Rhizosolenia sp.* *Gryosigma sp..* *Cymbella sp.* *Melosira sp.*	Absent	Materials having poor physical state are not identified	Present
Buleji	*Navicula sp.* *Nitzschia sp* *Rhizosolenia sp* *Cymbella sp.* *Suriella sp.* *Gryosigma sp..* *Synedra sp.*	Absent	Materials having poor physical state are not identified	Present

Table 3. Gut content analyses of *Cellana radiata* in aquarium.

Food Supplied	Gut Contents
Green sea weeds, including *Ulva sp.*	Only *Ulva sp.* --- present
Brown sea weeds	Absent
Red sea weeds	Absent
Rock chips having micro algal growth	Same as found in the field samples, no new micro or macro algal content is observed .
Scraped algae	
Sea water	

Table 4. Gut content analyses of *Acmaea sp*. in aquarium

Food Supplied	Gut Contents
Green sea weeds, including Ulva	Only *Ulva sp*.--- present
Brown sea weeds	Absent
Red sea weeds	Absent
Rock chips having micro algal growth.	Same as found in the field samples no new micro or macro algal content is observed .
Scraped algae	
Sea water	

DISCUSSION

The diversity and abundance of algal species which are present on the Karachi coast of Pakistan have been described by many workers (Anand, 1940; 1943; Chaghtai and Saifullah 1988; Shameel and Tanaka , 1992; Saifullah and Chaghtai, 1993; Qari and Qasim,1994). *Cellana radiata* and *Acmaea* sp., are algal grazers. Prosobranch molluscal groups utilize benthic algae as food (Fretter and Graham, 1962). Our both species belonging to this group are herbivore grazers, *Acmaea* sp., was strictly microphagous grazer while *Cellana radiata* was not strict microphagous grazer which also feeds upon macroalgae. Diatoms were the main food items which are found in the gut contents of these two limpet species, *Cellana radiata and Acmaea sp*. The similar to these are also found in different parts of the world (Castenholz, 1961; Nicotri,1977 and Osrio *et al*.,1988) which indicate that diatoms are the main food items for the limpets. Majority of the limpets are classified as generalist feeders Graham,1955; Purchan, 1968; Branch, 1981), however some are known to graze on macroalgae (Eaton, 1968; Goss-Custard *et al.*,1979; Jernakoff 1985; Moore *et al*., 2007) .Our investigations about food assessments of *Cellana radiata* are also in accordance with extra studies which have been reported by many workers that *Acmaea* sp., grazes upon micro algae (Test, 1945; Haven, 1966; Cui-Juan Niu *et al.*,1998) .The microalgal film present over the rocky shore consists of organic materials , diatoms and cyanobacteria and provide food for microphagous grazers such as limpets

(Jerkins and Hartnoll, 2001). All such investigations supporot our results in the present study. Our results for gut analyses of the limpets collected from the field and for the limpets which were provided with a variety of algae in the aquaria are same which shows that these limpet species keep their constant food preferences. Such trend of limpets has already been investigated by (Choat and Black,1979).

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