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A Comparative Study of the Biomass of Animals and Seaweeds of the Rocky Shore of Buleji Near Karachi, Pakistan

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Abstract

The studies on the rocky shore of Buleji during the period August, 1993 to July, 1994 revealed that the highest biomass (60%) of animals was in the mid-tide zone and the seaweeds in the low-tide zone (47%), with 56 percent animals and 44 percent seaweeds constituting the standing crop of macro-organisms. Totally 81 species of animals, comprising of; coelentrates, polychaetes, crustaceans, gastropods, bivalves, amphineurans, cephalopods, echinoderms, fish and protochordates and 39 species of red, brown and green seaweeds were collected from this coast. The highest numbers of seaweeds (69.81 and 69.42%) occurred in July and March and those of animals (98.17 and 91.99%) in August and May.

Introduction

No work has been done so far on the comparison of standing crop weight of animals and seaweeds on the rocky shore of Buleji. Attention has only been focused on the distribution, abundance and taxonomy of organisms on an occasional other beach of Pakistan. The intertidal zone has been fairly well studied by the following Pakistani workers: Khan and Dastagir (1971, 1972), who documented the presence of several species of pelecypods and gastropods from the coast of Pakistan; Haq *et al*. (1978) who dealt with the intertidal distribution and ecology of fouling organisms at Paradise Point, Karachi; Tirmizi and Kazmi (1986), Tirmizi and Siddiqui (1981) and Tirmizi *et al*. (1982), who worked on gastropod fauna of Pakistan. More recently Barkati and Burney (1991, 1995) worked on the biomass and species composition of macro-invertebrates on the rocky shore of Buleji, Karachi and Burney and Barkati (1995) worked out diversity indices and biomass on Buleji. In the case of seaweeds, Anand (1940, 1943) had collected several species red and green seaweeds from the different localities of the coast of Karachi. Dixit (1964) published a species list of Indian marine algae. Subsequently, Salim (1965) dealt with abundance, zonation and distribution of marine algae along Karachi coast. Saifullah (1973), Qari (1985) and Qari and Qasim (1988) described seasonal variation in the standing crop of seaweeds from Karachi coast especially from Buleji. Shameel and Tanaka (1992) worked on 475 species of seaweeds recorded from the various localities of the coast and inshore waters of Pakistan. A detailed work on the shore ecology of the Okha coast, India was done by Gopalkrishnan (1970). He dealt with habitat and distribution of common animals and seaweeds of the five collection grounds around Okha. Only one paper of Ahmed *et al*. (1982) is available on the study of animals and seaweeds of some beaches of Makran coast in Pakistan. They described abundance of several species of macro-organisms according to their habitat and species composition. The present study shows that the rocky shore of Buleji is a suitable habitat for the growth of animals as well as seaweeds.

Studies on the species composition and relative abundance of marine macro-organisms of Pakistan's coast are non-existent. It was therefore, desirably to obtain this information from different beaches of Pakistan and Buleji rocky ledge provided a good site for study.

Materials and Methods

Animals and plants were collected by transect line and quadrat method. They were placed in plastic bags and weighed. Details of the materials and methods can be seen in "Species diversity and biomass of marine animal communities of Buleji rocky ledge of the coast of Karachi, Pakistan" (Ahmed and Hameed, 1999).

Animal species were identified through the following papers and books: Subrahmanyam *et al*. (1952a, b), Chhapgar (1957a, b), Kundu (1962), Abbott (1963), Khan and Dastagir (1971, 1972), Dance (1977), Tirmizi and Siddiqui (1981), Tirmizi *et el*. (1982), Odum (1983) and Tirmizi and Kazmi (1986). Seaweeds were identified by using following literature: Anand (1940, 1943), Fritsch (1961), Nizamuddin and Gessner (1970), Saifullah and Nizamuddin (1977), Shameel (1978), Saifullah and Nizamuddin (1992) and Shameel and Tanaka (1992).

Results

The present study is based on the composition of fresh weight of seaweeds and total weight (animal + shell weight) of animals. The names of animal and seaweed species collected during the period August 1993 to July 1994 have already been mentioned in Ahmed and Hameed (1999) and Hameed and Ahmed (1999).

The variation of the seasonal biomass of macro-organisms, according to their tidal heights are summarized in Table 1 which shows that the growing period for animals ranged from January (5983.5 g/m^2) to August (12564.9 g/m^2). The highest biomass of seaweeds occurred from November (5847.5 g/m^2) to March (12775.3 g/m^2) whereas in the

Table 1: Variation of biomass (total weight g/m^2) of animal species and fresh weight (g/m^2) of seaweeds during the period August 1993 to July 1994 on the rocky shore of Buleji

Tide zones	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July
Total weight of animals												
Low-tide zone	4116	1172	1339	1559	1445	1725	1688	1416	1664	2127	2275	2226
Mid-tide zone	4205	1917	2084	2067	1853	1583	2112	2284	1823	2757	2276	2388
High-tide zone	4242	1473	2106	1689	2188	2674	2162	1926	1997	766	1942	2091
Fresh weight of seaweeds												
Low-tide zone	256	316	781	1931	2246	4342	3197	4829	1306	-	425	222
Mid-tide zone	257	324	754	1587	1749	4399	2684	4805	1088	104	388	231
High-tide zone	579	715	1338	2327	3279	5090	1863	3140	987	-	722	494

animals they were recorded in August (12564.9 g/m^2) and for seaweeds in January (13833.4 g/m^2). In the month of August, the low, mid and high-tide zones showed the maximum growth of animals. Seaweeds had their maximum productivity in the low and mid-tide zones in March and in the high-tide zone in January. During the study period a total of 81 species of animals, comprising of; coelenterates, polychaetes, crustaceans, gastropods, bivalves, amphineurans, cephalopods, echinoderms, fish and protochordates and 39 species of red, green and brown seaweeds were collected from this coast. The algal group that had the maximum number of species was of rhodophyta (18 species) and the animal group consisted of molluscs (43 species). The low-tide zone of the ledge was inhabited by the following animal and plant species; *Cerithium carbonarium*, *Tiara tuberculate*, barnacles, zoanthids, *Chama* spp., *Turbo intercostalis* and seaweeds, *Ahnfeltia plicate*, *Calliblepharis fimbriata*, *Sargassum* illicifolium, *Melanothamnus somaliensis*, *Ulva fasciata*, *Chaetomorpha antennina*, *Enteromorpha intestinalis*, *Caulerpa veravalensis*, *Ceramium manorense*, *Chaetomorpha prostrate*, *Codium flabellatum*, *Laminaria* sp. and *Janie adherans*. The mid-tide zone was represented by the following animals species: *Cerithium morus*, *Cerithium carbonarium*, *Cellana radiate*, *Astraea stellate*, *A. semicostata*, *Tiara tuberculate*, *Drupa* sp., *Ophionereis dubia* and *Cucumaria* sp. and by the seaweeds: *Scinaia indica*, *Champia globulifera*, *Sarcodia dichotoma*, *Laurencia obtuse*, *Botroycladia leptopoda*, *Sarconema furcellaturn*, *Pockoceilla* sp., *Cystosiera* sp. and *Sargassum crassifolium*. The high-tide zone was dominated by the animal species: *Turbo coronatus*, *Nerita albicilla*, *Cerithium carbonarium*, *Cellane radiate*, *Leptodius exaratus*, *Astraea stellate*, *Planaxis sulcatus* and by *Monodonta australis*. The seaweeds were *Valoniopsis pachynema*, *Jolyna laminarioides*, *Caulerpa racemosa*, *Geliclium usmanghani*, *Ulva indica*, *Caulerpa scalpelliformis*, *Chaetomorpha prostrate*, *Laurencia platyclada*, *Gracillaria verrucosa*, *Plocomium cartilaginum*, *Sargassum* sp., *Cystophyllum muricatum* and *Dictyota bifercata*. The low-tide zone was very rich in algae. Monthly distribution of animals and seaweeds in the low-tide zone showed that January (69.9%) was the more productive month for algal vegetation and May (98.17%)foranimals(Fig. 1). These occurred in a relative percent composition of 98.17 percent (for animals), 1.82 percent (for seaweeds) in May; 91.99 percent (for animals) and 8.00 percent (for seaweeds) in August; 69.80 percent (for seaweeds) in January. 30.19 percent (for animals) and 69.42 percent (for seaweeds), 30.57 percent (for animals) in March (Fig. 1). The molluscs contributed nearly 96 percent of the total fauna. Among the seaweeds, brown seaweeds formed 70 percent, green 19 percent and red 10 percent fresh weight of the standing crop. Figure 2 shows that the total composition of animals and seaweeds on different tidal zones. In the mid-tide zone 60 percent fauna and 40 percent flora was recorded while the low-tide zone was favourable for the growth of seaweeds (47%). During the study period it was found that the major contributor to the biomass was made by animals (56%) followed by seaweeds (44%; Fig. 3).

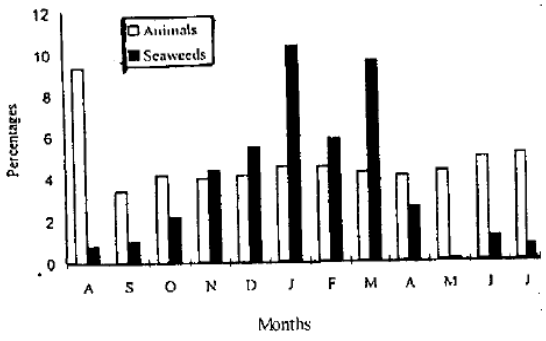

Fig. 1: Comparative seasonal variation in biomasses of seaweeds and animals

Discussion

The rocky beach at Buleji harbours a large number of animals and seaweeds belonging to different groups. During the present study it was noted the animals were the major contributors to biomass more than the seaweeds, since Fifty six percent animals and 44 percent seaweeds were recorded. Recently, Hameed (1996) recorded 25 percent seaweed and 75 percent animal biomasses on the rocky bench of Pacha. At Buleji the low-tide zone was rich in algal vegetation while the mid-tide zone harboured a large animal population, Barkati and Burney (1995) recorded the

highest values of biomass from the mid-tide zone in 8 out of 12 months from the same beach. This clearly showed that the mid-tide zone produced the maximum biomass of animals. Hameed (1996) reported that the high-tide zone of Pacha was more populated by animals than the low and mid-tide zones. Saifullah (1973) who worked on the biomass of drift and attached algae on the Buleji rocky ledge formed high production of seaweeds in the mid-tide zone. Hameed (1996) found that the low-tide zone of Pacha rich in algal vegetation.

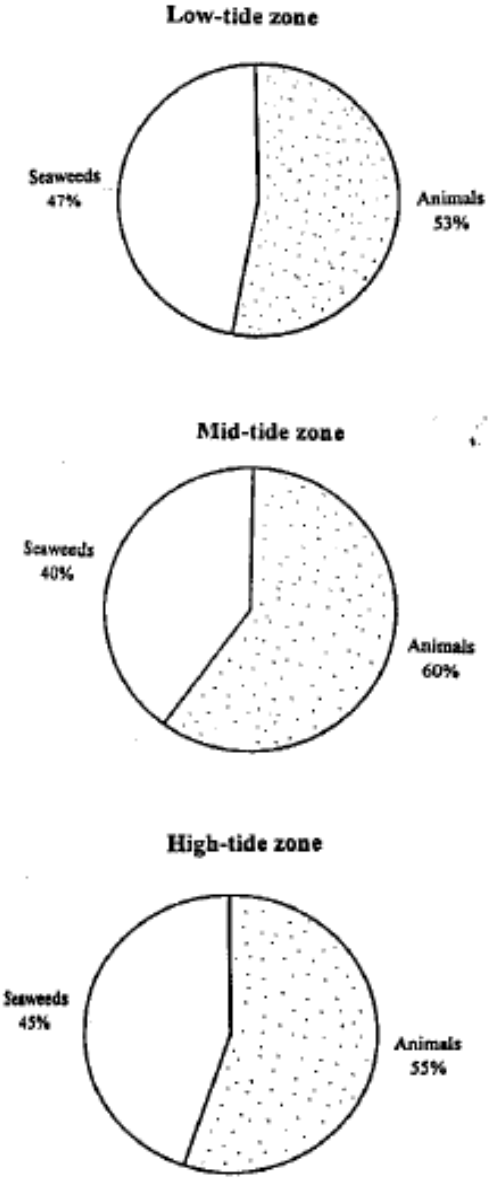

Fig.2: Relative incidences of animals and seaweeds in different tidal zones at Buleji

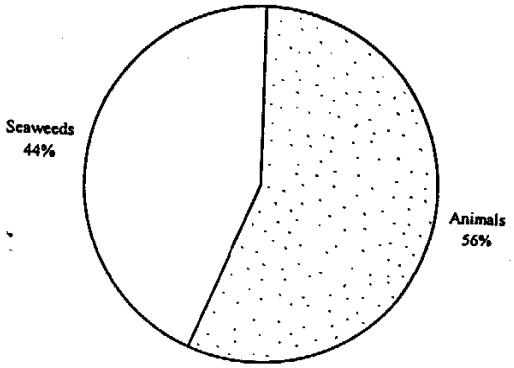

Fig. 3: Relative incidence of animals and seaweeds during the study period August '1993 to July 1994 at Buleji

A total of 81 species of animals and 39 species of seaweeds were recorded during this study from Buleji. The maximum number of animal species was recorded from the mid-tide zone and of the seaweed species from the low-tide zone. Ahmed *et al*. (1982) recorded 41 species of animals from the West Bay of Gawader and 33 species from East Bay of Gawader; Barkati and Burney (1991,1995) recorded 53 species of animals from Buleji and Hameed (1996) and 106 species from Pacha. Earlier Borgesen (1934, 1938, 1939) had recorded 96 species of seaweeds from Dwarka and Okha Port and Anand (1940, 1943) 125 species of red and green seaweeds from different localities of Karachi. Salim (1965) recorded 82 species of seaweeds from the low, mid and high-tide zones of Paradise Point, Manora, Hawks Bay, Sandspit and from the saltwater marshes along the Karachi coast. Qari (1985) found 42 species of seaweeds from Buleji and Hameed (1996) 85 species from Pacha.

In the present study of Buleji rocky ledge it was noted that the red algae was represented by the highest number of species (18) and the animals were dominated by molluscs (43 species). Salim (1965) had also observed that the red seaweed species were the most numerous (37) of seaweed species on different localities of Karachi.

This is the first study at Buleji and reveals the richness of its fauna and flora. It would be worthwhile to extend the study further to acquire more data about the marine communities of this site to serve the base-line studies for further companions.

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