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Biodiversity in the Surface Dwelling Fauna from Cholistan Desert, Pakistan

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Abstract: A field study aimed at knowing the patterns of distribution of surface dwelling fauna in Cholistan desert, was conducted from January 2000 to December 2001. Class insecta was found to achieve maximum abundance (68%) in such a dry and harsh conditions of Cholistan desert. The individuals recorded in class arachnida were 18%, in scincida 5%, in lacerta 4%, in squamata 3% and in mammalia 2%. Maximum number of animals were captured during the months of August, September and October of both the years. It is concluded from the results that the Cholistan desert sustains a high faunal range and a wide range of habitat selection mainly depending upon their feeding habits and other behavior.

Key words: Surface dwelling, fauna, Cholistan desert, biodiversity

Introduction

Cholistan desert is comprised of 2.6 million hectares having a length of about 480 km while its width varies from 32 to 192 km (FAO, 1993; Akbar *et al.*, 1996 and Akbar and Arshad, 2000). Based on its topography, parent material, soil and vegetation, this desert can be divided into two geomorphic regions. The northern region or Lesser Cholistan borders canal irrigated areas and covers about 7770 km² area and the southern region or Greater Cholistan is comprised of 18130 km². The lesser Cholistan consists of saline alluvial flats (locally called dahars) alternating with low sandy ridges (Akbar *et al.*, 1996; Akbar and Arshad, 2000). These soils are classified as either saline or saline-sodic, with pH ranging from 8.2 to 8.4 and from 8.8 to 9.6, respectively. The Greater Cholistan is a wind resorted sandy desert and comprised of river terraces, large sand dunes and depressions (Akbar *et al.*, 1996; Akbar and Arshad, 2000; Baig *et al.*, 1980). The dunes reach an average height of about 100 m (Rao *et al.*, 1989 and Akbar *et al.*, 1996).

The climate of the area ranges from extreme hot in summer when the temperature may exceeds 50°C. The difference between day and night temperatures is considerable. The rainfalls in the area are irregular, unpredictable and scanty generally ranging between 100 to 250 mm occurring mostly during monsoon (July to September) (Akbar *et al.*, 1996 and Akbar and Arshad, 2000). Unfortunately the area has been facing severe drought conditions for the last several years. These prolong droughts has significantly affected the ecology of the area both directly (poor years of grass and herbs production following monsoon) and indirectly (consumption of already limited natural resources by human-beings and livestock).

Most of the herpetological studies carried out in Pakistan are old and mainly restricted to the Sind and Balochistan

Provinces (Murray, 1884, 1886; Baulenger, 1890; Smith, 1935; Minton, 1966; Mertens, 1969). Considering the pivotal and crucially important position of faunal diversity in Cholistan desert the present study was conducted to document the fauna of the area and to study their biological aspects.

Materials and Methods

The specimens were collected during January 2000 to December 2001. The area around the Field Station of Cholistan Institute of Desert Studies CIDS, Islamia University, Bahawalpur comprised of desert part of the Baghdad-ul-Jadeed Campus that represents the mini picture of Cholistan desert. Three study sites were earmarked on the basis of topography, vegetation composition and habitat variations. Site I was located on the northern side of CIDS Field Station with dense vegetation cover mainly of grasses and shrubs. This site consists of small dunes and hammocks with interdunal flat sandy areas. Site II was located on the east of CIDS Field Station and comprised of undulant topography with somewhat plain sandy areas. The vegetation cover was moderate and having large shrubs with little grass component. Site III was located on the southern side of the CIDS Field Station and comprised of small dunes of 2-3 meters high. Due to ethnic interventions, the vegetation cover was very low as the area is near to the hostels.

Pit-fall technique was used during the present study as it proves to be very useful in capturing various kinds of small organisms like lacertians, reptiles, small mammals, ground dwelling arthropods etc. in the sandy areas (Bury, 1982). Ten pit-fall traps were fabricated at randomly at each study site and inspected after every three days for the collection of a wide range of specimens. The specimens collected were fixed in 10% Formaline and date

of collection, locality and habitat was recorded. The specimens were sent to Pakistan Museum of Natural History for their identification. The data collected was tabulated on the basis of the diversity of animals among different months of the year and according to the seasonality.

Results and Discussion

Frequency occurrence of surface dwelling fauna in Cholistan desert during 2000 and 2001 are presented in Table 1. Maximum number of specimens collected were of beetles during both the years and minimum number of specimens were of toads/frogs. Number of specimens of moths/butterfly during 2001 and 2002 were 40 and 42, respectively. The diversity in the species may be due to preference or availability of prey species or food for individual species.

The diversity of various organisms belonging to different classes during the 2001 and 2002 is being summarized in the Fig 1. The data revealed that the organisms belonging to class insecta were maximum (68%) followed by the arachnida i.e 18%. Frequency of occurrence of animals in scincida were 5%, in lacerta 4%, in squamata 3% and in mammalia 2%.

Seasonal and month-wise faunal diversity during the year 2000 and 2001, given in Fig 2. showed that maximum diversity among the captured organisms was recorded during the month of August very closely followed by September and October. Minimum diversity was found during the months of February and March. During December rest of the months diversity among the organisms remained almost same with little fluctuation. The differences among the number of organisms captured during various seasons were very high. Maximum organisms were trapped during the monsoon season and minimum during spring season. It has been observed that the gradual decrease in the number of captured animals from monsoon to spring was due to the decrease in the temperature in the area. A gradual increase in the captured animals was recorded during summer season of both the years. Desert biomes usually have less diversity due to the harsh extreme values of temperature, low vegetation cover and high evapotranspiration.

The results indicated that all the organisms trapped were surface dweller. The ratio of sampled organisms remained relatively high during 2000 as compared to 2001. Because of the prolonged droughts the vegetation cover was very low and the grass component was almost absent from the study area. Non-availability of moisture hampered the production of all the organisms particularly toads and frogs where as multiplication solely depended upon the availability of water. The richest percentage of beetles

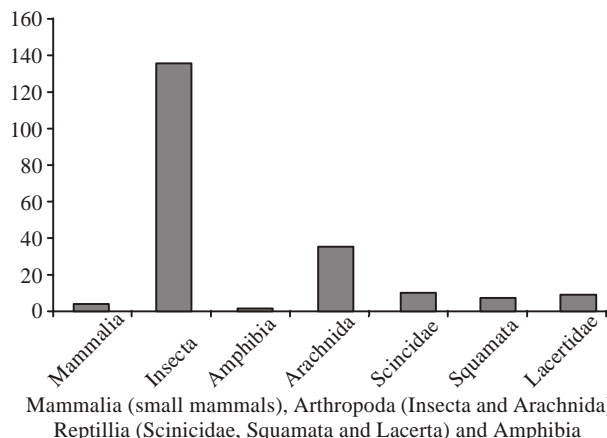


Fig. 1: Percentage of frequency occurrence of organisms

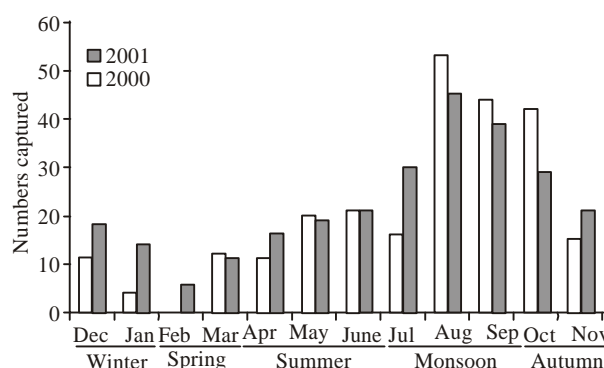


Fig. 2: Seasonal faunal diversity during the year 2000 and 2001

(47.25 and 51.67%) during the study years may be due to availability of food and favourable environmental conditions to this insect. Moths and butterfly gained the second place (14.62 and 15.61) of the total population of organisms captured. These results are conformity with the findings of Sial and Shafiq 1999.

On the other hand spiders were found to be more common on the grasses litter/trash, densely vegetation. Vegetation type and cover plays an important role in the distribution, food chain, behaviour and ecological niche of the land dwelling animals. Sand fish can be survived on bare sand dunes to enter inner side of the sand to safe themselves from enemies but also to escape from the high temperature of the summer. In contrast beetles were more abundant during the months of September to December due to suitable temperature and moisture availability. Moreover, it can be pointed out that 68% out of the total surface dwelling animals trapped were belonging to the class insecta in fig.1 Insects are generally poikilothermic. Under the harsh temperature conditions usually limit the survival of insects but within certain limits as temperature rises, metabolism rises, leading to accelerated development,

Table 1: Frequency occurrence of various dwelling fauna from 2000 to 2001, percentages are given in parentheses

Months	Rats		Beetles		Toads/frogs		Spiders		Scorpions	
	2000	2001	2000	2001	2000	2001	2000	2001	2000	2001
Jan				9(6.47)						Feb
Mar			3(2.15)							
Apr			2(1.55)	-	1(100.0)				2(7.14)	2(9.52)
May	2(40.0)	2(50.0)	2(1.55)	3(2.15)		2(10.0)		2(7.40)	1(3.57)	4(19.04)
June			6(4.65)	6(4.31)				3(11.11)	4(14.20)	3(14.28)
July		1(25.0)	5(3.87)	8(5.75)		1(5.0)		3(11.11)	4(14.20)	3(14.28)
Aug	1(20.0)	1(25.0)	2(1.55)	9(6.47)		-		5(18.51)	3(10.71)	3(14.28)
Sep			26(20.15)	20(14.38)			4(20.0)	6(22.22)	9(32.14)	3(14.28)
Oct			27(20.93)	26(18.70)		1(100.0)	5(25.0)	5(18.51)	3(10.71)	2(9.52)
Nov	2(40.0)		25(19.37)	22(15.82)			3(15.0)	3(11.11)	3(10.71)	
Dec			26(20.15)	18(12.94)			3(15.0)	3(11.11)		
Total	5(1.83)	4(1.48)	8(6.20)	15(10.79)	1(0.36)	1(0.37)	2(10.0)	2(10.0)	28(10.25)	21(7.80)
			129(47.25)	139(51.67)			20(7.32)	27(10.03)		
Months	Sand-fishes		Snakes		Moths/Butterfly		Bugs		Lizards	
	2000	2001	2000	2001	2000	2001	2000	2001	2000	2001
Jan					3(7.5)	4(9.52)				1(11.11)
Feb						3(2.15)	2(4.76)			1(11.11)
Mar	1(6.25)	1(7.69)		1(16.66)	3(7.5)	5(11.90)	2(22.22)	2(28.57)	2(13.33)	
Apr		2(15.38)			5(12.50)	6(14.28)	2(22.22)	1(14.28)	1(6.66)	
May	2(12.50)	2(15.38)			3(7.5)	3(7.14)		1(14.28)	1(6.66)	
June	3(18.75)	3(23.07)	4(40.00)	1(16.66)	3(7.5)	2(4.76)			1(6.66)	1(11.11)
July	3(18.75)	2(15.38)	2(20.00)	2(33.33)		5(11.90)	4(44.44)	1(14.28)	2(13.33)	2(22.22)
Aug	4(25.00)	3(23.07)	2(20.00)	2(33.33)	4(10.00)	6(14.28)		2(28.57)	3(20.00)	2(22.22)
Sep	2(12.50)		1(10.00)		3(7.5)	4(9.52)	1(11.11)		2(13.33)	1(11.11)
Oct	1(6.25)				8(20.00)	3(7.14)		2(13.33)		
Nov					8(20.00)					
Dec			1(10.00)			2(4.76)				1(11.11)
Total	16(5.86)	13(4.84)	10(3.66)	6(2.23)	40(14.62)	42(15.61)	9(3.29)	7(2.60)	15(5.49)	9(3.29)

increased reproductive activity and ultimately, increased in population growth. The major limit to class amphibia production is due to non-availability of water. The reptiles (sand fish, snakes and lizards) forms 25.41% of the total organisms sampled. As already mentioned the some study sites are located in the Baghdad-al-Jadeed Campus of Islamia University. There is now much enhanced constructional and ethnic activities. As snakes are thought to the worse enemy, either poisonous or not, therefore, at the first instance is killed by man. This activity of man has removed most of the snake population from the area.

The gradual decrease in number of captured animals from monsoon to spring (Fig. 2) may be attributed to the life cycles of cold blooded animals which is synchronized to the seasonal changes. The animals especially the insects survive annual periods of winter, drought, summer bent or food shortage by undergoing a state of dormancy. This dormancy, which last only for short period of time until the return of favourable conditions in quiescence.

During summer high temperatures limits the activity of animals however nights are relatively good in the sandy deserts. Maximum potential of fauna is reduced due to limitations imposed by harsh condition, drought and other environmental stresses. In the present study an attempt has been made to collect fauna according to seasons

throughout years 2000 and 2001 which can tolerate those stresses and at which maximum fauna can occur.

It can be concluded that various seasonal factors in the desert effect the faunal reproduction, their existence etc. However further work is needed to investigate the faunal tolerance or existence in drought conditions under field conditions.

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