



DIET COMPOSITION OF BLACK KITE (*MILVUS MIGRANS*) INHABITING THE ARID ZONE OF RAJASTHAN, INDIA

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ABSTRACT

The diet composition of the black kite (*Milvus migrans*) was studied during the 2012-2014 in twelve microhabitats in and around Churu city (28° 15' N and 74° 55' E, 286 msl) of Rajasthan, India. Stomach content analysis, fecal pellet analysis and field observations method was used to study diet composition of the black kite found in different microhabitats. Observations were taken in twelve viz. waste water body (WWB), municipal garbage dumping station (MGDS), animal dead body dumping station (ADBDS), agriculture field (AF), sand dune (SD), forest area (FA), slaughter house (SH), grazing field (GF), out skirts area of highways (OSH), human inhabitation (HI), graveyard area (GYA) and garden area (GA). Thirteen species of prey, belonging of six prey groups were registered in the diet. The most common prey was rodents, primarily rats and carrion of mammals. The second important group of food was birds, insects, lizards, snakes, frogs, sweets and snacks supplemented the diet. It was seen prey remains in the nest and nesting area of the black kite during the field observation. There are maximum prey's remains of other food material and minimum remains of prey reptiles at about 28.78% and 6.06%. Maximum biomass percentage 321.81% is from reptiles and minimum biomass percentage 0.30% from insect by the black kite.

Keywords: Diet composition, Indian black kite, Arid zone, Maximum biomass, Minimum biomass.

INTRODUCTION

Any living organism requires considerable amount of energy for the survival and reproduction. Because, birds do not accumulate enough reserve food in their body as compared to high daily energy expenditure; constant food intake is essential on day to day basis to fulfill energy demand. Seasonal variation in Seasonal rainfall and food abundance often influences the habitat use pattern and availability of food in birds (Fogden, 1972). For most of the birds critical seasonality is created by wet and dry cycles of weather (Kushlan, 1978). Many birds forage early in the morning and are more likely to forage in flocks. Although early morning feeding is explained in part by the preceding nightlong fast, early feeding may also be the result of a predictable and temporary increased availability of prey. Waste tips constitute important food sources widely utilized by a large number of bird species worldwide, particularly by opportunistic and scavenging species (Belant, 1997). Food sources of human origin have been implicated in the growth of several gull populations at

many regions in both the Northern and Southern hemisphere (Spaans and Blokpoel, 1991). Kites are the excellent biological indicators of ecosystem health (Machange *et al.*, 2005). They are the master of the sky (Grambo, 1997). They kill other animals for food and are the good scavengers of nature.

Kites are powerful predators with broad wings, hooked beaks, strong legs and feet with sharp talons. Kites help to control and stabilize the numbers of preys because they kill farm pests, such as rabbits, rats and grasshoppers. They help to maintain farm hygiene by catching sick animals and feeding on carrion (Bowland *et al.*, 1993). In this way, they are important predators which help in maintaining an ecological balance within their habitat. Raptors may forage on food left by humans. Kites are feed on human offal, road kills, animal carcasses and rubbish, sometimes forming spectacular concentrations of thousands of individuals at rubbish dump of large cities (Naoroji, 2006; Malhotra, 2007). In Rome, the black kites were found feeding at rubbish dump area. The earliest kites reached the rubbish

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dump at dawn and the last left just after dusk (Giacomo and Guerrieri, 2008). Larraz (1999) reported the Red kite forage on dead livestock in Spain. The Brahminy kite is known to eat small prey, such as insects and mice, frogs in flight (Bell, 1985). The present study was aimed to investigate the diet composition of the black kite, *Milvus migrans*.

MATERIALS AND METHODS

In Churu city (28°15' N, 74° 55' E) inhabiting arid zone of Rajasthan, India, kites were observed feeding at several places from 2012-2014. The study area was surveyed before starting actual research to classify various foraging grounds (microhabitats and microclimates). All the microhabitats were visited once a week during 2012-2014, and number of foraging birds counted to decide preference for habitats in summer, monsoon and winter seasons.

Food analysis

Feeding sites used by the black kite were located and food samples were collected exactly from the feeding site. Such, reference collections of specimen samples were immediately preserved in 70% alcohol, brought to the laboratory and stored. Size and fresh weight of each specimen were measured and identified up to family, genus or species level whenever possible. Food component of the black kite was studied by non-destructive methods because killing of bird is not desirable, following methods were employed.

Stomach content

Adult found dead in the string of kite and chicks found dead under the nests were collected in a plastic bag and brought to the laboratory. Stomach content of each chick and adult was removed and its fresh weight was determined. Samples then immediately preserved in 70% alcohol and stored in freezer before analysis. The samples were examined within 15 days after collection. Each identifiable piece of food item was separated and number of each food item was determined.

Fecal pellet analysis

The regurgitated pellets under the roosting trees of black kites were collected monthly during morning hours. Pellets were identified based on their morphological features and collected manually and stored in air tight small container of plastic. For each pellet, information regarding date and place of collection were recorded. Before analysis pellets were dried in hot over at 60°C to remove all moisture content, cooled and weighted. After drying, to identify different undigested prey items, pellets were teased carefully to separate the indigestible components such as insect body parts, bones of small animals, indigestible parts of birds etc. as describe by Huang *et al.* (2006). The parts of insect exoskeleton were observed under the microscope. For better identification of the bony parts they were kept in 5% KOH solution overnight for bleaching.

Direct field observations

The black kite is habituated to human presence and could be approached very closely to about 5 to 30 m. Therefore, the black kite taking food item larger than 2 cm could be easily identified by direct observation with 10 X 50 Olympus binocular. Some dead rodents, some bones of vertebrates, some feathers of birds, different body parts of birds and laddus, baddas were seen by direct observation in the nest of black kite. Some body parts of animals, bones and food material were seen under the tree where the black kite made her nest.

RESULTS

Various prey items were recorded in the food sample analysis, which were tabulated in Table: 1. Direct feeding observation on the black kite showed its omnivorous nature in feeding and prey selectivity. Primarily the black kite found to feed on rodents, piece of meat, frogs, lizard, but consumed sweet, badda and other house waste matter depending upon opportunity. Its diet composition was determined by following methods.

Stomach content analysis

Dead juvenile were collected from the ground below the nest of the black kite. Major components of stomach contents were identified as rodents (57%), frog (8%), lizard (17%), insects (5%), birds (4%), earthworm (3%), and house waste (6%). 24% rat and 12% lizard found in the sample collected from Taranagar. The dead black kite from Taranagar has much carrion of mammals at about 28%.

Fecal pellet analysis

Twenty intact fecal pellets were collected of which eight obtained from grazing field and remaining from the nests of rural and urban area. Fecal pellets collected from grazing field N=8 analyzed. They contained undigested bones of rodents (62%), lizard (18%). It was undigested elytra and leg parts of dung beetles, *Periplanata americana* and other Orthoptera species (7%). 4% unidentified material observed in fecal pellet.

Field observations

The Black kite seasonally utilized different foraging habitats. Therefore, a wide variety of food items were recorded in its diet (Table 1). The black kite was often found to snatch into grasshopper, dung beetles, earthworm, frogs, lizards, snakes, parrot, pigeon, ring dove, rabbit, and rat at study area. Thirteen species of prey, belonging of six prey groups were registered in the diet. Most common prey was rodents, primarily rats and carrion of mammals. The second important group of food was birds, insects, lizards, snakes, frogs, sweets and snacks supplemented the diet.

It was observed that the prey remains in the nest and nesting area of the black kite during the field observation. There are maximum prey's remains of other food material and minimum remains of prey reptiles at about 28.78% and

6.06%. Maximum biomass percentage 321.81% is from reptiles and minimum biomass percentage 0.30% from insect by black kite. In MGDS, SD, FA, GF and GA black kite was found to feed on the larva and insects. To eating earthworm have been seen AFH, FA, GF and GA by black kite because these regions are wet area.

In monsoon season the black kite was found to capture frog from WWB, MGDS, HI and GA. Eating by black kite

rats in all microhabitats has been seen. The black kites eat laddus, baddas and other sweets in absence of rodents, frogs and other animals at HI. In ADBDS, SH and HI black kite was found to feed on the carrion. However, when waste water was partly dried and restricted to a small ditch, the black kite captured small tadpoles of *Bufo melanostictus*.

Table 1. Diet composition of the black kite, *Milvus migrans*.

Species	N	% N	Biomass consumed (g)	% Biomass
Grasshopper	4	6.06	1.03	0.09
Dung beetles	5	7.57	1.35	0.12
Undetermined insects	3	4.54	1.01	0.09
Total insects	12	18.18	3.39	0.30
Earthworm	5	7.57	20	1.81
Total Annelida	5	7.57	20	1.81
<i>Ranatigrina</i>	4	6.06	50	4.54
<i>Bufo melanostictus</i>	6	9.09	30	2.72
Total Amphibians	10	15.15	80	7.27
Lizards	3	4.54	40	3.63
Snakes	1	1.51	3500	318.18
Total Reptiles	4	6.06	3540	321.81
Parrot	2	3.03	135	12.27
Pigeon	1	1.51	1000	90.90
Ring dove	1	1.51	900	81.81
Undetermined Aves	2	3.03	1200	109.09
Total Aves	6	9.09	3235	294.09
Rabbit	1	1.51	2232	202.90
Rat	6	9.09	280	25.45
Undetermined Mammalia	3	4.54	320	29.09
Total Mammalia	10	15.15	2832	257.45
Carrion of Mammals	9	13.63	1200	109.09
Laddu (sweets)	2	3.03	40	3.63
Badda (snacks)	8	12.12	20	1.81
Total other materials	19	28.78	1260	114.54
Total	66	99.98	11 Kg.	997.27

Data from pellets and prey remains.

DISCUSSION

In the present study, it was found that in the species which has adapted to urban environment, the major sites for source of food is concentrated near garbage dumping stations, slaughter houses and also sometimes around human inhabitations. The pellets of the black kites show the remains of insect's exoskeleton, bony remains and undigested parts.

The result of the present study on black kites stresses on the dependence of the bird on the leftovers of slaughter houses, the easy availability of food near human inhabitations, and adaptation on the part of the bird to such urban areas. The data collected on the basis of the

undigested food on the pellets of birds shows such results. Churu city is located in the arid zone of Northern Rajasthan, India having hot and dry summers and scarcity of rains, gives a challenging ecological adaptation base to the black kites. black kites have omnivorous feeding adaptability. It has been observed here that they also feed on the food stuff left over by the human beings. The Muslim people of the area have a tradition of giving meat piece to black kites. They call it "Sadka". In this practice they feed the birds by throwing small piece of meat in the air and shouting "Chillo" (The common hindi name for black kite being chel). The birds are thus attracted and they catch their food in the air itself. Vegetarian food leftover is also found in abundance in garbage dumping stations. Such food attracts small insects, rodents and small

birds, snakes, lizards also visits for their prey at such sites. These become easy prey of black kites.

Slaughter houses leftovers and unused parts of these houses also become easily available in the urban areas. The rubbish management plans of such a rapidly developing city are inevitably poor, which results in a network of enormous, legally authorized rubbish dumps coupled with hundreds of smaller and often illegal sites where garbage is dumped daily. At an even finer scale, private individuals, families and shops often leave their daily garbage directly in the streets, resulting in a network of ephemeral, small piles of food. In turn, these must promote large populations of potential prey species, such as rats and pigeons. All the above, coupled with the high abundance of meat shops throughout the city, sets and ideal scenario of enormous food availability for an opportunistic predator and facultative scavenger.

On the basis of the observation of nests and pellets of the kites, the presence of bony parts of meat, feathers, exoskeleton of insects and the presence of other food stuffs, shows changes in feeding habits with the changing locality. The ecology of an area is an important factor in deciding these feeding behaviours (Cameroon 2003, Mahmood-ul-Hassan *et al.* 2007). Under the nests of black kites, presence of bones of rodents, rabbits, feathers of other birds like pigeon, parrots and body parts of such small birds and animals shows variety of prey species taken as food by the kites. The presence of vegetarian food items like 'baddas', bread and sweets also shows that these birds can fulfill their needs by taking such foods in the absence of insects or rodents etc. Sometime the black kites snatch the food from the hand of children. Similar observation recorded by Whistler (1949) and Ali and Ripley (1978).

CONCLUSION

The results of the present study shows that the energy needs of the birds is fully satisfied by the presence of plenty of food near the urban areas of Churu, arid zone of Rajasthan region providing enough time and energy and help them to soar and breed freely. The availability of plenty of biomass as food is an area give advantage to these birds over those who rely on limited biomass in limited areas and spent much of their time and energy in hunting and searching food. black kite nests can be seen near garbage dumping sites, slaughter houses and near the outskirts of the forests. Their water and food is readily available.

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