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A comprehensive note on habitat analyses and new record of jungle cat (*Felis chaus*) from Rawalpindi, Pakistan

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SUMMARY

The jungle cat (*Felis chaus*) is documented from the riverine, semi-gregarious and territorial felid, and this species is well adapted to live in plantations around water sources or in agrarian areas. *F. chaus* is documented in Palearctic and Oriental regions. Main aim of the study is to document the habitat analysis and first record of jungle cat (*Felis chaus*) from Rawalpindi. During the study we documented topography, ecology, distribution, behavior and food in their habitat as well as conservation and management issues of this species. We believe that in Pakistan, a little or few records are known on the population ecology and habitat characterization of this rare wild cat.

Keywords: Cat, Ecology, Rawalpindi, Pakistan

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INTRODUCTION

The jungle cat is the infrequent and riparian wild feline; well adapted to dwell in thick forests and dense flora around rivers, sanctuaries and agricultural areas (Osborn and Helmy, 1980; Harrison and Bates, 1991; Kristin and Jackson, 1996; Novell and Jackson, 1996; Sunquist and Sunquist, 2002; Baker *et al.*, 2003; Ogurlu*et al.*, 2010; Rasool *et al.*, 2015).It is also acknowledged to dwell at altitudes of up to 2500 m overhead sea in Himalayas (International Society for Endangered Cats, 2001).

Their length ranges from 70 – 120 cm and height 35 - 38 cm. They can weigh up to 16 kg. Coat color of jungle cat is pale brown or greyish brown, ventral side pale buffy-white. Ventral sides of ears are light golden white, lined with brown hairs while dorsally they are dark brown. Jungle cats also have black ears tuft that reaches up to 10 mm in length. The tail is relatively shorter 27 cm, than the feline or domestic cat. It is generally less than half of the body length. Tail has also three vague black rings like feline or wild cat and a pure black tip. A vague light grey band extended along the back to its tail.

Limbs are long and slender but sturdy. Upper parts of limbs have vague dark bands (Pocock, 1951), fore limbs with three black stripes on the inner side, and several black bands on the outer side (Harrison and Bates, 1991). During breeding period they stay in groups (Mendelssohn, 1989). The jungle cat can be seen active

during any time (Ünal *et al.*, 2019) but keep on concealed during day time and can be seen during afternoon (Gaynor *et al.*, 2018). They can live in burrows small dens or holes (Allayarov, 1964).

It is documented from Palearctic and Oriental regions and outspreads in Vietnam, Thailand, Southern China, Nepal, Indian Subcontinent, Southeast Asia, Iran, Middle East and Turkey (Hatt, 1959; Lay, 1967; Hassinger, 1973; Corbet, 1978; Osborn and Helmy, 1980; Mendelssohn, 1989; Harrison and Bates, 1991; Kock *et al.*, 1993; Qumsiyeh, 1996; Amr, 2000).

Taber*et al.,* (1967) conducted studies in Pakistan and showed jungle cats have a great ability to swim for hunting fishes or for escaping an attack. Previously in Egypt, Osborn and Helmy (1980) reported to feed on fish and reptiles, especially snakes. They use their keen senses for their wellbeing. In 1996, Tehsin H. R., observed the self-medication in a sick jungle cat, which ate *Eclipta alba* (Family: Compositae) and became good after emesis. This species is also a cryptic predator, hid their-selves and hunt (Tehsin and Tehsin, 1988).

Jungle cat is territorial felid and home ranges can expands more than 150 km^2 (Duckworth*et al.*, 2005; Mukherjee and Groves, 2007). They use visual, acoustic and chemical means to communicate inter and intra-specifically (Mellen, 1993; Peters*et al.*, 2008). They are polygynandrous and can breed 1 or 2 times a year depends upon the food availability (International Society for Endangered Cats, 2001). The gestation period longs for 63 – 66 days and litter is 3- 6 kittens. Mothers nourish their juveniles for approximately 50- 90 days. They attain sexual maturity during their second year of age (Sunquist and Sunquist, 2002). Some experiments showed that in captive conditions males show protective attitudes towards their litter (Schauenberg, 1979; Mendelssohn, 1989). Males are comparatively stronger and heftier than females. In the wild they can thrive up to 14 years while captivity has shown their longer lifespan of 15 – 20 years (Weigl, 2005; Mukherjee *et al.,* 2008; Ogurlu *et al.*, 2010).

In Pakistan, a little or few information is known on the population ecology and habitat characterization of this rare wild cat. In this context, we are presenting this record and reviewing the current distribution, morphology, habitat description and characterization and conservation issues on Jungle cat. Main aim of the study is to document the first record of jungle cat (*Felis chaus*) from Rawalpindi.

MATERIALS AND METHODS

On 20 October, 2020, a male specimen was found dead on the asphalt road by a road accident near Daultala (33° 11’ 34.81” N x 73° 9’ 25.80” E). It is a populous municipality, on Mandra-Chakwal road (33° 16’ 1.3658” N x 73° 9’ 23.7774” E) (Bilal *et al.*, 2020). The specimen was carried to the road side where essential morphometric analyses were made. Then the case was reported to the officers of Punjab Wildlife and Parks Department,

TOPOGRAPHY

The topography of the area is undulant and characteristic of plateaus, hills, valleys and plains (Figure 1). The plain with clayey loam soil and the hillocks are made of alluvial material. This area comprises of relatively less sandy patches of soil than

nearby district Chakwal. The alluvial deposits in the form of pebble ridges are a peculiar feature of the Rawalpindi district. The color of the soil of this area is brown.

Figure 1: Shows the topography and habitat of the jungle cat.

The climate of the area is semi-arid, sub-tropical and humid. Area is characterized by the mean annual precipitation of 900 mm, most of which falls in the monsoon from July to September (Sarwar*et al.*, 2014). The winter rain begins in January and persists up to beginning of March. January is the coldest month with mean temperature of 0.6°C while June is the scorching warmest (mean maximum temperature 45°C). The highest relative humidity of 83% is recorded (Malik and Husain, 2006).

Daultala is in fast development and wilderness areas are declining day by day. Almost 70% population lives in rural areas. Intensive agricultural practices and human interventions are characteristics of the area. As the human population is growing in the area, infrastructure and developments are shifting towards wildlife habitats. It is obvious that in few years the damage will be irreparable for wild animals. This area encloses hundreds of small pieces of private land on all sides.

WATER SOURCES

Water is essential for growth, biodiversity, environment, agriculture and all types of living organisms. Potable water availability has become world issue due to continuous depletion of fresh surface resources (Ghani *et al.*, 2013).Ogurlu *et al.*, (2010) stated that habitat preference, water source and a shelter to hide also played an important role. All the previous studies recorded the association of jungle cat the water sources or their courses (Baker*et al.*, 2003; Duckworth*et al.*, 2005; Mukherjee and Groves, 2007; Ogurlu*et al.*, 2010).

The dams near the incident areas are Naveed Agricultural Dam (33°15’53.532” N, 73°7’50.5452” E), Jajja Dam (33.16’37.1922” N, 73°7’38.262” E), Jamal Dam (33°17’7.677” N, 73°7’17.5944” E), Darkala Dam (33°15’49.5462” N, 73°6’1.1298” E), Hugha Hun Dam (33°14′41.0454″N, 73°10’54.3684” E), and

several small water ponds: Churabani (33°14’47.7414” N, 73°8’37.7262” E) Khumbbani (33°14’55.5792” N, 73°9’33.6882" E), Sarahadnaybani (33°15’15.1302” N, 73°9’0.867” E), Sakrila Bun (33°16’5.9844” N, 73°8’43.5222” E). A large number of seasonal nullahas, locally called “Naaly” also flow though this site.

Figure 2: shows a seasonal mullah of the Jajja dam in the habitat of jungle cat.

RESULTS AND DISCUSSIONS

We observed all the morphometric features of the jungle cat. We weighed the dead specimen and found it to be 5.8 kg. Pocock (1951) concluded that males (6.1±1.5 kg) are distinctively heavier and bigger than females (4.2±1.1 kg). In Russia, Heptner and Sludskii (1992) trapped a hoary male jungle cat, whose recorded weight was 13 kg. Due to more competition the weight is less in Indian Subcontinent (Mukherjee and Groves, 2007). Jungle cats have larger auricle tussocks reaching 15 mm (Roberts, 1977). By morphometric analysis we found following observations: head-body length: 62 cm, shoulder height: 40 cm, hind limbs height: 37 cm, front limbs length: 35 cm, tail length: 25 cm, ear length: 6.5 cm, ear tufts: 0.8 cm, paw length: 3.7 cm, mean nails length (hind + front): 1.4 cm, Number of teeth: 30.

Figure 3: Shows the specimen found dead on a paved road at (33° 16’ 1.3658” N x 73° 9’ 23.7774” E).

Figure 4: A jungle cat trapped at Khandahar air field, Afghanistan. Specimen had thinner, summer and light coloured fur.

The dead specimen was found in winter season near cultivated area. Begum *et al.*, (2013) reported their detectability only winter and it is harder to spot in summer. The dead specimen was yellowish brown (Fig.3), lighter than previously identified specimens in Haripur District, Pakistan (Anjum *et al.*, 2020). This observation was in contradiction with the studies by Heptner and Sludskii (1972), who found that the winter pelage is somewhat darker and thicker than summer pelage. In their distribution ranges, very light coloured and dark-coloured/melanistic jungle cats can also be found (Pocock, 1951; Heptner and Sludskii, 1972; Harrison and Bates, 1991). A specimen trapped at Khandahar Air Field, Afghanistan was light in fur colour as shown in the Fig. 4.The results of present study are comparable with the data in literature.

FLORA AND FAUNA

The key flora of the area are mulberry (*Morus alba*)*,* sukh chain (*Pongamia pinnata*), sacred fig (*Ficus religiosa*), java plum (*Syzygium cumini*), bottle brush (*Callistemon rigidus*), guava (*Psidium guavaja*), sheesham (*Dalbergia sissoo*), dhrek (*Melia azendarach*), eucalyptus (*Eucalyptus camaldulensis*), beri (*Ziziphus Jujuba*), keekar (*Acacia nilotica*), phulai (*A. modesta*), *Cypress spp*., neem (*Azadirachta indica*), bermuda grass (*Cynodon dactylon*), giant milkweed (*Calotropis gigantea*), small milkweed (*C. procera*). *Adhatoda zeylanica, Tribulus terrestris, Dab spp., Prosopis julifera, Lilihe spp., Fumaria indica, Gymnosporia royleana, Typha latifolia*, *T. angustata, Saccharum bengalensis, Babur spp. Parthenium hysterophorus, Launaea procumbens, Rumex obtusifolius, Euphorbia helioscopia, Malva neglecta* (Malik and Husain, 2006; Bilal *et al.*, 2020).

The crops sown in the area maize (*Zea mays*), sorghum (*Sorghum bicolor*), barley (*Hordeum vulgare*), wheat (*Triticum vulgare*), groundnut (*Arachis hypogaea*), brassica (*Brassica rapa*), chick pea legume (*Cicer arietinum*), lentilspecies (*Lens culinaris*) and Red millet (*Panicum miliaceum*) (Amir*et al.*, 2019). In the crop fields and farm houses, House mouse (*Mus musculus*), Roof rat (*Rattus rattus*), Indian gerbil (*Tatera indica*), Soft-furred field rat (*Millardia meltada*), *Golunda ellioti*, *Suncus murinus* and Little Indian field mouse (*Mus booduga*) are reported (Faiz et al., 2015; Mosvi *et al.*, 2020).

They feed on rodents, amphibians, reptiles, invertebrates, birds, fish, poultry and fruits (Lay, 1967; Kristin and Jackson, 1996).Previous studies by Harrison and Bates (1991) documented its hunting and feeding on agricultural lands. In Daultala area, the Roof rat: *Rattus rattus* and House rat: *Maus musculus* are quite common and must be part of its diet. In India a study by Mukherjee *et al.*, (2004) reported its intake of daily energy (*approx.*70%) from rodents. Thus they help in regulating the rodent pests and their concomitant zoonotic parasites in agrarian fields (Pearson, 1964; Kitchener, 1991; Mukherjee *et al.*, 2004; Karawita et al., 2016; Khanam *et al.*, 2017).

This cat dwell in areas of low water vegetation especially marsh habitats and thick vegetation of *Typha latifolia*, *T. angustata* and *Cynodon dactylon* around the dams and some ponds (Baker *et al.*, 2003; Rasool *et al.*, 2015). Unfortunately, the productivity of this area and Potohar in general has been decreased from 2.5 to 7 times due to over grazing and removal of vegetative cover for household purposes (Gong *et al.*, 2015; Amir *et al.*, 2019). They are well adapted to live near farm houses

because of food availability in the form of gnawers. Many parts of this area are undisturbed with less human activity and can be an excellent refuge.

Carnivores documented in this area include the golden jackal (*Canis aureus*), red fox (*Vulpes vulpes*), small Indian mongoose (*Herpestes edwardsii*), and Asiatic wild cat (*Felis sylvestris ornate*). The area is also inhabited by Indian crested porcupine (*Hystrix indica*),cape hare (*Lepus capensis*), wild boar (*Sus scrofa*). Their prey size is ranges from small rodents to as large as young wild boar (Rathore and Thapar, 1984). Moreover, they prey ondifferent ground dwelling birds, their eggs and nestlings like grey francolin (*Francolinus pondicerianus*) (Khalil *et al.*, 2015) and red-wattled lapwing (*Vanellus indicus*). Martin (1993); Yanes and Suarez (1995) also concluded that ground nesting birds living in shrub and grassland habitats are more affected by predation.

High nocturnal activities in felids have been credited to their specialty in catching night-time rodents and some invertebrates (Ludlow and Sunquist, 1987). Nocturnal behaviour in wild animals is feasible in order to hunt and survive. Jungle cat is considered as nocturnal species (Ünal and Eryilmaz, 2020). However, previous works has also recorded its diurnal activities in the fields (Solanki *et al.*, 2017; Gaynor *et al.*, 2018).

Previous studies also concluded that nocturnal carnivore species are more exposed to become a victim of road kills (Errizoe *et al.*, 2003; Akrim *et al.*, 2019). This may be endorsed to the animal behaviour, time and season, visibility for drivers and requirement of large areas for foraging (Danilkin and Hewlson, 1996; Clevenger, *et al.*, 2001; Madsen *et al.*, 2002; Cahill *et al.*, 2003; Hothorn *et al.*, 2015).A study conducted on Mandra-Chakwal road, found (n=10)jungle cats killed on road and total 0.05 road kill animals/km (Akrim *et al.*, 2019).Studies also inveterate that male carnivores are more susceptible to road killing because males guard larger territorial areas by patrolling (Caro *et al.*, 2000; Sunquist and Sunquist, 2002; Collinson 2013; Palei *et al.*, 2018).

CONSERVATION AND MANAGEMENT

Due to human-jungle cat conflict, this species is killed with bore guns shooting, poison. This species killing is common among the poultry farmers (Baker *et al.,* 2003; Duckworth *et al.*, 2005; Mukherjee *et al.*, 2007). Hunters organize hunting events to kill the wild boars by dogs. This activity is also associated with the killing of other carnivore species like foxes, Jackals and jungle cats.

The feasting of jungle cat meat for medicinal use is not prevalent in this area. Their different body parts (e.g. blood, teeth and claws) are considered as source of valued paranormal charm and used for black magic in some parts of the area. Such superstitious beliefs encourage mass killing and intentional wildlife trade. Their primary predator is only human sometimes venomous snakes, when they try to prey them.

It is protected species in “The Punjab Wildlife (Protection, Preservation, Conservation and Management) Act, 1974”. They can be hunted all year round without any bag limit as prescribed by First Schedule, Part I: Wild Birds and Animals which may be hunted on an Ordinary Shooting License. There is a need for better portrayal and amendment of the laws and regulations governing wildlife to take

conservation and preservation measures for the sustainable control of wildlife and biodiversity in their key habitats (Johannesen, 2006).

Globally jungle cat is registered in Appendix II of Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Jungle cat's population is declining and prone to enter in threatened category in the whole world. The European, Russian and Georgian populations are in high peril (Duckworth *et al.*, 2005; Ünal and Eryilmaz, 2020). In this regard most of the countries have banned its hunting except Bhutan, Burma Georgia, Laos, Lebanon, Nepal, Sri Lanka and Vietnam (Ogurlu *et al.*, 2010).

Anthropogenic pressures are global problems especially for carnivores. Jungle cat is highly affected by the spreading out of agricultural areas near the water sources (Durant, 1998; Bisi *et al.*, 2007; Rawshan, 2012; Seoraj-Pillai and Pillay, 2016; Ünal and Eryilmaz, 2020). Habitat degradation, destruction, fragmentation, food loss, Fuel wood collection, poaching are the main threats to jungle cats (Soyumert, 2010; Ünal and Çulhacı, 2018). The remnant surviving populations suffer direct human pressures; often go to local extinctions (Karanth and Stith, 1999).

CONCLUSION

In Pakistan, a little or few information is known on the population ecology and habitat characterization of this rare wild cat. We presented this record and reviewed the literature to find out distribution, morphology, habitat description & characterization and conservation issues on Jungle cat. Further investigations should be carried out in order to understand the real patterns of population paradigms, competition, feeding biology, human-jungle cat interactions, road mortality and management for this specie. This study will provide future guidance to conduct studies on Jungle cat. More efforts should be made towards finding base-line data on the current population status and ecological interactions in Pakistan.

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