



Short Communication

Comparative Morphology and Anatomy of Two Sympatric Mongoose Species (*Herpestes javanicus* and *H. edwardsii*) from Potohar Plateau

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ABSTRACT

Two species of mongoose reported from Pakistan (*Herpestes javanicus* and *H. edwardsii*) are sympatric in many areas of their distribution range in the Potohar Plateau. Morphologically, the two species differ in their body size, so there could be substantial anatomical differences between them, not yet documented. The current study compared morphological and anatomical characteristics of the two species inhabiting the Potohar Plateau. Results showed marked morphological and anatomical differences between two mongoose species studied. External morphometrical characteristics including body weight, length of fore limbs, hind limbs and snout length of the two species differed significantly ($p < 0.05$). Among anatomical parameters, among females, liver weight and heart length of the two species differed significantly ($p < 0.05$). Among males, significant differences were found between heart length ($p < .001$), weight of large intestine, stomach, liver and lungs, and weight of right and left testes ($p < 0.05$) of the two mongoose species. Other anatomical variables of the two species differed non-significantly ($p > 0.05$).

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Authors' Contributions

TM planned and supervised the work. FF, FA and HF collected the data from the field and compiled the manuscript. MSN analysed the data statistically.

Key words

Sympatric, Mongooses, Morphology, Anatomy, Potohar, Pakistan.

Eight different species of mongoose occur in the Indo-Malayan region, all belonging to the same genus *Herpestes* (Corbet and Hill, 1992). They occupy various habitats from Africa to South-east Asia (Thulin *et al.*, 2006). In Pakistan, the genus *Herpestes* is represented by two species; small Indian mongoose (*Herpestes javanicus*; Geoffroy, E 1818) and the large Indian mongoose or the grey mongoose (*H. edwardsii*; Geoffroy, E 1818). Both species are sympatric in the Potohar range of their distribution. Hussain and Mahmood (2016) have provided an account of comparative ecology of these two mongoose species in the Potohar Plateau.

The grey mongoose is better adapted to arid conditions than the smaller species and is more widespread in the country. It is considerably larger in size than the smaller species and can be easily distinguished in the field by its longer contour hairs which form almost a cape along the flanks and over the hind quarters (Roberts, 1997). A thorough survey of the past published literature shows that studies on anatomical records and characteristics of

the mongoose are very scanty except a very recent study in Bangladesh on a single specimen, *Herpestes edwardsii* Shil *et al.* (2013) reporting the anatomy of digestive and respiratory systems. From Pakistan, no such studies have been reported yet. Morphologically, the two species differ in their body size (Roberts, 1997); it is expected that there could be substantial anatomical differences between the two species, which are not yet documented. The current study was, therefore, designed to record and compare the anatomical characteristics of the two mongoose species inhabiting Potohar Plateau.

Methodology

Live specimens of the two mongoose species were trapped from the Potohar Plateau (32° 33' - 34° 3' N and 71° 89' - 73° 37' E) using especially designed mesh traps. The traps were set in the field depending upon the abundance of active burrows of each mongoose species. Poultry intestines were used as bait in the traps to attract mongooses. Traps were set at mid-day or in the evening and checked the next dawn. The captured live specimens were brought to the laboratory, their external body measurements were recorded including total body length, head length, tail length, head to tail length, limbs length,

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tail hairs length, and gross body weight. The mongoose were then euthanized using chloroform and sacrificed to record data on their anatomical characteristics, including the digestive, respiratory, and reproductive systems and heart, and kidneys, to make a comparative analysis between the two sympatric mongoose species.

We used paired sample *t*-test to compare external and internal organ characteristics of the two mongoose species. We used SPSS version 20 for statistical analysis at 5% level of significance.

Results and discussion

In general, the small Indian mongoose (SIM) was found smaller in size (body length and body weight) as compared to that of the grey mongoose (GM) (Table I). Roberts (1997) reported the two mongoose species from Pakistan, he described small Indian mongoose being small in size with a head and body 30-35 cm long and the tail length being 80 percent of the body. For the other species (Grey mongoose) he described that being larger in size compared to the small Indian mongoose, and body length 36-45 cm while tail length being 90 to 100 percent of the head and body length. He also described two specimens of the small Indian mongoose from Sindh province; body length being 25 and 32 cm tail length 20 and 24 cm, respectively. The largest specimen of small Indian mongoose weighed 907 g. For the grey mongoose,

Roberts (1997) described it as larger in size than small Indian mongoose, the average head and body length being 39.30 cm (range from 35.5 to 43 cm), average tail length being 33.7 cm (range 32 to 39 cm), a freshly killed male

Table I.- Morphological parameters of the two sympatric mongoose species from Potohar Plateau. The various measurements are shown as Mean±SEM. Ranges are shown below each mean.

	Small Indian mongoose (n=14)	Grey mongoose (n=15)
Body weight (g)	528.5±99.5 (123 - 868)	1230.15±75.6* (742 - 1618)
Head-Tail length (cm)	32.67±5.5 (14.5 - 75.0)	47.04±5.8 (26 - 83.82)
Tail length (cm)	17.15±2.76 (9.0 - 41.0)	24.76±3.26 (12 - 45.72)
Head length (cm)	4.07±0.60 (2.2 - 9.0)	5.30±0.57 (3.0 - 8.89)
Body length between head and tail (cm)	13.70±2.21 (8.0 - 30.7)	17.98±2.14 (11 - 33.02)
Forelimbs (cm)	4.81±0.58 (2.9 - 9.0)	7.26±0.76* (4.0 - 12.7)
Hind limbs (cm)	5.97±0.71 (3.2 - 11.0)	9.27±1.08* (5 - 16.51)

* p < 0.01.

Table II.- Measurements of anatomical structures of the two sympatric mongoose species (*Herpestes javanicus* and *H. edwardsii*) from Potohar Plateau.

		Small Indian mongoose		Grey mongoose	
		Male (n=10)	Female (n=3)	Male (n=11)	Female (n=4)
Stomach	Length (cm)	6.4 ± 0.33	6.2 ± 0.62	6 ± 0.58	4.6 ± 0.37
	Weight (g)	14.02 ± 1.19	18.3 ± 5.48	33.3 ± 9.40*	17.9 ± 4.85
	Girth (cm)	5.8 ± 0.47	5.5 ± 1.34	6.3 ± 0.99	5.5 ± 0.87
Pancreas	Length (cm)	4.9 ± 0.05	4.6 ± 0.6	5.9 ± 0.26	5.2 ± 0.55
	Weight (g)	3 ± 0.7	2.5 ± 0.5	5.2 ± 0.76	2.9 ± 0.51
Liver	Weight (g)	28.1±4.17	19.8 ± 2.60	40.1 ± 5.19**	833 ± 6.1
Small intestine	Length (cm)	88.9 ± 4.85	66.6 ± 9.50	78.6 ± 4.19	77.5 ± 3.57
	Weight (g)	24.2 ± 1.05	17.6 ± 2.68	30.0 ± 3.06	24.3 ± 3.88
Large intestine	Length (cm)	11.07±1.05	10.4 ± 4.21	12.5 ± 0.96	12.5 ± 1.55
	Weight (g)	7.3 ± 0.79	9.07 ± 5.99	12.5 ± 1.35**	10.7 ± 0.67
Heart	Length (cm)	2.2±0.15	1.9±0.14	2.9±0.23***	7.3±1.06
	Weight (g)	5.66±0.55	3.6±0.87	2.55 ± 0.21**	5±0.83
Lungs length (cm)	Right	5.08±0.36	3.6 ± 0.86	9.10±0.97	7.31±1.61
	Left	8.6±1.01	5.9±1.03	11±1.37	10±2.84
Kidneys length (cm)	Right	1.98±0.10	1.45±0.25	2.4±0.55	1.9±0.14
	Left	2.06±0.06	1.85±0.15	2.8±0.60	2.2±0.14
Kidneys weight (g)	Right	2.42±0.36	2.3±0.3	3.1±0.29	3±0.38
	Left	2.93±0.47	2.9±0.03	3.3±0.32	3.3±0.30

*, p < 0.05; **, p < 0.01; ***, p < 0.001.

weighed 1800 g. In the current study, the general body measurements (including body weight, head and body length and the tail length) are somewhat smaller (in both species) than those reported previously by Roberts (1997).

Both species differed in the size and weight of their digestive systems (Table II). The small Indian mongoose females showed shorter length of small intestine and mean length of large intestine was found shorter than that of grey mongoose females. The male specimens of the two mongoose species also showed the similar trend. Average length and weight of pancreas was found greater in females and males of the grey mongoose compared to the other species. The females of small Indian mongoose showed smaller weight of liver compared to that of grey mongoose. Similarly, male specimens of the grey mongoose showed heavier weight of liver compared to males of the other species. Table II shows similar trend for heart, lungs, kidneys, ovaries and testes. In addition, snout length (cm), liver weight (female) (g), length of heart (female) (cm), weight of large intestine male (g), stomach weight (male) (g), liver weight (male) (g), lungs weight (male) (g), length of heart (male) (cm), heart girth (male) (cm), right testes weight(g) and left testes weight (g) show statistically significant differences between the two mongoose species.

As far as previous published literature is concerned, Roberts (1997) described only external body measurements of the two mongoose species from Pakistan; however, he did not report any findings about the anatomical measurements of different organs and systems of the two mongoose species. One recent study by Shil *et al.* (2013) reported anatomy of digestive and respiratory systems of a single specimen of the grey mongoose from Chittagong (Bangladesh). They showed that the digestive tract of the species comprised of oesophagus (a straight tube with a length of 12.3 cm), the stomach was of carnivore type and 'J'-shaped with a total length of 9.5 cm, the pancreas was

located along the border of the duodenum, the jejunum was the longest portion of the small intestine, with a length of 92 cm, the colon was a straight tube with a length of 4.3 cm and diameter 5 mm. Rectum was also the straight tube which terminated at the anus. Its maximum length was 7.1 cm with a circumference of 2.7 cm, while the liver was divisible into five chief lobes.

Pearson and Baldwin (1953) reported that the anatomy of the female reproductive tract of the grey mongoose comprised of bipartite uterus, usually 20 to 30 mm in length, which was long in non-pregnant females with long oviducts. Membranous bursa, in which the oviduct lies, encapsulated the ovary. The ovaries were relatively small.

Statement of conflict of interest

Authors have declared no conflict of interest.

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