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**Morphological Variation
in *Tatera indica indica* Hardwicke, 1807,
Inhabiting Two Types of Indian Desert Habitats**

[With 4 Tables]

A comparison was made of external body parts and cranial measurements in two population of the Indian Gerbil, *Tatera indica indica* Hardwicke, 1807, one series collected from the city streets at Bikaner and the other from natural pasture on a sandy plain at Jodhpur in the Rajasthan desert, India. No significant inter-population differences were observed in respect of the external body parts but many of the cranial measurements of the Jodhpur population were larger than those of gerbils from Bikaner. A comparison has also been made of the body part measurement data on the Rajasthan specimens with previously published data for the same species collected from Sind and Uttar Pradesh.

I. INTRODUCTION

Only a few biometrical studies on rodent species have so far been conducted in India. Hinton (1919) studied *Rattus rattus* and Roonwal & Guha Roy (1966) gave an account of the plasticity of body parts and skull measurements of *Rattus rattus bullocki* Roonwal. The present paper reports a similar study on the Indian Gerbil, *Tatera indica indica* Hardwicke, 1807, originating from Bikaner and Jodhpur. At Bikaner, rodents were collected from the city streets at night and at Jodhpur from a natural pasture situated on a sandy plain. The measurements made were compared with those collected from Sind and Uttar Pradesh (Ellerman, 1961).

II. MATERIAL AND METHODS

The animals were collected by setting Sherman live traps at night. Only adult animals were used in this study. The criteria for judging maturity in the male was presence of sperms in the epididymal smears, and in the female, presence of *corpora lutea*. Standard body measurements were made after chloroforming the captured gerbils. Cranial measurements were made according to techniques and definitions discussed by Roonwal (1950) and Prakash (1959a, 1959b).

The following abbreviations are used in the text: M = male, F = female, H. B. = head & body, H. F. = hind foot, E = ear, S. E. = standard error, and S. D. P. = sexual dimorphism percentage, N = number of individuals, * = significant at 5 percent level of probability, ** = significant at 1 percent level of probability.

III. RESULTS AND DISCUSSION

Tables 1 and 2 present the variations and statistical analyses of standard body measurements and cranial measurements of male and female *T. i. indica* collected from the two habitats.

1. Differences between Sexes

In gerbils of both the habitats no inter sex differences were observed in external body parts and the skull measurements, except in the occipito-premaxillar length of male *Tatera* from Bikaner which was significantly ($P < .01$) larger than that of female (Table 2) and the condylobasal length and the length of lower molar in the Jodhpur sample were significantly longer ($P < .05$) in males as compared to those of females.

S. D. P. values, which were determined by the formula¹⁾ given by Roonwal & Guha Roy (1966), of all standard body parts ranged from -3.19 to $+0.37$ and in cranial measurements from -4.50 to $+4.89$ in the Bikaner population, whereas from -3.08 to $+4.89$ and -10.82 to $+2.40$ in the Jodhpur population respectively, thereby indicating that the body size of *Tatera indica* in the latter population is comparatively more variable (Table 3) but the variations in the S. D. P. of cranial measurements of *Tatera* from both the localities are almost equal.

2. Differences between the Two Populations

The H. B. length of males as well as of females in the Jodhpur population was larger than that in the Bikaner group. H. F. length in both the sexes of *Tatera* from Bikaner was apparently larger, but the difference was significant ($P < .01$) only in males (Table 1).

The combined width of anterior palatine foramina of *Tatera* in the Jodhpur population was significantly larger in males ($P < .01$) and in females ($P < .05$) than that in the Bikaner gerbils (Table 2). Cranial width, the combined width of nasals, length of upper and lower molars in males and length of tympanic bulla, length of anterior palatine foramina in females of *Tatera* from Jodhpur were significantly greater ($P < .01$) than those of their counterparts from Bikaner. However, the combined width of nasals ($P < .05$), the length of nasals, palatal length

¹⁾ S. D. P. = $\frac{\text{mean value of female}}{\text{mean value of male}} - 1$ (100)

Table 1. Variations in mean values of external body parts in mm of *Tatera i. indica* Hardwicke from two populations.

Body parts	Bikaner population		Jodhpur population		Level of probability			
	M (N=20) mean±S.E.	F (N=20) mean±S.E.	M (N=10) mean±S.E.	F (N=10) mean±S.E.	1 & 2	3 & 4	1 & 3	2 & 4
Head and body	163.15 ± 2.90	157.90 ± 2.52	165.80 ± 2.91	160.70 ± 2.61	P < .20	P < .20	P < .50	P < .30
Tail	167.50 ± 2.28	168.13 ± 1.75	166.42 ± 4.63	173.00 ± 2.94	P < .90	P < .30	P < .80	P < .10
Hind foot	38.12 ± 0.39	37.25 ± 0.29	35.60 ± 0.39	35.20 ± 0.24	P < .50	P < .30	P < .01**	P < .10
Ear	19.97 ± 0.36	19.75 ± 0.31	19.40 ± 0.70	20.35 ± 0.70	P < .50	P < .30	P < .30	P < .30
Percent of external body parts in relation to head and body								
Tail	104.82 ± 2.13	107.44 ± 1.61	101.24 ± 3.38	107.11 ± 2.91	P < .50	P < .10	P < .30	P < .90
Hind foot	23.55 ± 0.50	23.67 ± 0.40	20.54 ± 1.64	21.95 ± 0.42	P < .90	P < .80	P < .10	P < .20
Ear	12.29 ± 0.18	12.51 ± 0.18	10.69 ± 1.20	12.69 ± 0.33	P < .80	P < .10	P < .30	P < .80

Table 4. Comparison of mean values (± S.E.) of body measurements (mm) of *Tatera indica* from Rajasthan (present study), from Sind and Uttar Pradesh (Ellerman, 1961).

Locality	Body parts					
	H. & P.		Tail		Ear	
	M	F	M	B	M	F
1. Rajasthan (N = ♂ 30, ♀ 30)	164.03 ± 2.46	158.83 ± 1.68	161.16 ± 8.70	170.08 ± 12.74	19.78 ± 0.33	19.98 ± 0.33
2. Sind (N = ♂ 5, ♀ 8)	151.00 ± 6.00	147.50 ± 2.64	174.60 ± 6.00	177.62 ± 3.90	23.80 ± 0.42	23.50 ± 0.71
3. U.P. (N = ♂ 9, ♀ 5)	163.00 ± 7.48	151.40 ± 16.12	186.88 ± 7.46	179.40 ± 12.90	23.33 ± 0.46	23.90 ± 0.80
Level of probability	P < .05*	P < .01**	P < .10	P < .50	P < .01**	P < .01**
1 & 2	P < .80	P < .50	P < .05*	P < .50	P < .01**	P < .01**
1 & 3	P < .10	P < .70	P < .10	P < .80	P < .10	P < .50
2 & 3						

Table 2.
Variations in cranial characters of *Tatera indica indica* Hardwicke of two populations.

Cranial characters	Bikaner population		Jodhpur population		Level of probability between			
	M (N=20)	M (N=20)	F (N=10)	F (N=10)	1 & 2	3 & 4	1 & 3	2 & 4
	Mean ± S.E.	Mean ± S.E.	Mean ± S.E. ¹	Mean ± S.E.				
	1	2	3	4				
Occipitopremaxillar length	44.30 ± 0.40	42.31 ± 0.41	43.05 ± 0.81	42.01 ± 0.78	P < .01**	P < .30	P < .10	P < .70
Condylbasal length	43.30 ± 0.32	42.10 ± 0.58	43.05 ± 0.81	41.68 ± 0.16	P < .05*	P < .05*	P < .70	P < .50
Zygomatic width	21.22 ± 0.29	20.74 ± 0.30	20.73 ± 0.33	21.02 ± 0.28	P < .70	P < .30	P < .50	P < .30
Interorbital width	7.18 ± 0.22	7.25 ± 0.40	7.60 ± 0.17	7.40 ± 0.12	P < .30	P < .30	P < .50	P < .70
Cranial width	17.00 ± 0.17	18.14 ± 0.22	18.40 ± 0.27	18.25 ± 0.39	P < .10	P < .80	P < .01**	P < .80
Occipital breadth	16.45 ± 0.37	16.80 ± 0.93	17.15 ± 0.35	16.45 ± 0.35	P < .70	P < .10	P < .10	P < .30
Mean depth of occiput	11.63 ± 0.18	11.60 ± 0.95	11.95 ± 0.28	11.56 ± 0.27	P < .70	P < .70	P < .50	P < .90
Post molar length	18.63 ± 0.35	18.25 ± 0.27	18.55 ± 0.45	18.35 ± 0.38	P < .70	P < .70	P < .80	P < .90
Auditory length	14.47 ± 0.31	14.47 ± 0.27	14.30 ± 0.15	14.45 ± 0.36	—	P < .80	P < .30	P < .90
Length of tympanic bulla	11.87 ± 0.24	11.89 ± 0.27	12.15 ± 0.40	12.00 ± 0.19	P < .90	P < .80	P < .70	P < .01**
Breadth of tympanic bulla	7.87 ± 0.22	8.57 ± 0.22	8.30 ± 0.16	8.35 ± 0.27	P < .30	P < .90	P < .50	P < .50
Length of nasals	18.44 ± 0.29	18.41 ± 0.25	18.80 ± 0.36	18.30 ± 0.22	P < .80	P < .50	P < .70	P < .01**
Combined width of nasals	4.15 ± 0.13	4.29 ± 0.16	4.50 ± 0.13	4.25 ± 0.16	P < .80	P < .30	P < .01**	P < .05*
Palatal length	19.65 ± 0.34	19.04 ± 0.26	19.00 ± 0.40	18.40 ± 0.26	P < .50	P < .50	P < .20	P < .01**
Length of diastema	11.90 ± 0.16	11.52 ± 0.19	11.65 ± 0.29	11.40 ± 0.14	P < .50	P < .80	P < .50	P < .01**
Length of anterior palatine foramina	7.60 ± 0.19	7.69 ± 0.17	8.30 ± 0.35	8.50 ± 0.22	P < .90	P < .70	P < .10	P < .01**
Combined width of anterior palatine foramina	3.22 ± 0.07	3.83 ± 0.11	4.50 ± 0.16	4.45 ± 0.25	P < .30	P < .90	P < .01**	P < .05*
Length of upper molars	6.60 ± 0.07	6.50 ± 0.21	6.90 ± 0.16	6.80 ± 0.25	P < .90	P < .90	P < .01**	P < .30
Length of lower molars	5.95 ± 0.17	5.94 ± 0.12	6.22 ± 0.16	5.95 ± 0.20	P < .80	P < .05*	P < .01**	P < .50
Mandibular length	20.55 ± 0.30	20.39 ± 0.35	20.58 ± 0.59	20.65 ± 0.42	P < .80	P < .90	P < .70	P < .50

and the length of diastema in the females of the Bikaner population were significantly greater ($P < .01$) than those in females from Jodhpur.

The sexual dimorphism percentage in *Tatera* from Jodhpur was higher in all the standard body parts in comparison with animals from Bikaner population (Table 3).

The sexual dimorphism percentage in respect of occipitopremaxillar length, breadth of tympanic bulla, combined width of palatine foramina and mandibular length in the Bikaner population were higher than the

Table 3.

Comparison of sexual dimorphism percentage in external body parts and cranial characters for two populations of Indian gerbils.

Body parts and cranial characters	Bikaner, S.D.P. (N=40)	Jophpur, S.D.P. (N=20)
Head and body	— 3.19	— 3.08
Tail	+ 0.37	+ 3.95
Hind foot	— 2.49	— 1.13
Ear	— 1.01	+ 4.89
Occipitopremaxillar length	— 4.50	— 2.42
Condylbasal length	— 2.70	— 3.19
Zygomatic width	— 2.27	+ 1.39
Inter-orbital width	+ 0.97	— 2.64
Cranial width	+ 6.70	— 10.82
Occipital breadth	+ 2.12	— 4.09
Mean depth of occiput	— 2.60	— 3.35
Post molar length	— 2.55	— 1.79
Auditory length	+ 1.00	+ 1.10
Length of tympanic bulla	+ 0.16	— 1.24
Breadth of tympanic bulla	+ 8.89	+ 0.06
Length of nasals	— 0.17	— 2.69
Combined width of nasals	+ 3.37	— 5.56
Palatal length	— 3.11	— 3.16
Length of diastema	— 3.20	— 2.15
Length of anterior palatine foramina	+ 1.18	+ 2.40
Combined width of palatine foramina	+ 1.89	— 1.12
Length of upper molars	— 1.52	— 1.45
Length of lower molars	— 0.17	— 4.35
Mandibular length	— 1.78	+ 0.35

corresponding values of the Jodhpur population. The S. D. P. of inter-orbital width, cranial width, occipital breadth, length of tympanic bulla, length of nasals, length of lower molars and combined width of nasals in the Jodhpur population were greater than that in Bikaner population (Table 3).

3. Differences between Populations of Rajasthan, Sind and Uttar Pradesh

A comparison (Table 4) of body measurements of *Tatera i. indica* collected from Rajasthan with those of Sind and eastern Uttar Pradesh

(Ellerman, 1961) revealed that H. B. of Sind specimens is significantly smaller ($P < .05$ in males and $P < .01$ in females) than that of Rajasthan desert specimens, but the tail of male *Tatera* from Uttar Pradesh is significantly longer ($P < .05$) in males than the corresponding value for the Rajasthan desert specimens. The ear of the gerbils of the Rajasthan desert specimens is also significantly shorter ($P < .01$) than that of rodents from the other two populations.

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ZMIENNOŚĆ MORFOLOGICZNA U *TATERA I. INDICA* HARDWICKE, 1807 ZAMIESZKUJĄCYCH DWA TYPY ŚRODOWISKA PUSTYNNEGO INDII

Dokonano porównania wymiarów ciała i czaszki dwu populacji *Tatera indica indica* Hardwicke, 1807. Zwierzęta pochodziły z miasta Bikaner oraz z naturalnego środowiska, z pustyni Rajasthan. Nie stwierdzono różnic istotnych statystycznie w wymiarach ciała między obu populacjami (Tabela 1), ale wiele wymiarów czaszki zwierząt z populacji pustynnej było większych niż u łowionych w Bikaner (Tabela 2). Oceniono również dymorfizm płciowy w obu populacjach (Tabela 3). Wymiary ciała populacji z pustyni Rajasthan porównano z danymi dla tego gatunku z rejonów Sind i Uttar Pradesh (Tabela 4).