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New Field Data on Tail Carriage in the Common South Asian Langur, *Presbytis entellus* (Primates), and its Biological and Evolutionary Significance

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The widespread South Asian langur, *Presbytis entellus*, has been shown to exhibit geographical, subspecific and clinal variations in the mode of carriage of its long, rope-like tail, and two principal types, I (Northern, tail looped forward) and II (Southern, tail looped backward) have been recognised, along with a number of subtypes (Roonwal 1979a). New field data, especially around the crucial border zones separating the different types, have now made it possible to present new and more precise information on the problems involved, especially on the following aspects: (i) The range of the Sub-Himalayan Type, IB, has been extended considerably to the south so as to include some of the eastern districts of Uttar Pradesh, e.g., Gorakhpur and Azamgarh. (ii) The Dividing Line between the Northern and Southern tail types (hitherto regarded as a belt some 200 km or more in width) has been narrowed sharply, almost to a line. It lies higher, between Bharuch (21.41 N and Surat (21.12 N) in Gujarat, and runs lower (between *c.* 20.15 N and 18.05 N) as we move east. (iii) Weak clines have been found in the southern half of the Northern Type, and the occurrence of strong clines confirmed in the South. Quantification of clinal gradations has been done in the latter case. (A probable north-south cline is also noticeable in the size of the hair tuft on the head in the southernmost group of subspecies in the Peninsula and Sri Lanka). (iv) Tail types have been redefined. (v) The biological and evolutionary significance of tail carriage is discussed with especial reference to subspeciation.

Key Words: **Primates, *Presbytis entellus*, Tail carriage, Clinal variations Biological significance**

Introduction

The mode of tail carriage in the common or Hanuman langur of South Asia, *Presbytis entellus* (Dufresne) (Primates, Cercopithecidae, Colobinae), has in recent years been the subject of field studies by Roonwal (1976, 1977, 1979a, b and in press, a, b),

Roonwal and Makwana (1976) and Roonwal and Mohnot (1977). A number of types or styles of carriage have been discovered. Additional field data assembled recently throw new light on the concerned phenomena and are presented here.

Results

1. *New locality records*

The following new locality records (figures 1 and 2) for tail carriage types have been assembled since those given in the initial account (Roonwal 1979a). These records have helped in marking the dividing lines between the various types more precisely.

Type IA (Tail looped forward; tip lying above or below the back and *not outcurved*)

1. Sikandra, *c.* 12 km N W of Agra, Uttar Pradesh (27.13 N, 77.58 E). Tail well below the back; *P. e. entellus*. [1 group, *c.* 40 examples.]

2. Chakia, 40 km S E of Varanasi, Uttar Pradesh (25.00 N, 81.10 E). Tail well below the back; tip not outcurved. *P. e. entellus*. (R S Pirta, pers. comm.) [1 group, 18 examples.]

3. Bhubaneswar, Orissa (20.15 N, 85.52 E). Tail well below the back; tip not outcurved. *P. e. entellus*. (R S Pirta, pers. comm.) [1 group, several examples.]

4. Bharuch (Broach), Gujarat (21.41 N, 73.01 E). Tail well above the back, but tip not outcurved. *P. e. entellus*. (Dr S C Makwana, pers. comm.) [1 group, several examples.]

Type IB (Tail looped forward; tip lying above or behind the back and *outcurved*)

5. Simla District, Himachal Pradesh: Charhabra (1 km W of Kufri, 31.05 N, 72.22 E, alt. 2,600 m) and Chail (30 km E of Simla, 31.01 N, 77.30 E, alt. 2,400 m). Tail well above the back, tip outcurved. *P. e. schistaceous*. [1 group, *c.* 20 examples.]

6. Kulu District, Himachal Pradesh: Rolla Bhandar and vicinity (*c.* 31.50 N, 77.40 E, alt. 2,100 m). Tail loop lying behind the animal. *P. e. schistaceous*. (P C Tak, pers. comm.) [1 group, several examples.]

7. Gorakhpur and Kusmi forest nearby (*c.* 26.45 N, 83.24 E) and Azamgarh (26.03 N, 83.13 E), Uttar Pradesh. *P. e. schistaceous*. [3 groups, many examples.]

Type II A (Tail looped backward; tip either below or above the tail base)

8. Surat, Gujarat (21.12 N, 72.52 E). Tail tip about level with base. *P. e. achates*. (Dr S C Makwana, pers. comm.) [1 group, several examples.]

9. Shores of Lake Lonar, Buldana District, Maharashtra (*c.* 19.58 N, 76.40 E). (Dr K K Tiwari, pers. comm.)

10. Mahabaleshwar, Maharashtra (17.58 N, 73.43 E). Tail tip well above level of tail base. *P. e. achates*. (Dr S C Makwana and P L Kankane, pers. comm.) [2 groups, several examples.]

11. Basavanbetta, near Kanakpura, Bangalore District, Karnataka (*c.* 12.30 N, 77.20 E). Tail tip well above level of tail base. (Dr M Gadgil and H C Sharatchandra, pers. comm.) [1 group, several examples.]

2. *Extension of range of Type IB*

In the earlier account (Roonwal 1979a), the southern limit of Type IB was a little below the southern border of Nepal (lat. *c.* 27 N). On the basis of new localities recorded here, the border in the central region dips far down so as to include Gorakhpur (26.45 N, 83.24 E) and Azamgarh (26.03 N, 83.13 E) (figure 1). In the north-west, Kulu District (Himachal Pradesh, alt. *c.* 2,100 m) now belongs here.

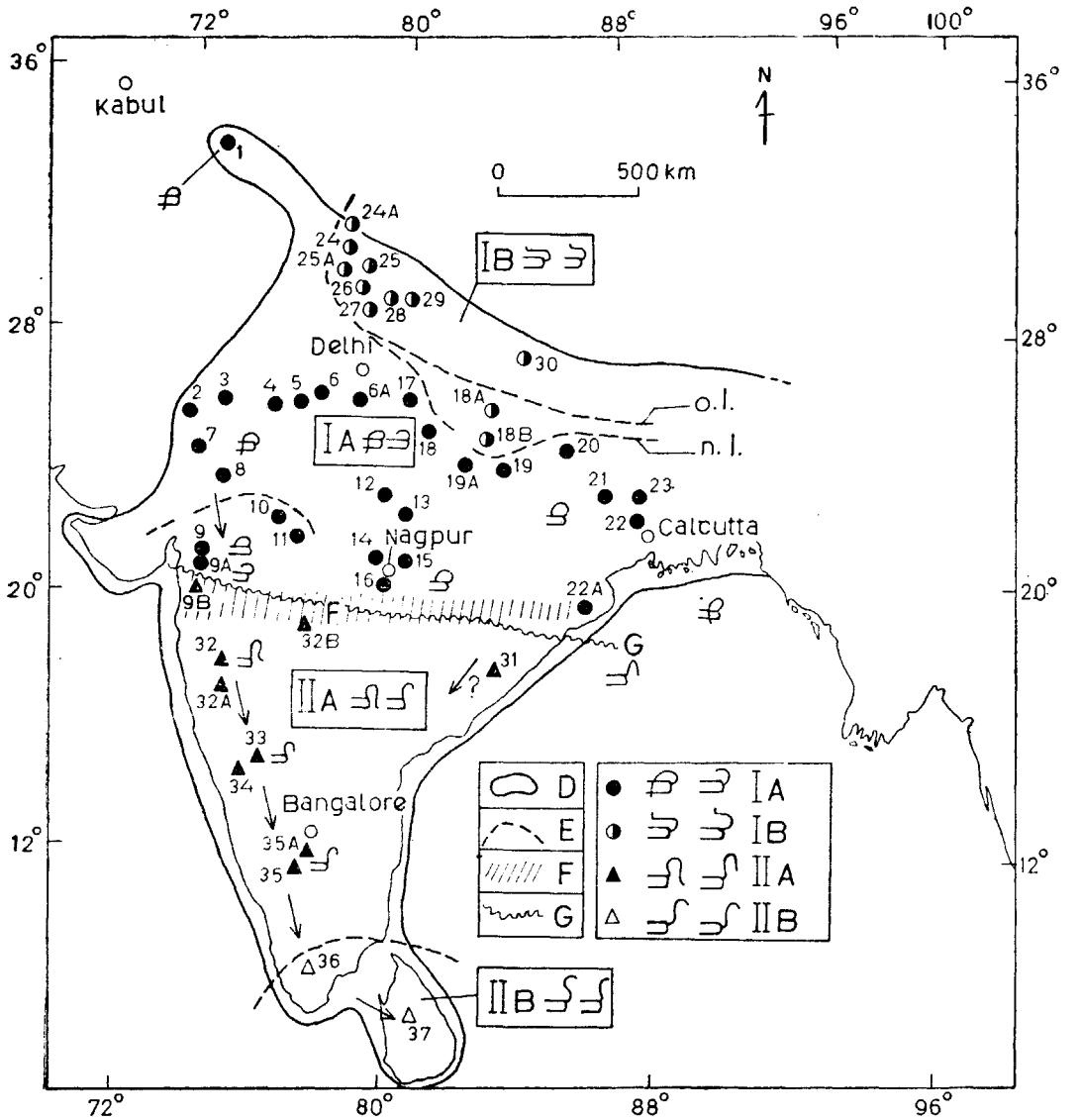

Figure 1 Map of South Asia showing distribution of types of tail carriage in *Presbytis entellus*. [Modified from Roonwal 1979a, with the addition of new data.] Arrows indicate probable direction of gradual, clinal variations. *Index*: **D**, approximate limits of distribution of *P. entellus*. **E**, approximate separating lines of different types of tail carriage within each principal type. Except where otherwise stated, all localities are in India. Abbreviations for States: **Bh.**, Bihar; **H.P.**, Himachal Pradesh; **Gj.**, Gujarat; **Kn.**, Karnataka; **Mh.**, Maharashtra; **M.P.**, Madhya Pradesh; **Or.**, Orissa; **Rj.**, Rajasthan; **T.N.**, Tamil Nadu; **U.P.**, Uttar Pradesh; **W.B.**, West Bengal. *Old localities*: *1*, Hazara District (Pakistan); *2*, Jodhpur; *3*, Ajmer (and Pushkar); *4*, Jaipur; *5*, Sariska; *6*, Alwar; *7*, Mt. Abu; *8*, Debari (near Udaipur) (2-8, Rj.); *9*, Vadodara (Baroda) (Gj.); *10*, Gautampura Road; *11*, Omkareshwar Road; *12*, Jabalpur; *13*, Kanha National Park (10-13, M.P.); *14*, Pench National Park; *15*, Ramtek; *16*, Tadoba National

(*Contd.*)

Park (14-16, Mh.); *17*, Etah (U.P.); *18*, Kakori (U.P.); *19*, Locality near Sasaram (Bh.); *20*, Village in Bhagalpur District (Bh.); *21*, Narayanpur; *22*, Dakshineswar; *23*, Madanpur (21-23, W.B.); *24*, Simla and vicinity (H.P.) *25*, Mussoorie; *26*, Dehra Dun and vicinity (Asarori and Thano forests); *27*, Hardwar and Chilla forest; *28*, Bhim Tal; *29*, Corbett National Park (Amdanda, Dhikala, etc.). (25-29, U.P.); *30*, Melmechigaon (Nepal); *31*, Orcha (M.P.); *32*, Pune (Mh.); *33*, Dharwar (Kn.); *34*, Dandeli (Kn.); *35*, Mudumalai Sanctuary (T.N.); *36*, Papanasam Camp, Mundanthurai Sanctuary (T.N.); *37*, Polonnaruwa (Sri Lanka). *New localities*: *6A*, Sikandra near Agra (U.P.); *9A*, Bharuch (Broach); *9B*, Surat (Gj.); *18A*, Gorakhpur; *18B*, Azamgarh; 19A, Chakia near Varanasi. (U.P.). *22A*, Bhubaneswar (Or.); *24A*, Rolla Bhandar; *25A*, Charhabra and Chail (H.P.); *32A*, Mahabaleshwar; *32B*, Lake Lonar (Mh.); *35A*, Basavanbetta near Kanakpura (Kn.)

D, approximate limits of distribution of *P. entellus*; **E**, approximate separating lines of different subtypes of tail carriage; **F**, old dividing belt (Roonwal 1979a) between types I (Northern) and II (Southern); **G**, Same, new dividing line (also see figure 2); **n.l.**, new line; and **o.l.**, old line of demarcation between Types IA and IB

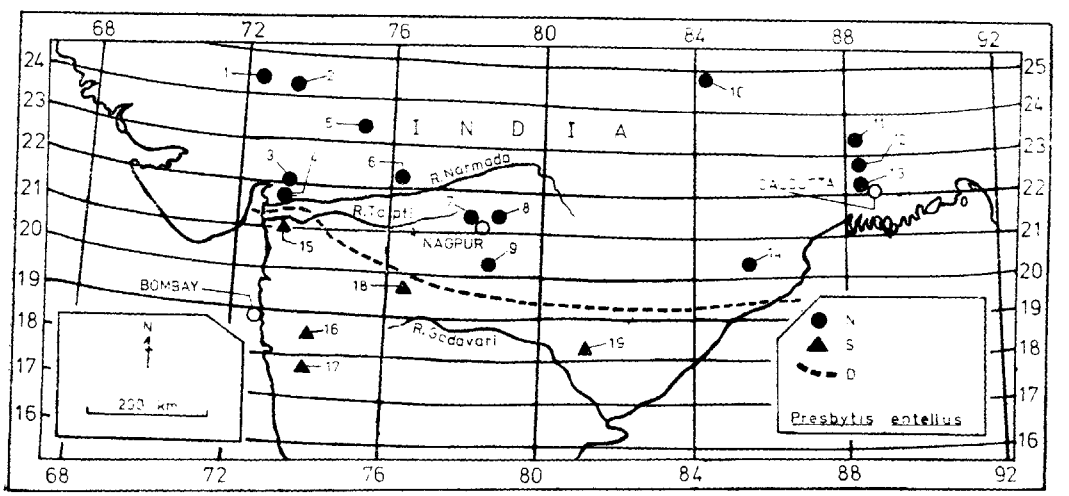

Figure 2 Map of middle India, showing the known distribution of the Northern (I, solid circles; tail looped forward) and Southern (II, solid triangles, tail looped backward) types of tail carriage in *Presbytis entellus*. Note the Dividing Line between the two; it is higher (between latitudes 21° and 22° N) at the western end and lower (between latitudes 19° and 20° N) in the centre and the east. Abbreviations as in figure 1. *Localities*: *1*, Mt. Abu; *2*, Debari near Udaipur (Rj.); *3*, Vadodara (Baroda); *4*, Bharuch (Broach) (Gj.); *5*, Gautampura Road; *6*, Omkareshwar Road (M.P.); *7*, Pench National Park; *8*, Ramtek; *9*, Tadoba National Park (Mh.); *10*, Locality near Sasaram (Bh.); *11*, Narayanpur; *12*, Madanpur; *13*, Dakshineshwar near Calcutta (W.B.); *14*, Bhubaneswar (Or.); *15*, Surat (Gj.); *16*, Pune; *17*, Mahabaleshwar; *18*, Lake Lonar (Mh.); *19*, Orcha (M.P.)

D, Dividing line between the Northern (Type I) and Southern (Type II) styles of tail carriage. **N**, known localities for the Northern style; **S**, same for the Southern style

3. *The Dividing Line between the Northern and Southern types*

In the initial account, Roonwal (1979a) had stated (p 249) that "the Dividing Belt between the two principal groups, I and II, lies around 20°N latitude"; and further, that "at its narrowest point this belt is still about 200 km wide, but it is likely that with more field observations in the region, the belt may be narrowed considerably, possibly even to a line".

The new data presented here have not only narrowed the belt considerably (so that we may now speak of it almost as a 'Dividing Line') but have also made its latitudinal location more precise (figures 1 and 2). The new data refer to three location-pairs, in the west, centre and east, as follows:

(1) In the west (Southern Gujarat), the Line lies between the approximate latitudes 21.50 and 21.10 N. Here the southernmost point of Type I tail is Bharuch (Broach) (21.41 N, 73.01 E) and the northernmost point of Type II tail is Surat (21.12 N, 72.52 E), only 60 km directly south of Bharuch.

(2) In the centre (Northern Maharashtra), the Line lies between the approximate latitudes 20.20 and 19.50 N. Here the southernmost point for Type I tail is the Tadoba National Park (*c.* 20.17 N, 79.15 E) in Warora Taluk, Chandrapur District, and the northernmost point for Type II is Lake Lonar (19.58 N, 76.40 E), a vertical distance of about 40 kms only.

(3) In the east (northeastern Orissa and southern Madhya Pradesh), the Line lies between the approximate latitudes 20.15 and 18.05 N. Here the southernmost point of Type I tail is Bhubaneswar in Orissa (20.15 N, 85.52 E) and the northernmost point of Type II is Orcha in the Bastar District, Madhya Pradesh (18.05 N, 81.10 E), a vertical distance of about 150 km.

The line is thus fairly sharply demarcated in the west and the centre (only 40–60 km wide) and rather less so in the east. Again, it lies in relatively higher latitudes in the west (between *c.* 21.50 and 21.10 N) and in lower latitudes in the centre (between 20.20 and 19.50 N) and the east (between 20.15 and 18.05 N).

The Bharuch population in the west is of special interest. With a single exception, all members of a unimale bisexual group which was observed had the Northern tail style (looped forward, plate 1, figures 4 and 5); the exception was a juvenile male which had the Southern style (looped backward, plate 1, figure 6); this suggests the probable occurrence of hybridisation. About 80 km north of Bharuch, at Vadodara (Baroda), the tail carriage is entirely Northern, while some 60 km south of it, at Surat, it is entirely Southern.

4. *Clines and their quantification*

Weak clines in the Northern Type IA: While the main cline variations are found within Type II in the Southern Sector, there is some evidence of the occurrence of weak clines in the southern part of the Northern Sector, especially below about 24 N latitude where the tail frequently remains fairly well above the back or just reaches the back level or sometimes a little below it. This is seen at its clearest at the western extremity, in Vadodara and Bharuch (in Gujarat) and Gautampura Road and Omkareshwar Road (in western Madhya Pradesh) (see figures 1 and 2). A similar but less clear situation is seen as we move from central Madhya Pradesh (e.g., Jabalpur) east towards West Bengal (Calcutta, etc.) where also the tail tip does not go down the sides extensively and sometimes remains a little above the level of the back.

A point to note in this connection is that where the tail tip remains above the back level, it is *not outcurved*, thus differing from

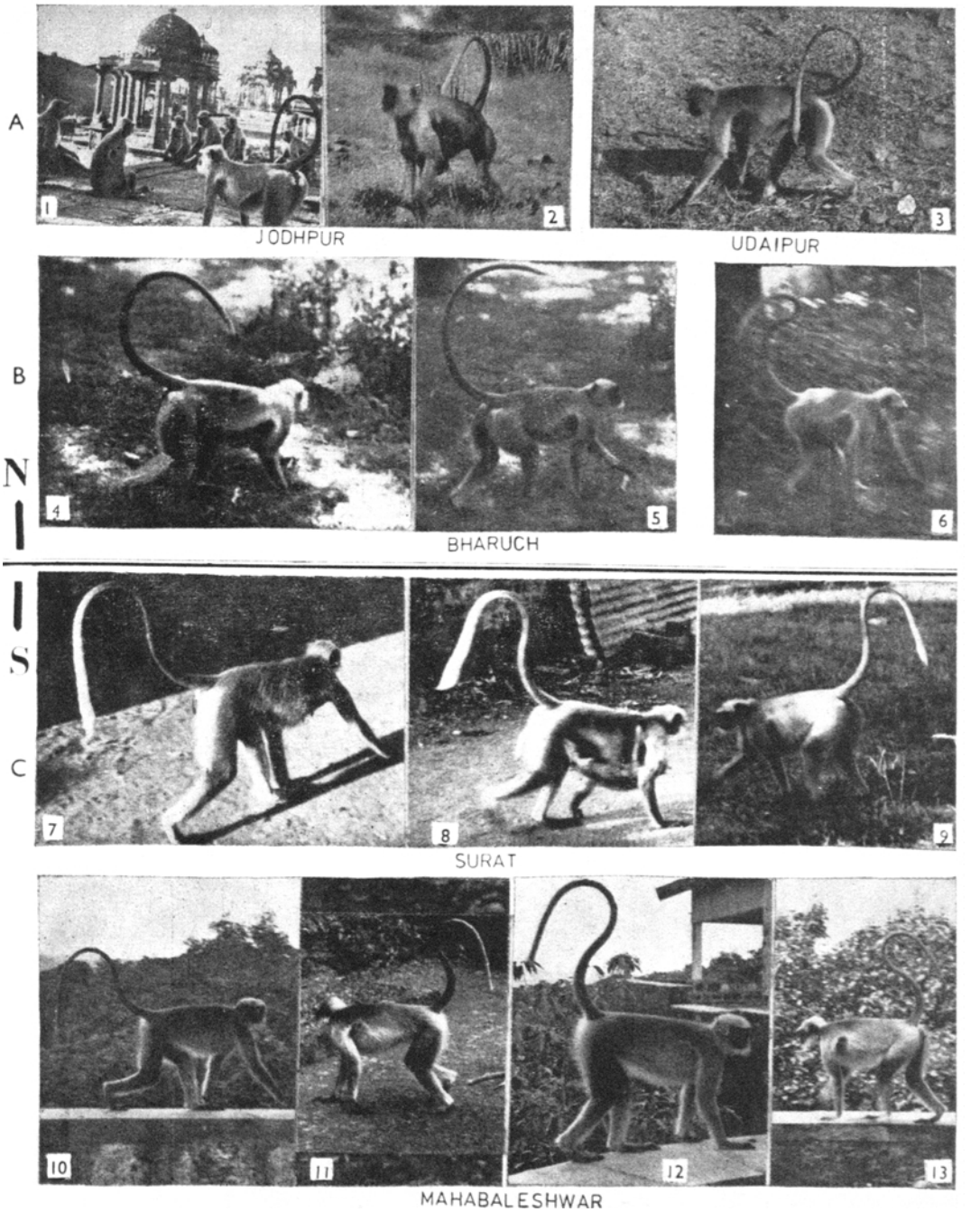

Plate I *Presbytis entellus*, India. Northern (Type I, tail looped, rows A, B) and Southern (Type II, tail looped backward, rows C, D) styles of tail carriage. All are adults, except figure 6) *Row A*: Rajasthan. Type 1 A (tail tip reaching the back, usually well below it). Figures *1, 2*, ♀♀, Jodhpur; *3*, ♂, Debari near Udaipur *Row B* : Bharuch (Broach), south Gujarat. Type IA, cline (tail tip remaining well above the back but not outcurved, see text). Figures *4, 5*, ♀♀; *6*, juvenile (note the southern style in this sole individual in the group; all others members had the Northern style) *Row C* : Surat south Gujarat, below Bharuch; the Southern style begins here universally, Type IIA, figures *7-9*, ♀♀ *Row D*: Mahabaleshwar, Maharashtra. Type IIA, but distal tail arm tends to be shorter than at Surat. Figures *10*, ♀; *11*, ♂; *12*, ♀; *13*, ♂

N, north; S, south

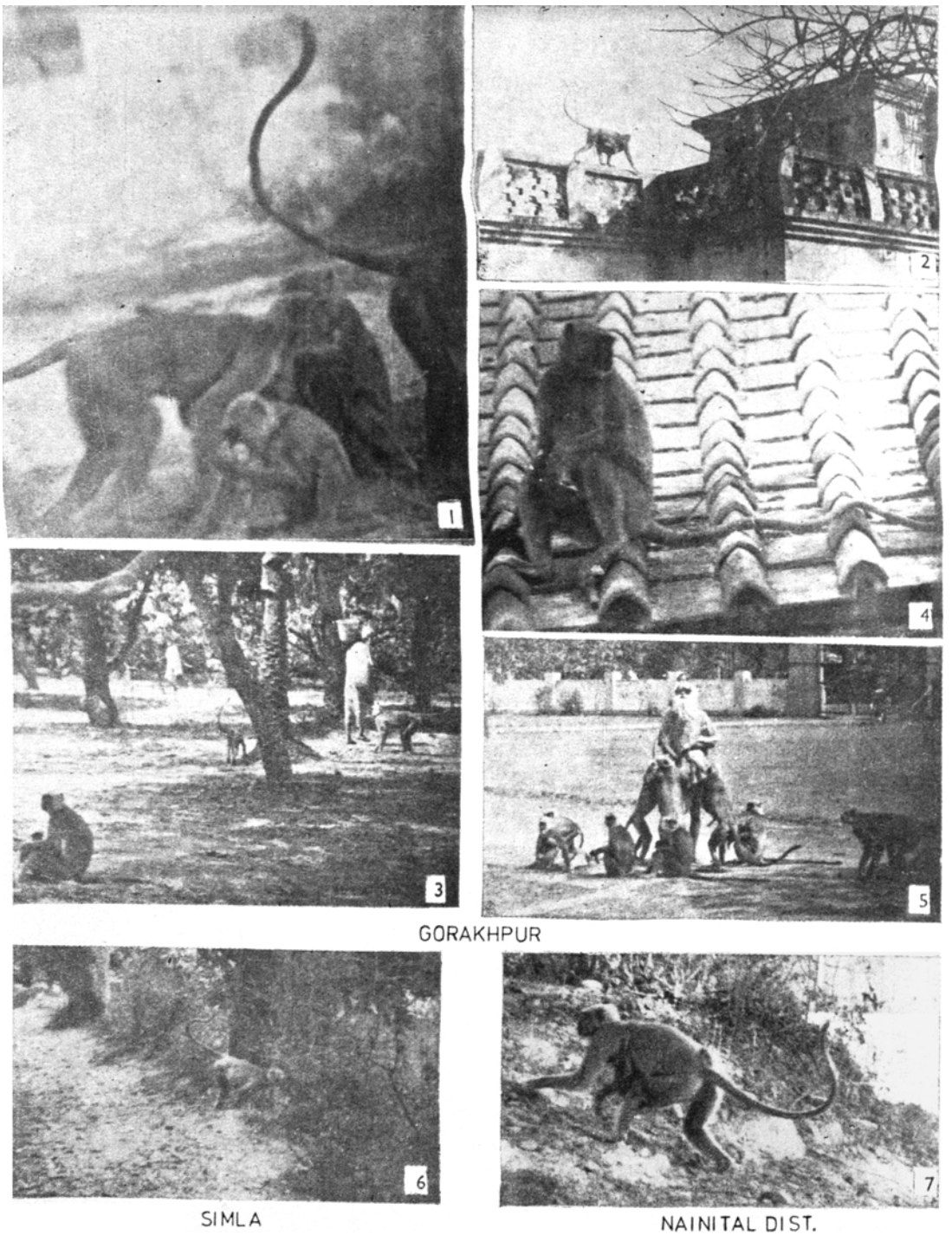

Plate 2 *Presbytis entellus schistaceous*, tail carriage. (1–5) Gorakhpur and vicinity, eastern Uttar Pradesh. *1*, A group in an orchard. Note the end-curve of tail in the standing langur on the right. *2*, In city: Female with infant, walking; *3*, Scattered group in orchard; *4*, Female, sitting on tiled roof in city. Note tail, stretched behind nonchalently; *5*, A sadhu feeding langurs in the compound of Gorakhnath temple; *6*, Simla (Himachal Pradesh). Slow running; *7*, Corbett National Park, Nainital district, Uttar Pradesh. Female with infant, walking on a slope

Type IB (in the Central Himalayan belt, *P. e. schistaceous*, etc.) where the tip is almost always markedly *outcurved.*

Strong clines in the Southern Type II: Some clinal tail characters have been quantified by Roonwal (in press, a) in a north-south direction. With the new data, it is now possible to discern the change over a wider range across some 13 degrees of latitude, from Surat in Gujarat (21.12 N) down to Polannaruwa in Sri Lanka (7.50 N), and a straight distance of some 1,860 km.

The characters measured, in lateral photographs, were: the proportionate lengths of the proximal (P) and distal (D) tail arms; the vertical distance (E) from tail tip to the maximum height of loop; the same (F) from tail base to the maximum height of loop; the same (G) from tail tip to base; and the ratios E/F and G/F. The behaviour of the clines is briefly as follows (fuller details can be seen in table 1 and figure 3).

The proportionate length of the proximal tail arm shows a gradual north-south rise from below 50% (averages 45.6%–49.4%) in the northern latitudes of about 21.12 N to 18.30 N (Surat, Pune) to well above 50% (up to *c.* 68%), in the extreme southern ones, the average change per degree of latitude (up to Mundanthurai, 8.43 N) being about 1.5%. From Mundanthurai to Sri Lanka there is a slight inexplicable fall. The distal tail arm shows a corresponding decline in length.

The ratio E/F shows a general north-south decline from near unity (0.83 at Surat, 21.12 N) to 0.26 in Sri Lanka (the Pune average of 2.03, at 18.31 N, is exceptional). The average decline per degree of latitude (ignoring the exceptional Pune value) is

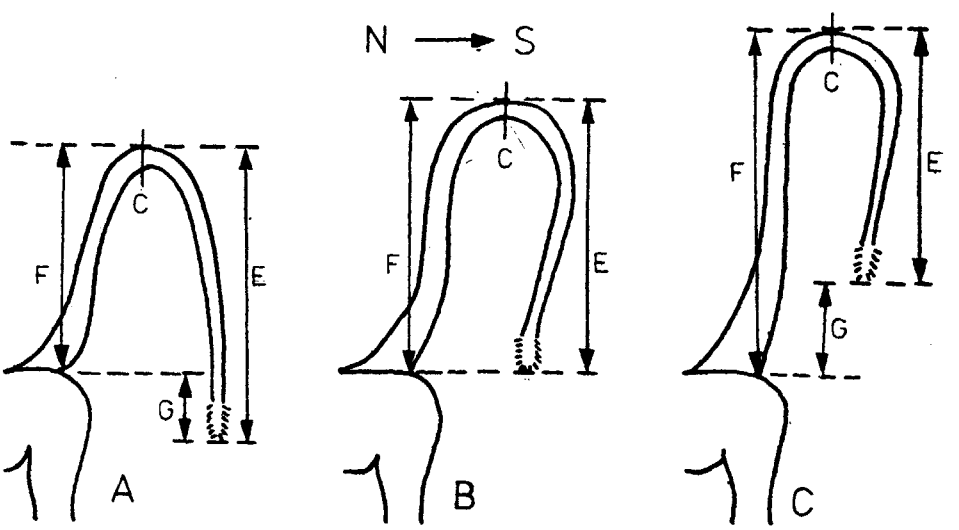

Figure 3 Some modes of tail carriage in *Presbytis entellus* in Peninsular India, to show the points for the measurement of various characters to quantify the north-south clinal variations

C, central point of tail toop, to separate the proximal and distal arms; vertical distance from maximum height of loop curvature to tail tip including tuft (E), and tail base (F); G, vertical distance of loop from tail tip including tuft to level of tail base (the value is considered as negative when the tail tip extends below the level of the tail base (figure A), positive when it remains above the base (figure C), and zero when the two are in the same level (figure B); N→S, north to south

Table 1 *Presbytis entellus* (*adults of both sexes*). *Summary of data on proportions and ratios of tail parts and their relative positions* (*Based on lateral photographs*)

Location (and number of examples)	Approximate latitude and longitude	Probable subspecies of *P. entellus*	Proportions (%) of two arms of tail (lengths along curves)		Ratios of vertical distances of tail parts		Remarks
			Proximal arm (P)	Distal arm (D)	Ratio E/F [Tail tip to maximum height of loop (E)/Tail base to maximum height of loop (F)]	Ratio G/F [Tail tip to tail base (G)/ Tail base to maximum height of loop (F)]	
1	2	3	4	5	6	7	8
Surat (Gujarat) (n=4)	21.12°N; 72.52 E	? *achates*	R. 44-55 Av. 49.4	R. 45-55.6 Av. 50.6	R. 0-1.30 Av. 0.83	R.—0.40 to+0.13 Av.—0.09	—
Pune [Poona] (Maharashtra) (n=3)	18.31°N; 73.55 E	*achates*	R. 42.6-47.5 Av. 45.6	R. 52.5-57.4 Av. 54.4	R. 1.4-2.7 Av. 2.03	R.—0.36 to—1.00 Av.—0.99	—
Orcha (Bastar District, Madhya Pradesh) (n=1)	18.05°N; 81.10 E	? *achates*	R. 52.8 Av. 52.8	R. 47.2 Av. 47.2	R. 1.0 Av. 1.0	R.0 Av. 0	—
Mahabaleshwar (Maharashtra) (n=6)	17.58°N; 73.43 E	*achates*	R. 47.5-61.4 Av. 55.2	R. 38.6-52.5 Av. 44.8	R. 0.48-1.33 Av. 0.82	R.—0.22 to +0.60 Av. +0.21	Taill tip blunt without tuft
Dharwar (Dharwar District, Karnataka) (n=2)	15.27°N; 75.05 E	? *achates*	R. 55-55.9 Av. 55.5	R. 44.1-45 Av. 44.6	R. 0.74-0.83 Av. 0.79	R. +0 13 to +0.26 Av. +0.195	—
Bandipur Wild Life Sanctuary (Karnataka) (n=1)	11.45°N; 77.30 E	*priam*	R. 61.0 Av. 61.0	R. 39.0 Av. 39.0	R. 0.51 Av. 0.51	R. +0.49 Av. +0.49	—
Mudumalai Wild Life Sanctuary (Tamil Nadu) (n=3)	11.30°N; 77.25 E	*priam*	R. 62.8-64.2 Av. 63.7	R. 35.8-37.2 Av. 36.3	R. 0.56-0.72 Av. 0.63	R. +0.44 to +0.63 Av. +0.52	—
Mundanthurai Wild Life Sanctuary (Tamil Nadu) (n=2)	8.43°N; 77.28 E	? *priam* or *thersites*	R. 66.1-69.8 Av. 67.95	R. 30.2-33.9 Av. 32.05	R. 0.33-0.42 Av. 0.38	R. +0.62 to +0.67 Av. +0.65	—
Polonnaruwa (Sri Lanka) (n=2)	7.50°N; 81.00 E	*thersites*	R. 64.6-65.2 Av. 64.9	R. 34.8-35.4 Av. 35.1	R. 0.15-0.36 Av. 0.26	R. +0.71 to +0.85 Av. +0.78	—

R, range; *Av.*, average; *n*, number of examples; —, tail below level of tail base, and +above tail base

c. 0.05. The ratio G/F registers a north-south rise from — 0.09 at Surat (21.12 N) (ignoring the exceptional values of —0.99 at Pune, 18.31 N), to + 0.78 in Sri Lanka, the average per degree of latitude being about 0.05. The position of the tail tip registers a gradual north-south rise from below the tail base to high above it.

Discussion

The new locality records have made it possible to obtain more precise information than was hitherto possible on a number of problems, as discussed above.

Clines in other characters: In the southernmost subspecies, *elissa*, *priam* and *thersites*, there is evidence of the presence a north-south cline in yet another character, viz., the presence of a hair tuft on the head. The tuft is first evident about 12 N latitude and becomes gradually accentuated as we move south until, in Sri Lanka, it is very prominent, assuming the shape almost of a high cone. Comparative measurements of the tuft are, however, not available so that it is not possible to quantify this character or correlate it with the tail cline. Similar gradations are noticeable in the extent of black colour on the hands and feet in some subspecies.

Redefinition of tail types (figure 4)

On the basis of the new data, tail types in respect of its carriage in the relaxed or

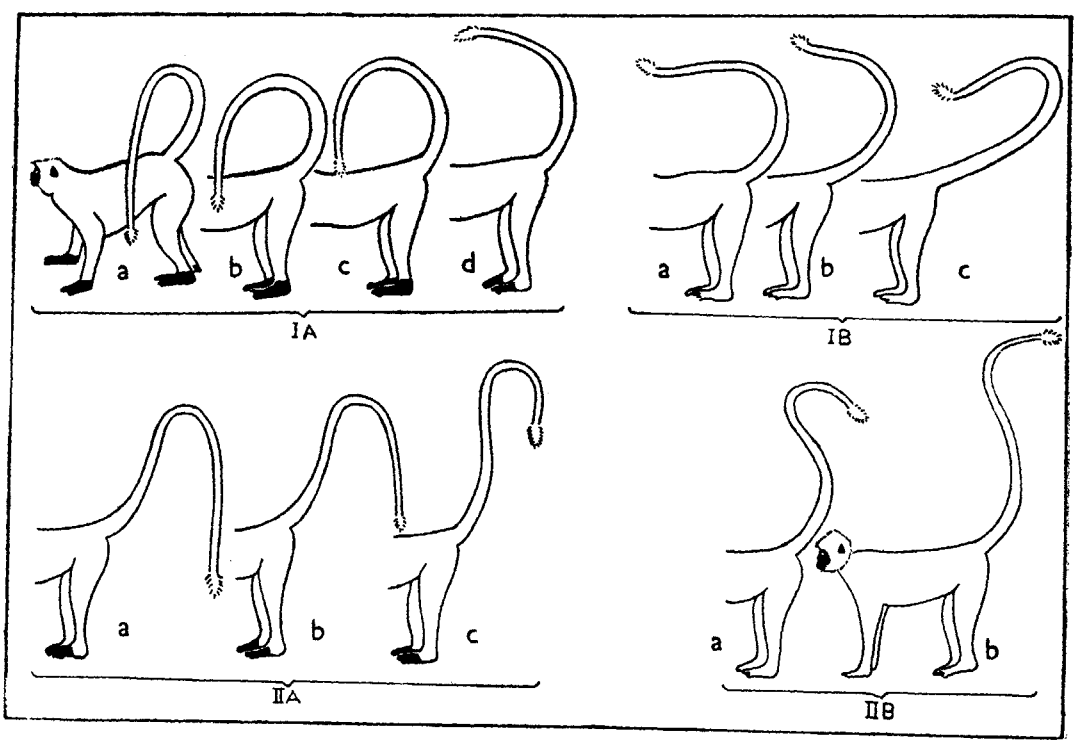

Figure 4 Types of tail carriage in *Presbytis entellus*, to show geographical and subspecific variations. [Modified from Roonwal 1979a, with the addition of new data; also see text.]. *Top row*: Northern Group I (tail looped forward). Type IA (subspecies *ajax* and *entellus*). Tail tip generally reaching the back or below it; sometimes remaining above it (figure IA, d). Type IB (subspecies *schistaceous* and *achilles*). Tail tip well above the back, tip outcurved. *Bottom row*: Southern Group, II (tail looped backward). Types IIA and B (several southern subspecies, showing clines). IIA, northern half of Peninsula; IIB, tail S-shaped, southern half of Peninsula and Sri Lanka

normal state (standing, walking) may be redefined as follows:

Type IA (subspecies *ajax* and *entellus*): Tail looped forward, the tip generally reaching the back or well below it (but sometimes remaining above it in a wide arc); in either case the extreme tip of the tail is *not* outcurved. Shows *weak* clines in this respect. Tail short to long (average length *c.* 123% —157% of head-and-body).

Type IB (subspecies *schistaceous* and *achilles*): Tail looped forward, the tip remaining well above the back; the extreme tip markedly outcurved (rarely not so). Tail short (average length *c.* 121%–136% of head-and-body).

Types II A and IIB (the southern groups of subspecies): Tail looped backward in a ∩ or S shape with the distal half longer than, subequal to, or shorter than the proximal half; in this respect a clear north-south quantifiable clinal gradation exists from shapes ∩ to S, and the separation of Types IIA and II B becomes rather arbitrary. Tail medium to long (average length *c.* 138%–159% of head-and-body).

Biological and evolutionary significance

When we consider the biological and evolutionary significance of the various types of tail carriage in *Presbytis entellus* and its geographical, subspecific and clinal variation, the following are the main theoretical conclusions which emerge:—

1. The two principal groups in respect of tail carriage are the Northern (Type I) and Southern (Type II), with dramatically different types of tail carriage, suggesting two broad genetic groupings, divided by a narrow, near-horizontal zone or Dividing Line, which runs across the entire width of continental India, from Gujarat to Orissa (figures 1 and 2).

2. At the western extremity, in Gujarat, the Satpura Range seems to mark the dividing line. Immediately north, runs the river Narmada near whose mouth lies Bharuch (Broach) on its northern bank. The Bharuch population is mainly 'Northern', but the find of a single juvenile with a southern tail style in an otherwise northern group suggests probable hybridisation. Some 80 km north of it lies Vadodara (Baroda) where the population is wholely northern. About 60 km south of Bharuch lies Surat on the southern bank of the river Tapti, and here the population is wholely southern. In the centre and the east the Dividing Line dips down appreciably.

3. In the absence of fossil evidence, it is difficult to be certain about the origin of the two major groups. I am inclined to the view that the species arose in the northern part of the Peninsula (with the southern, backwardly looped tail as its original style of carriage) during the Pleistocene and quickly spread south well before the separation of Sri Lanka (Ceylon) from the mainland in Sub-Recent times. (According to Wadia, 1965, "The island of Ceylon is a part of the Madras mainland, severed only in recent geological, even prehistoric, times", p. 153.) Here, owing to an abundance of isolated niches among hills and impenetrable evergreen forests, the species split up into numerous subspecies (10 in the South,* as against only 5 in the North, *vide infra*), and developed clinal variations by a process which may be briefly and diagrametically visualised as follows:

Isolation in small niches → Subspeciation → Reassociation and hybridisation between small groups → Clines

*The genetic process involved in the splitting up was probably random drift (or the Wright-Dubinin Effect)

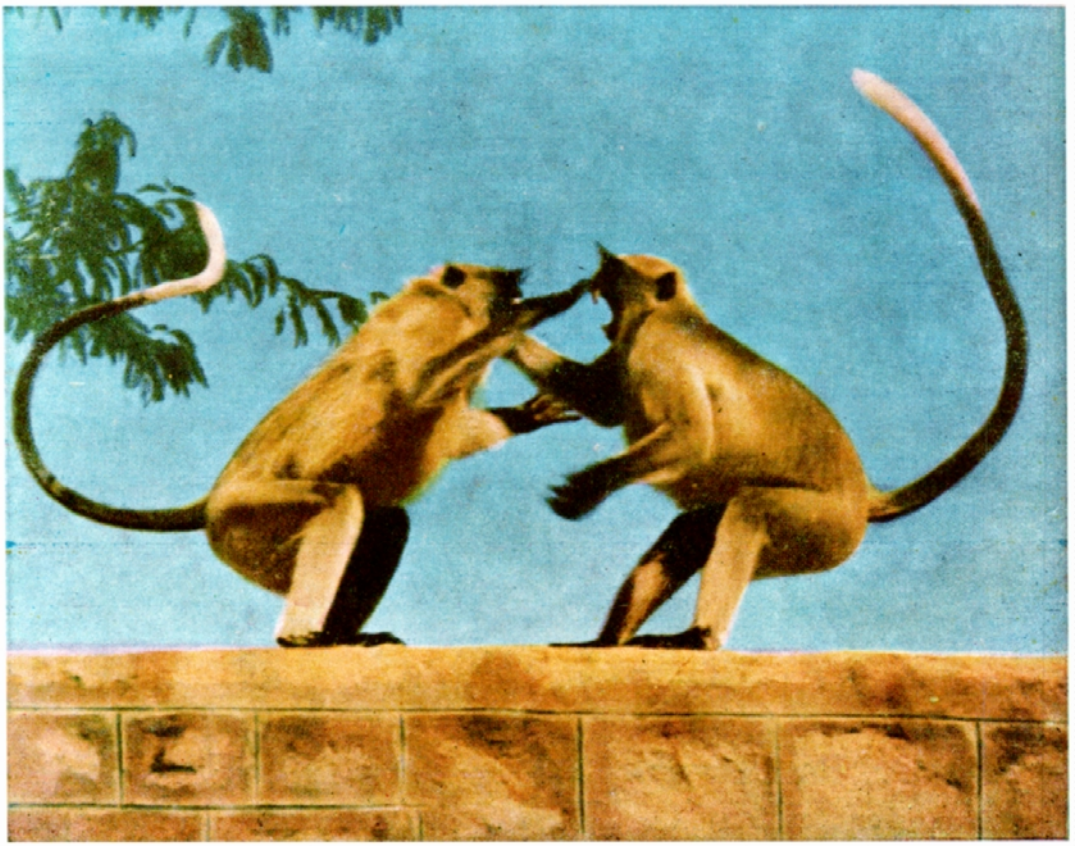

Plate 3 *Presbytis entellus entellus*, Jodhpur. Two adults during a severe fight, with mutual slapping. The tail, under stress, opens out (the normal relaxed carriage is as shown in plate 1, figure 1). (Ex Thorington.)

4. In the north-western part of the Peninsula, probably in the region between the rivers Narmada and Tapti, the species underwent a tail mutation and acquired a forward loop in place of the initial backward one. This mutant spread quickly, fanwise, over the Northern Plains. Once having entered the plains, there were few or no physical barriers, and the species quickly spread far and wide, as suggested by the wide extent and relative unformity of the single plains form, *P. entellus entellus*, with its distinctive tail style (Type IA).

5. On reaching the Sub-Himalayas, however, the species again encountered the conditions of isolation niches and difficult barriers (hills and forests), as it initially did in the Peninsula. And here, as a consequence, it developed not only *a few* closely related subspecies (suggesting recent origins), e.g., (*schistaceous, achilles*, etc.) but also a distinctive tail style (Type IB) which differs markedly from the plains style (Type IA).

6. The South, with a distributional land area of some 11,70,000 km^2, has 10 subspecies, and thus a much greater proliferation of subspeciation than the North where the species distributional area is one-and-a-half times greater (some 18,40,000 km^2) and only five subspecies have been evolved.

7. It is difficult to correlate tail styles with behaviour except in a limited way. The distinctive styles that have been discussed above are those occurring in the normal or relaxed state, as when the animals are standing or walking slowly. In repose (sitting) the tail simply hangs down limp and loose if the animals are sitting on a tree branch or a ledge, or lies full length nonchalently on the ground behind the animal (plate 2, figure 4). Under stress situations, as when the animals are running fast, climbing steep slopes or fighting each other, the tail loop opens out and becomes bow-shaped, and here a geographical difference is noticeable. In the Northern Group, with the tail looped forward, the tail bow is curved 'upward' (plate 3), while in the Southern Group it is curved 'downward'. During leaps, from tree to tree, the tail becomes stiff and straight like a rod behind the animal and probably serves as a balancing organ; no geographical differences are, however, noticeable here.

8. The position of the tail tip with respect to the back and the sides of the body varies with the type of tail carriage and also with the individuals within a type. As studied largely in the Jodhpur population (Type IA), there is a strong tendency towards individual constancy; sexual dimorphism is also evident, males showing less variation than females.

9. Where the tail trails down the sides, handedness comes into evidence and there is here considerable individual constancy in the left-right stance of the tail. These and allied aspects have been discussed by Roonwal (1979a) and Roonwal and Makwana (1976).

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