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INTRASPECIFIC GEOGRAPHICAL VARIATIONS IN THE INDIAN LONG-TAILED TREE MOUSE, *VANDELEURIA OLERACEA* (BENNETT)

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ABSTRACT

The authors described in this paper the intraspecific geographical variations in the Indian long-tailed tree mouse, *V. oleracca* (Bennett). The colour in different subspecies is also briefly described. External and cranial measurements in different populations of *V. oleracea* are also examined.

Bennett (1832) described the species *Mus oleraceus* from Dukhun (=Deccan, South India) on the basis of its having a very long tail as compared to the body. Later, Gray (1842) erected the genus *Vandeleuria*, with *M. oleraceus* Bennett as its type. Its generic characters are : Postero-internal cusp retained in first and second upper molars, hallux clawless and opposable, and fifth finger and toe also clawless. Since then a number of species and subspecies have been described from India, Burma, Sri Lanka and Nepal by Hodgson (1845), Blyth (1859), Jerdon (1867), Ryley (1914), Thomas (1914, 1915) and Phillips (1929). Ellerman (1963) recognized only one species, namely, *Vandeleuria oleracea*, and treated all others, namely, *dumeticola* Hodgson, *nilagirica* Jerdon, *spadicea* Ryley, *rubida* Thomas, *modesta* Thomas and *nolthenii* Phillips as its subspecies, and synonymized *wroughtoni* Ryley with the nominate subspecies, and *provensis* Hodgson, *badius* Blyth and *marica* Thomas with *dumeticola* Hodgson.

During the course of identification of rodents, we have come across several specimens of *Vandeleuria oleracea* from different accepted subspecific ranges of distribution, which according to extant literature, cannot be distinguished from one another. Hence, it was felt necessary to study the geographical variation of the species afresh, based on the material present in the Zoological Survey of India, the Bombay Natural History Society and the data available in literature. The results of our study are presented in this paper.

All measurements are in millimetres and have been taken after Ellerman (1963). The body and cranial measurements of about 200 specimens belonging to different populations were statistically analysed. The measurements of type-specimens, wherever available, have been taken into consideration. Population range diagrams (Fig. 1 to 5) for different external and cranial measurements have been prepared according to the methods of Dice and Leraas (1936) and Hubbs and Perlmutter

(1942). The length of each ordinate represents the extremes of each set of measurements and a central cross-bar the mean ; a narrow shaded rectangle represents a distance equal to one stan dard deviation from the mean on either side of the mean, while the broad rectangle represents a distance equal to twice the standard error of the mean on either side of the mean. The colour names given with initial capital letters in the text are after Ridgway (1886).

Observations

Colour : The colour in different subspecies is briefly described below.

Vandeleuria o. oleracea : Dorsum ranging from Broccoli-Brown to Wood Brown and in

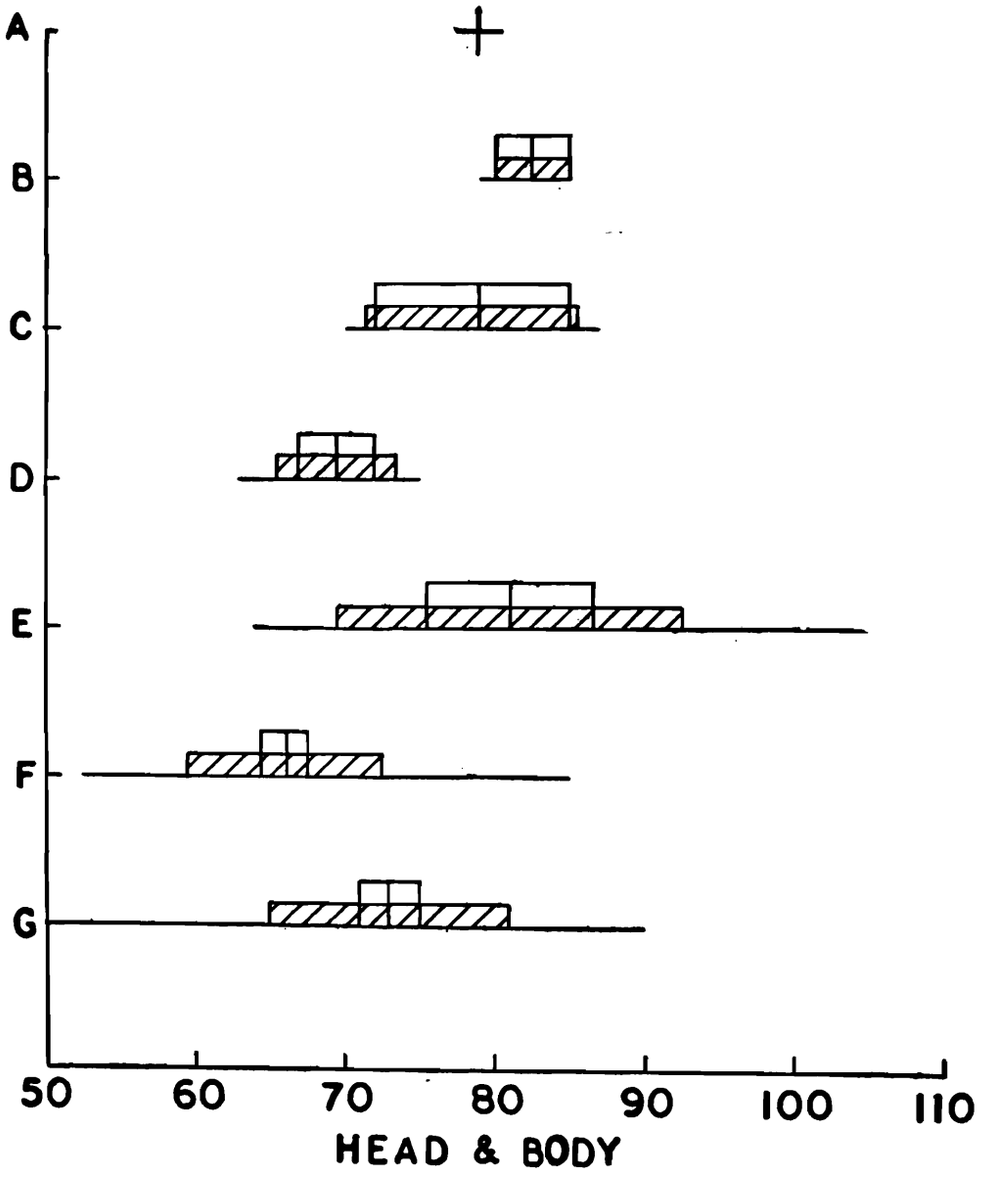

Fig. 1. Graphic comparison of head and body length (in mm) in seven populations of *Vandeleuria oleracea* (Bennett). A, *rubida* ; B, *spadicea* ; C, *nolthenii* ; D, *modesta* ; E, *nilagirica* ; F, *dumeticola* ; G, *oleracea*.

some light brown ; in two moulting specimens from Gwalior (Madhya Pradesh) Hair Brown. Sides slightly paler, no sharp line of demarcation between dorsum and venter. Ventral surface generally white, in some dirty white ; in many it is suffused with fulvous on chest and belly.

Vandeleuria o. dumeticola : Dorsum reddish ranging from pale Russet to deep Russet; in one specimen from Darjeeling and two from Bhutan Duars (West Bengal) light brown and in a specimen from Kathmandu (Nepal) Tawny Olive. A sharp line of demarcation present between dorsum and venter. Ventral surface generally white, sometimes inconspicuously suffused with fulvous on chest.

Vandeleuria o. rubida : The subspecies is known by the type-specimen only. Thomas (1914) described the colour as "dorsum bright rich rufous (Tawny of Ridgway).....sides paler,

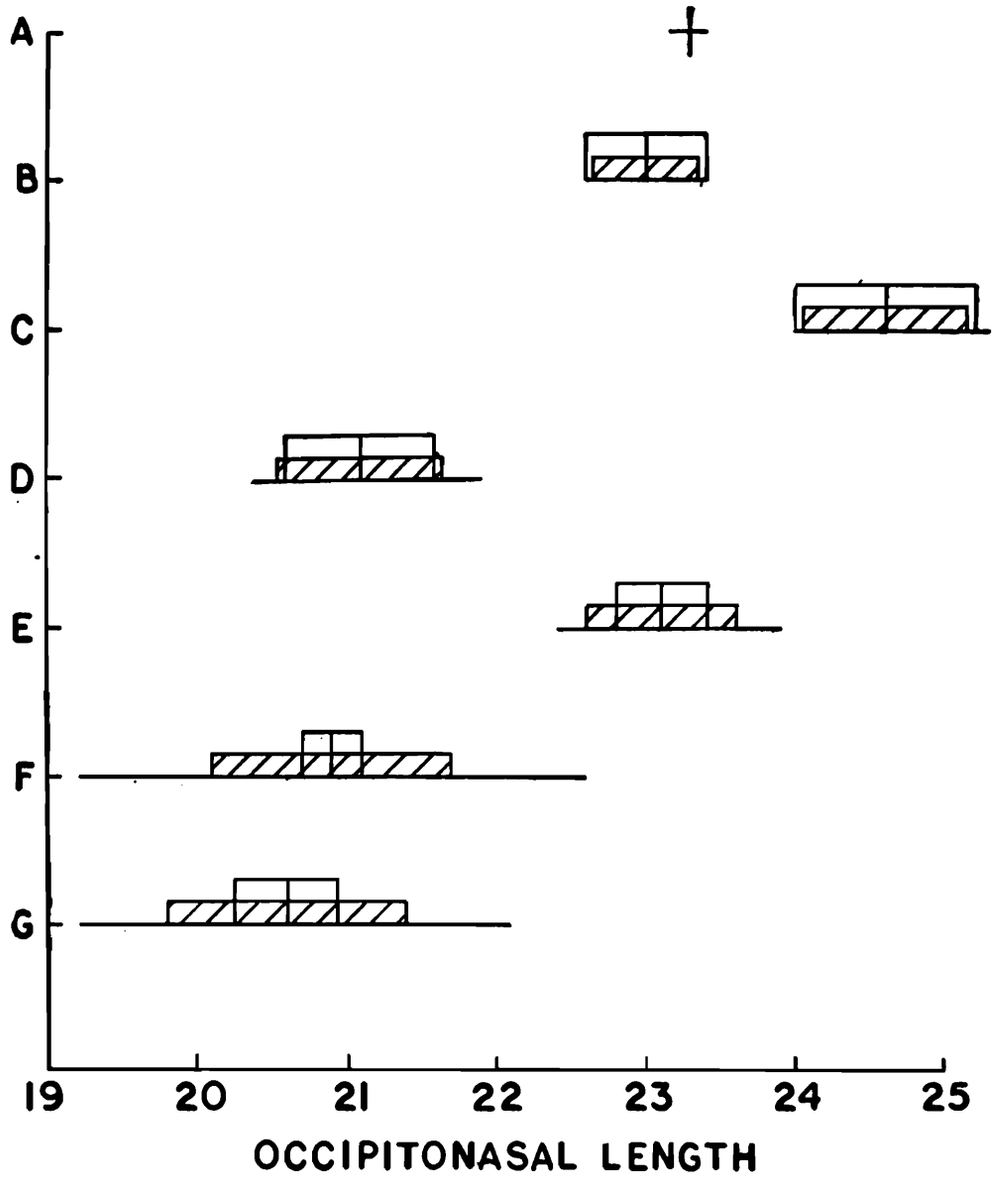

Fig. 2. Graphic comparison of length of tail as percentage of head and body in seven populations of *Vandeleuria oleracea* (Bennett).

edged with a narrow tawny line. Undersurface white, inconspicuously suffused with fulvous on belly"

Vandeleuria o. modesta : Dorsum ranging from Fawn (in two specimens from Ramnagar, Uttar Pradesh), Isabella (in one specimen from Ramnagar), pale Russet (in three specimens, one each from Ramnagar, Kalka and Nainital) to deep Russet (in one specimen from Nainital). Ventral surface white.

Vandeleuria o. nilagirica : Dorsum ranging from Broccoli Brown to Chestnut Brown. Ventral surface white, in some suffused with fulvous on belly. A line of demarcation present between dorsum and venter.

Vandeleuria o. spadicea : Dorsum paler, varies from pale sandy brown to light reddish fawn. Ventral surface white.

Vandeleuria o. nolthenii : Dorsum ranging from brown to dark brown. Venter bluish grey.

Tail uniformly brown all round in all the populations except in three specimens of *oleracea* (from Gwalior and Dharwar) and one of *dumeticola* (from Bhutan Duars) where undersurface is slightly paler. Hands and feet vary from dirty white, buffy, pale brown to dark brown irrespective of the localities.

Size : Head and body length : Head and body length is highly variable in all the popu-

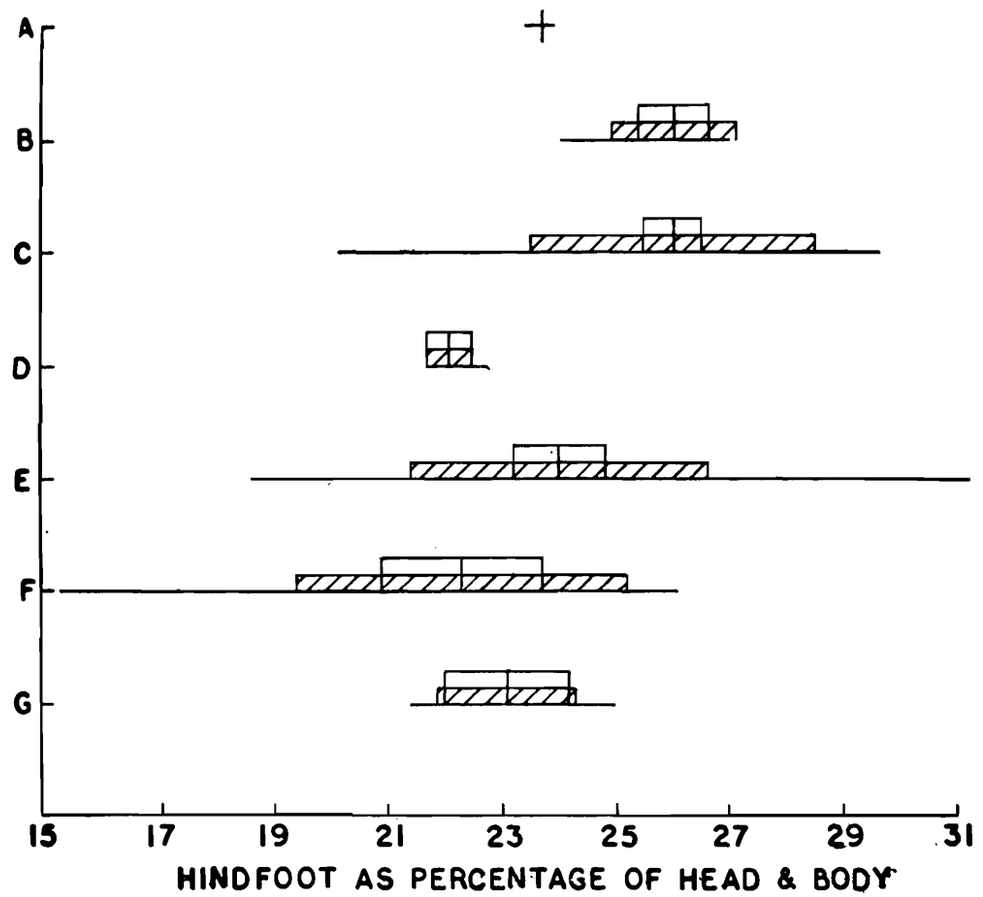

Fig. 3. Graphic comparison of length of hindfoot as percentage of head and body in seven populations of *Vandeleuria oleracea* (Bennett).

lations of *V. oleracea*. However, populations of *oleracea, dumeticola* and *modesta*, on an average, tend to be smaller (HB less than 75 mm.) than those of *rubida, spadicea, nilagirica* and *nolthenii* (HB more than 75 mm.). Further, *modesta* and *dumeticola* differ significantly from *rubida* in the head and body length (indicated by non-overlap of one standard deviation rectangles), but the latter population is known only by the type-specimen (Fig. 1).

Tail : Length of tail varies from 84 to 142 mm. As regards the absolute length of tail there is no difference between different populations. But the tail in relation to head

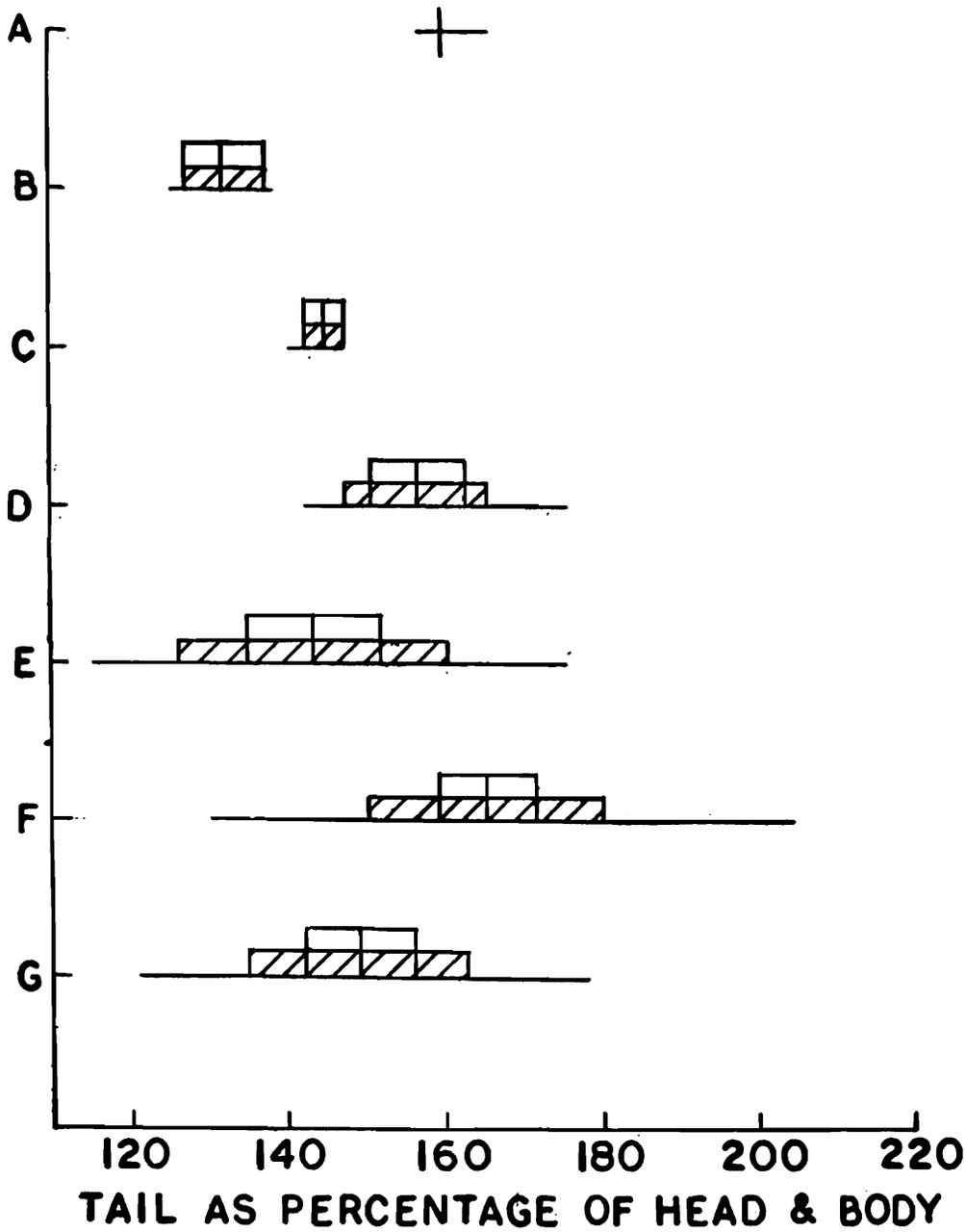

Fig. 4. Graphic comparison of occipitonasal length of skull (in mm) in seven populations of *Vandeleuria oleracea* (Bennett).

and body is, on an average, longer in *rubida, modesta* and *dumeticola* (more than 150%) than in *oleracea, nilagirica* and *spadicea.* However, the range of measurements from different subspecific zones overlap even at one standard deviation from the mean except for *spadicea* where the difference is significant (Fig. 2).

Hindfoot : Hindfoot in relation to head and body length is, on an average, longer in *modesta* and *dumeticola* (more than 25%) than in other populations (less than 25%). Although these differences are of probable significance (indicated by non overlap of the standard error rectangles of comparable lines) they are insufficient to warrant subspecific distinction (Fig. 3).

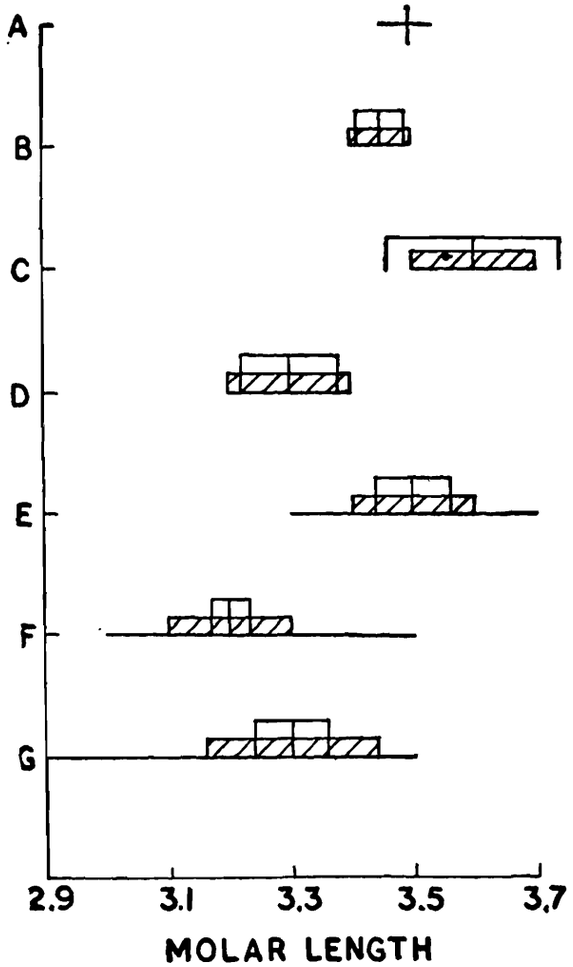

Fig. 5. Graphic comparison of molar length of skull (in mm) in seven populations of *Vandeleuria oleracea* (Bennett).

Skull : Small-sized, occipitonasal length ranging from 19.5 to 25.3 mm ; frontals considerably constricted ; supraorbital ridges poorly developed ; palate less than half of occipitonasal length ; bulla quite large, more than 16% of occipitonasal length. First and second upper molars retain the posterointernal cusp.

The description holds good for all its subspecies except in the occipitonasal length of skull which shows some variations. From the data available, two distinct divisions can be made on the basis of the occipitonasal length, *viz* ONL less than 23 mm. in *modesta, dumeticola* and *oleracea,* and ONL more than 23 mm in *rubida, spadicea, nilagirica* and *nolthenii,* being largest in the lattermost population (ONL more than 24 mm.) (Figs 4 & 5). The same tendency is reflected in their molar length.

Discussion

In the light of the above study it is obvious that *nolthenii* can be distinguished from all other populations by its ventral coloration being bluish grey as against white. Similarly, populations of northern India, namely, *modesta, rubida* and *dumeticola* differ from those of the southern India namely, *oleracea, spadicea* and *nilagirica* by their dorsal colour, which is generally brighter (Fawn, rufous or Russet) as against dull (ranging from sandy brown to Broccoli Brown).

Ellerman (1963) separated *modesta* from *dumeticola* on the paleness of the dorsum *viz* brown in the former and reddish in the latter. But the colour in specimens of *modesta* from

Ramnagar (type-locality) varies much from Fawn, Isabella to pale Russet and resembles *dumeticola* from many localities. Hence, the separation of *modesta* from *dumeticola* on the basis of colour is not justified.

Ryley (1914) differentiated *spadicea* from *oleracea*, and Ellerman (1963) separated it from *nilagirica* on the basis of its lighter dorsal coloration. But the dorsal colour in some specimens of *oleracea* from Gwalior, Nasik and Panchgani is as light as that of *spadicea*. Moreover, the type-specimen of *spadicea* is not so pale as the other topo-typic specimens. Hence, it is possible to get more specimens of this subspecies which are as dark as that of *oleracea*. As regards the colour difference between *spadicea* and *nilagirica*, it is only perceptible when a series of specimens of both the populations are kept side by side.

Analysis of the head and body length from different populations reveals that there is no significant difference between them in this character (Fig. 1). However, specimens of *rubida*, *spadicea*, *nilagirica* and *nolthenii* have a tendency of being larger which is clearly reflected in the occipitonasal length of their skulls.

Ellerman (1963) distinguished *dumeticola*, *modesta* and *rubida* from *oleracea*, *spadicea*, *nilagirica* and *nolthenii* on the relative length of their tail. But it is obvious from the statistical analysis (Fig. 2) that this cannot be treated as a distinguishing character for differentiating the two groups of populations.

TABLE 1. External measurements in different populations of *Vandeleuria oleracea* (Bennett). Range, mean ±2 Standard error ; sample size in parentheses

	Head & body	Tail as % of HB	Hindfoot	Hindfoot as % of HB	Ear
V.o. oleracea	50—90 73±2 (53)	121—178 149±3.6 (53)	14—20 17.5±.32 (51)	18.6—31.2 24±0.74 (51)	12—18 15±0.3 (51)
V.o. dumeticola	53—85 66±1.4 (88)	130—204 165±3.2 (88)	15—20 17±0.22 (88)	20.1—30.6 26±0.54 (88)	11—16 14±0.16 (88)
V.o. modesta	63—75 69.5±2.4 (10)	142—175 156±6 (10)	17—19 18±0.48 (10)	24—27 26±0.65 (10)	14—15 14.5±0.3 (10)
V.o. rubida	78	159	18.5	23.7	15
V.o. spadicea	79—85 82.5±2.2 (4)	125—138 131±4.9 (4)	18—19 18.2±0.44 (4)	21.7—22.8 22.1±0.4 (4)	15—16 15.5±0.5 (4)
V.o. nilagirica	64—105 81±5.4 (18)	115—175 143±8.5 (18)	15—20.5 18±0.85 (17)	15.2—26.1 22.3±1.4 (17)	13—19 16±0.66 (18)
V.o. nolthenii	70—87 79±6.8 (5)	140—147 144±2.4 (5)	15—20 18.5±2.2 (5)	21.4—25 23.1±1.1 (5)	13—14 13.4±.44 (5)

TABLE 2. Cranial measurements in different populations of *Vandeleuria oleracea* (Bennett). Range, mean ±2 Standard error ; sample size in parentheses.

	Occipitonasal	Toothrow
V.o. oleracea	19.2—22.1 20.6±0.34 (23)	2.9—3.5 3.3±0.06 (23)
V.o. dumeticola	19.2—22.6 20.9±0.2 (59)	3—3.5 3.2±0.03 (59)
V.o. modesta	20.3—21.9 21.3±0.4 (6)	3.2—3.4 3.3±0.08 (6)
V.o. rubida	23.4	3.5
V.o. spadicea	22.6—23.4 23±0.4 (3)	3.4—3.5 3.45±0.05 (3)
V.o. nilagirica	22.4—23.9 23.1±0.5 (11)	3.3—3.7 3.5±0.06 (11)
V.o. nolthenii	24—25.3 24.6±0.6 (3)	3.5—3.7 3.6±0.14 (3)

There is neither any difference in the length of hindfoot nor in the ear in different populations.

Ellerman (1963) differentiated *rubida* from *dumeticola* (occipitonasal length more than 23 mm. *vs.* less than 23 mm.) and *spadicea* and *nilagirica* from *oleracea* (ONL more than 22 mm. *vs.* less than 22 mm.) on the length of skull. From our analysis of the occipitonasal length, it is clear that *nothenii*, *nilagirica*, *spadicea* and rubida have occipitonasal length greater than that of *oleracea*, *dumeticola* and *modesta* (Fig. 4). But *rubida* and *spadicea* are known only from the type-locality and are represented by only one and four specimens respectively. Hence, it is not improbable to get smaller specimens from these localities, similar to those of *dumeticola* or *oleracea*. However, on the basis of the present material *rubida* and *spadicea* are maintained as subspecies distinct from *dumeticola* and *oleracea* respectively by large size of their skull. As regards *modesta* and *dumeticola* there is neither any difference in coloration nor in body and skull measurements. Therefore, we would treat *modesta* as a synonym of *dumeticola*.

A key to identification of the subspecies of *Vandeleuria oleracea* as recognized by us is given below.

1. Underparts bluish grey ...*nolthenii*
   Underparts white. ...2
2. Colour of dorsum bright, being fawn, rufous or Russet ...3
   Colour of dorsum brownish ...4
3. Size large, occipitonasal length more than 23 mm ...*rubida*.

Size small, occipitonasal length less than 23 mm .....*dumeticola* (*modesta*).

4. **Size large, occipitonasal length more than 22.4 mm ...5.**

   Size small, occipitonasal length less than 22·4 mm ...*oleracea*

5. **Colour of dorsum pale sandy brown ...*spadicea*.**

   Colour of dorsum Broccoli Brown to Chestnut Brown ...*nilagirica*.

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