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Annals and Magazine of Natural History: Series 7

Publication details, including instructions for authors and subscription information:

<http://www.tandfonline.com/loi/tnah13>

LXIX.—Notes on the various Forms of *Arvicanthis pumilio*, Sparrm

R. C. Wroughton

Published online: 01 Dec 2009.

To cite this article: R. C. Wroughton (1905) LXIX.—Notes on the various Forms of *Arvicanthis pumilio*, Sparrm , *Annals and Magazine of Natural History: Series 7*, 16:96, 629-639, DOI: [10.1080/03745480509443306](https://doi.org/10.1080/03745480509443306)

To link to this article: <http://dx.doi.org/10.1080/03745480509443306>

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the margins of both wings; a black spot at the end of each cell; no other markings.

Expanse of wings $1\frac{8}{10}$ inch.

Kashmir; one example.

Family Geometridæ.

Microloxia vestigiata, nov.

♂. Palpi above orange-red, whitish beneath; antenæ orange, shafts and base white; frons orange-red, with a pale band; top of head and abdomen ochreous white; thorax and wings of a uniform pale grass-green; costal line of fore wings pale ochreous white; cilia white, no markings above or below: body below white; legs tinged with ochreous.

Expanse of wings $1\frac{4}{5}$ inch.

Kashmir; three examples.

LXIX.—*Notes on the various Forms of Arvicanthis punilio, Sparrm.* By R. C. WROUGHTON.

THE Natural History Museum possesses a very fine series of specimens of this common South-African mouse, amounting to over 130 individuals from more than thirty localities. The majority of these and the best prepared have been obtained by Mr. C. H. B. Grant in connexion with the exploration of the mammal fauna of South Africa now being carried on by Mr. C. D. Rudd, by whom they have been presented to the Museum. Those from Deelfontein were obtained by the same collector working for Col. Sloggett, and other smaller series are due to Mr. F. C. Selous, Mr. J. H. Polliott Darling, Sir H. H. Johnston, Mr. R. B. Woosnam, Dr. W. J. Ansorge, Mr. F. J. Jackson, and others.

A detailed examination of this collection has satisfied me that the general pattern of the coloration in this species (or group of species) is, without exception, absolutely constant in all the forms, which are spread over Africa south of the Equator.

The coloration, on the other hand, is almost as variable as the pattern is constant. From one or two localities there are series which are fairly evenly coloured, but in the majority of cases there are almost as many variations of colour as there are individuals in a series.

I have found, however, that the size of the bullæ furnishes

a reliable character on which to base a differentiation of forms, which agrees very fairly with their geographical distribution, and have thus been able to distinguish four groups with bullæ whose antero-posterior lengths are respectively 6·5, 6, 5·5, and 5 mm.

Group I. covers the country, roughly speaking, south of 25° S. lat. and west of 25° E. long.

Group II. runs along the coast from the Cape to Zululand, but a form of this group crops up in Angola. The area directly north of Group I. is unrepresented in the collection except by a single specimen from Matopo, but this specimen falls also into Group II.

Group III. occupies the whole of the country north of 25° S. lat. and east of 25° E. long, except in two small isolated patches.

Group IV., so far, is represented by specimens from two isolated areas, viz. :—

1. Basutoland, and a small area adjoining, along the crest of the Drakensberg.

2. The Mlangi Plateau, Nyasaland.

The specimens from both these localities are labelled "6000' Alt.," and possibly even this altitude is a comparatively lower level surrounded by still greater heights; it certainly is so in the case of the Basutoland specimens. In any case, however, this group is evidently a high-level form.

Each of these groups contains, as will be seen, more than one form, and I have found it very difficult to decide as to the systematic status which should be given to these forms. I think that each of these four groups should probably rank as a species; but if *pumilio* is once broken up consistency would require that other species besides these should be formed (e. g. *pumilio* and *vittatus*, both taken at Cape Town, &c.). I have come to the conclusion that, in view of the absolute identity of pattern, the variability of coloration, and the difficulty of deciding the inter-relationship of the different forms, the simpler and safer way is to call them all subspecies of the original species *pumilio*.

The following is a key to the various forms I have been able to differentiate:—

- | | |
|---|---------------------------------|
| A. Antero-posterior length of bullæ 6·5 mm. | |
| a. Hind foot 27 mm. or more | <i>bechuana</i> , Thos. |
| b. Hind foot less than 27 mm. | |
| a ¹ . Length of tooth-row 5 mm. | |
| a ² . Hind foot 25 mm. or more | <i>cinereus</i> , Thos. & Schw. |
| b ² . Hind foot at most 25 mm. | <i>meridionalis</i> , subsp. n. |
| b ¹ . Length of tooth-row 4·6 mm. | <i>grivica</i> , subsp. n. |

- B. Antero-posterior length of bullæ 6 mm.
- a. Length of tooth-row 4·8 mm.
 - a¹. Basilar length of skull 24 mm. *pumilio*, Sparrm.
 - b¹. Basilar length of skull 21 mm. (?) *vittatus*, Wagner.
 - b. Length of tooth-row less than 4·8 mm.
 - a¹. Hind foot 23 mm.; basilar length of skull 23 mm.; length of tooth-row 4·7 mm. *angolæ*, subsp. n.
 - b¹. Hind foot 22 mm.; basilar length of skull 21·5 mm.; length of tooth-row 4·6 mm. *intermedius*, subsp. n.
 - c¹. Hind foot 21 mm.; basilar length of skull 20 mm.; length of tooth-row 4·5 mm. (Matopo specimen.)
- C. Antero-posterior length of bullæ 5·5 mm.
- a. Hind foot 22 mm.; basilar length of skull 24 mm.; length of tooth-row 4·5 mm. *Chakæ*, subsp. n.
 - b. Hind foot 20 mm.; basilar length of skull 23·5 mm.; length of tooth-row 4·5 mm. *diminutus*, Thos.
 - c. Hind foot 20 mm.; basilar length of skull 22 mm.; length of tooth-row 4·4 mm. *dilectus*, de Wint.
- D. Antero-posterior length of bullæ 5 mm.
- a. Brighter coloured. Basutoland *Moshesh*, subsp. n.
 - b. Sombre-coloured. Nyasa *nyasæ*, subsp. n.

Arvicanthis pumilio bechuanae.

Isomys pumilio bechuanae, Thomas, P. Z. S. 1892, p. 551.

57. 1. 28. 10. "Bechuanaland." (Type.)

81. 3. 8. 8. ♀. Great Namaqualand.

The type specimen is a very old one, and the skull is not available, but the enormous hind foot is alone sufficient to differentiate this form from any other.

Arvicanthis pumilio cinereus.

Arvicanthis pumilio cinereus, Thos. & Schw. P. Z. S. 1903, vol. ii. p. 336.

4. 2. 3. 68-74. Klipfontein, Namaqualand. Alt. 3101'. Rudd Collection.

98. 9. 3. 5-7. Garies, Namaqualand. (No skulls.) Dr. R. Broom.

In the original description the length of the hind foot is given, from the collector's label, as 28 mm., but this measurement is not, I think, reliable; measured on the specimen, the majority of the series show a hind foot of 26 mm. or slightly over. Judging from the other dimensions recorded by the collector, the tail in this form is slightly longer than the head and body.

The following are the normal dimensions of an adult individual:—

Head and body 120 mm.; tail 125; hind foot 26.

Skull: basilar length 24; length of tooth-row 5; ant.-post. length of bullæ 6·5.

The following are measurements taken on a few selected specimens:—

			Hind foot.	Basilar length of skull.	Length of tooth-row.	Bullæ.
4. 2. 3. 69.	♂.	V. old*	26	24·5	5	6·5
4. 2. 3. 74.	♀.	Old	26	24	5	6·5
4. 2. 3. 70.	♂.	Y. adult	26	23	5	6·5
98. 9. 3. 5.	♂.	?	27	?	?	?

Arvicanthis pumilio meridionalis, subsp. n.

95. 9. 3. 11–12. Rondebosch, Cape Town. F. C. Selous.

3. 7. 2. 32, 34. Tokai Retreat, Cape Town. Alt. 600'.
Rudd Exploration.

2. 9. 1. 63. Deelfontein. Col. Sloggett.

The normal dimensions of this form are:—

Head and body 125 mm.; tail 120; hind foot 25.

Skull: basilar length 24; length of tooth-row 5; bullæ 6·5.

This form differs but little in dimensions from *cinereus* except that the hind foot is slightly but constantly shorter.

Whereas *cinereus*, however, is one of the few forms which are constant in their coloration, in which there is no trace of rufous or fulvous, *meridionalis*, on the other hand, has no two individuals alike, though all are markedly tinged with fulvous.

The following are dimensions taken from selected specimens of *meridionalis*:—

			Hind foot.	Basilar length of skull.	Length of tooth-row.	Bullæ.
95. 9. 3. 11.	♂.	Old	25	24·3	5	6·5
95. 9. 3. 12.	♂.	Adult ..	25	23·5	5	6·5
(Type) 3. 7. 2. 34.	♀.	V. old ..	25	24	5	6·5
2. 9. 1. 63.	♂.	Adult ..	24	23	5	6·5

Arvicanthis pumilio griquæ, subsp. n.

4. 10. 1. 61, 4. 4. 8. 15–21. Kuruman, Bechuanaland.
Alt. 4000'.

* These age classes throughout this paper are:—Young: basilar suture not closed. Y. adult: all teeth unworn. Adult: posterior molar worn. Old: all teeth slightly worn. V. old: teeth worn flat.

4. 1. G. 4-7. Abraham's Kraal, Modder River. Alt. 4500'.

? 97. 1. 13. 1. Kimberley, O.R.C.

This form is exceptionally constant in its coloration, but the modifying tinge is rufous rather than the ordinary fulvous.

The normal dimensions may be taken to be as follows:—

Head and body 115 mm.; tail 110; hind foot 24.

Skull: basilar length 22; length of tooth-row 4·6; bullæ 6·5.

The following are actual measurements of some selected specimens:—

		Hind foot.	Basilar length of skull.	Length of tooth-row.	Bullæ.
(Type)	4. 1. G. 5. ♀. Old	24	22	4·6	6·5
	4. 4. 8. 15. ♂. V. old ..	24	22	4·6	6·5
	4. 4. 8. 20. ♀. Y. adult.	23	20·5	4·6	6·5
	97. 1. 13. 1. ♂. Old	24	23	4·6	6·5

The Kimberley specimen has an abnormal length of skull, but as by its other measurements and geographically it belongs here, I have ranked it as *griqua*.

Arvicanthis pumilio.

Mus pumilio, Sparrman, Vet.-Akad. Handl. 1784, p. 339.

Arvicola pumilio, Desmarest, Mamm. 1822, p. 285.

Mus pumilio major, Brants, Muiz, 1827, p. 103.

Mus lineatus, Cuv. Mamm. 1829, pl. clxi.

Mus Donovanii, Donovan, Nat. Repos. 1834, vol. iii. pl. lxxiii.

Mus septemvittatus, Schinz, Synops. Mamm. ii. 1845, p. 155.

Mus striatus, Sundeval, Cefv. Vet.-Ak. For. Stockh. 1846, p. 88.

The *Mus pumilio major* of Brants is said to come from the country interior to Cape Town and it is stated that it does not occur in Cape Town itself, while the habitat of *Mus Donovanii* is given as "the same part of Africa" as that from which Sparrman's *Mus pumilio* came. There is nothing in either description by which any particular form can be recognized, and both descriptions give a length of head and body of $5\frac{3}{4}$ inches (say 145 mm.). No specimen in the Museum collection reaches even 130 mm. Under these circumstances there is nothing for it but to rank both names as synonyms of "*pumilio*." As Sparrman erected *pumilio* on a quite immature specimen, I am compelled to select as the representative of typical *pumilio* the specimen which nearest coincides with it in habitat. Sparrman states that

he obtained his specimens "in the Sitsicamma Forest hard by Slangen River," and his map shows that the "Sitsicamma" district extended along the shore of Algoa Bay as far as Cape Padrone, just short of which "Slang River" entered the sea. In the Museum collection are some specimens received from the Grahamstown Museum and labelled "Uitenhage" and "Fish River"; these, therefore, being practically topotypes, may be accepted as typical *pumilio*. This being so, I recognize the following specimens in the collection as being typical *pumilio* :—

97. 11. 5. 26-30. Uitenhage, C.C.

5. 5. 7. 67-75. Knysna, C.C. Alt. 1400'.

3. 6. 2. 14, 15. Port St. John, Pondoland.

4. 12. 3. 81. Umfolosi, Zululand. Alt. 230'.

3. 7. 2. 23, 25, 26, 28. Newlands, Cape Town. Alt. 700'.

3. 7. 2. 29-31. Tokai Retreat, Cape Town. Alt. 50-500'.

The normal dimensions of *A. pumilio* may be taken to be as follows :—

Head and body 120 mm.; tail 116; hind foot 24.

Skull: basilar length 24; length of tooth-row 4.8; bullæ 6.

The series from Knysna are quite constant in colour amongst themselves and show almost no tinge of either fulvous or rufous; they are probably a forest form, and it is noticeable that they come from a markedly higher elevation than the others. The remainder show the usual individual variation in the amount of fulvous colouring. The following are measurements of some selected specimens :—

			Hind foot.	Basilar length of skull.	Length of tooth-row.	Bullæ.
97. 11. 5. 28.	♀.	V. old	24	?	4.8	6
5. 5. 7. 70.	♂.	Y. adult	24	23	4.8	6
5. 5. 7. 73.	♂.	V. old	24	24.3	4.8	6
3. 6. 2. 15.	♀.	V. old	24	24	4.8	6
4. 12. 3. 81.	♀.	Old	24	24.3	4.8	6
3. 7. 2. 23.	♂.	Adult	24	24	4.8	6
3. 7. 2. 31.	♂.	Old	24	23.5	4.8	6

Unfortunately the Grahamstown Museum skulls are much broken and in no case is the "basilar length of skull" available; but the one whose dimensions are given above has a "greatest length" of 30 mm., which is about the same as that of all the others in the table.

The following specimens—

		Hind foot.	Basilar length of skull.	Length of tooth-row.	Bullæ.
3. 7. 2. 22.	Y. adult	24	20.5	4.8	6
3. 7. 2. 21.	Y. adult	24	20.5	4.8	6
3. 7. 2. 27.	Young	24	19	4.8	6
3. 7. 2. 33.	Adult	24	21.6	4.8	6

—among those taken at Cape Town seem to point to a distinct form having a far shorter head than *pumilio*. Unfortunately all the specimens are comparatively young. I have given the antero-posterior length of bullæ in these specimens as 6, but it is, I believe, slightly less, though greater than 5.5; this measurement is a difficult one to take uniformly, and I have not dared to record differences of less than $\frac{1}{2}$ mm. Should the receipt of more specimens, especially old ones, show later that this is a good form, the name of *vittatus*, Wagner (Arch. Naturg. viii. 1842, p. 11), is, perhaps, available for it, the name having been based on specimens from the Cape "Promontory"; till then I fear *vittatus* must rank as a synonym of *pumilio*.

Arvicanthis pumilio intermedius, subsp. n.

2. 9. 1. 62, 65, 69-71.	} Deelfontein.
3. 1. 4. 52-55.	
1. 7. 9. 35, 36.	

This is a form which combines some characters from each of its neighbours, *griguæ* on the north and *pumilio* on the east. From the former it differs by its smaller hind foot and bullæ and from the latter by its smaller hind foot and tooth-row. It is most variable in its coloration, no two specimens being exactly alike, and, judging from collector's measurements, the tail is slightly longer than the head and body.

The normal dimensions may be taken as:—

Head and body 105 mm.; tail 108; hind foot 22.

Skull: basilar length 21.5; length of tooth-row 4.6; bullæ 6.

The measured dimensions of some selected specimens are as follows:—

		Hind foot.	Basilar length of skull.	Length of tooth-row.	Bullæ.
	2. 9. 1. 69. ♀. Old....	22	?	4.6	6
	2. 9. 1. 70. ♀. Y. adult.	22	20.5	4.6	6
	2. 9. 1. 71. ♀. Adult..	22	21	4.6	6
(Type)	3. 1. 4. 53. ♂. Y. old..	22	21.5	4.6	6
	1. 7. 9. 35. ♀. Old....	22	21.5	4.6	6

Arvicanthis pumilio angolæ, subsp. n.

5. 5. 9. 41-46. Caconda, Angola. Alt. 4700'.

This form, though belonging to the group with medium bullæ, is completely separated from the other members of the group noticed above. It is rather smaller all round than *pumilio* and has a fairly constant though dull coloration, resembling that of *dilectus*. The tail is apparently markedly shorter than the head and body, much more so than in any other form.

The normal dimensions may be put as:—

Head and body 118 mm.; tail 95; hind foot 23.

Skull: basilar length 23; tooth-row 4.7; bullæ 6.

The skulls are unfortunately much broken and the actual basilar length cannot be measured in any one of them; but the greatest length and zygomatic breadth are about 28 and 13.5 mm. against 30 and 14 in *pumilio*. I have therefore taken 23 mm. as the probable "basilar length of skull." The following measurements are from selected specimens:—

		Hind	Basilar	Length of	Bullæ.
		foot.	length of	tooth-row.	
			skull.		
5. 5. 9. 43. ♀.	Adult ..	23	?	4.7	6
(Type) 5. 5. 9. 45.	Old	23	?	4.7	6

There is a single specimen from Matopo with dimensions as follows:—

	Hind	Basilar	Length of	Bullæ.	
	foot.	length of	tooth-row.		
		skull.			
4. 10. 1. 87. ♀.	Adult	21	19.5	4.5	6

and the label gives—head and body 89 mm.; tail 96.

I do not venture to give a specific name to this form represented by only a single specimen (and that a comparatively young individual), but have thought the existence of this specimen worthy of record as seeming to indicate that the country west of *dilectus* and north of Group II. will be found, when examples from it are available, to be peopled by a form with medium-sized bullæ, linking up this specimen with *angolæ*.

Arvicanthis pumilio Chakæ, subsp. n.

4. 5. 1. 68-74. Sibudeni, Zululand. Alt. 3500'.

4. 12. 5. 27-29. Estcourt, Natal. Alt. 4500'.

4. 6. 6. 14, 15. Notinsila, Pondoland.

4. 9. 1. 62, 65-67. Wakkerstroom, Transvaal. Alt. 6000'.

4. 9. 1. 61. Zuurbron, Transvaal. Alt. 4600'.

This form has slightly larger teeth than the other forms with small bullæ. It appears to range between the Drakensberg and the coast at somewhat high elevations, meeting the form of Basutoland and the Eastern Transvaal at Wakkerstroom. The Pondoland and Natal specimens are dull-coloured as compared with the more northern individuals, but there is much variation in colour.

The normal dimensions may be taken as:—

Head and body 115 mm.; tail 105; hind foot 22.

Skull: basilar length 23; tooth-row 4·6; bullæ 5·5.

The following are some measurements of selected specimens:—

			Hind	Basilar	Length of	Bullæ.
			foot.	length of	tooth-row.	
				skull.		
	4. 5. 1. 65.	♀. Y. adult..	22	22	4·6	5·5
	4. 5. 1. 68.	♀. V. old ..	22	24	4·6	5·5
(Type)	4. 5. 1. 72.	♂. Old.....	22	23	4·6	5·5
	4. 6. 6. 14.	♂. V. old ..	22	23·5	4·6	5·5
	4. 9. 1. 62.	♂. V. old ..	22	24	4·6	5·5
	4. 12. 5. 27.	♂. Adult ..	22	22·5	4·6	5·5

I have named this form after Chaka, the famous Zulu chief.

Arvicanthis pumilio dilectus.

Arvicanthis pumilio dilectus, de Wint. P. Z. S. 1896, p. 803.

95. 11. 3. 25-27. Mazoe, Mashonaland. Alt. 4000'.

1115, 1117, 1118, 1122, 1123, 1135, 1140, 1150. Zoutpansberg, Transvaal. Alt. 4400'. Rudd Exploration.

98. 4. 4. 22. Krugersdorp, Transvaal. Alt. 4900'.

The normal dimensions of this form may be taken as:—

Head and body 105 mm.; tail 95; hind foot 20.

Skull: basilar length 22; tooth-row 4·4; bullæ 5·5.

Mr. de Winton based his subsp. *dilectus* on the specimens from Mazoe and spoke of them as dull-coloured; the specimens from the N.W. Transvaal are brighter and curiously resemble *A. p. griquæ* in coloration, though they are darker than that form.

The following are some measurements from selected specimens:—

(Type)		Hind foot.	Basilar length of skull.	Length of tooth-row.	Bullæ.
95. 11. 3. 25.	♂. Old ..	20	22	4.4	5.5
95. 11. 3. 26.	♂. V. old.	20	22.3	4.4	5.5
95. 11. 3. 27.	♂. Y. adult.	20	21	4.4	5.5
1117.	♂. V. old	20	22.5	4.4	5.5
1135.	♂. Adult	20	21.5	4.4	5.5
1140.	♀. Old	20	21.5	4.4	5.5
98. 4. 4. 22.	♂. V. old.	20	22.5	4.4	5.5

Arvicanthis pumilio diminutus.

Isomys pumilio diminutus, Thos. P. Z. S. 1892, p. 551.

93. 2. 3. 39, 40. Mianzini, Masailand.

99. 8. 4. 85-88. Ravine Station, B.E.A.

The normal dimensions are:—

Head and body 94 mm.; tail 62; hind foot 20.

Skull: basilar length 23.5; tooth-row 4.5; bullæ 5.5.

The coloration, as shown by the half-dozen specimens, is very constant, showing a bright golden tinge throughout the dorsal ground-colour and bright, almost white, interspaces between the dorsal stripes.

Though not markedly larger than *dilectus* in any one dimension, it is distinctly though slightly larger all round. The following are some actual measurements:—

		Hind foot.	Basilar length of skull.	Length of tooth-row.	Bullæ.
93. 2. 3. 39.	? Old	20	23	4.5	5.5
99. 8. 4. 35.	♂. Old	20	23.5	4.5	5.5
99. 8. 4. 85.	♀. Y. adult	20	20	4.5	5.5

Arvicanthis pumilio Moshesh, sp. n.

4. 12. 5. 48-51. Maseru, Basutoland. Alt. 5000'.

4. 9. 1. 59, 60. Zuurbron, Transvaal. Alt. 4600'.

4. 9. 1. 63, 68. Wakkerstroom, Transvaal. Alt. 6000'.

98. 3. 23. 7. Potchefstroom, Transvaal.

97. 8. 5. 7. Krugersdorp, Transvaal. Alt. 4900'.

4. 5. 1. 69, 74. Sibudeni, Zululand. Alt. 3500'.

This is a form with very small bullæ, which seems to have its habitat in the country along the crest of the Drakensberg. At Krugersdorp it appears to meet *dilectus*, the form of the N.W. Transvaal &c., and at Wakkerstroom and Sibudeni the below Berg form (*Chakæ*). Whether it is or is not found immediately northwards, however, there is unfortunately no evidence to show; a very similar form has been

found on the high plateau south of Lake Nyasa (see below). It is fairly constant in coloration, showing but a slight fulvous tinge over the ground-colour of the back; the dorsal stripes are black and the interspaces differ in no way from the general dorsal coloration.

The normal measurements may be taken as:—

Head and body 110 mm.; tail 90; hind foot 21.

Skull: basilar length 22; tooth-row 4·5; bullae 5.

The following are some actual measurements:—

			Hind foot.	Basilar length of skull.	Length of tooth-row.	Bullae.
	4. 9. 1. 59.	♀. Y. adult.	21	20·5	4·5	5
	4. 5. 1. 74.	♀. V. old..	21	22	4·5	5
(Type)	4. 12. 5. 48.	♂. Adult..	21	21·5	4·5	5
	4. 12. 5. 50.	♀. Old....	21	21·5	4·5	5
	93. 3. 23. 7.	♂. V. old..	21	21·5	4·5	5
	97. 8. 5. 7.	♀. V. old..	21	22·5	4·5	5

I have named this species after Moshesh, the founder of the present ruling dynasty of Basutoland.

Arvicanthis pumilio nyasa, subsp. n.

92. 8. 1. 41—44. Mlanje Plateau, Nyasa. Alt. 6000'. Sir H. H. Johnston.

So far as the measurements go, on which I have chiefly relied, I can find no difference between this form and *Moshesh*. However, I regard the 600 or 700 miles which separate their habitats as a strong argument for separating the forms. *nyasa* is more sombre-coloured, i. e. less fulvous tinged, has a stouter broader skull, and a slight difference in the shape of the posterior molar, which is pentagonal or subcircular in horizontal section, while in *Moshesh* this tooth is laterally compressed in an oblique direction across the jaw, sloping backwards and slightly outwards. The skulls available are much broken, but I quote the following measurements:—

			Hind foot.	Basilar length of skull.	Length of tooth-row.	Bullae.
	92. 8. 1. 41.	? Old.....	21	?	4·5	?
(Type)	92. 8. 1. 43.	? Old.....	21	22	4·5	5