NOTES ON A BRAZILIAN MOUSE, *BLARINOMYS BREVICEPS* (WINGE)[1]

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Abstract: Non-geographic and possible geographic variation, natural history, and zoogeography of *Blarinomys breviceps* (Winge 1888) from two areas in Espírito Santo, Brazil, are discussed. Analysis of 21 specimens from Forno Grande revealed; adult females were larger in total length than adult males, while adult males were larger in condylobasal length. Five adult males from Santa Teresa were larger in total length and tail length than adult males from the Forno Grande locality. The low CV's for the measurements analysed (except for tail length) are discussed in terms of the apparent specialized nature of this species. The high CV's for tail length may be related to the tail's vestigial nature. Reproductive activity was recorded for the months of January and February. An apparent high population of *B. breviceps* and possible explanations for it are recorded.

Introduction

Relatively few specimens of *Blarinomys breviceps* (Winge 1888) have been reported. The species was first described in the genus *Oxymycterus* by Winge (1888) on the basis of a Pleistocene skull fragment. Later Thomas (1896) described the genus *Blarinomys* (type species = *Oxymycterus breviceps* Winge) and reported a Recent specimen. The conditions under which this second specimen was taken were reported by Goeldi (1902). Davis (1944) reported a third specimen, including some natural history notes. In a later paper, Davis (1945) reported three additional specimens. Avila-Pires (1960) recorded a single specimen and summarized the known distribution: Lagôa Santa, Estado do Minas Gerais; Terezópolis, Estado do Rio de Janeiro; Santa Teresa, Estado do Espírito Santo; and Ilhéus, Estado do Bahia. Since 1960 there has apparently been no new published information with the exception of that found in Walker (1968) which dealt with the burrows of *B. breviceps*.

Abravaya collected 31 specimens of *Blarinomys breviceps* in the Estado do Espírito Santo during the period August, 1970 through April, 1974. Twenty-two of these were taken at one locality within a period of three weeks. Since little is known of the species, we feel that an analysis of variation and notes on its natural history will add greatly to our knowledge of this rodent.

Collecting Localities and Specimens Examined

Espírito Santo, Castelo, 3 km NE Forno Grande, 1200 m: 22 specimens [16, Museu Nacional, Rio de Janeiro (MNRJ); 4, Natural History Museum of Los Angeles County (LACM); 2, discarded (damaged)].

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The trapping area was located in what Ruschi (1950, 1969) defined as an "altimontana" forest. The region consisted of numerous cleared areas with small (< 100 hectares), scattered patches of forest. These small forested areas had been extensively exploited for their hardwoods.

Large trees (over 30 m in height) were few in number, leaving an incomplete upper canopy. A more closed second canopy occurred at about 20 m in height. The trees were covered with epiphytes (orchids, lianas, and bromeliads). Tree ferns were found throughout these forested areas and according to Beard (1944) this would be indicative of what he describes as a "Cloud Forest." Ground cover consisted of dense clumps of bamboo, philodendrons, and bracken fern.

The surface of the ground was covered by a layer (about 3 cm thick) of leaf litter. There was a second, lower layer (about 8 cm thick) consisting of a spongy lattice of fine roots in which numerous small burrows were observed.

Espírito Santo, Cachoeiro de Itapemirim, 4 km N Castelinho, 1200 m: 3 specimens (2, MNRJ; 1, LACM).

This area is only 7 km east of the locality described above and essentially is the same type of habitat. In the analysis of variation presented below, specimens from this locality were pooled with those from 3 km NE of Forno Grande. The pooled sample is referred to as the Forno Grande population.

Espírito Santo, Santa Teresa, Nova Lombardia (Reserva Florestal), 800 m: 3 specimens (2, Museu de Biologia, "Prof. Mello Leitão;" 1, LACM).

This locality is about 130 km northeast of Forno Grande. The area has been a forest reserve for over 20 years and according to Ruschi (personal communication) it was relatively untouched before then. Compared to the vegetation at Forno Grande, this area had more large trees, though the upper canopy was not completely closed. The second layer was about the same height as but somewhat more closed than at Forno Grande. There was very little ground vegetation, the thick patches of bamboo being conspicuously absent. The soil profile was similar to that at Forno Grande.

Espírito Santo, Santa Teresa, Caixa Dagua, 750 m: 3 specimens (2, MNRJ; 1, LACM).

Vegetation at this locality was the same as that described for Forno Grande. The area is only about 8 km north of Nova Lombardia. The three specimens were pooled with those from Nova Lombardia and the pooled sample referred to as the Santa Teresa population.

METHODS

Measurements: All measurements are in millimeters, and were taken by Abravaya. Cranial measurements were taken with vernier calipers and recorded to the nearest 0.1 mm. Measurements taken were (abbreviations refer to those used in the tables): total length (TL); length of tail (T); length of hind foot (HF), with claw; length of ear (EL) from notch; greatest length of skull (GLS); con-

dylobasal length (CL); length of incisive foramen (IF); least interorbital breadth (IB); zygomatic breadth (ZB); length of maxillary toothrow (MT); and greatest nasal length (NL).

Age Classes: Only two age classes were recorded: juveniles with M3 not erupted or erupted but showing no sign of wear (only two specimens were considered juvenile); and adults with M3 erupted and showing at least some wear.

Analysis of Variation: Standard statistics (mean, range, standard deviation, and coefficient of variation) were computed for each measurement. Adult specimens from the Forno Grande locality were analysed by sex (12 males and 9 females), and differences between the sexes were determined by use of the t-test at the .05 level of significance (Table 1). The sample from Santa Teresa included males only (Table 2).

VARIATION

Age Variation (Table 1): The juvenile male (M3 not erupted) is considerably smaller in most measurements than those considered to be adults. This animal has a white-tipped tail (the remaining specimens all have unicolored tails). Most of the measurements of the juvenile female (M3 erupted but no sign of wear) fell within the ranges of the adults.

Individual Variation (Table 1): The coefficients of variation (CV's) for the four external measurements ranged from 3.37 (ear length for females) to 17.26 (tail length for males). The CV's of males were higher for all external measurements than those of females. The high CV's for tail length in both sexes could be the result of the difficulty in measuring this structure. However, since all measurements were taken by the same person, this high variation may actually reflect the variability in this character.

Blarinomys breviceps is a cricetine rodent specialized for a fossorial life (Hershkovitz 1966). There is doubtful structural need or adaptive significance for a long tail in a fossorial mammal. Long (1969) and others have discussed the highly variable nature of vestigial organs and have concluded that structures that are in the process of being lost show great variability. It may be that the high amount of variation in tail length of *B. breviceps* is a result of the tail being an adaptively unimportant structure to this species; however, the importance of tails as tactile organs in some fossorial mammals has been postulated (Hill 1937; Godfrey and Crowcroft 1960).

The seven cranial measurements had relatively low CV's ranging from 1.89 (greatest length of skull in females) to 6.18 (length of incisive foramen in females). Most were in the range of 2 to 3 (Table 1). Most rodents reported upon by Long (1968, 1969) had higher CV's.

Hershkovitz (1966, 1972) considered *B. breviceps* to fill the insectivorous "mole niche" in the Brazilian Highlands of Neotropica. Ronald H. Pine and

TABLE 1

External and cranial measurements of *Blarinomys breviceps* from near Forno Grande, Espírito Santo, Brazil. Significant differences (t-test, $p<.05$) between the sexes are indicated by asterisks. Measurements of two juveniles are given to the right.

Character	Sex	N	Mean	(Range)	SD	CV	Juv.
TL*	♂♂	11	142.36	(129-157)	8.49	5.96	121
	♀♀	8	152.12	(143-161)	5.51	3.62	130
T	♂♂	11	40.45	(30-49)	6.98	17.26	39
	♀♀	8	44.62	(40-52)	4.47	10.02	48
HF	♂♂	12	18.17	(16-21)	1.40	7.73	16
	♀♀	9	18.44	(16-20)	1.13	6.13	18
EL	♂♂	12	9.58	(8-10)	0.67	6.98	9
	♀♀	9	9.89	(9-10)	0.33	3.37	10
GLS	♂♂	10	26.00	(24.9-27.4)	0.76	2.91	—
	♀♀	4	25.50	(24.8-25.9)	0.48	1.89	24.0
CL*	♂♂	10	23.45	(22.2-24.0)	0.67	2.84	20.2
	♀♀	4	22.28	(21.7-22.7)	0.43	1.95	21.4
IF	♂♂	10	5.09	(4.8-5.4)	0.18	3.52	4.1
	♀♀	8	4.96	(4.3-5.3)	0.31	6.18	4.6
IB	♂♂	12	6.84	(6.5-7.2)	0.22	3.21	6.2
	♀♀	8	6.72	(6.5-7.0)	0.18	2.73	6.4
ZB	♂♂	4	14.00	(13.4-14.6)	0.52	3.69	—
	♀♀	3	13.30	(12.9-13.6)	0.36	2.71	13.2
MT	♂♂	12	4.40	(4.2-4.6)	0.13	3.06	3.3
	♀♀	8	4.42	(4.3-4.6)	0.10	2.34	4.3
NL	♂♂	1	11.40	—	—	—	—
	♀♀	3	11.30	(10.9-12.0)	0.61	5.38	10.2

Andrew Starrett (personal communications) consider *B. breviceps* to be more shrewlike (namely, *Blarina*like) than like the "typical" highly fossorial members of the Talpidae. We agree with Pine's and Starrett's opinions. There is nothing known of the feeding habits of *B. breviceps*. If it is indeed insectivorous, then the low CV's exhibited by *B. breviceps* fit well with Long's (1969) pattern for insectivorous mammals.

Secondary Sexual Variation (Table 1): Significant differences between males and females were found in only two of the eleven characters analysed (total length and condylobasal length). Females were larger in total length, whereas males were larger in condylobasal length. Females averaged larger in all four external measurements, but averaged smaller in six of the seven cranial measurements.

TABLE 2

External and cranial measurements of adult male *Blarinomys breviceps* from Santa Teresa, Espírito Santo, Brazil. Significant differences (t-test, $P<.05$) between these and males from Forno Grande (Table 1) are indicated by asterisks.

Character	N	Mean	(Range)	SD	CV
TL*	5	162.60	(157-172)	6.02	3.70
T*	5	48.40	(43-55)	4.45	9.19
HF	5	18.40	(15-20)	2.30	12.51
EL	5	10.00	(9-12)	1.22	12.25
GLS	3	26.73	(26.1-27.4)	0.65	2.43
CL	3	23.93	(23.1-24.4)	0.72	3.02
IF	3	5.13	(4.6-5.4)	0.46	9.00
IB	3	6.77	(6.7-6.8)	0.06	0.85
ZB	1	14.1	—	—	—
MT	3	4.40	(4.3-4.5)	0.10	2.27
NL	2	11.60	(11.1-12.1)	0.71	6.10

Since the sample sizes are small and do show some sexual dimorphism, we propose that the sexes should be separated in taxonomic work.

Geographic Variation (Tables 1 and 2): Comparison of males from Forno Grande with males from Santa Teresa revealed that significant differences occurred in total length and tail length, but not in any of the cranial measurements. Our sample sizes were too small for any conclusions to be made about this possible geographic variation.

NATURAL HISTORY

Davis (1945) recorded reproductive activity in *Blarinomys breviceps* for the months of September (a pregnant female) and January (male with scrotal testes). In the same paper he also reported the peak breeding season for most rodents in two Brazilian Highland forests to extend from the months of July through April. Our data on reproductive activity were taken only during the last of January and first half of February 1973. Of 11 females recorded during this period, three contained one embryo each (crown rump length 7 mm to 35 mm), all in the left uterine horn. One female contained two embryos (5 mm in length), both in the left uterine horn. One was lactating and six (one of which was an obvious juvenile) did not display any sign of reproductive activity. Of 11 males taken during the same period, five had scrotal testes. The remaining six (one of which was an obvious juvenile) did not show any sign of reproductive activity.

The capture of 22 specimens of *Blarinomys breviceps* within a period of three weeks at one locality may indicate an unusually high population. Davis (1945) trapped a similar habitat for over a year and caught only three specimens. Abravaya trapped intensively for a year in suitable habitats at Santa Teresa and took only two specimens. The apparent high population density of *B. breviceps* during late January and early February 1973 at Forno Grande may be accounted

for by one of two explanations: (1) correlation with the fruiting season, as are many "ratadas" (See Hershkovitz 1962), or (2) increased surface activity by animals because of flooding. Since Hershkovitz (1966, 1972) suggests that *B. breviceps* is insectivorous, it may be that the population high of *B. breviceps* was indirectly related to the fruiting season, which caused an increase of the primary food items (insects and worms). The more reasonable explanation seems to be that these fossorial rodents were forced out of their burrows by flooding. During the time that Abravaya trapped at Forno Grande it rained quite heavily. On the days of the heaviest rains as many as five (on two separate occasions) *B. breviceps* were taken.

Two additional observations seem worthy of note. First, Abravaya was able to capture a juvenile male by hand at 4:30 pm on 1 February 1973. This mouse was quite docile, but died within 24 hours of capture. Davis (1944) recorded his adult male *B. breviceps* as being caught by hand during the day. It was also docile, and died within a few hours of capture. Second, of the 22 specimens captured at Forno Grande, five were taken with half their bodies still in burrows. In these five cases, snap traps baited with corn were placed on top of the leaf litter in areas where no burrows were evident. It seems likely that the mice were traveling under the leaf litter and somehow detected the presence of the bait. They then burrowed up, exposed the anterior halves of their bodies and were caught, half in the trap and half still in the burrow.

ZOOGEOGRAPHICAL NOTES

Blarinomys breviceps is known only from the southeastern Brazilian Highlands, from the Late Pleistocene to Recent (Patterson and Pascual 1972; Hershkovitz 1972). It may have originated in and is presumably endemic to this region, probably arising from a late Tertiary akodont ancestor, filling the niche occupied in north temperate zones by insectivores. *B. breviceps* is a highly specialized cricetine which was apparently well differentiated by the Late Pleistocene. The rather low coefficients of variation (except for tail length) may be a reflection of its conservatism. If this is so, then as climatic changes occurred during and since the Pleistocene (see Vuillemier 1971), *B. breviceps* may not have had the genetic potential to allow it to adapt to surrounding more arid habitats. De la Torre (1975, in press) discussed the possible correlation of low CV's to reduced genetic potential and restricted distribution of some bats in northwestern South America.

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RESUMO

Variação não-geográfico e possivel variação geográfico, história naturál, e zoogeografia de *Blarinomys breviceps* de dois locaes de Espírito Santo, Brasil são discutidos. Analise de 21 exemplares de Forno Grande revelou; femeas adultas eram maiór em comprimento total do que machos adultos, em quanto machos adultos eram maiór em comprimento do condilobasal. Uma amostra de cinco machos de Santa Teresa foi maiór em comprimento total e comprimento do rabo do que os exemplares de Forno Grande. Os baixos coeficentes de variação (menos comprimento do rabo) são discutidos em termos do apparente natureza especializádo dêste espécie. O alto variabilidade do comprimento do rabo pode ser relacionado a sua natureza vestigial. Atividade reprodutivo foi notado nous meses de janeiro e fevereiro. Um apparente população alto de *B. breviceps* e possivel explicações são relatados.

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