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A New Species of *Microgale* (Insectivora: Tenrecidae) from Northeastern Madagascar

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ABSTRACT

A new species of *Microgale* (shrew-tenrec) is described from northeastern Madagascar. Comparisons are made with other species in the genus.

INTRODUCTION

The genus *Microgale* contains 15 named species according to Genest and Petter (1975). However, Heim de Balsac (1972) also included *Paramicrogale* and *Nesogale* in the same genus. The view that more species should be included was followed by Honacki et al. (1982) who listed 19 species and Corbet and Hill (1986) who also included *Leptogale* in the genus. However, these authors indicated that the status of several of these species is questionable. Many of the species of *Microgale* are known from few specimens and the characters used to distinguish them are mainly overall size and the relative proportions of the tail and hindfoot to head and body length. The most recent reviser of the

genus (MacPhee, 1987) has provided detailed dental characters and a more critical evaluation of the characters in current use. He demonstrated that several of the named forms are juveniles and concluded that only 10 species of *Microgale* are valid. The new species is distinguished from most other species in the genus by its small size and from all by its distinctive cranial and dental features.

All measurements are in millimeters. The dental nomenclature follows that of Mills (1966), Swindler (1976), Butler and Greenwood (1979), and MacPhee (1987). Since MacPhee demonstrated the problems associated with failure to distinguish deciduous

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TABLE 1
**Comparison of Measurements of *Microgale pulla*
 and *M. pusilla***

Data on external measurements of *M. pusilla* were taken from MacPhee (1987), the other data from material in the British Museum (Natural History)

	<i>M. pusilla</i>	<i>M. pulla</i>
Ratio of tail length to head and body length	1.03–1.61	0.83
Mean	1.33	
N =	10	
Ratio of hindfoot length to head and body length	0.20–0.25	0.16
Mean	0.23	
N =	8	
Condylolincisive length	16.2–16.7	16.3
Mean	16.5	
N =	4	
Width across zygomatic pro- cesses of maxilla	5.7–6.3	5.2
Mean	6.1	
N =	6	
Braincase breadth	6.8–7.3	6.9
Mean	7.0	
N =	4	
Braincase height	4.7–5.4	4.1
Mean	5.0	
N =	4	
Ratio of occipital length to brain- case length from anteglenoid notch to occipital condyle	58.1–66.1	39.1
Mean	61.4	
N =	4	
Ratio of height of I3 to height of I2	0.8–0.9	0.75
Mean	0.82	
N =	6	
Ratio of height of canine to height of I1	1.08–1.17	1.33
Mean	1.10	
N =	6	
Ratio of height of P2 to height of P3	0.78–0.88	1.0
Mean	0.82	
N =	6	
Mandible height at coronoid pro- cess	3.6–4.0	3.4
Mean	3.7	
N =	6	

from permanent dentitions, this factor has been carefully considered. The dentition of the holotype of the new species has been es-

tablished as permanent by comparison with material of other specimens of the genus in the British Museum (Natural History) collection and with the drawings and descriptions of permanent and deciduous dentitions shown by MacPhee.

ACKNOWLEDGMENTS

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SYSTEMATICS

Microgale pulla, new species

Figures 1–3

HOLOTYPE: BM(NH) 87.132, adult female, in alcohol, skull extracted. Collected by P. J. Stephenson, Esq. in 1986 from the Foret d'Andrivola, ca. 10 km southwest of Maintimbato Village, ca. 40 km southwest of Maroantsetra, northeast Madagascar, 15°46'S, 49°35'E, in lowland rain forest between 450 and 625 m elevation. Deposited in the British Museum (Natural History).

DIAGNOSIS: Small size but with the tail shorter than head and body length. The braincase is shallow and the occipital region is short. The first two upper premolars (P2 and P3) are subequal in height.

DESCRIPTION: Size small (head and body length 56, tail length 46.5, hindfoot length without claws 9, ear length 6, weight 4.1 g). The dorsal pelage is brown with a gradual transition into the gray brown ventral pelage.

The skull is small (see table 1); the rostrum is slender and appears to be long because of the posterior positioning of the zygomatic plate above the second and third upper mo-

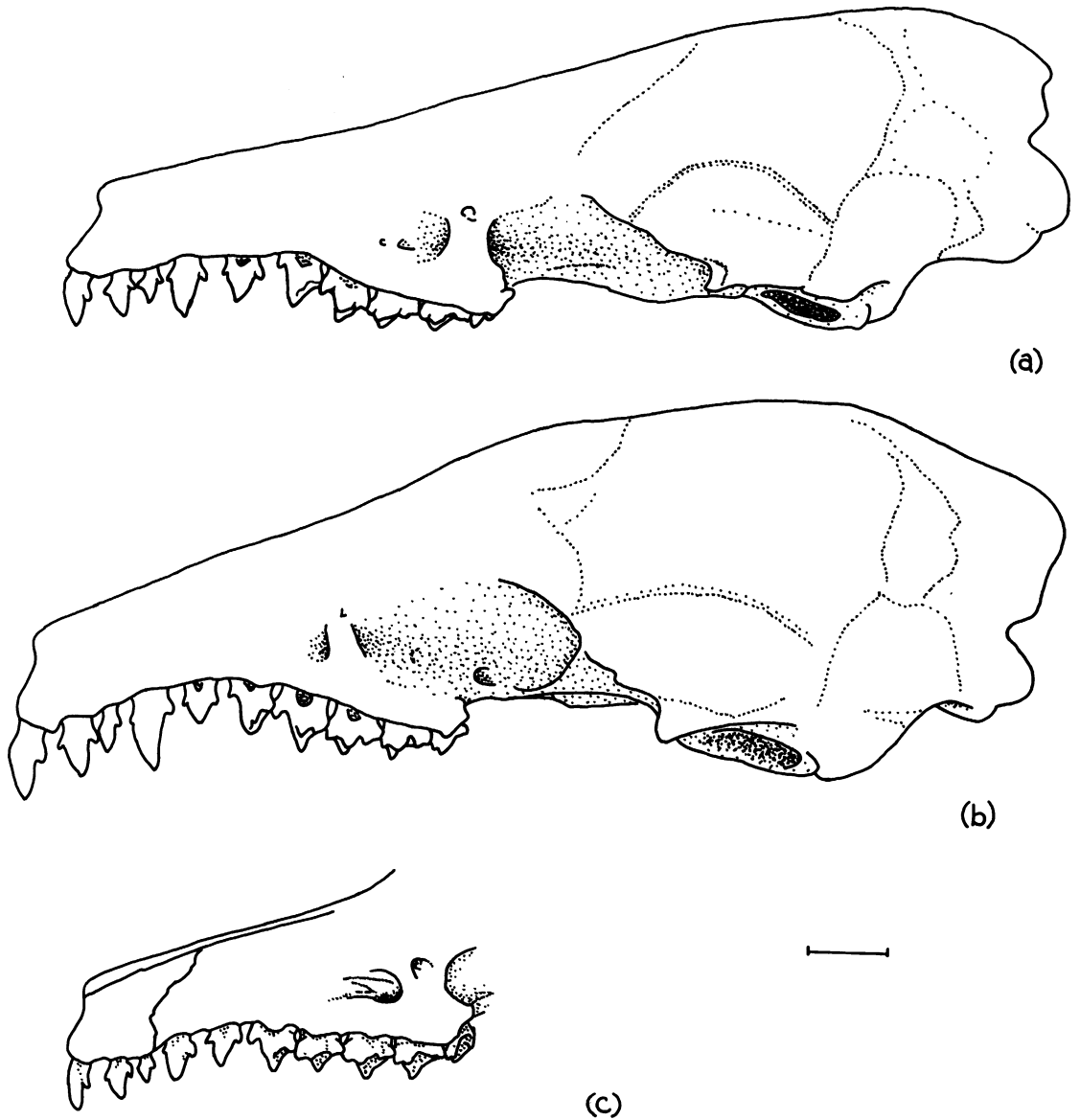


Fig. 1. Lateral view of cranium of (a) *M. pulla* [BM(NH) 87.132], (b) *M. pusilla* [BM(NH) 97.9.1.95], (c) *M. parvula* [Museum of Comparative Zoology, Harvard (MCZ 45465) drawing reproduced from MacPhee, 1987]; scale 1 mm.

lars (see fig. 1); the zygomatic process of the maxilla is short and extends only over the third upper molar; the braincase is shallow relative to braincase width (see table 1 and figs. 1 and 3); the occipital region of the braincase is short relative to braincase length and dorsally oriented, and the foramen magnum is positioned posteriorly so that the occipital

condyles are visible when the skull is viewed dorsally.

The dentition is illustrated in figures 1 and 2. The upper incisors are broad anteroposteriorly; the posterior cuspid on the first upper incisor (I1), the anterior and posterior cuspids on the second upper incisor (I2) and the posterior cuspid on the third upper in-

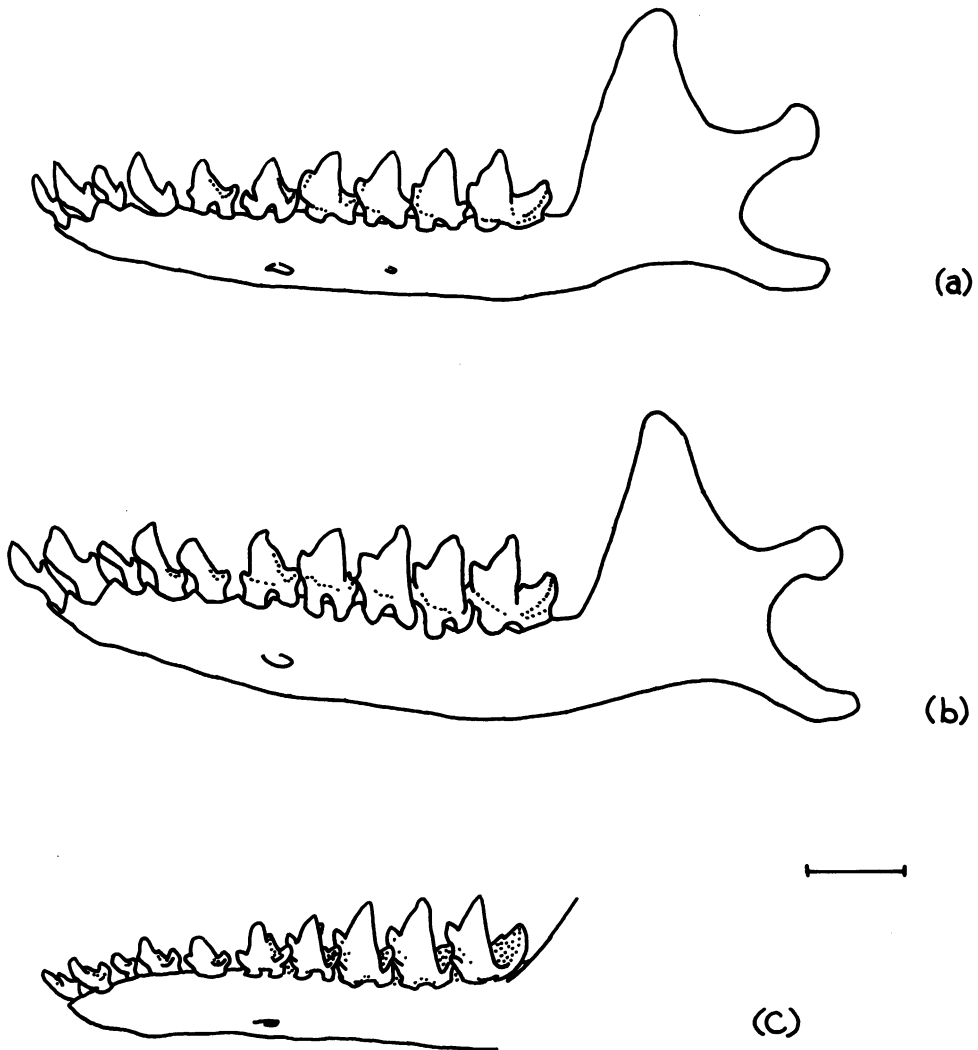


Fig. 2. Lateral view of left mandibular ramus of (a) *M. pulla* [BM(NH) 87.132], (b) *M. pusilla* [BM(NH) 97.9.1.95], (c) *M. parvula* [MCZ 45465 drawing reproduced from MacPhee, 1987]; scale 1 mm.

cisor (I3) are weakly developed; the anterior cuspid on I3 is very weakly developed. I2 and I3 are in contact. The anterior cuspid on the upper canine is barely discernible. The principal cuspid of the first upper premolar (P2) is large and this tooth is subequal in height to the second upper premolar (P3). There are diastemata on either side of P2. A moderately well-developed parastyle is present on P3, which also has a small anterior ectostyle and a well-defined posterolingual cuspid. The third upper premolar (P4) is molariform as in all members of the genus; the lingual region of the tooth is broad with well-developed an-

terolingual and posterolingual cuspids, the parastyle is small but prominent, the anterior ectostyle is prominent, and a small posterior ectostyle is present. The upper molars are similar to those of other members of the genus. The lower incisors are short and broad with well-developed posterior cuspids. The lower canine is stout with a well-developed posterior cuspid. The anterior cuspid on the first lower premolar (p2) is weakly developed, the posterior cuspid is well developed, and this tooth has two roots. There is a diastema between the canine and p2 and a smaller one between p2 and p3. The second lower pre-

molar (p3) and the first and second lower molars (m1 and m2) are similar in structure to those of other members of the genus. The paraconid on the third lower premolar (p4) is small but robust, while the hypoconid is poorly developed. The paraconid on the third lower molar (m3) is small, the hypoconid is large but simple with a shallow, narrow talonid basin and no entoconid.

ETYMOLOGY: The species name is taken from the Latin "pullus" meaning *dark colored*.

COMPARISON WITH OTHER SPECIES: *Microgale pulla* is larger than the single known, immature specimen of *M. parvula* Grandidier, 1934 (head and body length 42, tail length 51, hindfoot length 10; dimensions from the original description; greatest skull length 15.5, see MacPhee, 1987) and differs in body proportions: tail slightly longer than head and body in *M. parvula* (1.21), tail shorter than head and body in *M. pulla* (0.83); hindfoot longer relative to head and body in *M. parvula* (0.24) than in *M. pulla* (0.16). The posterior positioning of the zygomatic plate over M2 and M3 is shown in *M. parvula* and *M. pulla* but is more anteriorly positioned over P4 and M1, M1, or M1 and M2 in all other species (except *M. gracilis* where it lies above M2). There are obvious problems in comparing a deciduous with a permanent antemolar dentition but the metaconids on the deciduous lower premolars (p3 and p4) of *M. parvula* (see MacPhee, 1987) are not found in the permanent lower premolars (p3 and p4) of *M. pulla*. However since all three of the molars have erupted in *M. parvula*, the permanent dentition of both species may be compared with greater confidence. The drawing of *M. parvula* by MacPhee shows that the paraconid of m3 is prominent and the hypoconid has a broad talonid basin and a small entoconid, unlike *M. pulla* in which the paraconid is small and the hypoconid has a narrow, shallow talonid basin and lacks an entoconid.

The new species is similar in body and cranial size to *M. pusilla* Major, 1896, but smaller than any of the other named species (the smallest of these species is *M. longicaudata* Thomas, 1882, in which the condyloincisive length of eight specimens is 18.3–21.5, mean 19.8, SD 1.19).

Microgale pulla is distinguished from the

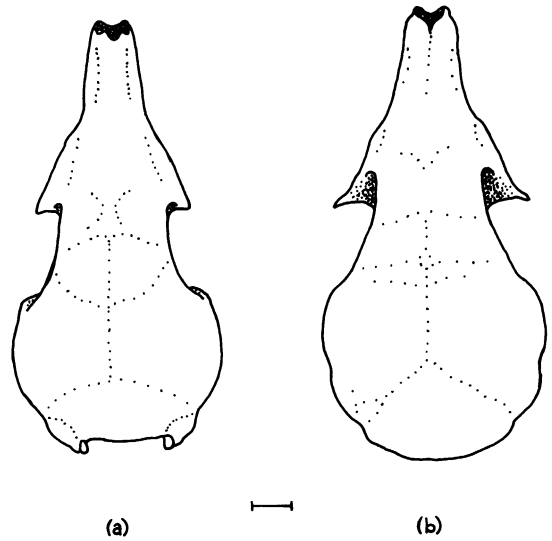


Fig. 3. Dorsal view of cranium of (a) *M. pulla* [BM(NH) 87.132], (b) *M. pusilla* [BM(NH) 97.9.1.95]; scale 1 mm.

similar sized *M. pusilla* by the following features. In *M. pusilla* the tail is 1.03 to 1.61 times longer than head and body length, while in *M. pulla* the tail is shorter (0.83) than head and body length. The ratio of hindfoot to head and body length is greater in *M. pusilla* (0.20–0.25, information from MacPhee, 1987) than in *M. pulla* (0.16). Although the crania of *M. pulla* and *M. pusilla* are similar in size, they differ in proportions and there are also distinct dental differences (see table 1 and figs. 1–3). In contrast to *M. pusilla*, the skull of *M. pulla* is narrower in the zygomatic region of the maxilla, the braincase is shallower and shorter, and the ascending ramus of the mandible is lower. In *M. pusilla* the zygomatic plate lies above the first upper molar, the zygomatic process of the maxilla is very long and extends along the entire molar row, while in *M. pulla* the zygomatic plate lies above the second upper molar and the zygomatic process is very short and extends only over the third upper molar. The proportions of the upper incisors and canine are relatively different. I3 is slightly shorter relative to I2 and the canine is slightly longer relative to I1 in *M. pulla* than in *M. pusilla*. The parastyle on P3 of *M. pulla* is well developed, the distostyle is small, the anterior ectostyle is small, and a posterolingual cuspid is well developed, while in *M. pusilla* the

parastyle and distostyle are small, the anterior ectostyle is well developed, but the posterolingual cuspid is poorly defined; P2 is subequal to P3 in height in *M. pulla* but shorter than P3 in *M. pusilla*; the lingual region of P4 is considerably broader anteroposteriorly in *M. pulla* than in *M. pusilla* but the parastyle in *M. pusilla* is larger; both have a prominent anterior ectostyle but *M. pulla* also shows a small but distinct posterior ectostyle. The lower incisors and canine of *M. pulla* are shorter and stouter than those of *M. pusilla*; the posterior cuspid on the canine of *M. pulla* is well developed, but weakly developed in *M. pusilla*. The first lower premolar (p2) of *M. pusilla* is caniniform; there is no anterior cuspid, the posterior cuspid is weakly developed and it has a single root; in contrast, in *M. pulla* the anterior cuspid is weakly developed, the posterior cuspid well developed, and two roots are present. The paraconid on p4 is smaller and stouter and the hypoconids on m1 and m2 more weakly developed in *M. pulla* than in *M. pusilla*. In *M. pulla* the paraconid of m3 is small and the hypoconid is simple with a narrow, shallow talonid basin and lacks an entoconid, while in *M. pusilla* the paraconid is well developed and an entoconid and broader talonid basin are present.

DISCUSSION

The possibility must be considered (MacPhee, personal commun.) that *M. pulla* is simply an adult of *M. parvula*. The two specimens share such characters as small size and position of the zygomatic plate but they show dissimilar body proportions. MacPhee (1987) demonstrated considerable variation in tail length and hindfoot length among all species of *Microgale*. The figures that he presented on ratios of tail length to head and body length show a range as high as 0.58 in *M. pusilla* and 0.59 in *M. longicaudata*, so the difference of 0.38 between *M. parvula* and *M. pulla* may not be significant. However, the greatest range in ratio of hindfoot length to head and body length is 0.06 in *M. cowani*, whereas the difference of 0.08 in this ratio between *M. pulla* and *M. parvula* indicates greater significance. Comparison of the deciduous antemolar dentition of one taxon with the permanent dentition of the other is inconclusive; in the absence of samples of adult

M. parvula there is no information on persistence or absence of the metaconids on the permanent lower premolars (p3 and p4) and similarly no knowledge of the deciduous dentition of *M. pulla*. However, in the permanent dentition, differences in the cusp morphology of the third lower molars do indicate a specific difference. The evidence suggests that the two taxa are distinct but no conclusions about their relationship are possible without additional material.

Thomas (1918), Grandidier (1934), and Morrison-Scott (1948) subdivided the genus *Microgale* on the basis of relative length of head and body to tail length: (1) species in which the tail is shorter than the head and body, (2) species with the tail about the same length as the head and body, and (3) species with long, prehensile tails. Eisenberg and Gould (1970) divided *Microgale* into four behavioral classes according to external morphology, based mainly on the ratio of tail to head and body length and hindfoot to head and body length. These classes are summarized as: (1) Semifossorial forms with short tails and little ability to spring, such as *M. brevicaudata* Grandidier (1899). (2) Surface foraging forms, believed to be deliberate climbers, which were further subdivided according to hindfoot length. Examples given were *M. cowani* Thomas (1882) and its synonyms, and *M. thomasi* Major (1896). (3) Surface foraging and climbing forms. Examples given included two taxa which are currently recognized as synonyms of *M. cowani* (MacPhee, 1987), and also *M. pusilla* and *M. parvula*. (4) Climbers and springers with long tails and hindfeet. The species placed in this group were *M. longicaudata* Thomas (1882), *M. principula* Thomas (1926), and synonyms of these two species.

MacPhee (1987) showed that inclusion of juvenile and immature material and the recognition of synonyms invalidated some of the groupings in the above classification; while group (4) apparently remained distinct, groups (1), (2), and (3) were no longer discrete. MacPhee revised this classification using adult material with permanent dentitions (but including the immature *M. parvula*). He concluded that *M. longicaudata* and *M. principula* remained distinct because of their very long tails (tail to head and body length > 1.77) and long hindfeet (hindfoot to head and body

length >0.23). *M. talazaci*, *M. pusilla*, and juvenile *M. parvula*, he considered to be an intermediate group with moderately long tails (0.96–1.61) and hindfeet (0.19–0.24), showing some distinction from the following group. Large samples of *M. cowani* showed that the ratio of tail to head and body length overlapped the ranges of this ratio in *M. brevicaudata*, *M. thomasi*, *M. gracilis*, and *M. dobsoni* (tail length to head and body length 0.50–1.05, hindfoot to head and body length 0.17–0.24); these species formed a less distinctive group. MacPhee cautioned that the interpretation of locomotor and behavioral traits should not be made without evidence from field studies. On the basis of MacPhee's revised classification, the new species would be grouped with the larger species of *M. brevicaudata*, *M. cowani*, *M. thomasi*, *M. gracilis*, and *M. dobsoni*. It thus differs from the other two pygmy shrew tenrecs, *M. pusilla* and *M. parvula*.

MacPhee grouped members of the genus *Microgale* into clusters on the basis of dental traits, body proportions, and other unspecified individual features. He emphasized that his groupings were not intended to have any supraspecific implication and that phylogenetic interpretations had not been attempted at this stage but would be dealt with in a forthcoming paper. It has therefore been deemed inadvisable and premature to attempt to assign *M. pulla* to any of these clusters. However, the gracile skull with a slender rostrum, some of the dental characters, and body proportions indicate some affinities with *M. cowani*.

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