The vestigial teeth of *Miniopterus fraterculus* and *Miniopterus inflatus*

M. van der Merwe
Mammal Research Institute, University of Pretoria, Pretoria

Both *Miniopterus fraterculus* and *Miniopterus inflatus* have a vestigial tooth on the maxilla situated between the canine and following premolar.
S. Afr. J. Zool. 1985, 20: 250 – 252

Beide *Miniopterus fraterculus* en *Miniopterus inflatus* het 'n vestigiale tand op die maksilla wat geleë is tussen die slagtand en daaropvolgende voorkiestand.
S.-Afr. Tydskr. Dierk. 1985, 20: 250 – 252

M. van der Merwe
Mammal Research Institute, University of Pretoria,
Pretoria, 0002 Republic of South Africa

Received 18 December 1984; accepted 6 May 1985

The Subfamily Miniopterinae with its single genus has a broad distribution over a large part of the Old World including Australasia (Hayman & Hill 1971). In Africa it occurs widely through the Ethiopian and Malagasy Regions, as well as the Palaearctic region of the north-west but apparently it does not occur in the arid regions of the Sahara and the north-east (Hayman & Hill 1971). Because members of this genus closely resemble each other more than a dozen species have been described for Africa to date (Smithers 1983). Hayman & Hill (1971) have simplified the taxonomy by recognizing only four species in Africa, three of which occur in the southern African subregion. Of these three species only two occur in the Republic of South Africa i.e. *M. schreibersii* and *M. fraterculus*. The other species in this subregion, *M. inflatulus* has not yet been recorded further south than Zimbabwe where it has been collected from Umtali and the Zimbabwe National Monument (Smithers 1983).

M. fraterculus, although widely distributed in Africa, is not common anywhere (Rautenbach 1982) and in the Republic of South Africa it is largely concentrated in the south-eastern parts of the Cape Province (Smithers 1983). Both *M. fraterculus* and *M. inflatus* are social and have occasionally been taken in association with *M. schreibersii* (Harrison 1959; Smithers 1983), and a general co-occurrence of *M. schreibersii* and *M. fraterculus* has been reported in the Natal Midlands (Laycock 1973; Bernard 1980). Because size is the major taxonomic characteristic used to distinguish between the various species it is clear that difficulties could be encountered in identifying them and therefore every possible identifiable characteristic should be exploited.

Because of the presence of vestigial teeth in *M. schreibersii* (Mein & Tupinier 1977; Van der Merwe in press) the other two species occurring in the southern African subregion were examined for the presence of similar teeth. The purpose of the present study was to elucidate the presence and position of vestigial teeth in the two species under discussion.

Methods

Forty four *Miniopterus fraterculus* Thomas and Schwann, 1906 and three *M. inflatus* Thomas, 1901 skulls were borrowed from the Transvaal Museum and carefully examined through a dissecting microscope. Some skulls had pieces of dried gum (gingiva) tissue covering the alveolar bone which were then carefully removed with thin needles in an attempt to uncover minute vestigial teeth. In the majority of skulls, however, this was not necessary as they had been cleaned sufficiently for the presence of these teeth to be revealed. The jaws were photographed using a Philips 500 scanning electron microscope (at 12 KV).

Results

In both *M. fraterculus* and *M. inflatus* a vestigial tooth was located at the same site between the upper permanent canine and following premolar (Figure 1). Vestigial teeth are minute and partly covered by the cingulum (broad basal ridge) of the canine and premolars (Figure 2). The mean length of twenty of these vestigial teeth in *M. fraterculus* was 0,22 ± 0,05 mm. In the living animal such teeth are invisible below the gingivae.

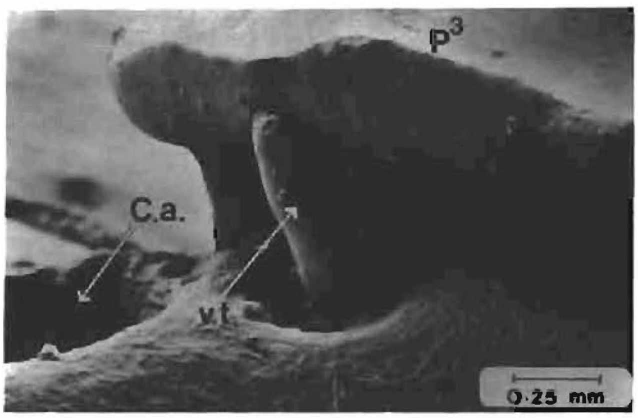

Figure 1 Part of the maxilla of an adult *Miniopterus fraterculus* showing the vestigial tooth (v.t.) on the buccal side of the third premolar (P^3). Anterior of P^3 part of the large alveolus of the canine (C.a.) is visible.

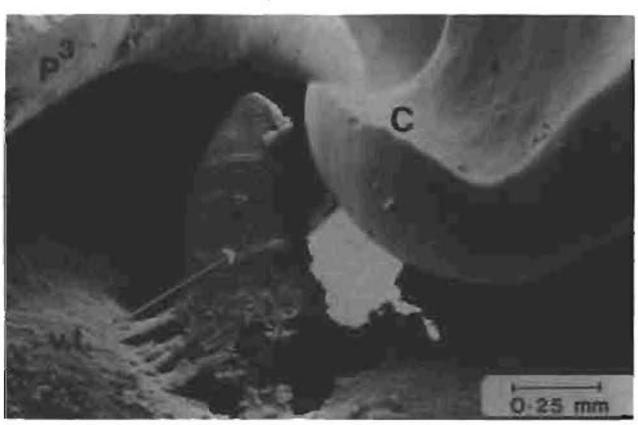

Figure 2 Low magnification of a part of the permanent canine (C) and following premolar (P^3) in the maxilla of an adult *Miniopterus fraterculus*. The small vestigial tooth (v.t.) is partly covered by the cingulum of the canine and following premolar. Dried-up bits of gingiva can be seen adhering to the vestigial tooth.

Vestigial teeth were found in all three skulls of *M. inflatus*. They were either very short or broken off in their minute alveoli but nevertheless clearly visible.

In *M. fraterculus*, skulls were divided into three age groups according to tooth wear to assess whether vestigial teeth remain throughout life or disappear with age (Table 1). Signs of vestigial teeth (i.e. the presence of one or two alveoli or one or two vestigial teeth) were found in 95% of the 44 skulls examined and in 44% of the cases both these teeth were present (Table 1). In skulls of older bats (Category III) signs of these teeth (i.e. their alveoli) were always present. In the intermediate category only two (9%) showed no signs of vestigial teeth, meaning that the teeth could either have been lost during the lives of the animals with their alveoli subsequently becoming ossified or that there could have been no vestigial teeth from the start. In the first and second category 47% and 45% of the skulls respectively contained both vestigial teeth which is 43% of the total number of skulls examined (Table 1).

Discussion

During the cleaning of skulls vestigial teeth may easily become dislodged and lost. This is particularly so where skulls are not specifically cleaned to uncover such minute vestigial teeth. It is nevertheless remarkable that such a high percentage of skulls were found still containing both vestigial teeth after the cleaning process (Table 1). Because only three skulls of *M. inflatus* were available no definite conclusions could be drawn on the vestigial teeth of this species. Contrary to the situation in *M. schreibersii natalensis* (Van der Merwe in press) such teeth are much more persistent in *M. fraterculus* and remain in place in bats of greater age. This assumption is based on the high percentage (95%) of skulls showing signs of these teeth and especially those in Category III where all of the skulls showed signs of these teeth (Table 1).

Therefore it can be predicted that signs of these teeth should be found in 95% of all *M. fraterculus* skulls collected at random. When vestigial teeth become dislodged from their alveoli it would appear that the latter would become closed completely with time. This has been deduced from the fact that two skulls in the middle category showed no signs whatsoever of vestigial teeth or their alveoli while in one of the Category III skulls only one alveolus was evident (Table 1). Another possibilty, although doubtful, is that these teeth might have been absent from the start.

Mein & Tupinier (1977) who described vestigial teeth in European *M. schreibersii* put forward some arguments that these vestigial teeth are permanent premolars rather than persistant deciduous teeth, and their hypothesis is supported by Van der Merwe (in press) and in the present study. Owing to the presence of this tooth the anterior premolar of *M. schreibersii* analysed by Miller (1907) as P^2 should in fact be

Table 1 Indication of the presence of vestigial teeth in the maxillae of 44 adult *Miniopterus fraterculus* skulls

Category I (Teeth not worn) Vestigial teeth					Category II (Tooth wear slight – medium) Vestigial teeth					Category III (Teeth worn) Vestigial teeth				
No sign	1 alveolus	2 alveoli	1 tooth	2 teeth	No sign	1 alveolus	2 alveoli	1 tooth	2 teeth	No sign	1 alveolus	2 alveoli	1 tooth	2 teeth
0	0	9 (47%)	1 (5%)	9 (47%)	2 (9%)	0	6 (27%)	4 (18%)	10 (45%)	0	2 (67%)	1 (33%)	0	0
Total 19					Total 22					Total 3				

P^3 as suggested by Mein & Tupinier (1977) with the vestigial tooth becoming P^2.

It is therefore suggested that *M. inflatus* and *M. fraterculus* have another permanent premolar in the maxilla present in vestigial form.

Acknowledgements

I am grateful to Drs I.L. Rautenbach and R.H.N. Smithers of the Transvaal Museum for allowing me access to their skull collections and Mr A.J. Botha who took the scanning electron microscope photographs.

References

BERNARD, R.T.F. 1980. Reproductive cycles of *Miniopterus schreibersii natalensis* (A. Smith, 1834) and *Miniopterus fraterculus* Thomas and Schwann, 1906. *Ann. Transv. Mus.* 32: 55 – 64.

HARRISON, D.L. 1959. Report on the bats (Chiroptera) in the collection of the National Museum of Southern Rhodesia, Bulawayo. *Ocas. pap. Natl. Mus. Rhod. B, Nat. Sci.* 23: 217 – 231.

HAYMAN, R.W. & HILL, J.E. 1971. Order Chiroptera. In: The mammals of Africa: an identification manual, (eds) Meester, J. & Setzer, H.W., Smithsonian Institution, Washington D.C.

LAYCOCK, P.A. 1973. Distribution and abundance of bats in the Natal Midlands. *Ann. Transv. Mus.*, 28: 207 – 229.

MEIN, P. & TUPINIER, Y. 1977. Formule dentaire et position systématique du Minioptère (Mammalia, Chiroptera). *Mammalia* 41: 207 – 211.

MILLER, G.S. 1907. The families and genera of bats. *U.S. Nat. Mus. Bull.* 57.

RAUTENBACH, I.L. 1982. Mammals of the Transvaal. Ecoplan Monograph No. 1, Colbyn, Pretoria.

SMITHERS, R.H.N. 1983. The Mammals of the Southern African Subregion. University of Pretoria, Pretoria.

VAN DER MERWE, M. In press. The vestigial teeth of *Miniopterus schreibersii natalensis*. *J. Zool., Lond.*