Pliocene vertebrate locality of Çalta, Ankara, Turkey. 3. Insectivores

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ABSTRACT
The insectivore fauna from Çalta (middle Ruscinian MN15) consists of four taxa: the Soricidae *Asoriculus gibberodon* (Petényi, 1864); *Mafia csarnotense* Reumer, 1984; an indeterminate species; and the Erinaceidae *Erinaceus* sp. The fauna, with a water shrew as its most abundant member, is extremely poor in number of species, indicating a dry environment with occasional rivers.

KEY WORDS
Ruscinian,
Insectivora,
Soricidae,
Erinaceidae,
Turkey,
paleoecology.

RÉSUMÉ
Le gisement de vertébrés pliocènes de Çalta, Ankara, Turquie. 3. Insectivores. La faune d'insectivores de Çalta (Ruscinien moyen, zone MN15) est constituée de quatre espèces. Il s'agit des soricidés *Asoriculus gibberodon* (Petényi, 1864), *Mafia csarnotense* Reumer, 1984, et d'une espèce indéterminée, ainsi que de l'érinacéidé *Erinaceus* sp. Bien que l'espèce principale soit une musaraigne aquatique, cette faune d'insectivores est extrêmement pauvre en espèces, indice d'un milieu aride avec des fleuves épars.

MOTS CLÉS
Ruscinien,
Insectivora,
Soricidae,
Erinaceidae,
Turquie,
paléoécologie.

INTRODUCTION

Sen (1977) described the abundant rodent fauna from the Turkish vertebrate locality of Çalta and gave a provisional fauna list of the locality, including three taxa of insectivores. The locality was attributed to a late Ruscinian age. The stratigraphic age was subsequently refined to the early middle Ruscinian (a zone characterized by the presence of *Mimomys davakosi* van de Weerd, 1979), mammalian zone MN15 by van der Meulen & van Kolfschoten (1986). De Bruijn *et al.* (1992) confirmed the age of Çalta as being MN15. Çalta has yielded a small sample of Insectivora. While abundant insectivore faunas dating to the Ruscinian are known from Central Europe, such faunas from southeastern Europe and Asia Minor are scarce, and hence their study is worthwhile.

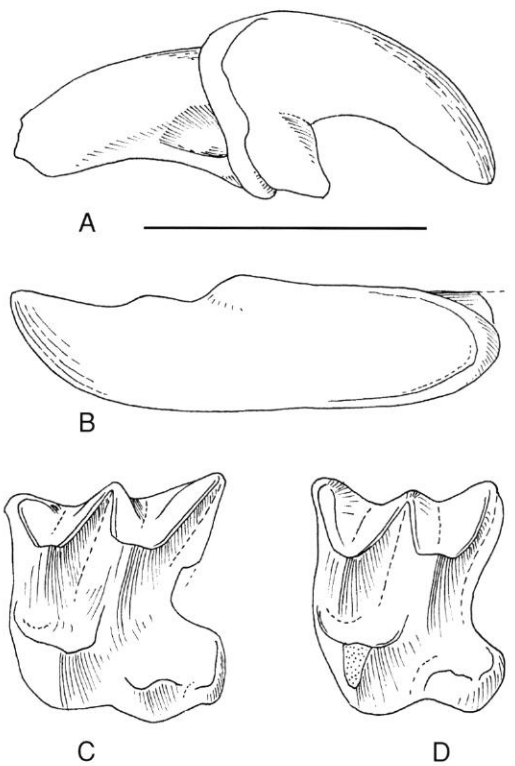

FIG. 1. — *Asoriculus gibberodon* from Çalta: **A**, right upper incisor, ÇAL025; **B**, left lower incisor, ÇAL042; **C**, left M1, ÇAL031; **D**, left M2, ÇAL039. Scale bar: 2 mm.

MATERIAL AND METHODS

Only sixty-one teeth and tooth fragments from Çalta can be attributed to insectivores; four of these to a hedgehog, the other fifty-seven specimens to shrews. The specimens were sent to the author by Dr Sevket Sen (Paris), and they were mounted in putty in order to be studied and measured. Descriptions were made with the aid of a Wild M5 binocular; measurements were made with a Leitz Ortholux binocular with measuring clocks at the Institute of Earth Sciences of Utrecht University. Measurements have been taken according to the method extensively described by Reumer (1984), the results are given in millimeters units in tables 1-3.

SYSTEMATIC PALEONTOLOGY

Family SORICIDAE Fischer, 1817
Subfamily SORICINAE Fischer, 1817
Tribe NEOMYINI Matschie, 1909
Genus *Asoriculus* Kretzoi, 1959

Asoriculus gibberodon (Petényi, 1864)
(Fig. 1, Table 1)

Episoriculus sp. – Sen 1977: 92.

REMARKS

For an extensive description of this species see Reumer (1984). The Çalta material conforms the description given for the Ruscinian samples; in size, *A. gibberodon* from Çalta falls well within the range established for central European representatives of the species as given by Reumer (1984) and for Greek material (Reumer & Doukas 1986; Doukas *et al.* 1995).

The loph running from the hypocone and surrounding the talon in the upper molars (M1 and M2) is sometimes continuous, sometimes not so, or there may be only a slight interruption in the loph. It is therefore difficult to attribute the material to either morphotypes A or B of Reumer (1984). *A. gibberodon* is a well-spread species during the Ruscinian; it is considered to indicate a rather moist environment (but see below).

TABLE 1. — Measurements of *Asoriculus gibberodon* in millimeter units.

Element	Parameter	n	min	x	max	sd
I	LT	2	0.79	0.80	0.81	
	L	2	1.84	1.93	2.01	
	H	3	1.15	1.19	1.24	
P4	BL	2	1.48	1.48	1.48	
M1	PE	5	1.14	1.23	1.30	0.073
	LL	5	1.44	1.49	1.52	0.030
	BL	4	1.44	1.51	1.56	
	AW	4	1.37	1.45	1.52	
	PW	4	1.64	1.65	1.67	
M2	PE	8	1.07	1.11	1.16	0.036
	LL	7	1.25	1.31	1.38	0.041
	BL	6	1.25	1.33	1.45	0.067
	AW	4	1.58	1.62	1.67	
	PW	6	1.43	1.50	1.54	0.040
i	L	1	–	3.25	–	
m1	TRW	6	0.75	0.82	0.85	0.041
	TAW	6	0.77	0.89	0.96	0.067
	L	5	1.44	1.49	1.56	0.052
m2	TRW	3	0.78	0.79	0.80	
	TAW	3	0.82	0.83	0.83	
	L	2	1.36	1.44	1.52	
m3	W	1	–	0.60	–	
	L	1	–	1.08	–	

TABLE 2. — Measurements of *Mafia csarnotense* in millimeter units.

Element	Parameter	n	min	x	max
I sup.	LT	2	1.25	1.33	1.40
	L	2	2.48	2.53	2.58
	H	2	1.44	1.45	1.46
P4	PE	1	–	1.26	–
	BL	1	–	1.78	–
M1	PE	3	1.30	1.33	1.35
	LL	2	1.45	1.48	1.50
	BL	2	1.58	1.59	1.60
	AW	3	1.52	1.56	1.58
	PW	1	–	1.55	–
M2	PE	4	1.16	1.18	1.22
	LL	3	1.28	1.37	1.40
	BL	2	1.38	1.40	1.41
	AW	2	1.62	1.64	1.66
	PW	2	1.34	1.43	1.52
M3	W	1	–	1.28	–
i	L	1	–	>3.95	–
m1	TRW	2	0.92	0.94	0.95
	TAW	2	0.97	1.01	1.05
	L	2	1.70	1.71	1.72

Tribe BLARININI Kretzoi, 1965
Genus *Mafia* Reumer, 1984

Mafia csarnotense Reumer, 1984
(Fig. 2, Table 2)

Blarinella sp. – Sen 1977: 92.

DESCRIPTION

Upper incisor: the upper incisor is relatively large and not fissident, having a strong apex and a small talon. The buccal cingulum is broad but not very high, running along a slightly undulate posterior margin. The upper edge is continuously convex.

P4: only two broken specimens are available. The parastyle is high and protruding; it is connected to the paracone by a high parastylar crest. The protocone is low and inconspicuous. The posterior emargination seems to have been rather weak.

M1-M2: the talon is small, surrounded by a low ridge on which no separately distinguishable hypocone is to be seen. The protocone is connected to both the paracone and the metacone; the metaloph is, however, shorter than the protoloph and separated from the metacone by a small depression. The posterior emargination is slight to moderate: the PE index, expressed as (LL + BL)/2 × PE – 1 is 0.15 for M1 and 0.17 for M2 (see Reumer 1984 for details).

M3: the only available M3 is broken, only a strong paracone and a weakly-developed protocone are present in the fragment. The anterior border of the tooth is convex, not straight.

Lower incisor: the tooth is long, possessing a strongly upturned apex, a bicuspulate dorsal margin and a well-developed buccal cingulum. The cuspules are well-developed but not inflated.

m1: the first lower molars (no m2's and m3's are unfortunately preserved) have a short talonid; the

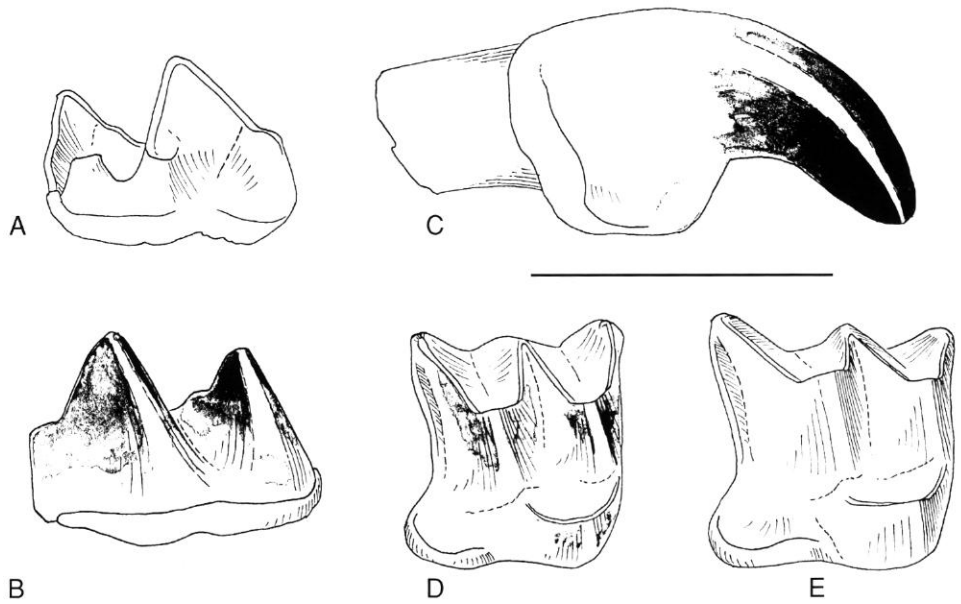

FIG. 2. — *Mafia csarnotense* from Çalta: **A**, left m1, ÇAL021, lingual view; **B**, the same, buccal view; **C**, right upper incisor, ÇAL007; **D**, right M2, ÇAL016; **E**, right M1, ÇAL018. Scale bar: 2 mm.

entoconid is situated halfway between metaconid and entostylid; an entoconid crest is absent. The lower molars make a robust appearance.
All dental elements are strongly pigmented with a dark red colour.

REMARKS
The clear absence of entoconid crests indicates that the material belongs to the tribe Blarinini. The combination of the strong dental pigmentation, the non-fissident large upper incisor, the robust lower molars, and the absence of hypocones in the upper molars are all indicative of a member of the genus *Mafia*. Comparison with the description, the illustrations and the measurements of *Mafia csarnotense* from the late Ruscinian of Hungary (given *in* Reumer 1984), and with the data provided by Rzebik-Kowalska (1990) for Polish material, strongly point towards *M. csarnotense*. The other species attributed to this genus, *M. dehneli* (Kowalski, 1956) (early Ruscinian of Poland), is considerably larger. In size, our Turkish material comes closer to the late Ruscinian *M. csarnotense* material than to the early Ruscinian Polish material of the same species, which is somewhat smaller. It is unfortunate that no mandibular osteological material is preserved. In *M. csarnotense* from Csarnóta-2, the lower incisor has a weaker cingulum than in the Çalta material. However, there are not many other differences to be discerned. As the measurements corroborate also, we attribute the material from Çalta to *M. csarnotense*. This find extends the geographic range of the species that was known so far only from Poland and Hungary. The species ranges in age from MN14 through MN16, so our material fits nicely into the stratigraphic range of the species.

Family SORICIDAE g. et sp. indet.

REMARKS
One fragmentary P4 is preserved that does not belong to either *Mafia csarnotense* or to *Asoriculus gibberodon*. It is a slender tooth, with high and pointed cusps. The parastylar crest is high, the protocone is high and pointed, almost conical but with a small ridge running in a posterior direction. The valley between protocone and parastyle is closed by a low and narrow

TABLE 3. — Measurements of *Erinaceus* sp., in millimeter units.

Element	Parameter	n	size
P3	L	1	2.56
	W	1	2.14
M1	L	1	4.92
	W	1	5.61

ridge; the valley between protocone and the large hypocone is wide and open. Measurements: PE = 0.75; BL = 1.47; W = 1.37 mm. The tooth, although having a *Sorex*-like appearance, is thus considerably larger than P4's from the Ruscinian species *S. minutus* Linné, 1766 or *S. bor* Reumer, 1984, and smaller than *Sorex* sp. from the Hungarian locality of Osztramos-7 (Reumer 1984). A possible attribution to the genus *Crocidura*, another taxon with slender teeth having high and pointed cusps, can be excluded by reason of the highly individualized protocone. We cannot therefore attribute the fragmentary tooth to any taxon.

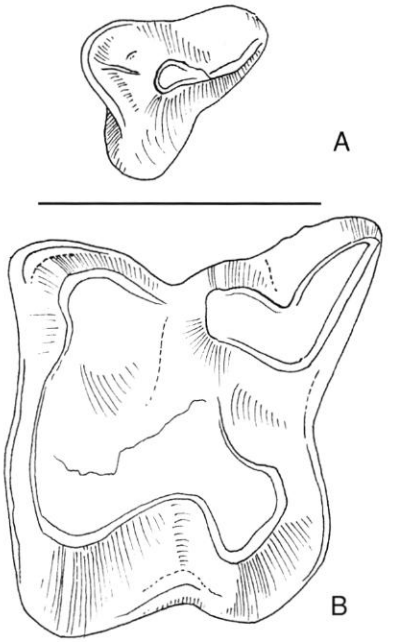

FIG. 3. — *Erinaceus* sp. from Çalta: **A**, left P3, ÇAL004; **B**, left M1, ÇAL001. Scale bar: 4 mm.

Family ERINACEIDAE Bonaparte, 1838
Subfamily ERINACEINAE Bonaparte, 1838
Genus *Erinaceus* Linné, 1758

Erinaceus sp. indet.
(Fig. 3, Table 3)

Erinaceus sp. – Sen 1977: 92.

Only four dental elements of a hedgehog are preserved: a buccal fragment of (most probably) a left C, P1 or P2; a left P3; a left P4 missing its posterobuccal corner; and a left M1. All elements are from the left side and they might thus originate from one single maxilla.

The only complete elements, the P3 and the M1, are not very diagnostic in their appearance. P3 has only one cusp developed, the paracone, with a loph running in posterior direction. There is a faint indication of a parastylar crest, but a parastyle cannot be seen. A cingulum is present along the anterior margin.

In the M1, the cusps are strongly worn and hence the tooth has become rather flat. This is not unusual in hedgehogs. Narrow and sometimes even delicate cingula are present along the anterior and posterior margins, below the paracone, and between protocone and hypocone.

Due to the scant material available, it seems unadvisable to make an identification at the species level.

GENERAL DISCUSSION

Our insectivore sample consists of only four species. Among the Soricidae, the most abundant species is the neomyine *A. gibberodon* (related to the water shrews), with thirty-seven out of fifty-seven specimens (64.9%), followed by *M. csarnotense* with nineteen specimens (33.3%), and the single indeterminate tooth (1.8%).

Even considering the fact that the sample of insectivores from Çalta is small, the number of species of Soricidae is extremely low for a (middle) Ruscinian locality. Ruscinian localities in Central Europe (such as Weze, Podlesice, Rebielice, Csarnóta-2, or Osztramos-7) have a considerably larger diversity, sometimes counting

over a dozen species (see Reumer 1984). This makes Çalta an interesting sample from a paleoclimatological point of view. A high soricid diversity indicates a humid paleoclimate, while a low diversity indicates a drier situation (Reumer 1995). The presence of two, possibly three, species of shrews in Çalta is thus indicative of an arid paleoclimate. The high percentage of *Asoriculus* in our sample, however, seems at a first glance to contradict a dry or arid climate.

Sen (1977) came to the conclusion that the paleoenvironment of Çalta was that of a steppe ("*un milieu steppique*"). Van der Meulen & van Kolfschoten (1986) were of the same opinion: they spoke of "extensive dry open country". Reumer (1984) attributed an open environment to the genus *Mafia*, which corroborates the conclusions of Sen (1977) and van der Meulen & van Kolfschoten (1986). Our shrew sample thus may seem somewhat contradictory in itself: a wet element (the water shrew *Asoriculus*) together with an indicator of more steppic conditions (*Mafia*), while the low number of species indicates a dry paleoclimate. The conclusion that can be reached is that indeed the situation of Anatolia in the middle Ruscinian was dry and steppic. Sparsely present rivers or other water-bodies provided the environment necessary for water shrews (vegetational cover and an abundance of invertebrate food items).

As far as biogeography is concerned, it is interesting to compare the fauna from Çalta with the one from Apolakkia (Rhodes, Greece; see Van de Weerd *et al.* 1982). Apolakkia is, biogeographically speaking, a locality that belongs to the Turkish realm; it is also of MN15 age, and only slightly younger than Çalta according to van der Meulen & van Kolfschoten (1986). *Asoriculus gibberodon* is found in Apolakkia as well, along with what can so far be considered to be the oldest *Crocidura* in the European fauna region. This genus, originating from Africa, is supposed to have reached Europe via Asia Minor. Its absence in Çalta is therefore noteworthy. It could mean that *Crocidura* entered the region during MN15, between the moments of deposition of the Çalta and Apolakkia faunules, respectively.

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