National and Kapodistrian University of Athens, Greece
Faculty of Geology and Geoenvironment
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Study of *Cricetodon* (Rodentia, Mammalia) from the Early Miocene locality of Karydia (Rhodope, North Greece)

Master Thesis

Depositional Environments, Ecosystems and Geo-Bioresources

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Μελέτη του *Cricetodon* (Τρωκτικά, Θηλαστικά) από το Κατώτερο Μειόκαινο της Καρυδιάς (Ροδόπη, Ελλάδα)

Μεταπτυχιακή Διπλωματική Εργασία

Περιβάλλοντα Ιζηματογένεσης, Οικοσυστήματα και Γεωβιοπόροι

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To my friend, Chris Solomos

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1. Prologue

This thesis is part of the Master of Science program “Depositional Environments, Ecosystems and Geo-Bioresources” of the Department of Historical Geology and Paleontology of the Faculty of Geology and Geoenvironment of the National and Kapodistrian University of Athens. Part of it was conducted at the University of Utrecht in Netherlands thanks to the European exchange program, Erasmus+.

Cricetodon aliveriensis was first described by Hofmeijer and de Bruijn in 1988. It is a small rodent from the Early Miocene (MN 4) of Greece. The type locality of the species is the fossiliferous locality of Aliveri on the Greek Island of Evia which does not exist anymore. The subject of this thesis is to record and describe the material of this genus from the Greek locality of Karydia and to prove whether it belongs to the same species.

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2. Introduction

2.1. The Mediterranean area during the Early Miocene

The Neogene history of the eastern Mediterranean, especially in Greece, is complicated. During the Early Miocene in Eurasia, active tectonism caused the movement and the collision of tectonic plate boundaries (Fig. 1). During this time period the anticlockwise movement of the African and Arabian plates resulted in their collision to the Anatolian (Rögl, 1999). Mountains emerged, new overland migration routes appeared and the sea level changed. It was the first time the Mediterranean Sea was cut off from the Indian Ocean. Greece being the crossroad between Anatolia and Europe played a major role in the geological and geographical history of the Mediterranean area. The new land bridges between the areas above enabled mammal migration events at the base of the MN 4 zone (Rögl, 1999). The study of Greece's key localities is essential for understanding these migration events between Anatolia, Greece and Western Europe at the beginning of the Miocene.

During the Early Miocene, there was no land connection between Greece and Anatolia (Popov *et al*., 2004). However, because of the appearance of some common genera in both areas, like Gliridae (Ünay, 1994), a connection between them probably existed before the Early Miocene. In addition, the migration of two insectivore genera, *Galerix* and *Desmanodon* from Anatolia to Europe between the MN 2 and MN 3 indicate an intermittent connection between these areas (Hoek Ostende *et al*., 2015). Furthermore, by the early Middle Miocene the Anatolian block is connected to Europe through a northern corridor (Hoek Ostende *et al*., 2015).

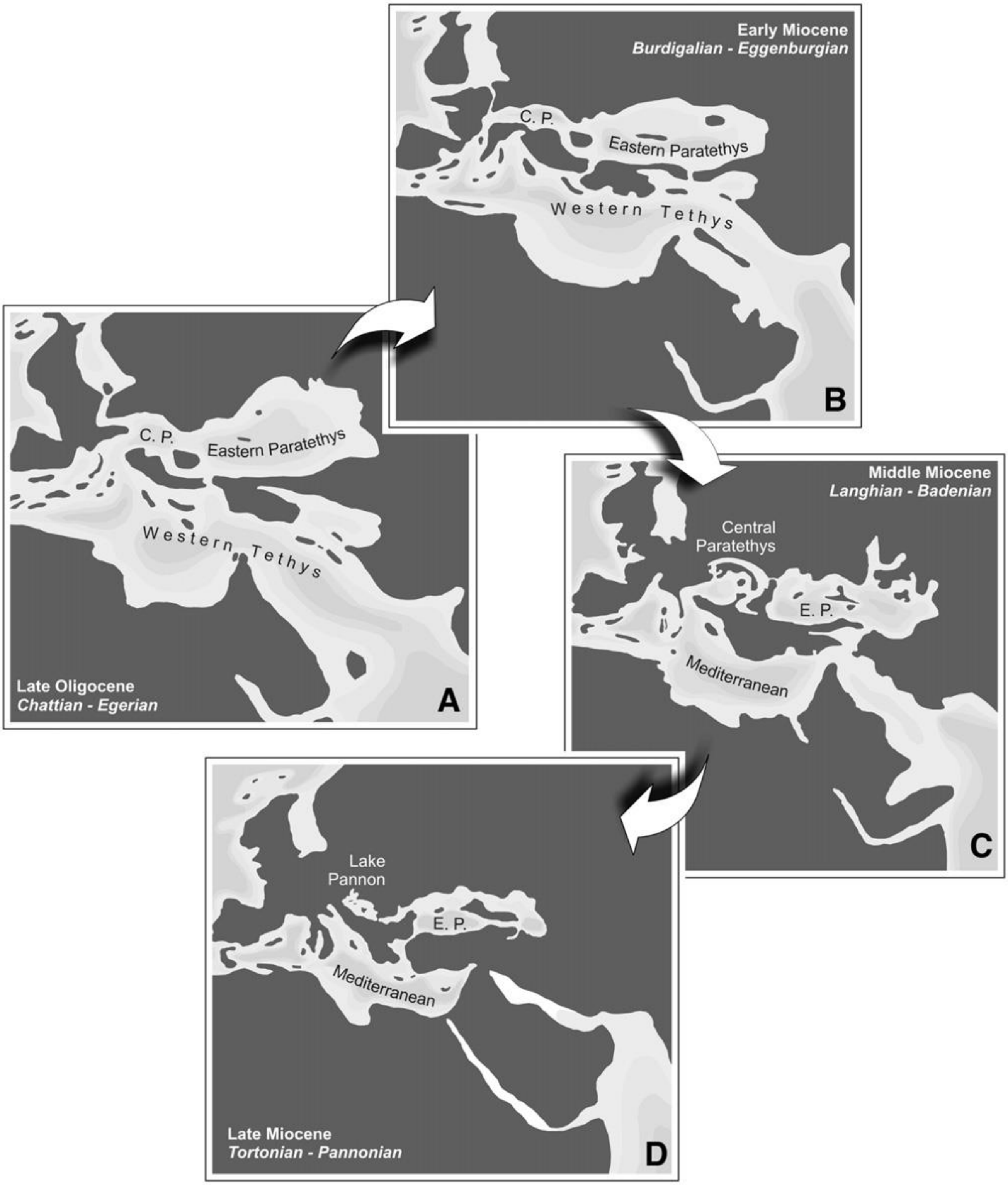


Figure 1. Late Oligocene to Late Miocene paleogeographic evolution of the Paratethys and Mediterranean Sea (Harzhauser and Piller, 2007)

2.2. The MN 4 localities of Greece

Two of the richest Greek localities with Early Miocene (MN 4) micro - faunas are those of Aliveri and Karydia (Doukas, 2003). During this time period, the Alpine system possibly established a land connection between Europe and Asia (Dercourt *et al.*, 1986). The elaboration of all the available data of these localities, like the type of the faunas and their sediment data, are essential for the comprehension of the Early Miocene of Greece. Through this process, it will be possible to understand and fill the gaps in the stratigraphic distribution of various taxa in Anatolia and Greece.

In addition, in Kalimeriani locality, on Evia Island, a mandible of the anthracothere *Brachyodus onoideus* was found (Melentis, 1966; Koufos, 2016). This mandible is the first and only specimen of the species from this locality but its stratigraphic level is unknown. As a result, the material cannot provide a specific age for the locality. However, this taxon is already known from MN 3-4 of Europe (de Bruijn *et al*., 1992) and therefore, a similar age could be considered for Kalimeriani locality (Koufos, 2006).

The Lapsarna locality, on Lesvos Island, is another possible MN 4 locality. The locality's *Eumyarion* bears a resemblance to *E. latior and E. weinfurteri*. The former has been found in MN 4 - MN 5 localities in Central Europe (Fortelius, 2011) and the latter in MN 4 - 5 localities in Germany, Czech Republic and Greece (de Bruijn, 2009; Fortelius, 2011). Moreover, the *Democricetodon* species from Lapsarna are similar to *D. doukasi*, *D. franconicus* and *D. gracilis* and suggest an early Middle Miocene age for the fauna (Vasileiadou and Zouros, 2012). In addition, another genus that was found in Lapsarna locality is *Glirulus*. The same genus is also present in the MN 4 localites of Aliveri (de Bruijn and van der Meulen, 1972) and Karydia (Fortelius, 2011; Theocharopoulos, 2000). However, only the fauna of Lapsarna locality correlates with the Lower Miocene age. The fossiliferous sediments which have been found below thick volcanic series are dated to 18.4 ± 0.5 Ma (Pe - Piper and Piper, 2002) which sets the youngest limit of the locality at the age above (Koufos *et al*., 2003). This age does not accord with the MN 4 but with MN 3 biozone (Vasileiadou and Zouros, 2012). However, the fauna is not complete enough to choose between the two biozones (Vasileiadou and Zouros, 2012).

It must be mentioned that the correlation of the European MN zones with those of Greece is very difficult because of the problem with the geographical and the latitudinal gradients (Krijgsman *et al.*, 1994). The usage of the MN zones becomes problematic when the area of interest is geographically far from the locality of the reference fauna (Doukas, 2003). The duration of a specific MN zone can be the same or different between regions. Because of that, these biozones and any conclusion about the paleogeographic history of the eastern Mediterranean must be used with caution (Hoek Ostende *et al.*, 2015).

2.3. The locality of Karydia

The locality of Karydia (Figs 2, 5) was discovered by de Bruijn and Foussekis in 1989, located North - East of the town of Komotini (Doukas, 2005). It belongs to the region unit of Rhodope in the Administrative region of East Macedonia and Thrace, in Greece.

Figure 2. The locality of Karydia

Karydia locality is part of the Thrace basin (Fig. 3). It is a complex system of depocentres located between the Rhodope - Strandja massifs to the North and the Biga Peninsula to the South (Caracciolo *et al*., 2015). The Marmara Sea covers the southern - eastern margin of the basin which is deformed by the North Anatolian Fault Zone (Caracciolo *et al*., 2015). It is referred to as the largest and thickest Tertiary sedimentary basin of the eastern Balkan region (Turgut and Eseller, 2000; Siyako and Huvaz, 2007). The Thrace basin includes deposits from the Early Eocene to the Late Oligocene followed by the Neogene-Quaternary succession with maximum total thickness of 9000 m (Turgut and Eseller, 2000; Siyako and Huvaz, 2007). The majority of the Eocene - Oligocene sedimentary succession is made of basin - plain turbidites (Turgut *et al*., 1991). The oldest part of the basin appears all along its margins. Its center is covered by Plio - Quaternary deposits (Caracciolo *et al*., 2015). The sediments of the northern, western and central part of the Thrace basin overlie the basement complexes of the Rhodope - Strandja massifs (Caracciolo *et al*., 2015) (Fig. 4). Furthermore, the Thrace depocentres are a hanging wall supradetachment basin evolving into a strike slip basin from the Late Miocene to the present (Kilias *et al*., 2013). The deposits of the basin came from three possible sources. The first one is the Rhodope - Strandja massifs, especially for W and NW Thrace and the main depocentre. The second possible source is the Circum - Rhodope Belt and the last possible one is the Biga and Izmir - Ankara suture zones in South Thrace (Caracciolo *et al*., 2015). Moreover, “an extensive volcanic source was also active, delivering huge quantities of volcaniclastic debris throughout the Thrace basin between the Late Eocene and the Miocene” (Caracciolo *et al*., 2015). Furthermore, the Limnos and western Thrace deposits, where the locality of Karydia belongs, were supplied by the Circum - Rhodope Belt (CRB) with low - grade metamorphic material to the western part and with meta-ophiolitic detritus to the southern part (Limnos Island) (Caracciolo *et al*., 2015) (Fig. 6).

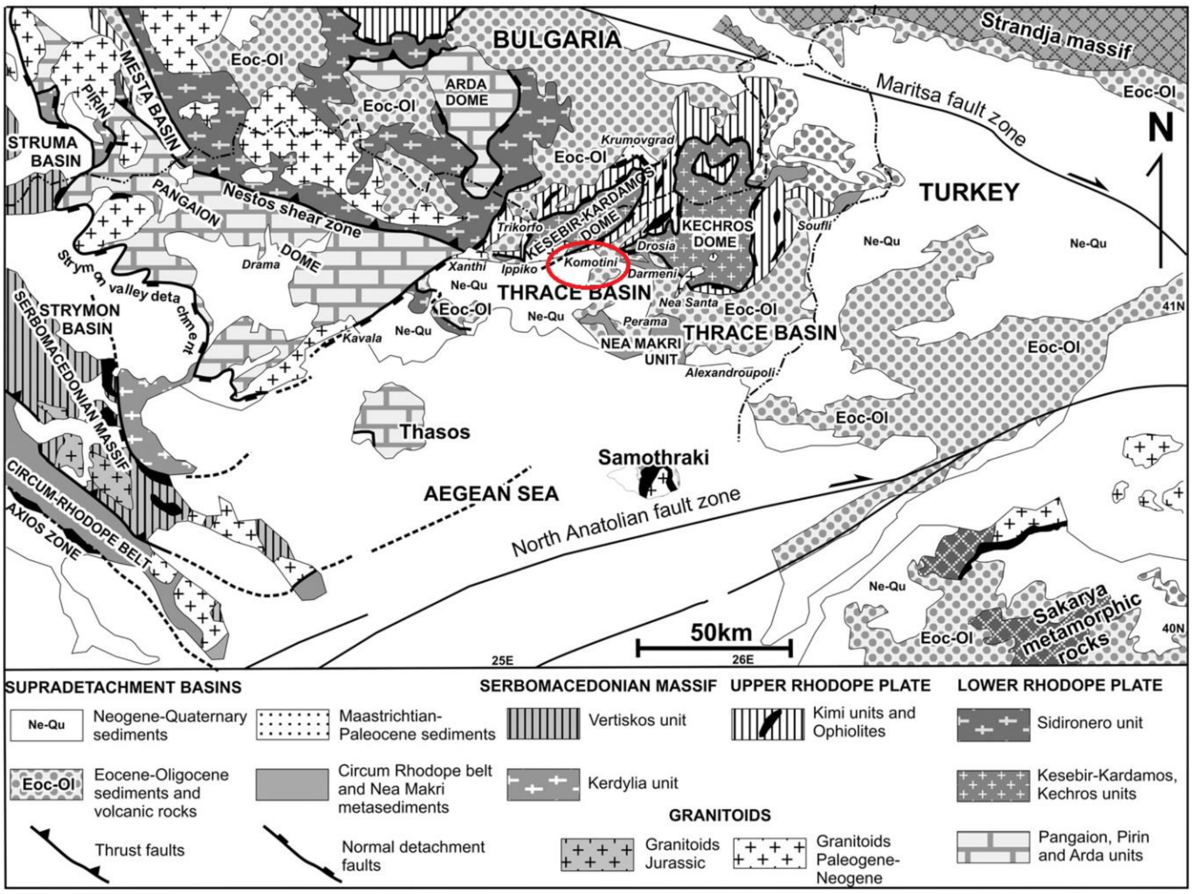


Figure 3. Simplified geological map of the Rhodope province (Kilias *et al*., 2013)

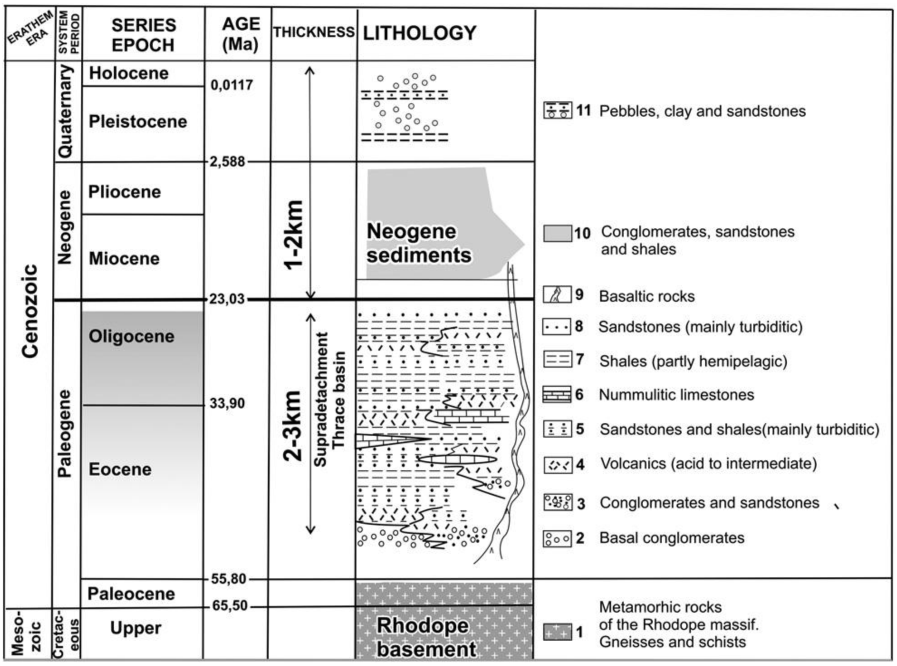


Figure 4. Schematic tectonostratigraphic column of the Thrace basin (Kilias *et al*., 2013)

Furthermore, the area of Komotini includes a fault segment (Fig. 3), over 30 km long with a complicated geometry (Robertson and Mountrakis, 2006). Several WNE-ESE and E-W synthetic fault strands smaller than 8 km long, move with a SSW direction southward at medium - high angles (Robertson and Mountrakis, 2006). The predominant faults are the Tichiro, Gratini, Dokos and Fillira - Skaloma faults which lower the landscape to the South. These are boundary faults striking WNW - ESE which controlled the deposition of the Neogene, molassa - type sediments (Karfakis and Doutsos, 1995). These are the sediments where Karydia locality is included.

Figure 5. A closer look to the locality of Karydia (41°08'26'' N 25°26' E)

Karydia locality includes three fossiliferous levels in a clay pit 800 meters South from the village of Karydia (Doukas, 2005) (Fig. 5). These are, Karydia 1, Karydia 2 and Karydia 3. They took their names after the three consecutive field campaigns that took place in the area (Doukas, 2005). All three of them are situated around a hill. Karydia 1 is located at one side of a hill while Karydia 2 and 3 are located on the other. All levels are considered synchronous. However, the lithology would point to a slightly older Karydia 3 (Doukas and Hoek Ostende, 2006).

The locality belongs to the MN 4 zone, based on the presence of the cricetids *Democricetodon* and *Cricetodon* (Theocharopoulos, 2000). All the faunal elements point to humid environment (Doukas, 2003) but the lithostratigraphic data and the sedimentology record of Karydia are poor or lacking.

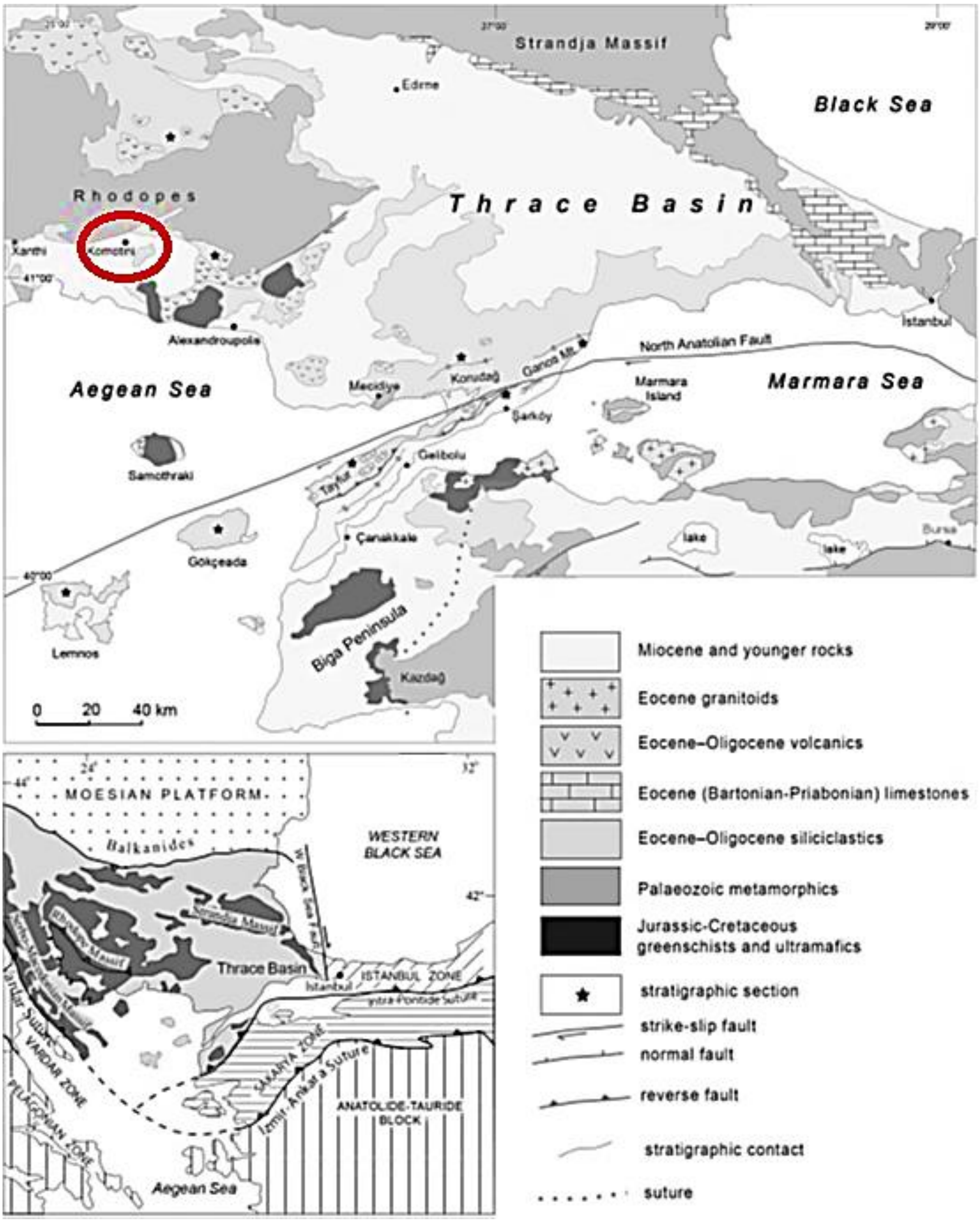


Figure 6. The geological map of the Thrace basin (Caracciolo *et al.*, 2015)

2.4. The locality of Aliveri

Aliveri locality (Fig. 7), which does not exist anymore because of the soil remediation of the area, belongs to the regional unit of Euboea and was first discovered by H. de Bruijn, van der Meulen and Katsikatsos in 1977 (Doukas, 2003). The micro - fauna material comes from an opencast lignite mine near the village of Aliveri. Like Karydia, Aliveri dates back to the Early Miocene (MN 4) due to the presence of the modern cricetids *Democricetodon*, *Megacricetodon* and *Cricetodon* (Alvarez Sierra *et al.*, 1987). Aliveri is one of the oldest Neogene localities of Greece (Hoek Ostende *et al*., 2015)

The palaeographical position of Aliveri is difficult to assess because of the complicate Neogene tectonic history of the eastern Mediterranean (de Bruijn *et al*., 2013). The opening of the Aegean in the Late Neogene and the rapid westward movement of the Aegean - Anatolian block (ten Veen and Kleinspehn, 2002) influenced the composition of the locality's fauna (Hoek Ostende *et al*., 2015).

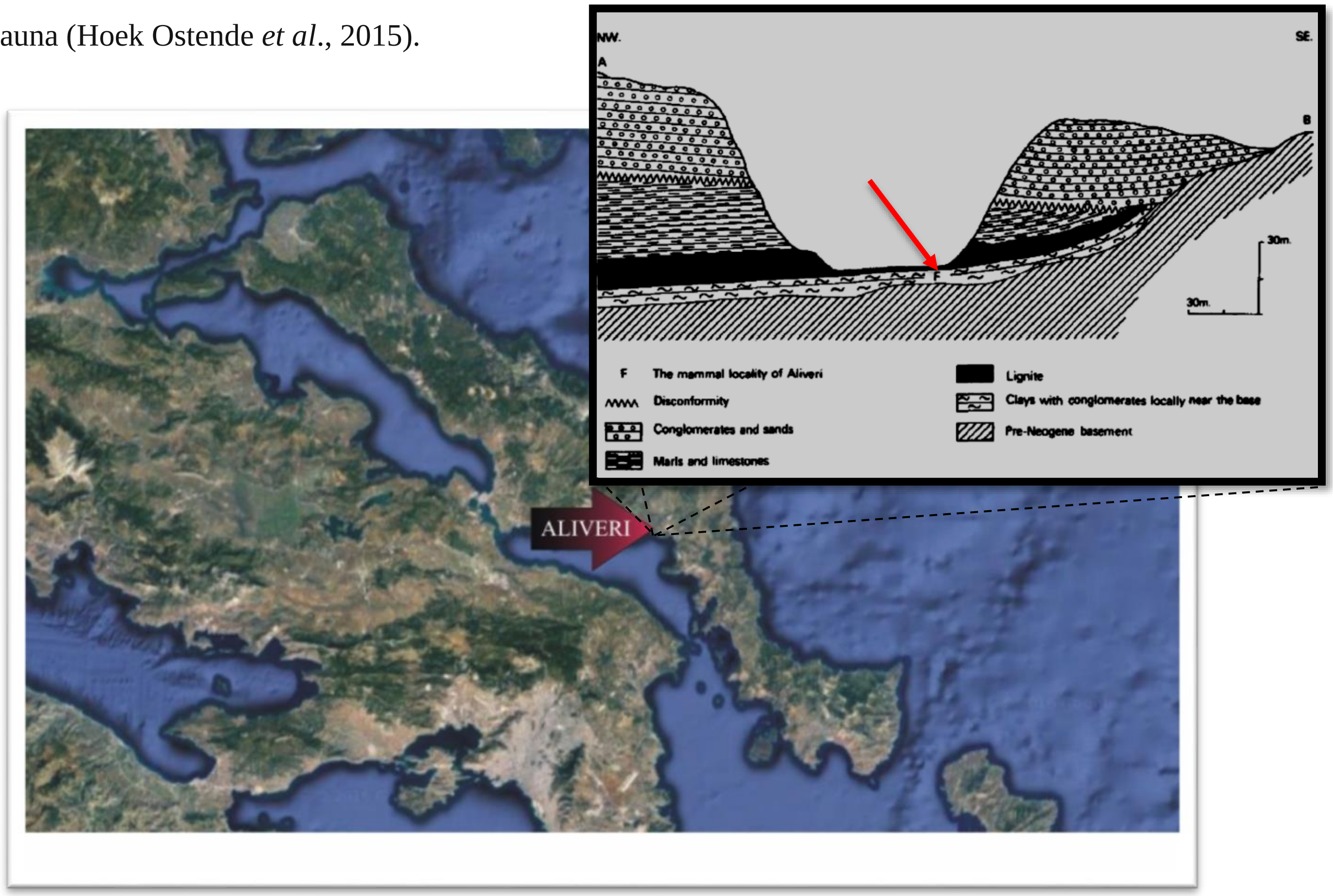
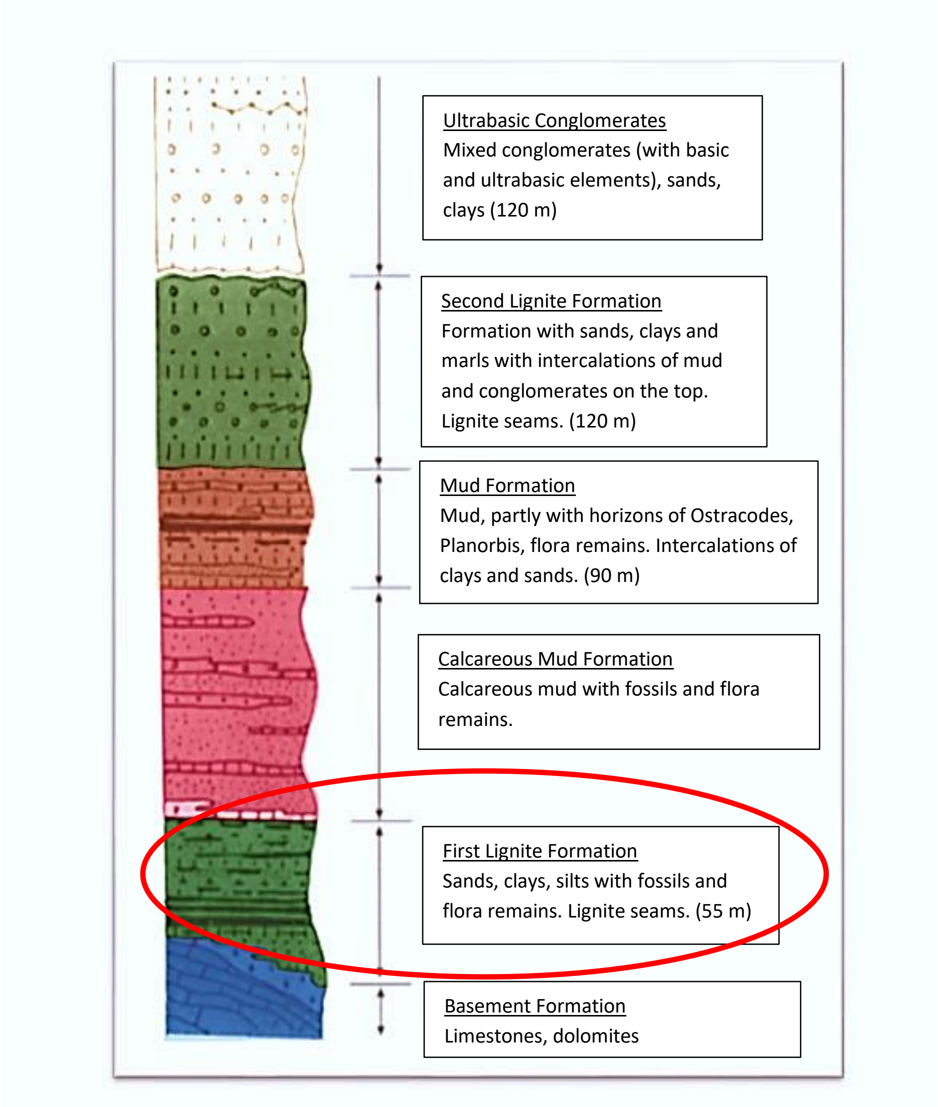


Figure 7. The locality of Aliveri and section of the Aliveri open - pit mine (Katsikatsos *et al*., 1981), the arrow indicates the position of the vertebrate locality

The fauna of Aliveri (Table 1) was present in a period of isolation from Anatolian ones. This isolation ended when a connection with Eurasia was established, around the early Middle Miocene (Hoek Ostende *et al*., 2015).

The mammal material of Aliveri (Table 1) has been collected from a lignite formation appearing North of Aliveri village, along the eastern edge of the basin. In that area, the lignite formation wedges out against Mesozoic limestones (de Bruijn *et al*., 1980). This fossiliferous bed (Fig. 8) contains well preserved tree roots, mollusks and fragments from mammals and it is exposed towards the eastern limit of the lignite deposit (de Bruijn, *et al*., 1980). However, no mammals have ever been found on the western side of the quarry (de Bruijn *et al*., 1980).



Ultrabasic Conglomerates
Mixed conglomerates (with basic and ultrabasic elements), sands, clays (120 m)

Second Lignite Formation
Formation with sands, clays and marls with intercalations of mud and conglomerates on the top. Lignite seams. (120 m)

Mud Formation
Mud, partly with horizons of Ostracodes, Planorbis, flora remains. Intercalations of clays and sands. (90 m)

Calcareous Mud Formation
Calcareous mud with fossils and flora remains.

First Lignite Formation
Sands, clays, silts with fossils and flora remains. Lignite seams. (55 m)

Basement Formation
Limestones, dolomites

Figure 8. Synthetic stratigraphical profile of the Miocene deposits, Aliveri, Kymi - Palioura Basin (Kotis *et al*., 2002; Ioakim *et al*., 2005)

The locality of Aliveri includes small and large mammals (Table 1) and also the reptile *Chameleo* cf. *andrusovi* (Georgalis *et al.,* 2016). First of all, carnivores are represented by the genera *Palaeogale* and *Euboictis* (Doukas, 1987; de Bruijn *et al*., 1987). However, it should be noted that there is not unanimity in the scientific community about the position of the feliform *Palaeogale* in the Carnivora order (Hoek Ostende *et al*., 2015). It has been recognized as Carnivora incertae sedis, as Mustelidae, as Viverravidae and as its own family, Palaeogalidae (Peigne *et al*., 2014). The same issue is also observed in *Euboictis*. It was first recognized as *Sivanasua*, belonging to Feliformia (Schmidt - Kittler, 1983) but later it was distinguished from all the *Sivanasua* species and considered as representing a new viverrid genus, *Euboictis* (Fejfar and Schmidt - Kittler, 1984). Moreover, in Aliveri lived the equid *Anchitherium* (Mein, 1989). This *Anchitherium* is morphologically similar to *Anchitherium aurelianense* (Cuvier, 1825) and it is referred to as *Anchitherium aurelianense* cf. *aurelianense* (Hoek Ostende *et al*., 2015). Furthermore, the pecora material from Aliveri recalls the genus *Palaeomeryx* but their dimensions resemble the species *Palaeomeryx kaupi* and *Ampelomeryx ginsburgi*. However, today the material is described as Palaeomerycidae gen. et sp. indet (Hoek Ostende *et al*., 2015). A small cervid is also known from Aliveri resembling to *Lagomeryx parvulus* and a medium sized cervid resembling to *Lagomeryx ruetimeyeri*. These two species are more abundant than the remaining pecorans (Hoek Ostende *et al*., 2015). Moreover, an upper and a lower molar have also been found that are morphologically and metrically similar to *Eotragus*.

Insectivora	**Erinaceidae**	***Galerix symeonidisi***
	Dimylidae	***Plesiodimylus huerzeleri* (*chantrei*)**
	Heterosoricidae	***Heterosorex ruemkeae***
	Talpidae	***Myxomygale engesseri***
		Desmanodon antiquus
	Soricidae	***Crocidurinae***
Lagomorpha	**Ochotonidae**	***Albertona balkanica***
Rodentia	**Eomyidae**	***Pseudotheridomys parvulus***
	Sciuridae	***Aliveria brinkerinki***
		Aliveria luteyni
		Miopetaurista dehmi
		Blackia miocaenica
		Tamias eviensis
		Palaeosciurus* aff. *fissurae
	Cricetidae	***Cricetodon aliveriensis***
		Democricetodon gracilis
		Democricetodon franconicus
		Megacricetodon hellenicus
		Eumyarion weifurteri
		Mirrabella tuberosa
	Anomalomyidae	***Anomalomys aliveriensis***
	Spalacidae	***Heramys eviensis***
	Gliridae	***Glirulus diremptus***
		Paraglirulus agelakisi
		Glis galitopouli
		Glirudinus euryodon
		Bransatoglis complicatus
		***Microdyromys* sp.**
Carnivora	**Palaeogalidae**	***Palaeogale* sp.**
	Viverridae	***Euboictis aliveriensis***
Perissodactyla	**Equidae**	***Anchitherium aurelianense* cf. *aurelianense***
Cetartiodactyla	**Palaeomerycidae**	**gen. et sp. indet.**
	Cervidae	***Lagomeryx* cf. *parvulus***
		Lagomeryx* cf. *ruetimeyeri
	Bovidae	***Eotragus* cf. *artenensis***

Table 1. The mammalian fauna list of Aliveri (Doukas, 2003; Hoek Ostende *et al*., 2015)

The flora, the presence of *Chameleo* cf. *andrusovi* (Georgalis *et al.*, 2016) and the sediments from the Aliveri (Fig. 8) locality show a lacustrine environment (Doukas, 2003) and further suggests relatively dense vegetation (Georgalis *et al.*, 2016). The locality contains lignite deposits around 3 km long and up to 60 m thick (Ioakim *et al*., 2005). It also includes sediments of mainly cohesive marls with sandstone intercalations, overlying the lignite beds (Ioakim *et al*., 2005). The sediments underlying these lignite beds are mainly clays with intercalations of marls and sandstones (Ioakim *et al*., 2005). Moreover, the pollen data of the area, such as *Pinus*, *Platycarya, Engelhardtia, Ulmus,* Palmae, *Cinnamomum, Myrica* and *Rhamnus* show a rich thermophilous open forest (Ioakim *et al*., 2005).

2.5. Comparison of Karydia and Aliveri mammal faunas

The fossil assemblages of Aliveri and Karydia (Table 2) are more complex than those from Anatolia (Theocharopoulos, 2000) with all the elements of the first two being indicative of humid preferences (Doukas, 2003). Karydia is assigned to MN 4 like Aliveri but based on the evolutionary stage of the Muroidea and the presence of *Galerix kostakii* in Karydia, which is considered a descendant of *Galerix symeonidisi* from Aliveri, Karydia may be deemed younger than Aliveri (Doukas, 2006).

The locality of Karydia includes generally the same insectivore genera as the MN 4 locality of Aliveri, apart a form that is referred as *Dinosorex* sp. that is absent from Aliveri (Doukas and Hoek Ostende, 2006). However, it includes the Rodentia genera *Karydomys*, *Ligerimys, Deperetomys Miodyromys*, *Seorsumuscardinus* and *Debruijnia*, which are absent in Aliveri locality (Doukas, 2003) (Table 2).

Taxa		Locality	
		Aliveri	Karydia
Erinaceidae	*Galerix symeonidisi*	+	
	Galerix kostakii		+
Talpidae	*Desmanodon antiquus*	+	
	Desmanodon sp.		+
	Myxomygale engesseri	+	
Dimylidae	*Plesiodimylus chantrei (huerzeleri)*	+	
Heterosoricidae	*Dinosorex* sp.		+
	Heterosorex ruemkeae	+	
Soricidae	*Crocidurinae*	+	
Cricetidae	*Cricetodon aliveriensis*	+	+
	Democricetodon gracilis	+	+
	Democricetodon franconicus	+	+
	Democricetodon anatolicus		+
	Democricetodon cf. *gaillardi*		+
	Karydomys symeonidisi		+
	Karydomys boskosi		+
	Megacricetodon hellenicus	+	
	Eumyarion weifurteri	+	
	Eumyarion aff. *latior*		+
	Deperetomys sp.		+
	Mirrabella tuberosa	+	+
Sciuridae	*Aliveria brinkerinki*	+	
	Aliveria luteijni	+	+
	Miopetaurista dehmi	+	
	Blackia miocaenica	+	+
	Tamias eviensis	+	
	Palaeosciurus aff. *fissurae*	+	+
Eomyidae	*Pseudotheridomys parvulus*	+	
	Ligerimys sp.		+
Anomalomyidae	*Anomalomys aliveriensis*	+	+
Spalacidae	*Debruijnia kostakii*		+
	Heramys eviensis	+	
Gliridae	*Glirulus (Glirulus) diremptus*	+	+
	Glirulus (Paraglirulus) agelakisi	+	+
	Glis galitopouli	+	+
	Glirudinus gracilis		+
	Glirudinus euryodon	+	
	Bransatoglis cf. *fugax*	+	
	Microdyromys sp.	+	
	Miodyromys cf. *praecox*		+
	Seorsumuscardinus alpinus		+
Ochotonidae	*Albertona balkanica*	+	

Table 2. The small mammals from Aliveri and Karydia (Doukas, 2003; Hoek Ostende *et al.*, 2015; de Bruijn *et. al.*, 2006)

The main differences of the two faunas is identified at the species level of Rodentia and Insectivora (Doukas, 2003). The insectivores, although are considered conservative, do not share any common species in these two MN 4 localities (Doukas, 2003). Moreover, in Aliveri lived *Galerix symeonidisi* which in western Europe was present until MN 5. After this period, it is replaced by *Galerix exilis*. In Karydia *Galerix kostakii* is the species that took the place of *Galerix symeonidisi* and not *Galerix exilis*, as it is the case for western Europe

(Doukas, 2003). On the contrary, the Rodentia, even though they considered more “plastic” than the Insectivora, they are represented by a number of common species in both localities (Doukas, 2003) as *D. gracilis* and *D. franconicus* (Table 2).

During the Early Miocene, a land bridge probably connected Anatolia to Greece with a sea barrier developed in Aliveri (Dermitzakis *et al*., 1981) (Fig. 1). A westward migration to Karydia probably occurred at this time period (Doukas, 2003). However, this migration event is not justified in Aliveri. As a result, a connection occured between Karydia and Anatolia but not between Aliveri and Anatolia. This event probably explains the eastern influence in Karydia but the western in Aliveri (Doukas, 2003). Finally, the same rodents which are present in both localities probably migrated from Aliveri to Karydia due to a North - South connection. Other rodents reached Karydia with a simultaneous invasion from the East (Doukas, 2003).

2.6. Tribe Cricetodontini

The tribe Cricetodontini (Simpson, 1945) “includes a well distinguishable morphological unit of cricetids” (Rummel, 1999), characterized by the large size compared to other similar tribes. As in other members of the Muroidea, Cricetodontini retain only one upper and one lower incisor, three upper and three lower molars, and lack premolars. The molar’s enamel is thick, well developed and wrinkled (Rummel, 1999). Furthermore, the molars towards the Middle Miocene, show a tendency to increase the hypsodonty and their size (Rummel, 1999). As a result, their cusps become steeper and their sinuses deeper. The enamel ridges, like the mesoloph/mesolophid, the entomesoloph/ectomesolophid and the anteroloph tend to reduce in size, and the anteroconid becomes narrower and approaches the mesial cusps (Rummel, 1999).

It should be mentioned that during the Miocene period the representatives of the Cricetodontini display a unique “mosaic” of primitive and derived characters (Rummel, 1999). For example, *D. gracilis* has a smaller mesoloph in Aliveri locality than the same species in Karydia locality, even though the latter is considered younger (Theocharopoulos, 2000).

2.7. Genus *Cricetodon*

The genus *Cricetodon* (Lartet, 1851) originated in central Asia, entering Europe from Turkey (Hoek Ostende *et al*., 2015). One of the first destinations of its migration towards Europe was Aliveri (Hoek Ostende *et al*., 2015). The age of the arrival of these Asian "migrants" in Europe is placed at the end of the "Cricetid vacuum" (Freudenthal and Daams, 1988). It was a period around the Lower MN 3, in western Europe, during which the cricetid hamsters almost disappeared (Hoek Ostende *et al*., 2015). During this period the eomyids and the glirids dominated the small mammalian faunas (Klietmann *et al*., 2014). At the end of this period, new cricetid species appeared and became the dominant elements of the micro-mammalian faunas expanding their domains (Hoek Ostende *et al*., 2015). This event marked the transition from MN 3 to MN 4 at around 17.5 Ma in western Europe (Larrasoaña *et al*., 2006; van der Meulen *et al*., 2011; 2012).

Cricetodon aliveriensis belongs to these "modern" Cricetidae which lived in Europe during the Early Miocene (MN 4). The type locality of the species is the locality of Aliveri on the Greek Island of Evia which does not exist anymore because of the rehabilitation of the lignite mine of the area. *Cricetodon aliveriensis* was first described by Hofmeijer and de Bruijn in 1988 as a small rodent from the Early Miocene (MN 4) of Greece.

3. Material and methods

All material was collected by wet screening on a set of sieves with the finest mesh used being 0.5 mm (Theocharopoulos, 2000).

The collection from the Karydia and Aliveri localities is stored in the Faculty of Earth Sciences of the University of Utrecht. It includes specimens of *Cricetodon* from Karydia 1, Karydia 2 and Karydia 3.

The molars figured on the plates 1 to 8 are dextral. On the other hand, the molars figured on the ninth plate are sinistral but the picture has been mirrored in order to do the necessary comparisons. The magnification in all figures ranges from approximately from x30 and x34. The upper molars are indicated by **M** and the lower by **m**.

The software “**Microsoft Office**” and “**Past**” were used for the data analysis and for the creation of the various plots. Moreover, the graphic software “**Corel**” was used for the elaboration of the photographs.

The taxonomy follows McKenna and Bell (1997) and the nomenclature (Fig. 9) used for the description of the molars is after Freudenthal *et al*. (1994).

The dimensions, length (**L**) and width (**W**) of the molars have measured with a Leitz Ortholux microscope with a mechanical stage and measuring clocks and are given in mm units (Fig. 10).

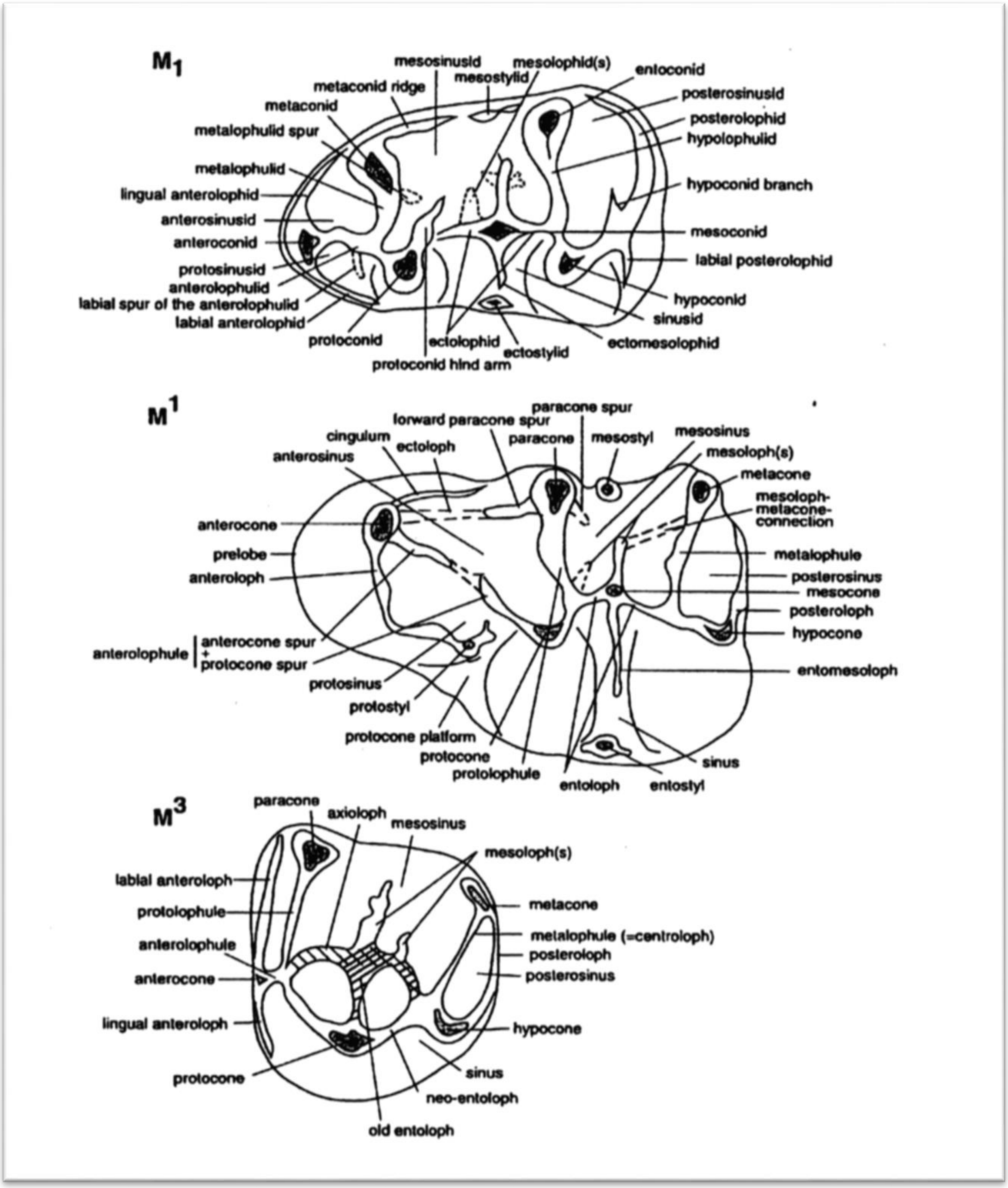


Figure 9. Terminology of the molars (Theocharopoulos, 2000)

3.1. Statistical analysis

In order to explore the relationship of the mean values between the Aliveri and Karydia *Cricetodon* material, the statistical test of one - way analysis of variance (ANOVA) and the Welch's t - test were employed. The variables used for the analysis include the ratios of the tooth length (L) and width (W) of all specimens. For the ratio of M1, which violated the assumption of normality, the non - parametric test of Kruskal - Wallis was used instead.

A series of scatter plots of the tooth dimensions help to better portray the relationships between the various rodent taxa from Greece and Anatolia. The use of this type of plot is to portray the length and the width data of the material from Karydia and Aliveri localities, as well as to compare with eastern species.

With the aim to distinguish the amount of the difference between the material of the two localities, the first and third molars (upper and lower) were divided by the second upper and lower molar. This method helps to identify any differences or similarities in the tooth row between *Cricetodon* from Aliveri and Karydia (Duncan, 2012).

Furthermore, two more diagram types have been used to visualize the percentage difference between *C. aliveriensis* from Aliveri and a number of other Cricetidae taxa from the Greek localities of Karydia (MN 4), Antonios (MN 5) and the Anatolian localities of Yapinti and Keseköy (MN 3/4), Kinik, Kilçak and Kargi (MN 1) (Durgut and Ünay, 2016; Kakali, 2013). These plots have been created using the mean values of the length and width of the species above. These localities have been selected to show the difference of Karydia's and Aliveri's *Cricetodon* from other genera and species from selected areas in Anatolia and Greece.

The last method is the box plot. Through it, the length and width data range from both Aliveri and Karydia localities can be optimized. The usage of these charts aims to distinguish whether the data range of Karydia's material is included in the data range of Aliveri's. The ratio of the L/W values are also included in this plots.

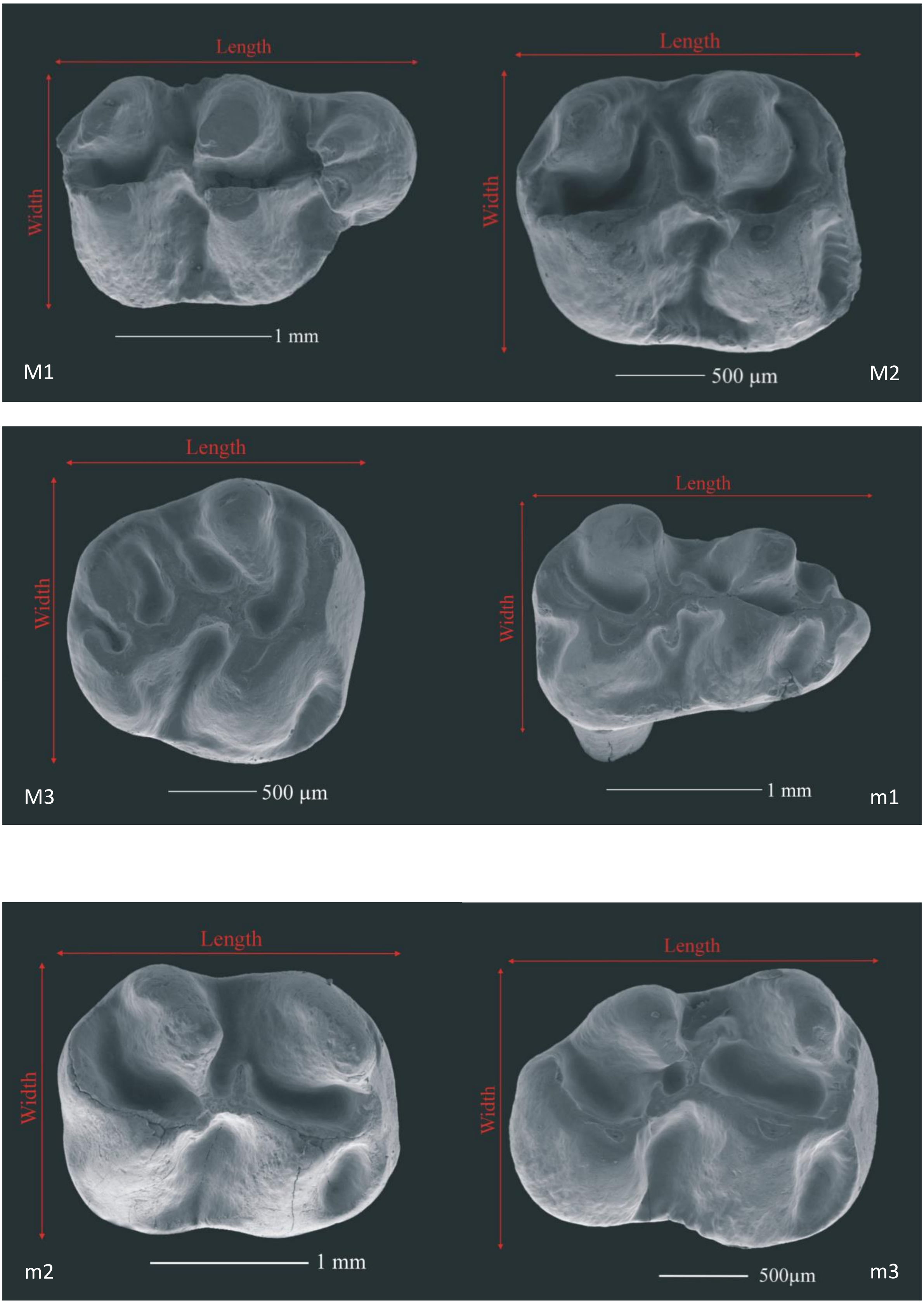


Figure 10. Depiction of measurements of the *Cricetodon* molars

4. *Cricetodon aliveriensis* from Karydia locality

4.1. Systematic paleontology

Family: Muridae Illiger, 1811

Subfamily: Cricetodontinae Schaub, 1925

Tribe: Cricetodontini Simpson, 1945

Genus: *Cricetodon* Lartet, 1851

Species: *Cricetodon aliveriensis* Klein Hofmeijer and de Bruijn, 1988

Type Locality: Aliveri

Type level: Early Miocene (MN 4)

Locality: Karydia (Karydia 1+Karydia 2+Karydia 3),

The material studied includes 564 teeth: M1 (n=112), M2 (n=122), M3 (n=70), m1 (n=96), m2 (n=100), m3 (n=64)

4.2. Morphological description

4.2.1. M1 (Pl. 1, Figs 1-7)

The width of the tooth is reduced on the anterior, lingual part. M1 has strong and high cusps leaning to the posterior side. The lingual cusps, the protocone and the hypocone lean towards the buccal side of the tooth. Moreover, M1 is a tooth with four long and wide roots and with a strong and well developed cingulum, especially on the lingual and labial border. On the anterior part of the tooth, the anterocone is split and the two cusps are connected to each other (Pl. 1, Figs 1-7). On the labial side of them a small linear fissure extends (Pl. 1, Figs 1-4, 6). In 37 out of 80 specimens (46.3%) the protostyle is connected to the anterolophule, separating the protosinus in two parts (Pl. 1, Fig. 1). In the other 43 specimens (53.8%) there is no connection. Furthermore, the protocone is connected to the double anterocone via the anterolophule. In 38 out of 73 specimens (52.1%) the protocone is connected to the lingual anterocone via a simple anterolophule (Pl. 1, Figs 1, 5). In 11 of the specimens (15.1%) the anterior part of the anterolophule splits in two ridges (Pl. 1, Fig. 3).

The first one connects to the lingual anterocone, while the second one to the buccal anterocone. In 11 of the specimens (15.1%) the anterolophule also splits but only the lingual branch ends to the lingual anterocone (Pl. 1, Figs 4, 6). The buccal branch ends freely at the anterosinus. Moreover, in 13 out of the 73 specimens (17.8%) the buccal branch of the anteroloph ends freely at the anterosinus with the buccal anterocone spur close to it, without being connected (Pl. 1, Fig. 7). Additionally, the morphology of the protocone and the paracone is variable. In 53 out of 92 specimens (57.6%) a posterior paracone spur exists and is directed towards the metacone (Pl. 1, Fig. 1,3,6). Finally, in 40 out of 96 specimens (41.7%) a posterior protocone spur extends towards the hypocone (Pl. 1, Fig. 1). Towards the posterior part of the tooth, the entoloph which starts from the mesocone, reaches the meeting point of the protolophule and the protocone's posterior arm. Moreover, starting from the mesocone the mesoloph extends towards the buccal border of the tooth. To be more specific, in 45 out of 93 specimens (48.4%) the mesoloph stops freely at the mesosinus (Pl. 1, Figs 1-2, 5, 7) and in the other 48 specimens (51.6%) it is connected to the metacone (Pl. 1, Fig. 4). To conclude, on the posterior part of the tooth, the posteroloph is connected to the hypocone and the posterior spur of the metacone. In 61 out of 76 specimens (80.3%) the posteroloph does not stop on the distal spur of the metacone but it also continues behind it (Pl. 1, Fig. 7). In the other 15 specimens (19.7%) the posteroloph stops on the metacone (Pl. 1, Figs 1-6). The hypocone is also connected to the mesocone via the entoloph.

4.2.2. M2 (Pl. 2, Figs 1-4 and Pl. 3, Figs 1-2)

M2 is a square shaped tooth with four long and wide roots. The cingulum is strong on the lingual side of the tooth. The cusps are strong and high, leaning to the posterior side. Moreover, the protocone and the hypocone lean towards the buccal side of the tooth. On the anterior part of the tooth, the labial anteroloph is well developed and connected to the base of the paracone. On the other hand, the lingual anteroloph may or may not be well developed and if it is, it may or may not be connected to the base of the protocone. In 103 out of 109 specimens (94.5%) the lingual anteroloph is well developed (Pl. 2, Figs 1-4 and Pl. 3, Fig. 1), while in 6 specimens (5.5%) it is not (Pl. 2, Fig. 4 and Pl. 3, Fig. 2). In addition, the anterolophule, starting from the protocone, expands towards the labial side of the tooth and it stops on the anterior border of it. The entoloph meets the protolophule and the posterior arm of the protocone. The morphology of the protocone and the paracone is variable. In 39 out of 107 specimens (36.5%) a posterior paracone spur exists and is directed towards the metacone

(Pl. 2, Figs 1-4 and Pl. 3, Fig. 1). In the other 68 specimens (63.6%) there is no posterior spur (Pl. 3, Fig. 2). On the other hand, in 67 out of 105 specimens (63.8%) a posterior protocone spur extends towards the hypocone (Pl. 2, Figs 3-4) while in the other 38 specimens (36.2%) the posterior protocone spur does not exist (Pl. 2, Figs 1-2). Moreover, from the mesocone the mesoloph extends towards the buccal border of the tooth. In 48 out of 113 specimens (42.5%) the mesoloph is long and stops freely at the mesosinus (Pl. 3, Fig. 1). In 38 out of 113 specimens (33.6%) the mesoloph is short and it also stops freely at the mesosinus (Pl. 2, Figs 1-3). In 26 specimens (23%) it is connected to the base of the metacone. Finally, in 1 specimen (0.9%) the mesoloph stops on the buccal border of the tooth. In addition, the hypocone connects to the mesocone via the entoloph. On the posterior part of the tooth, the posteroloph, thinner than in M1, connects the hypocone with the distal spur of the metacone. In 18 out of 93 specimens (19.4%) the posteroloph ends on the spur of the metacone (Pl. 2, Fig. 4). Moreover, in 36 out of 93 specimens (38.7%) the posteroloph does not stop on the spur of the metacon, it crosses it and expands towards the buccal border of the tooth and stops on the posterior base of the metacon, separating the posterosinus in two parts (Pl. 2, Figs 1-3). In the other 39 specimens (41.9%) the posteroloph also continues behind of the metacone distal spur and it ends on the buccal border of the tooth, separating again the posterosinus in two parts (Pl. 3, Fig. 2).

4.2.3. M3 (Pl. 4, Figs 1-3 and Pl. 5, Figs 1-3)

It is the smallest of the three upper molars, with three roots. M3 has four cusps but the metacone is small and linear, placed on the buccal border of the tooth. The width of the tooth is reduced on the posterior part. Besides the metacone, the other three cusps are strong and high, leaning to the posterior side. Moreover, the protocone and the hypocone lean towards the buccal side of the tooth. The anterolophule, starting from the protocone, meets the well-developed labial and lingual anteroloph in 56 out of 57 specimens (98.3%) (Pl. 4, Figs 2-3 and Pl. 5, Figs 1-3) In 1 specimen (1.8%) the anterolophule meets only the labial anteroloph (Pl. 4, Fig. 1). Additionally, in 17 out of 61 specimens (27.9%) only the protocone has a posterior spur expanding towards the hypocone (Pl. 4, Figs 2-3 and Pl. 5, Fig. 2), whereas, in 7 specimens (11.5%) only the paracone has a posterior spur towards the metacone. In 26 out of 61 specimens (42.6%) both the protocone and the paracone have a posterior spur (Pl. 4, Fig. 1). Finally, in 11 out of 61 specimens (18%) there are no posterior spurs developed (Pl. 5, Fig. 1). Furthermore, the morphology of the mesoloph varies. In 16 out of 63 specimens

(25.4%) the mesoloph has a medium size and ends freely at the mesosinus (Pl. 5, Fig. 3). In 33 specimens (52.4%) the mesoloph connects to the buccal border of the tooth (Pl. 4, Figs 2-3), near the metacone. Furthermore, in 10 out of 63 specimens (15.2%) the mesoloph is short, without any connection (Pl. 5, Fig. 2). Finally, in 4 specimens (6.4%) the mesoloph is underdeveloped and ends at the mesosinus while there is another short ridge opposite to it, starting from the buccal border of the tooth, without being connected to each other (Pl. 4, Fig. 1). One particular specimen has to be mentioned where the neo - entoloph is not connected to the protolophule and the protocone but only to the posterior spur of the protocone (Pl. 4, Fig. 1). In all the other specimens, the neo - entoloph is connected with both the protolophule and the protocone, like in M1 and M2. Finally, the posterior part of the tooth varies. In 58 out of 87 specimens (66.7%) the posteroloph connects the hypocone with the metacone while the metalophule is well developed and connected to the neo-entoloph. On the other hand, in 14 out of 87 specimens (16.1%) only the posteroloph exists (Pl. 5, Fig. 1). In 7 specimens (8.1%), the metalophule is well developed but the posteroloph is not (Pl. 4, Fig. 2-3). In 6 specimens (6.9%) the posteroloph connects the hypocone with the metacone while the metalophule is not well developed and lacks a connection with the neo-entoloph. Moreover, 1 specimen (1.2%) has both the posteroloph and the metalophule underdeveloped (Pl. 4, Fig. 1) and another one (1.2%) has an extra ridge which starts from the metalophule and stops freely at the mesosinus (Pl. 4, Fig. 3).

4.2.4. m1 (Pl. 6, Figs 1-7)

The outline of the molar is elongated. It has five strong and high cusps, leaning to the anterior side. In addition, it has two double and long roots vertically developed. First of all, the simple anteroconid is symmetric with the lingual and labial anterolophid, well developed or not, surrounding the protosinusid and the anterosinusid. The anterior part of the tooth varies a lot. The first variation is the existence of the labial spur of the anterolophulid. The 76 out of the 78 specimens (97.4%) don’t have it (Pl. 6, Figs 1-4, 6) but in 2 specimens (2.6%) it is well developed (Pl. 6, Figs 5, 7). Moreover, in 4 out of 70 specimens (5.7%) only the anterolophulid is well developed and it is connected to the simple anteroconid (Pl. 6, Fig. 5). In 10 out of 70 specimens (14.3%) the anterolophulid and the metalophulid are well-developed and connected to a single ridge that ends to the anteroconid (Pl. 6, Fig. 3). Furthermore, in 28 specimens (40 %) the anterolophulid and the metalophulid, separately from each other, connect with the simple anteroconid (Pl. 6, Fig. 6). Moreover, in 13 out of

70 specimens (18.6%) the anterolophulid and the metalophulid are well developed and connected to the simple anteroconid but both of them have an extra short ridge, one towards the other and very close to each other without a connection (Pl. 6, Fig. 4). In 4 specimens (5.7%) only the metalophulid exists and ends to the anteroconid. In 5 out of 70 specimens (7.1%) the anterolophulid is connected to the metalophulid, making a 90 degrees' angle and the metalophulid is the one that meets the anteroconid (Pl. 6, Fig. 1). Furthermore, in 2 out of 70 specimens (2.9%) the metalophulid is the one that connects to the anterolophulid, making a 90 degrees' angle (Pl. 6, Fig. 7). Then, the anterolophulid connects with the anteroconid. Additionally, in 57 out of 90 specimens (63.4%) the ectomesolophid exists and ends freely in the sinusoid (Pl. 6, Figs 2-3, 6-7). In the other 33 specimens (36.7%) it is not developed (Pl. 6, Fig. 1, 4, 5). Moreover, in 8 out of 78 specimens (10.3%) the ectolophid crosses the mesoconid and connects with the protoconid's hind arm and also with the metalophulid spur (Pl. 6, Fig. 7). In 22 out of 78 specimens (28.2%) the mesolophid and the ectolophid are connected to the metaconid (Pl. 6, Fig. 2, 4). In 9 specimens (11.5%) only the ectolophid is connected to the metaconid. Moreover, in 31 specimens (39.7%) the ectolophid connects with the metaconid spur but the mesolophid is underdeveloped, ending freely at the mesosinus (Pl. 6, Fig. 5). In addition, 3 specimens (3.8%) lack a connection with the metaconid (Pl. 6, Figs 1, 3). In 1 specimen (1.3%) 2 mesolophids exist and only one of them is connected to the metaconid. The other one ends freely at the mesosinusid. In 4 out of 78 specimens (5.1%) there is not any connection to the metaconid but the mesolophid is well developed and it ends freely at the mesosinusid. Furthermore, the ectolophid connects the hypoconid with, the shorter than the other cusps, mesoconid. Finally, the posterolophid starts from the hypoconid and riches the lingual border of the tooth encircling the posterosinusid.

4.2.5. m2 (Pl. 7, Figs 1-6)

It is a square shape tooth with four strong and high cusps, leaning to the anterior side. The m2 has two double roots vertically developed to the tooth. Moreover, the protoconid and the hypoconid lean towards the buccal side of the tooth. First of all, there is no anteroconid. Furthermore, the anterolophulid starts from the protoconid and ends at the meeting-point of the lingual anterolophid, which is the anterior border of the protosinusid, and the labial anterolophid, which is the anterior border of the anterosinusid. The ectolophid is developed towards the anterior part of the tooth and connects with the protoconid. Furthermore, in 13 out of 91 specimens (14.3%), we meet a small ectomesolophid which ends freely at the sinusid

(Pl. 7, Figs 6). Additionally, in 5 specimens (5.5%), the ectomesolophid is well developed and longer than the specimens before (Pl. 7, Fig. 3). On the other hand, in 73 out of 91 specimens (80.2%), there is no ectomesolophid at the sinusid (Pl. 7, Figs 1-2, 4, 5-6). The mesoconid is not well developed and small in size. In 28 out of 87 specimens (32.2%), a small mesolophid exists that ends freely at the mesosinusid (Pl. 7, Figs 3-4). In 36 out of 87 specimens (41.4%), this mesolophid is longer but still with no connection (Pl. 7, Figs 5-6). Finally, in 23 specimens (26.4%), the mesolophid is connected to the base of the metaconid. Moreover, the hypoconid connects with the mesoconid via the ectolophid (Pl. 7, Fig. 2). To conclude, on the posterior half of the tooth, the posterolophid starts from the hypoconid and riches the lingual border of the tooth, encircling the posterosinusid. In 57 out of 78 specimens (73.1%), the labial posterolophid is well developed (Pl. 7, Figs 1-6). In the other 21 specimens (26.9%), lack a labial posterolophid.

4.2.6. m3 (Pl. 8, Figs 1-2, 4-6)

The posterior part of the tooth is reduced. It has a triangular outline that is common in many cricetids. Moreover, it has three wide roots. Two of them are in the anterior half of the tooth and one on the posterior half. Its cusps lean towards the anterior side. The anterior half of the tooth that includes the anterolophulid, the labial and the lingual anterolohpid, the protoconid and the metaconide, is similar to the m2. Furthermore, towards the posterior part, the ectolophid connects the protoconid to the mesoconid. In 38 out of 62 specimens (61.3%), the mesolophid which starts from the mesoconid, is long and it ends freely at the mesosinusid (Pl. 8, Figs 5-6). In 3 specimens (4.8%), there is no mesolophid (Pl. 8, Fig. 1) and finally in 21 out of 62 specimens (33.9%), the mesolophid is connected to the base of the metaconid (Pl. 8, Fig. 2). In one of the specimens, the anterior surface of the entoconid is connected with the mesolophid which also connects to the metaconid (Pl. Fig. 4). In the posterior part of the tooth, the ectolophid connects with the hypoconid and the entoconid via the hypolophulid.

4.3. Morphological description of *Cricetodon aliveriensis* from Aliveri and its comparison with *Cricetodon* from Karydia

The material studied includes 87 teeth: M1 (n=13), M2 (n=13), M3 (n=15), m1 (n=21), m2 (n=9) and m3 (n=16)

4.3.1. M1 (Pl. 9, Figs 1-3)

M1 is an elongated tooth with strong cusps leaning to the posterior side. The width of the tooth is reduced on the anterior-lingual part. Additionally, the protocone and the hypocone, lean toward the buccal side of the tooth. It has four roots with a well-developed cingulum, especially on the lingual and labial border. On the anterior side of the tooth, the anterocone is split and the two cusps are connected to each other. On the labial side of them a small linear fissure extends. In 11 out of 12 specimens (91.7%) the protostyle is connected to the anterolophule, separating the protosinus in two parts (Fig. 11). In only 1 specimen (8.3%) there is no connection between them. Moreover, the protocone is connected to the double anterocone via the anterolophule. In 9 out of 13 specimens (69.2%) the protocone is connected to the lingual anterocone via a simple anterolophule (Fig. 12). In only 1 specimen (7.7%) the anterior part of the anterolophule splits in two ridges. The first one connects to the lingual anterocone, while the second one to the buccal anterocone.

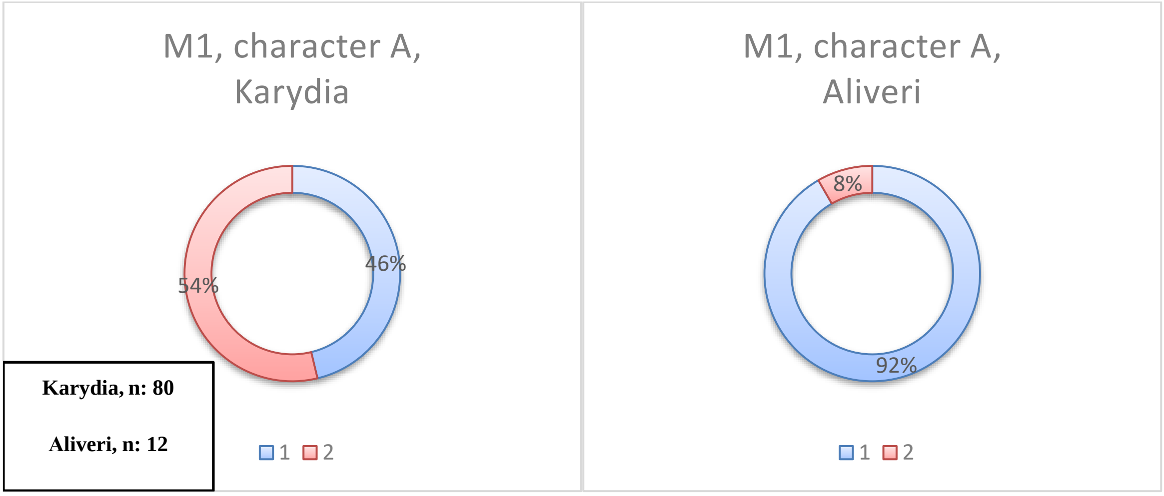


Fig. 11. **1**: The protostyle is connected to the anterolophule.**2**: No connection between the protostyle and the anterolophule

In 3 specimens (23.1%) from Aliveri the anterolophule is also split, but only the lingual branch connects to the lingual anterocone while the buccal branch ends freely in the anterosinus. Additionally, the morphology of the protocone and the paracone varies. In 7 out of 13 specimens (53.8%) a posterior paracone spur is developed and directed towards the metacone (Fig. 13). On the other hand, in 6 out of 13 specimens (46.2%) a posterior protocone spur extends to the hypocone without any connection (Fig. 14).

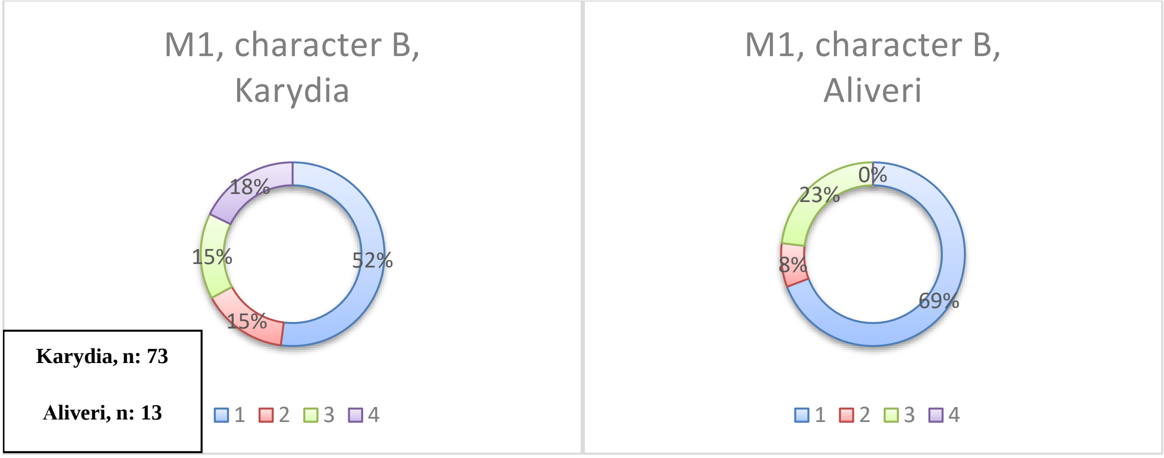


Figure 12. **1**: The protocone is connected to the lingual anterocone via a simple anterolophule. **2**: The anterior part of the anterolophule splits in two ridges. The first one connects to the lingual and the second one to the buccal anterocone. **3**: The anterolophule is split, but only the lingual branch connects to the lingual anterocone while the buccal branch ends freely in the anterosinus. **4**: The buccal branch of the anterolophule ends freely in the anterosinus with the buccal anterocone spur close to it, without a connection

Towards the posterior part of the tooth, the entoloph which starts from the mesocone, reaches the meeting point of the protolophule and the protocone's posterior arm. Moreover, from the mesocone the mesoloph extends towards the buccal border of the tooth. To be more specific, in 3 out of 12 specimens (25%) it stops freely at the mesosinus and in the other 9 specimens (75%) it is connected to the metacone (Fig. 15). Finally, on the posterior part of the tooth, the posteroloph connects to the hypocone and the posterior spur of the metacone. In 9 out of 13 specimens (69.2%), the posteroloph does not stop on the distal spur of the metacone but it also continues behind it (Fig. 16). In the other 4 specimens (30.8%), the posteroloph stops on the metacone.

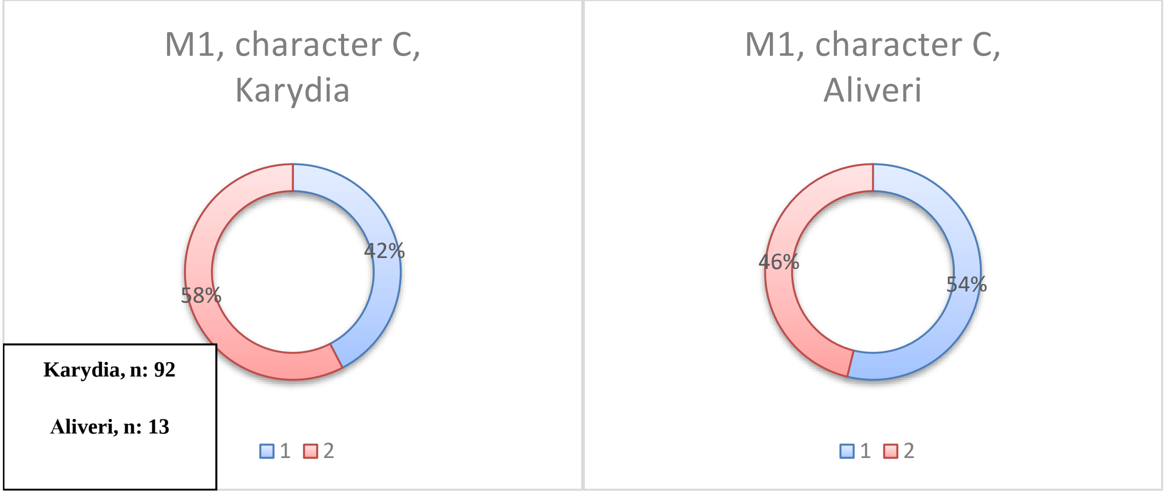


Fig. 13. **1**: The posterior paracone spur does not exist. **2**: The posterior paracone spur exists and is directed towards the metacone

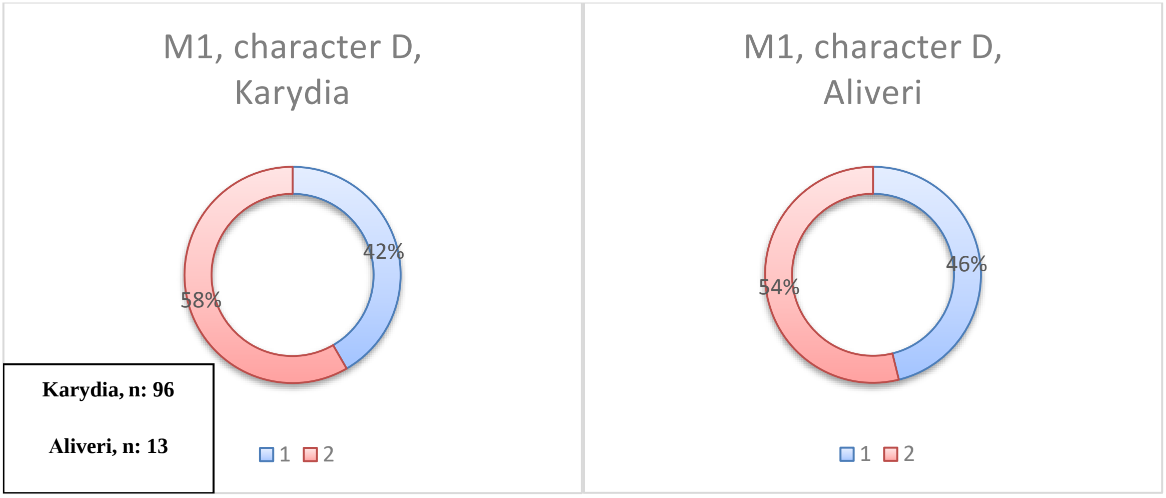


Fig. 14. **1**: The posterior protocone spur extends towards the hypocone. **2**: The posterior protocone spur does not exist

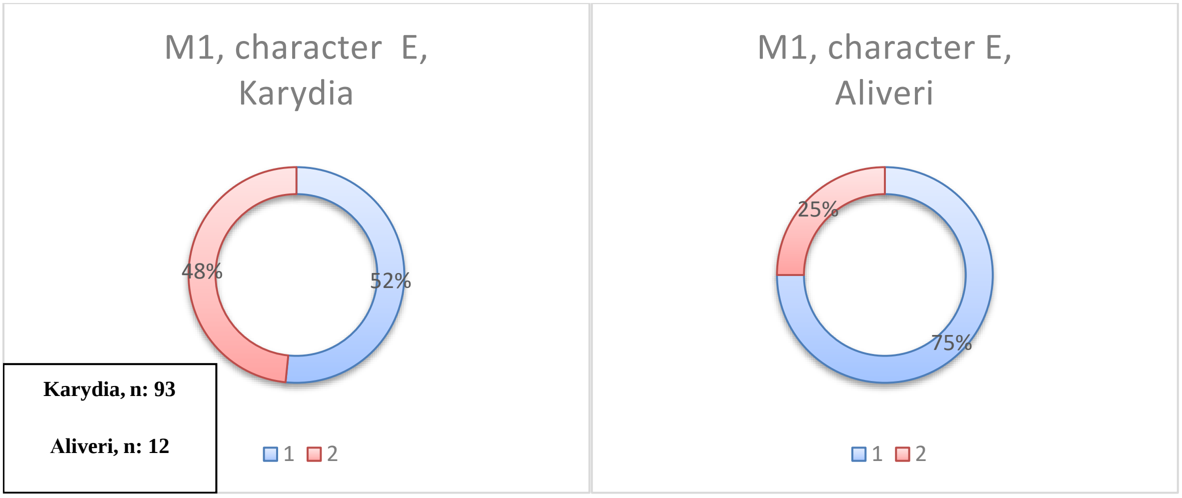


Fig. 15. **1**: The mesoloph is connected to the metacone. **2**: The mesoloph stops freely at the mesosinus

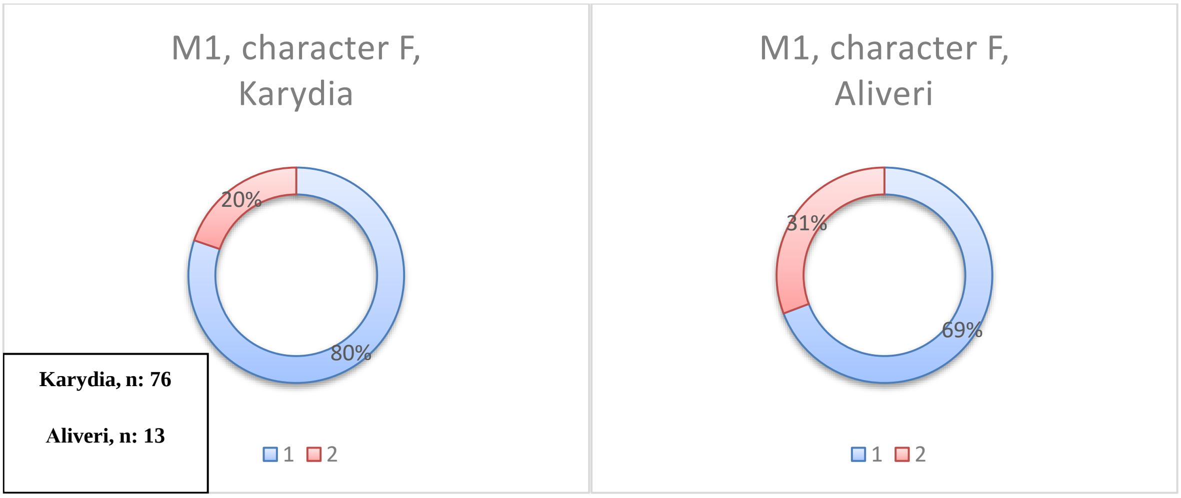


Fig. 16. **1**: The posteroloph does not stop on the distal spur of the metacone but it continues behind it.**2**: The posteroloph stops on the metacone

4.3.2. M2 (Pl. 9, Figs 4-6)

M2 is a square shaped tooth with four roots and a well-developed cingulum on the lingual side. The cusps are strong and high, leaning to the posterior side. The protocone and the hypocone lean towards the buccal side of the tooth, just like the other two molars. On the anterior side of the tooth, the labial anteroloph is connected to the base of the paracone and the lingual anteroloph may or may not be well developed. In case it is, it may or may not be connected to the base of the protocone. In all 13 specimens (100%) the lingual anteroloph is well developed (Fig. 17). On the contrary, some of the specimens of *Cricetodon* from the locality of Karydia lack the lingual anteroloph. Furthermore, in Aliveri specimens the anterolophule starting from the protocone expands towards the labial side of the tooth and stops on the anterior border of it. Moreover, the entoloph meets the protolophule and the posterior arm of the protocone. Additionally, the morphology of the protocone and the paracone is variable. In 8 out of 13 specimens (61.5%) the posterior paracone spur is directed towards the metacone (Fig. 18). In the other 5 specimens (38.5%) there is no posterior spur. On the other hand, in 8 out of 13 specimens (61.5%) the posterior protocone spur extends towards the hypocone while in the other 5 specimens (38.5%) the posterior protocone spur does not exist (Fig. 19). Moreover, starting from the mesocone, the mesoloph extends towards the buccal border of the tooth. In 9 out of 13 specimens (69.2%) it is long and stops freely at the mesosinus (Fig. 20). In 3 out of 13 specimens (23.1%) mesoloph is short and it also stops freely at the mesosinus. Finally, in 1 specimen (7.7%) it is connected to the base of the metacone. In addition, the hypocone connects to the mesocone via the entoloph.

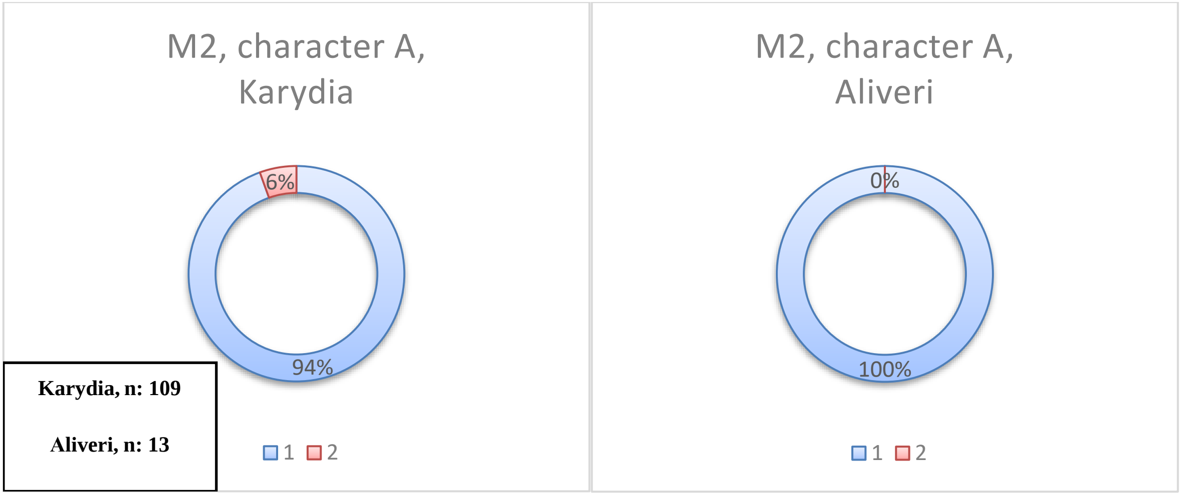


Fig. 17. **1**: The lingual anteroloph is well developed. **2**: The lingual anteroloph is not developed

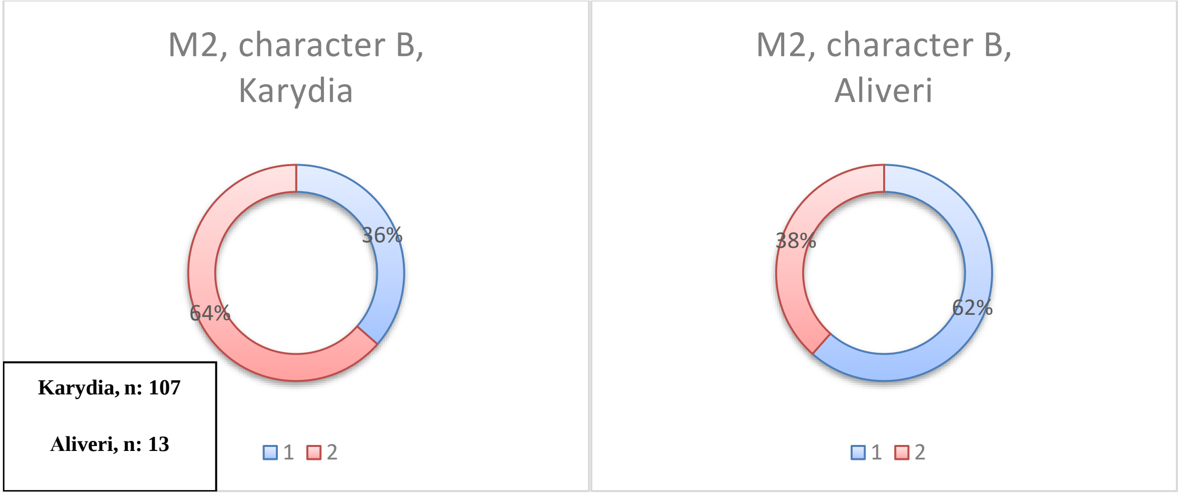


Fig. 18. **1**: The posterior paracone spur exists and is directed towards the metacone. **2**: There is no posterior spur

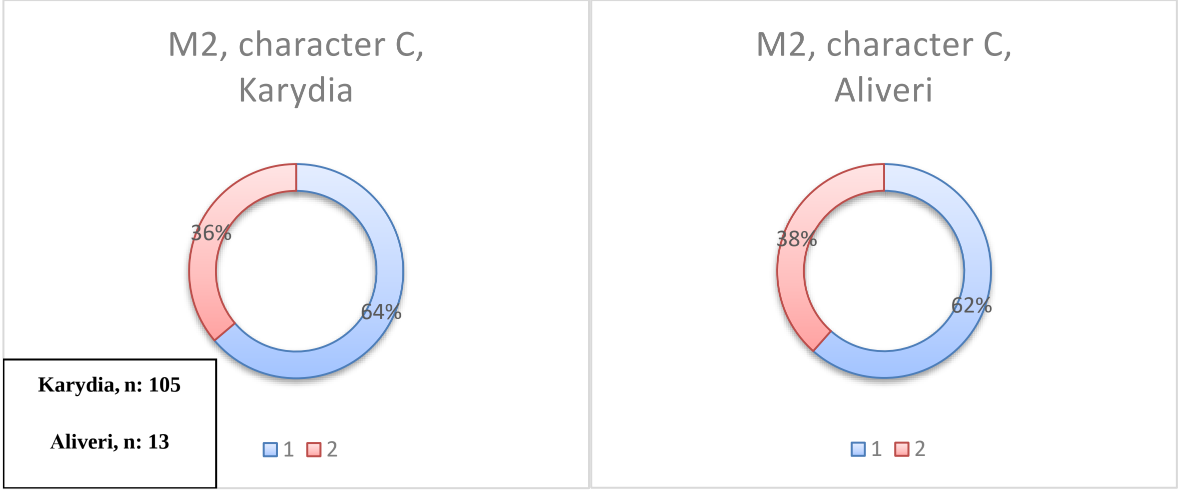


Fig. 19. **1**: The posterior protocone spur extends towards the hypocone. **2**: The posterior protocone spur does not exist

Fig. 20. **1**: The mesoloph is long and stops freely at the mesosinus. **2**: The mesoloph is short and it stops freely at the mesosinus. **3**: The mesoloph is connected to the base of the metacone. **4**: The mesoloph stops on the buccal border of the tooth

To conclude, on the posterior part of the tooth, the posteroloph, thinner than M1's, connects the hypocone with the distal spur of metacone without ending on the spur of the metacone but it continues behind it. On the contrary, in some of the specimens of *Cricetodon* from Karydia locality, the posteroloph ends on the base of the metacone. To be more specific, in 4 out of 8 specimens (50%) of Aliveri's *C. aliveriensis*, the posteroloph expands behind of the metacone and towards the buccal border of the tooth stopping on the posterior base of the metacon, separating the posterosinus in two parts. In the other 4 specimens (50%) the posteroloph also continues behind of the metacone distal spur and it ends on the buccal border of the tooth, separating again the posterosinus in two parts (Fig. 21).

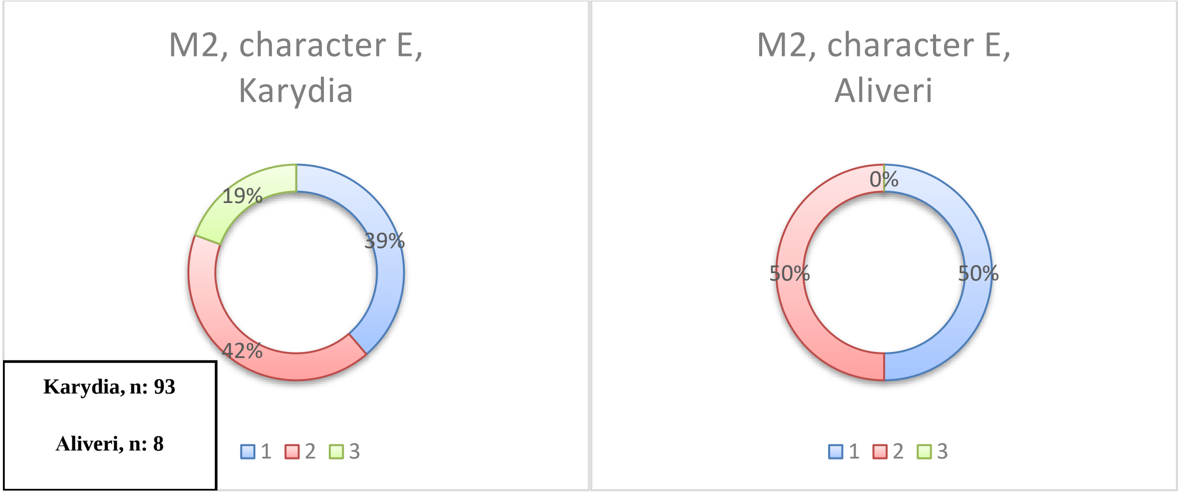


Fig. 21. **1**. The posteroloph does not stop on the spur of the metacone, it crosses it and expands towards the buccal border of the tooth and stops on the posterior base of the metacon. 2. The posteroloph continues behind of the metacone distal spur and it ends on the buccal border of the tooth, separating again the posterosinus in two parts. 3.The posteroloph ends on the metacone spur

4.3.3. M3 (Pl. 9, Figs 7-10)

The width of the tooth is reduced on the posterior part. It is the smallest of the upper molars with three roots. M3 has four cusps but the metacone is small and linear, placed on the buccal border of the tooth. Besides the metacone, the other three cusps are strong and high, leaning to the posterior side. Moreover, the protocone and the hypocone lean towards the buccal side of the tooth. First of all, in 14 specimens (100%) the anterolophule which starts from the protocone, meets the well-developed labial and lingual anteroloph (Fig. 22). None of the specimens have only the labial anteroloph. On the other hand, some of the specimens from the locality of Karydia have only the labial anteroloph. Additionally, the morphology of the cusps also varies. In 1 out of 15 specimens (6.7%) from Aliveri, only the protocone has a posterior spur expanding towards the hypocone (Fig. 23). Whereas, in 7 specimens (46.7%)

only the paracone has a posterior spur towards the metacone. In 5 out of 15 specimens (33.3 %) both the protocone and the paracone have a posterior spur. Finally, in 2 out of 15 specimens (13.3%) none of them have posterior spurs. Furthermore, the morphology of the mesoloph varies. In 6 out of 13 specimens (46.2%) the mesoloph has a medium size and ends freely at the mesosinus. In 6 specimens (46.2%) the mesoloph connects to the buccal border of the tooth, near the metacone. Furthermore, in 1 out of 13 specimens (7.7%) the mesoloph is short, without any connection (Fig. 24). Finally, none of the specimens of Aliveri are like the four of Karydia's specimens where the mesoloph is underdeveloped ending freely at the mesosinus near another short ridge opposite to it, starting from the buccal border of the tooth but without being connected to each other. In all the other specimens from Aliveri, the neo-entoloph is connected with both the protolophule and the protocone, like in M1 and M2. Finally, the posterior part of the tooth varies (Fig. 25). In 9 out of 13 specimens (69.2%) the posteroloph connects the hypocone with the metacone while the metalophule is well developed and connected to the neo-entoloph. On the other hand, in 1 out of 13 specimens (7.7%) only the posteroloph exists. Moreover, in 1 specimen (7.7%) the metalophule is well developed but the posteroloph is not. Moreover, in 2 specimens (15.4%) the posteroloph connects the hypocone with the metacone while the metalophule is not well developed without a connection with the neo-entoloph.

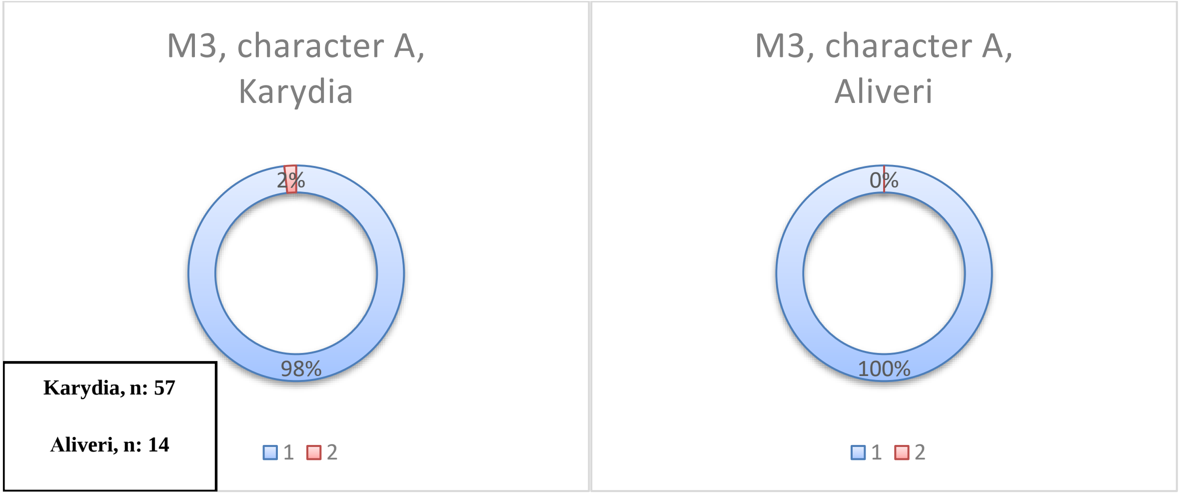


Fig. 22. **1**: The anterolophule meets the labial and the lingual anteroloph. **2**: The anterolophule meets only the labial anteroloph

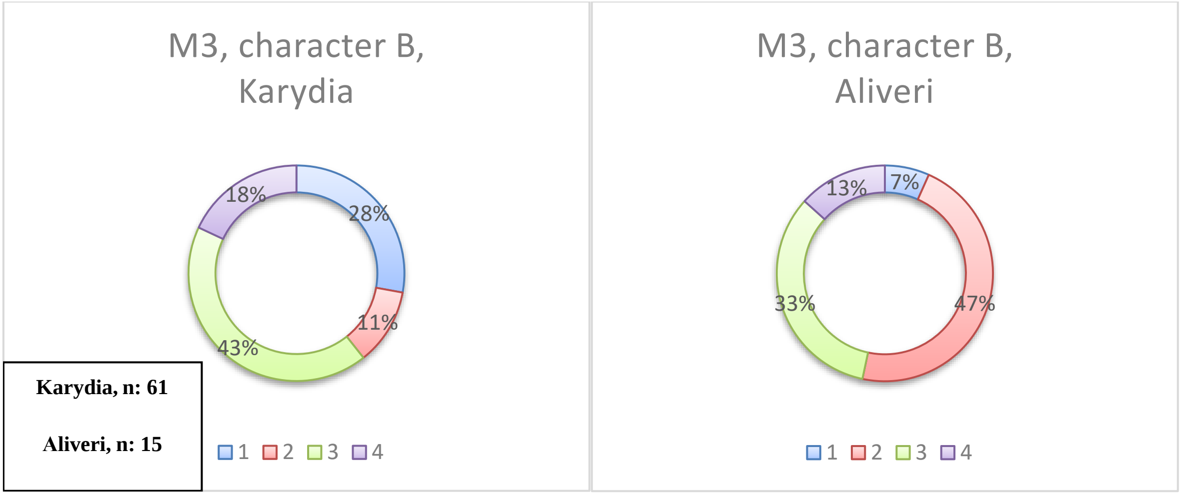


Fig. 23. **1**: The protocone has a posterior spur expanding towards the hypocone. **2**: The paracone has a posterior spur towards the metacone. **3**: Both the protocone and the paracone have a posterior spur. **4**: None of them have posterior spurs

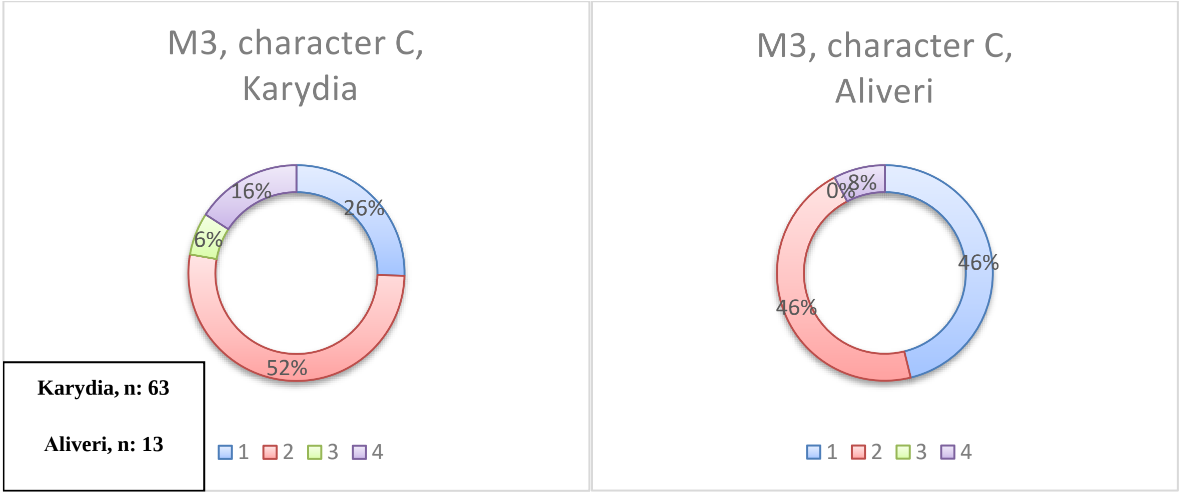


Fig. 24. **1**: The mesoloph has a medium size and ends freely at the mesosinus. **2**: The mesoloph connects to the buccal border of the tooth, near the metacone. **3**: The mesoloph is underdeveloped and ends at the mesosinus while there is another short ridge opposite to it, starting from the buccal border of the tooth, without being connected to each other. **4**: The mesoloph is short, without any connection

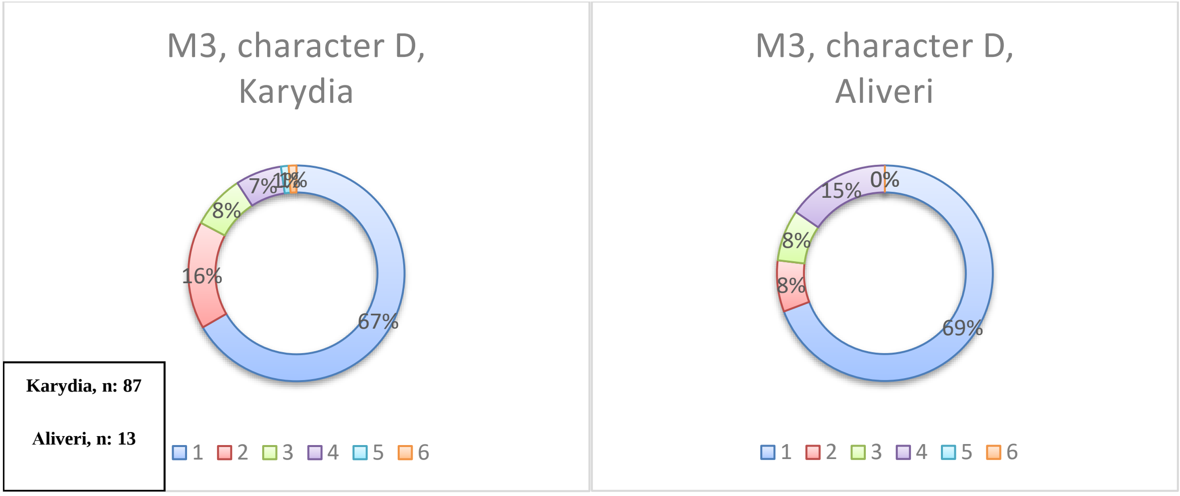


Fig. 25. **1**. The posteroloph connects the hypocone with the metacone while the metalophule is well developed and connected. **2**: Only the posteroloph exists. **3**: The metalophule is well developed but the posteroloph is not. **4**: The posteroloph connects the hypocone with the metacone while the metalophule is not well developed without a connection with the neo-entoloph. **5**: Both the posteroloph and the metalophule are underdeveloped. **6**: An extra ridge is developed which starts from the metalophule and stops freely at the mesosinus

4.3.4. m1 (Pl. 9, Figs 11-13)

The outline of the molar is elongated. It has five cusps, leaning to the anterior side, both of them double and vertically developed. First of all, the simple anteroconid is symmetric to the lingual and labial anterolophid well developed or not, surrounding the protosinusid and the anterosinusid just like the material from the locality of Karydia. The 17 out of the 19 specimens (89.5%) of Aliveri don't have the labial spur of the anterolophulid but in 2 specimens (10.5%) it is well developed (Fig. 26). Additionally, in only 1 out of 19 specimens (5.3%) the anterolophulid is well developed connected to the simple anteroconid. The metalophulid also exists but it is underdeveloped. In 4 out of 19 specimens (21.1%) the anterolophulid and the metalophulid are well-developed and connected to a single ridge that ends to the anteroconid. Furthermore, in 12 specimens (63.2%) the anterolophulid and the metalophulid, separately from each other, connect with the simple anteroconid (Fig. 27). Comparing it to the specimens from Karydia, none of Aliveri's m1 have only the anterolophulid connected to the anteroconid or the anterolophulid and the metalophulid well developed and connected to the simple anteroconid both with an extra short ridge, one towards the other but without a connection. In addition, none of the specimens have only the metalophulid that ends to the anteroconid. On the other hand, in 1 out of 19 specimens (5.3%) the anterolophulid is connected to the metalophulid, making a 90 degrees' angle and then, the metalophulid meets the anteroconid. Furthermore, in 1 out of 19 specimens (5.3%) the metalophulid connects to the anterolophulid, making a 90 degrees’ angle. The anterolophulid then connects with the anteroconid.

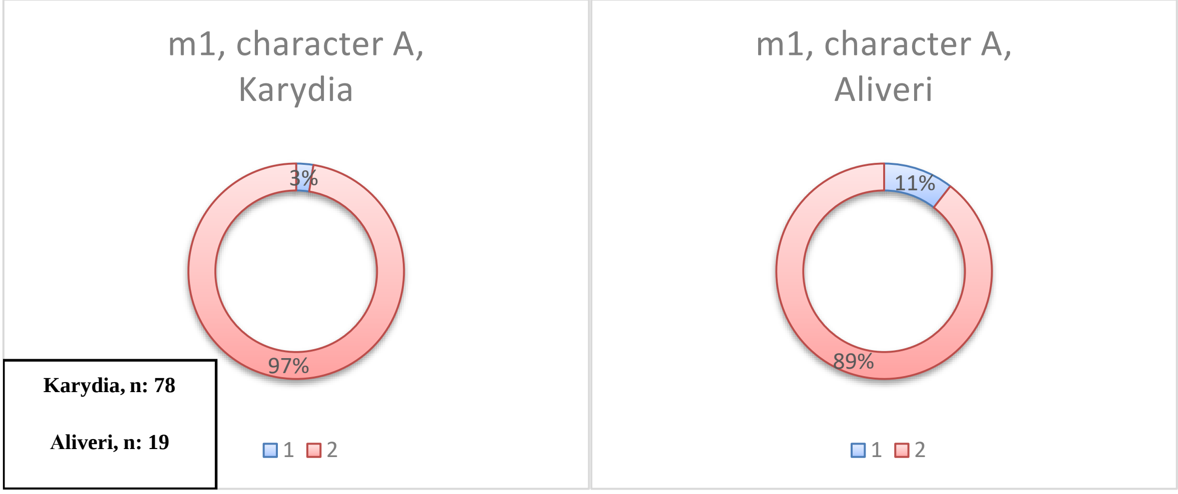


Fig. 26. **1**: The labial spur of the anterolophulidis well developed. **2**: The labial spur of the anterolophulid is not developed.

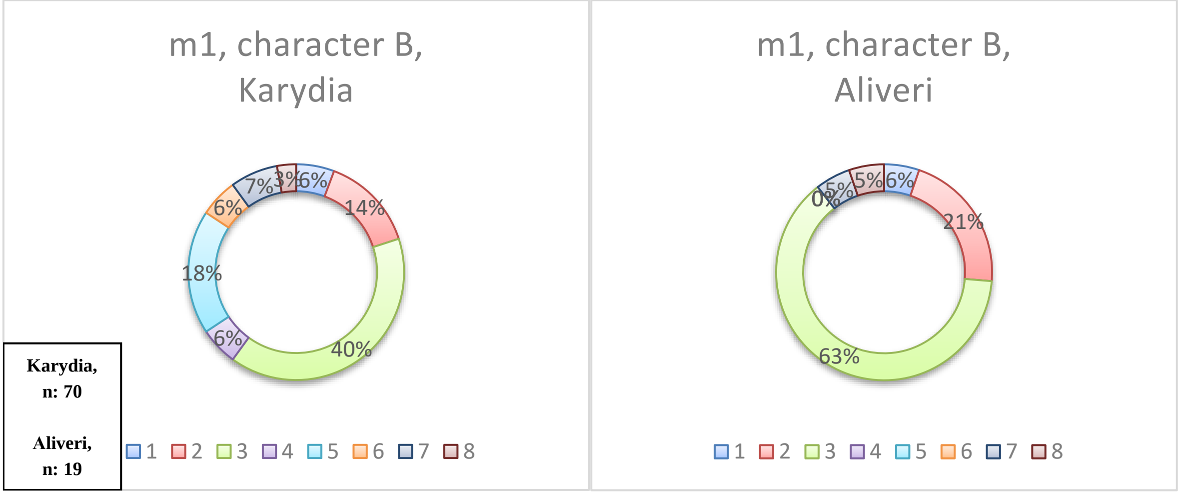


Fig. 27. **1**: The anterolophulid is well developed and is connected to the simple anteroconid. The metalophulid exists but it is underdeveloped. **2**: The anterolophulid and the metalophulid are well-developed and connected to a single ridge that ends to the anteroconid. **3**: The anterolophulid and the metalophulid, separately from each other, connect with the simple anteroconid. **4**: Only the anterolophulid exists and connects to the anteroconid. **5**: The anterolophulid and the metalophulid are well developed and connected to the simple anteroconid but both of them have an extra short ridge, one towards the other without a connection. **6**: Only the metalophulid exists and ends to the anteroconid. **7**: The anterolophulid is connected to the metalophulid, making a 90 degrees’ angle. **8**: The metalophulid connects to the anterolophulid, making a 90 degrees’ angle

In addition, in 17 out of 21 specimens (81%) the ectomesolophid appears and ends freely at the sinusoid (Fig. 28). In the other 4 specimens (19.1%) it is not developed. Moreover, unlike the specimens from the locality of Karydia, none of the specimens have the ectolophid crossing the mesoconid to connect with the protoconid’s hind arm and to the metalophulid’s spur. In 2 out of 17 specimens (11.8%) the mesolophid and the ectolophid are connected to the metaconid (Fig. 29). In 3 specimens (17.7%) only the ectolophid is connected to the metaconid and in 12 specimens (70.6%) the ectolophid connects with the metaconid spur but the mesolophid is underdeveloped, ending freely at the mesosinus. In addition, none of the specimens have only the mesolophid connected to the metaconid and also specimens where there is not any connection to the metaconid. Moreover, no specimen has been located with two mesolophids of which only the one is connected to the metaconid and the other one ending freely at the mesosinusid. Compare it, again to the specimens from the locality of Karydia, in Aliveri not a single m1 specimen exists where there is not any connection to the metaconid but with the mesolophid well developed ending freely at the mesosinusid. Furthermore, the ectolophid connects the hypoconid with the shorter than the other cusps, mesoconid. Finally, the posterolophid starts from the hypoconid and riches the lingual border of the tooth encircling the posterosinusid just like the specimens from Karydia locality.

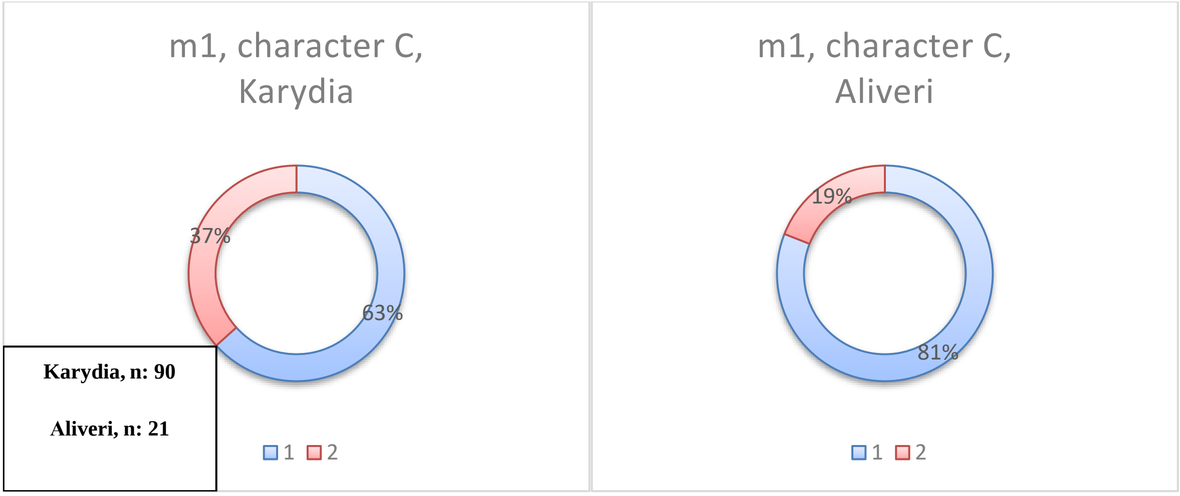


Fig. 28. **1**: The ectomesolophid exists and ends freely in the sinusoid. **2**: The ectomesolophid is not developed

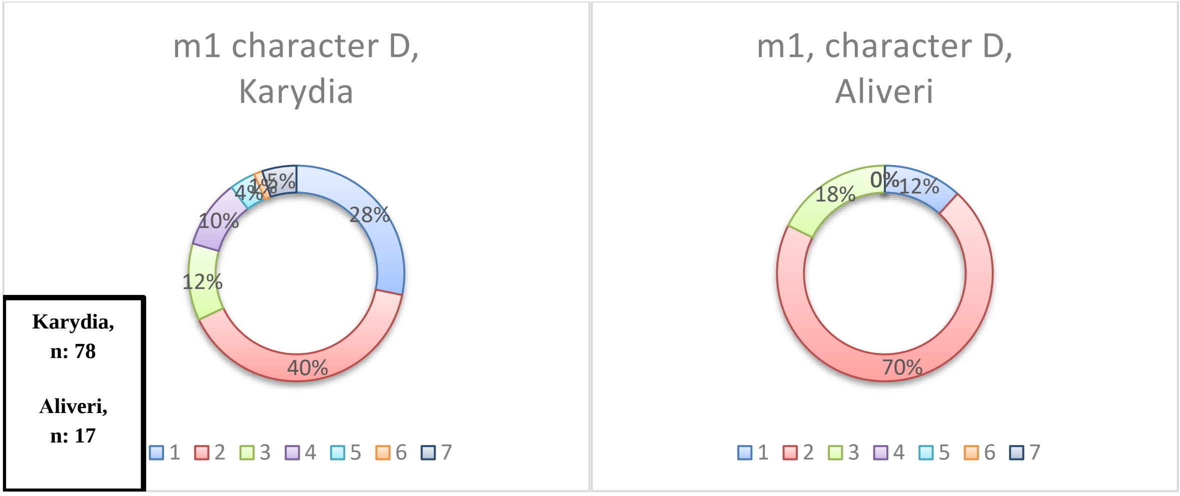


Fig. 29. **1**: The mesolophid and the ectolophid are connected to the metaconid. **2**: The ectolophid connects with the metaconid spur and the mesolophid is underdeveloped, ending freely at the mesosinus. **3**: Only the ectolophid is connected to the metaconid. **4**: The ectolophid crosses the mesoconid and connects with the protoconid's hind arm and with the metalophulid spur. **5**: There is no connection to the metaconid. **6**: There are 2 mesolophids and only the one is connected to the metaconid. The other one ends freely at the mesosinusid. **7**: There is no connection to the metaconid but the mesolophid is well developed and it ends freely at the mesosinusid

4.3.5. m2 (Pl. 9, Figs 14-16)

The outline of the m2 has a square shape with four cusps, leaning to the anterior side and two double roots vertically developed to the tooth. Moreover, the protoconid and the hypoconid lean towards the buccal side of the tooth. There is no anteroconid and the anterolophulid starts from the protoconid and ends at the meeting-point of the lingual anterolophid, which is the anterior border of the protosinusid, and the labial anterolophid, which is the anterior border of the anterosinusid. Furthermore, the ectolophid is developed towards the anterior part of the tooth and connects with the protoconid. In 3 out of 8 specimens (37.5%) a small ectomesolophid is spotted which ends freely at the sinusid (Fig. 30). Additionally, unlike the specimens from the locality of Karydia, in none of the specimens the ectomesolophid is well developed and longer than the three specimens before. On the other hand, in 5 out of 8 specimens (62.5%) there is no ectomesolophid at the sinusid. The mesoconid is underdeveloped and small in size. In 6 out of 8 specimens (75%) a small mesolophid exists that ends freely at the mesosinusid (Fig. 31). Compare it, again to the 87 specimens from Karydia neither of them have a longer mesolophid nor a connection. Finally, in 2 specimens (25%) the mesolophid is connected to the base of the metaconid. Moreover, the hypoconid connects with the mesoconid via the ectolophid. Furthermore, on the posterior half of the tooth, the posterolophid which starts from the hypoconid it riches the lingual border of the tooth and encircles the posterosinusid. In 7 out of 8 specimens (87.5%) the labial posterolophid is well developed (Fig. 32). Finally, in only 1 specimen (12.5%) there is not a labial posterolophid.

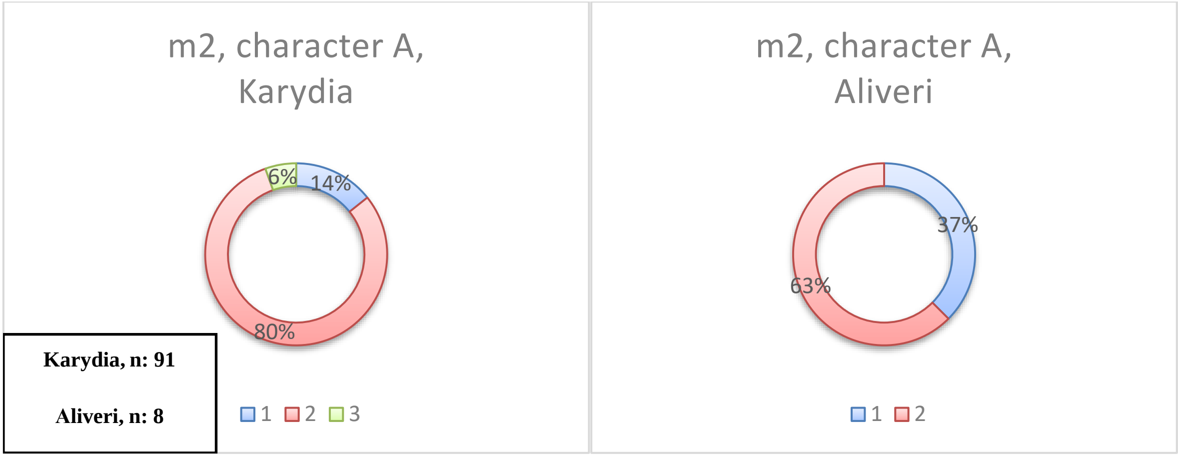


Fig. 30. **1**: The small ectomesolophid ends freely at the sinusid. **2**: There is no ectomesolophid at the sinusid. **3**: The ectomesolophid is well developed and longer than the other specimens

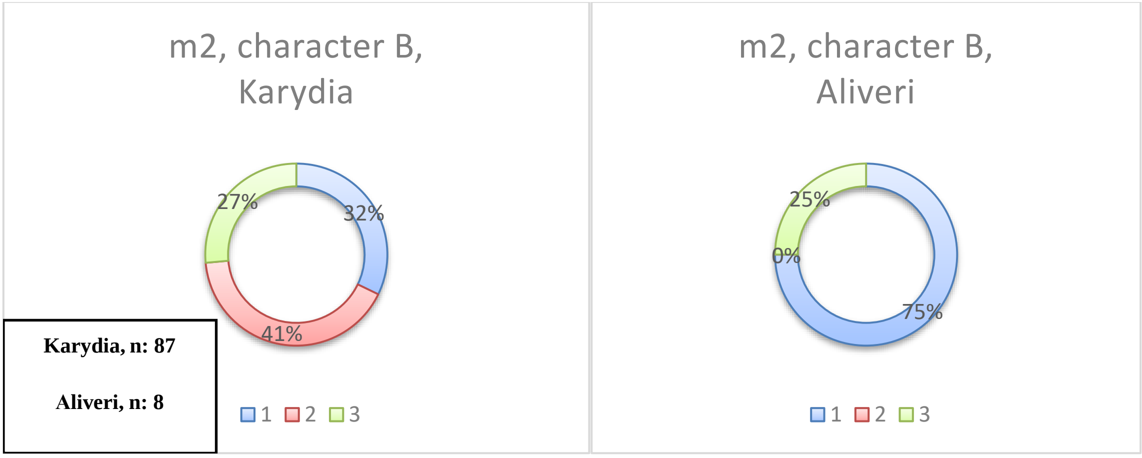


Fig. 31. **1**: The small mesolophid ends freely at the mesosinusid. **2**: The mesolophid is longer without a connection. **3**: The mesolophid is connected to the base of the metaconid

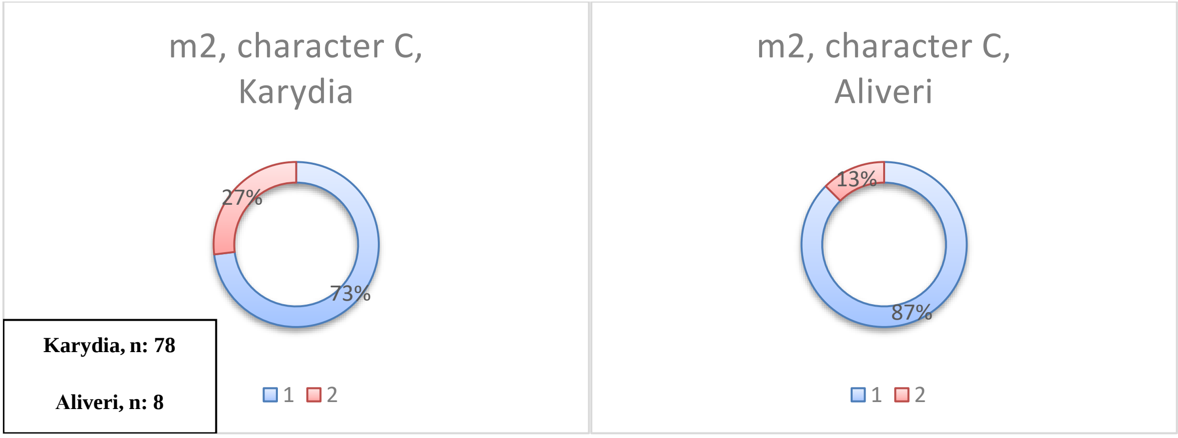


Fig. 32. **1**: The labial posterolophid is well developed. **2**: There is no labial posterolophid

4.3.6. m3 (Pl. 9, Figs 17-20)

The width of the tooth is reduced on the posterior part creating a triangular outline. It has three roots with two of them placed in the anterior part of the tooth and one on the posterior part. The cusps lean towards the anterior side. Furthermore, the anterior half of the tooth, including the anterolophulid, the labial and the lingual anterolophid, the protoconid and the metaconid, is like that of the m2 from the locality of Karydia and Aliveri. Moreover, towards the posterior part, the ectolophid connects the protoconid to the mesoconid. In 12 out of 14 specimens (85.7%) the mesolophid which starts from the mesoconid, is long and it ends freely at the mesosinusid. Unlike the specimens from Karydia the Aliveri molars lack a mesolophid. Finally, in 2 out of 14 specimens (14.3%) the mesolophid is connected to the base of the metaconid (Fig. 33). In the posterior part of the tooth, the ectolophid is connected with the hypoconid and the entoconid via the hypolophulid.

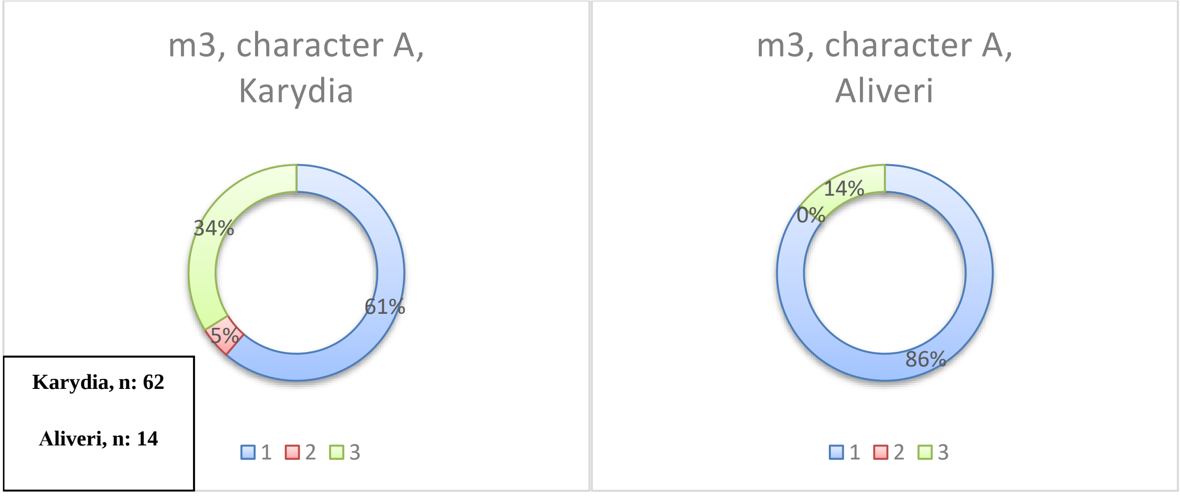


Fig. 33. **1**: The mesolophid, is long and ends freely at the mesosinusid. **2**: There is no mesolophid. **3**: The mesolophid is connected to the base of the metaconid

5. *Cricetodon* sp. from Karydia locality (Pl. 8, Fig. 3)

Family: Muridae Illiger, 1811

Subfamily: Cricetodontinae Schaub, 1925

Tribe: Cricetodontini Simpson, 1945

Genus: *Cricetodon* Lartet, 1851

Species: *Cricetodon* sp.

Locality: Karydia (KR 1)

Type level: Lower Miocene (MN 4)

Among the *Cricetodon* molars from the locality of Karydia, one distinct m3 (KR 1, specimen 1001) has been identified. Even though this molar has the dimensions and all the morphological characters of the *Cricetodon* of Karydia, it also has a unique character among the other *Cricetodon* molars from Karydia and Aliveri. This specimen has a triangular shape and three wide roots like the m3 of *C. aliveriensis*. The anterior part of the tooth includes the anterolophulid with the labial and the lingual anterolophid. The protoconid and the metaconid are like those of *C. aliveriensis* and towards the posterior part of the tooth the ectolophid connects the protoconid to the mesoconid. Furthermore, the short mesolophid starting from the mesoconid ends freely at the mesosinusid. Finally, the posterior part of the tooth includes an extra, none typical for *C. aliveriensis*, ridge. This ridge ends freely in the posterosinusid. The posterolophid starts from the hypoconid and reaches the lingual border of the tooth encircling the posterosinusid (Pl. 8, Fig. 3). The length of the tooth is 2.22 mm and the width 1.73 mm. These values are inside the *Cricetodon*'s m3 range from both Aliveri and Karydia (Chapter 12, pp. 112-113)

6. Results

6.1. Statistical analysis of the *Cricetodon* molars

6.1.1. Comparison of the *Cricetodon* teeth from Karydia 1, Karydia 2 and Karydia 3

Figures 34-39 show the correlation between the three fossiliferous levels of the clay pit. The X axis represents the length (L) of the molar teeth and the Y axon the width (W). All plots include well developed point clusters and highlighted by them the 95% ellipse of confidence. Each of them represents the material of Karydia 1, Karydia 2 and Karydia 3. The first diagram (Fig. 34) shows the measurements of the first upper molars (M1) from Karydia 1 (Table 3) and Karydia 2 (Table 4). It is observed that the 95% confidence ellipse of the molars from these two fossiliferous levels overlap each other. The M1 molars from Karydia 3 are absent from the scatter plot since observations could not be made due to their poor preservation. The same situation can be observed in the m2 diagram (Fig. 38), However, one molar from Karydia 3 (Table 5) has been measured and is plotted inside the 95% confidence interval ellipses of Karydia 1 and 2.

	Length				Width			
	N	Min	Max	Mean	N	Min	Max	Mean
M1	33	2.2	2.76	2.49	47	1.43	1.85	1.66
M2	52	1.66	2.13	1.93	52	1.38	1.83	1.65
M3	63	1.48	1.93	1.73	64	1.35	1.66	1.52
m1	79	1.97	2.5	2.21	89	1.24	1.56	1.39
m2	72	1.7	2.23	2	75	1.44	1.81	1.59
m3	53	1.85	2.25	2.05	54	1.37	1.73	1.52

Table 3. Material and measurements of *Cricetodon* from the locality of Karydia 1 (mm)

	Length				Width			
	N	Min	Max	Mean	N	Min	Max	Mean
M1	49	1.9	2.88	2.51	59	1.39	1.9	1.65
M2	67	1.72	2.2	1.95	68	1.48	1.83	1.64
M3	1	1.87	1.87	1.87	1	1.59	1.59	1.59
m1	3	1.94	2.14	2.04	2	1.28	1.59	1.44
m2	13	1.87	2.11	1.96	20	1.46	1.86	1.61
m3	3	1.97	2.07	2.01	8	1.45	1.6	1.51

Table 4. Material and measurements of *Cricetodon* from the locality of Karydia 2 (mm)

	Length				Width			
	N	Min	Max	Mean	N	Min	Max	Mean
M1		-	-	-	2	1.45	1.56	-
M2	-	-	-	-	-	-	-	-
M3	2	1.7	1.79	1.745	2	1.46	1.46	1.46
m1	1	1.89	1.89	1.89	2	1.29	1.62	1.46
m2	1	1.89	1.89	1.84	2	1.55	1.56	1.56
m3	-	-	-	-	1	1.53	1.53	-

Table 5. Material and measurements of *Cricetodon* from the locality of Karydia 3 (mm)

Furthermore, to proceed in the comparison of the *Cricetodon* samples from Karydia it is essential to use the Welch’s t-test (unequal variances t-test), in order to compare the tooth ratios (L/W). The null hypothesis (H_0) tested by the Welch’s t-test is that the population means of the samples are the same. Here the Welch’s t-test was applied to the most numerous samples and most specifically to the M1, M2 and m2 from Karydia 1 and Karydia 2 since the sample of Karydia 3 is inadequate.

	Welch's t-test
Teeth (L/W)	**p**
M1	0.40647
M2	0.1902
m2	0.035167

Table 6. Welch's t-test of the ratios (L/W) of *Cricetodon* from Karydia 1 and Karydia 2

According to Welch’s test, the variances of all the teeth ratios (L/W) do not have a significant difference because in all the teeth the “p” value is bigger than 0.001. Consequently, the ratio mean values of the two *Cricetodon* samples from Karydia 1 and 2 are not significantly different.

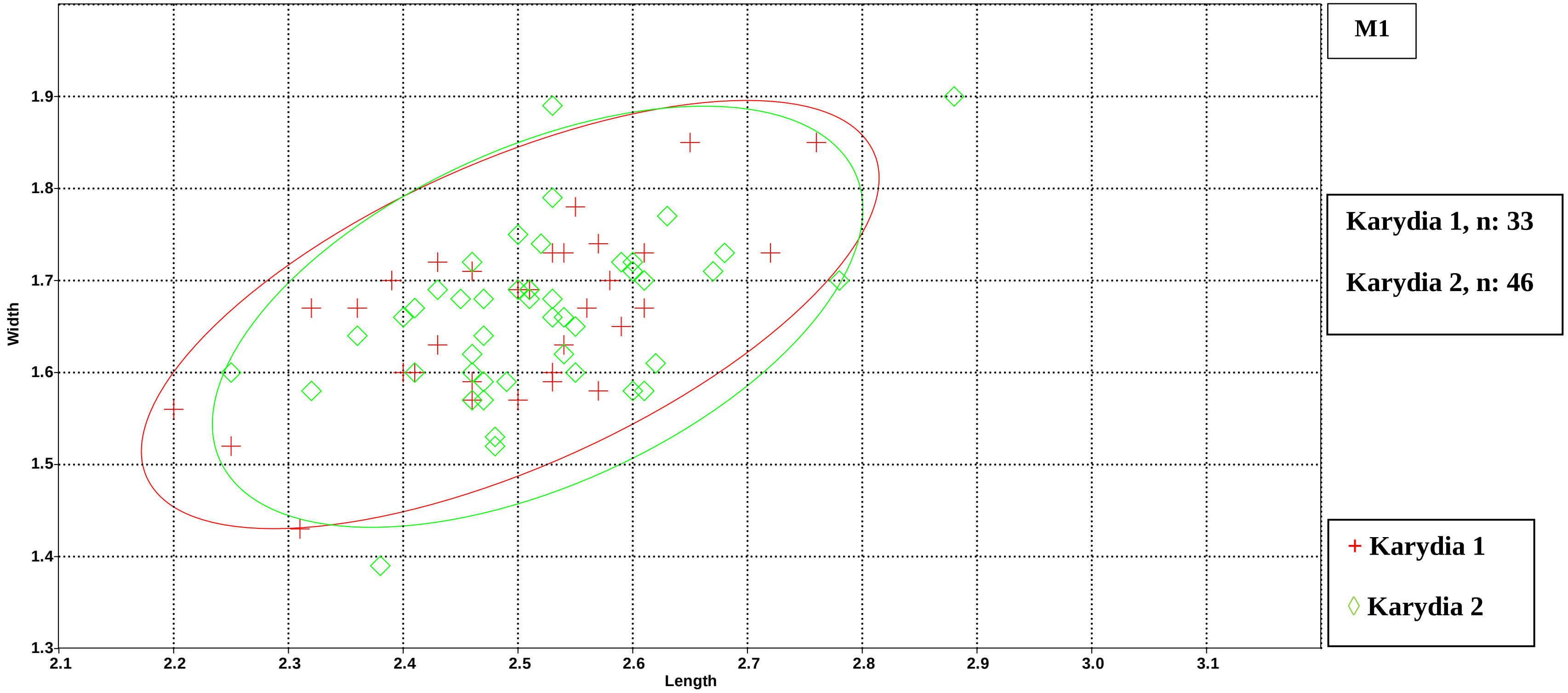


Figure 34. L/W scatter plot of the M1 from *Cricetodon aliveriensis* from Karydia 1, Karydia 2 and Karydia 3

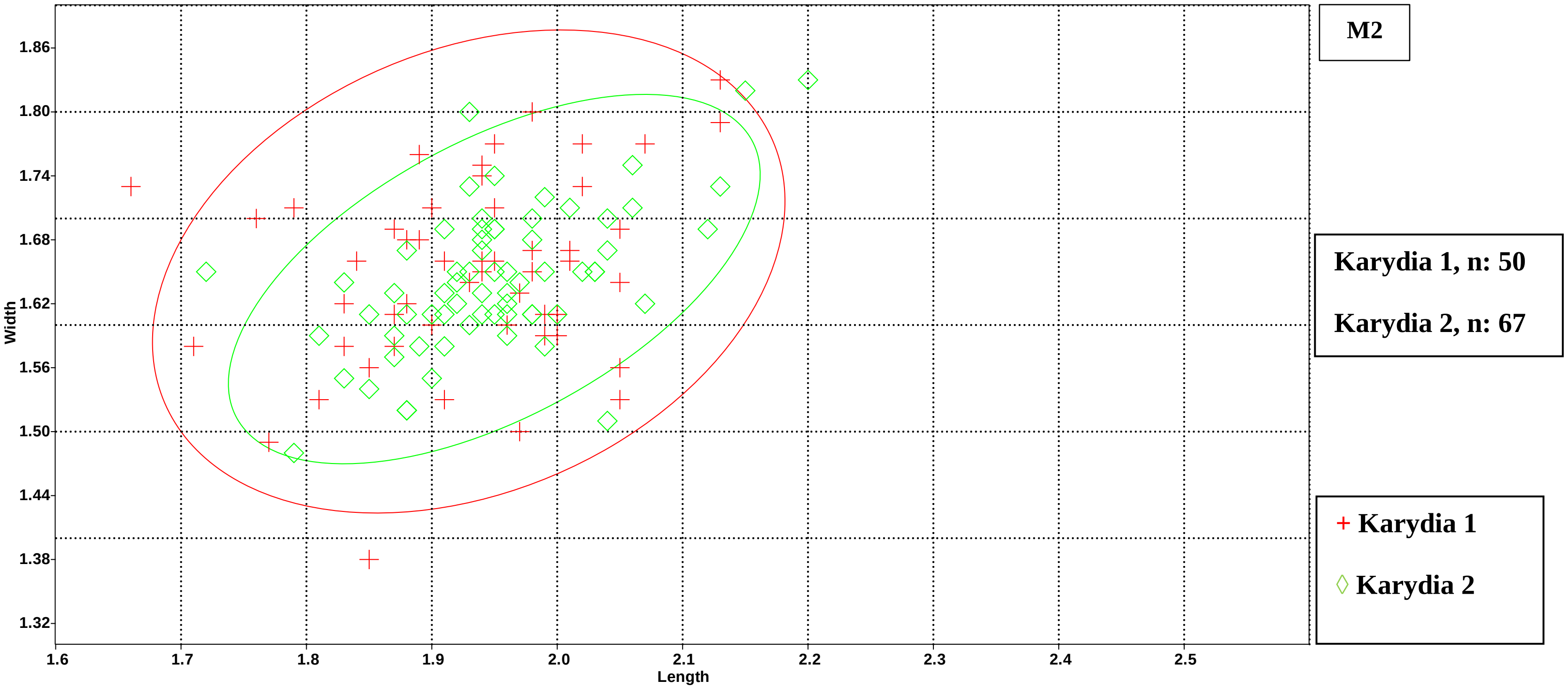


Figure 35. L/W scatter plot of the M2 from *Cricetodon aliveriensis* from Karydia 1, Karydia 2 and Karydia 3

In the second diagram (Fig. 35), the 95% confidence interval ellipse of the second upper molars from Karydia 1 and Karydia 2 are nearly concentric. The confidence ellipse of Karydia 1 overlaps the 95% confidence ellipse of Karydia 2. The M2 molars from Karydia 3 are again absent due to their poor preservation and their small sample size.

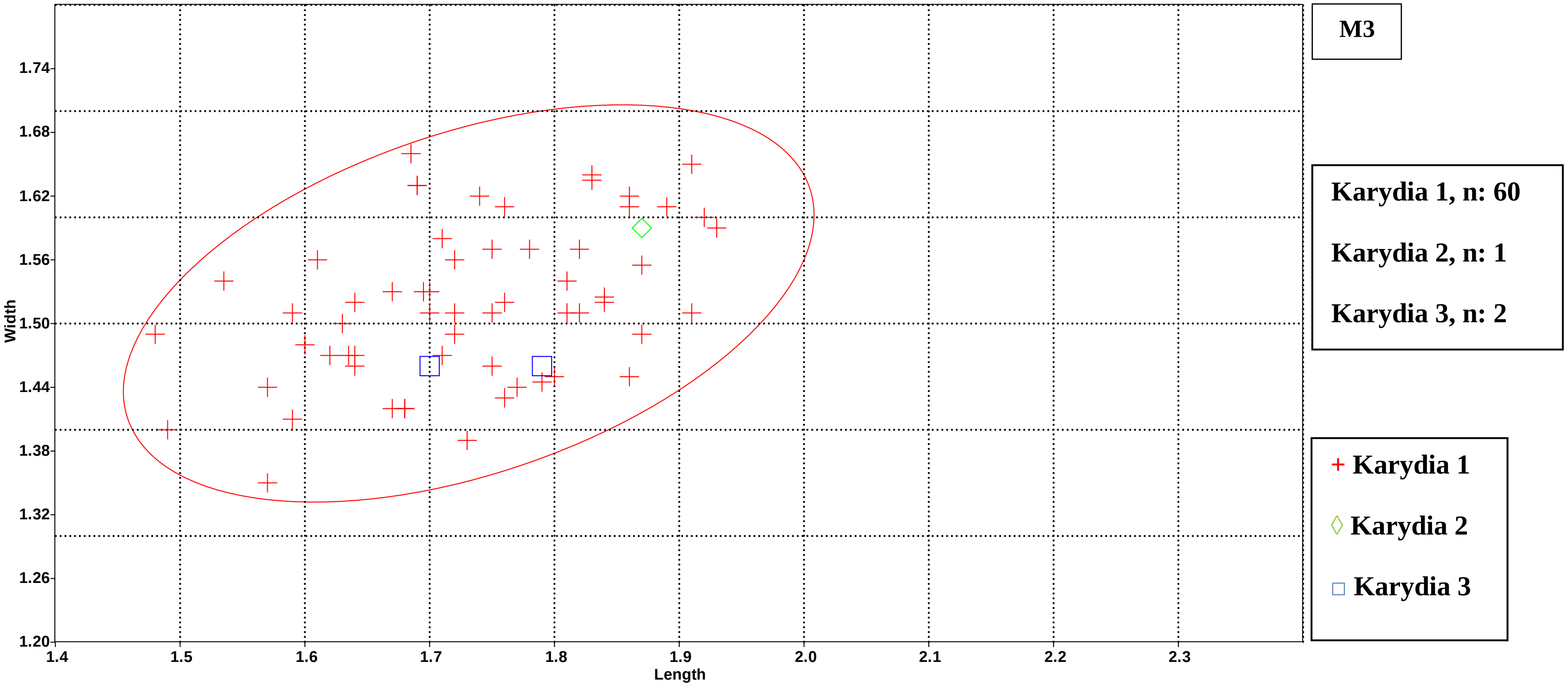


Figure 36. L/W scatter plot of the M3 from *Cricetodon aliveriensis* from Karydia 1, Karydia 2 and Karydia 3

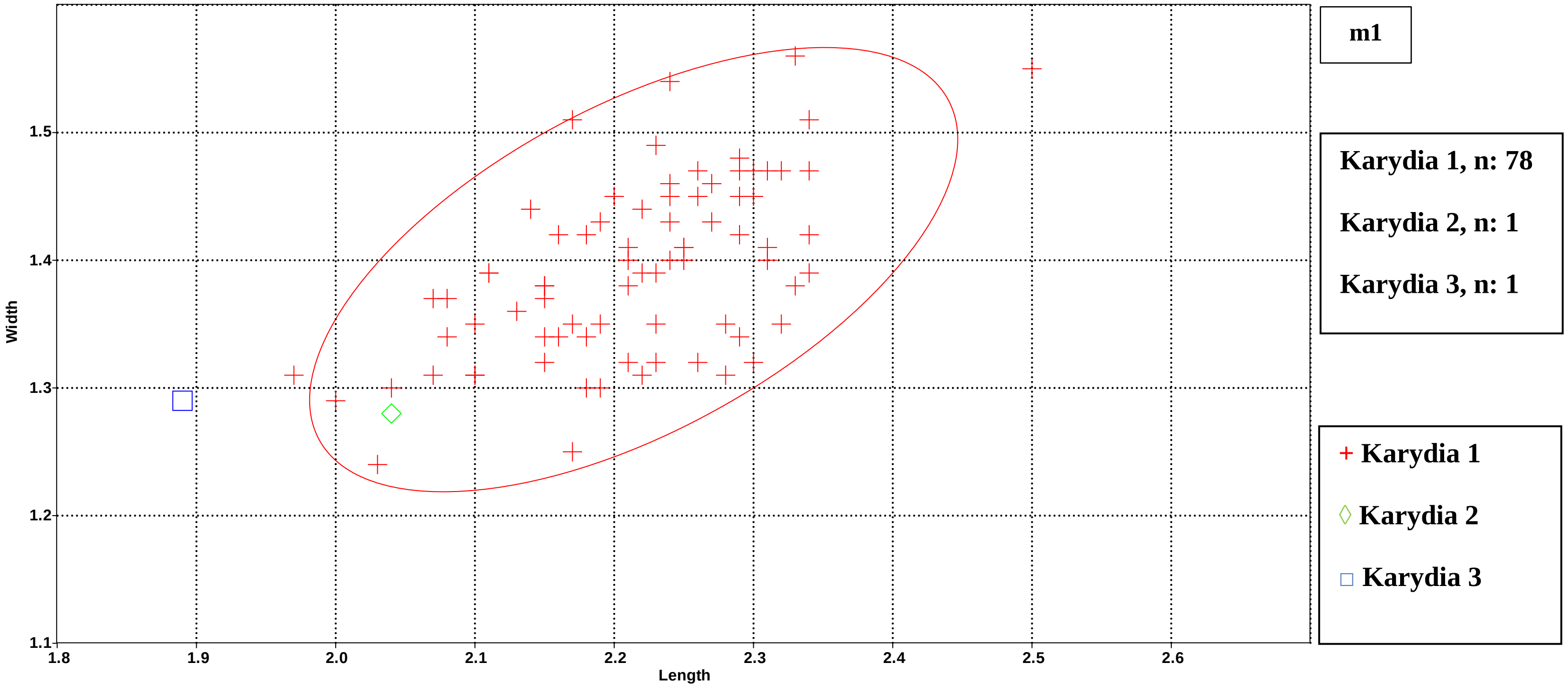


Figure 37. L/W scatter plot of the m1 from *Cricetodon aliveriensis* from Karydia 1, Karydia 2 and Karydia 3

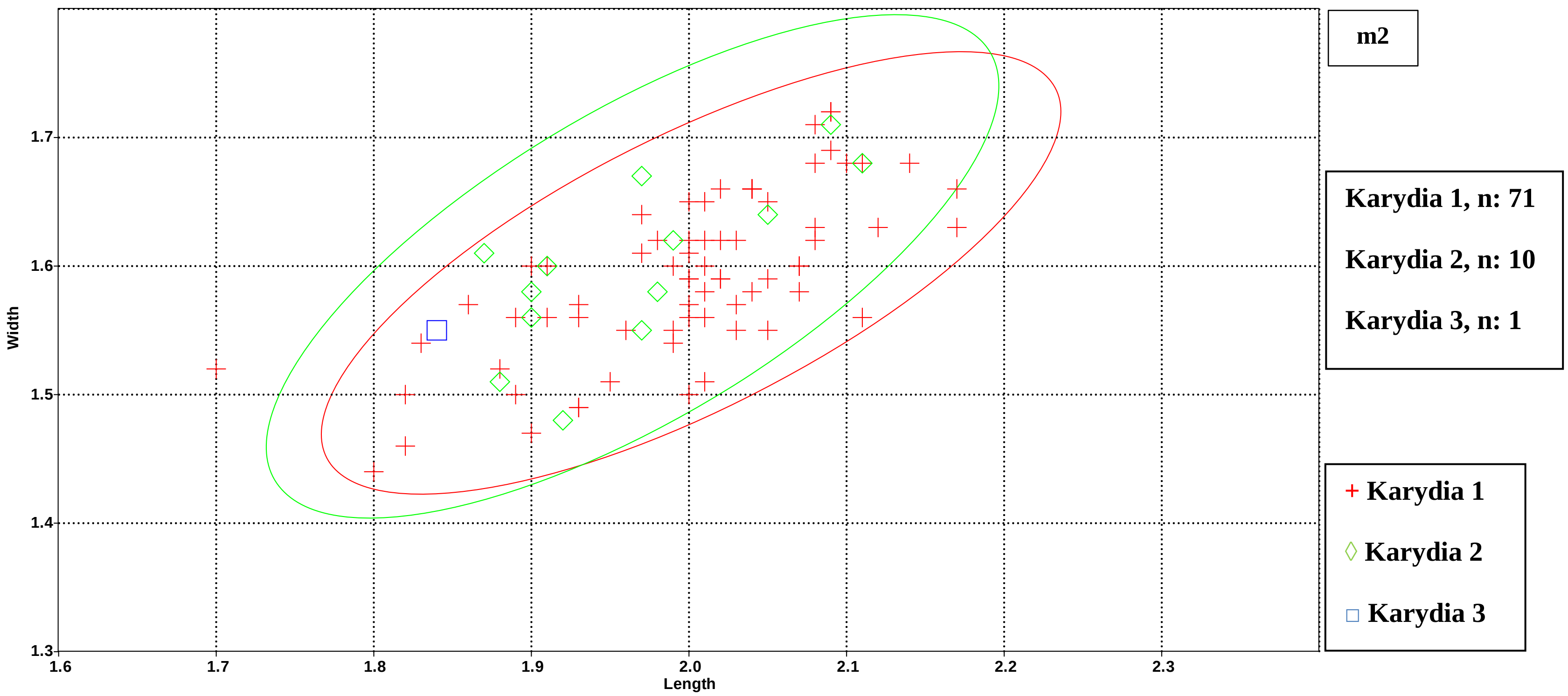


Figure 38. L/W scatter plot of the m2 from *Cricetodon aliveriensis* from Karydia 1, Karydia 2 and Karydia 3

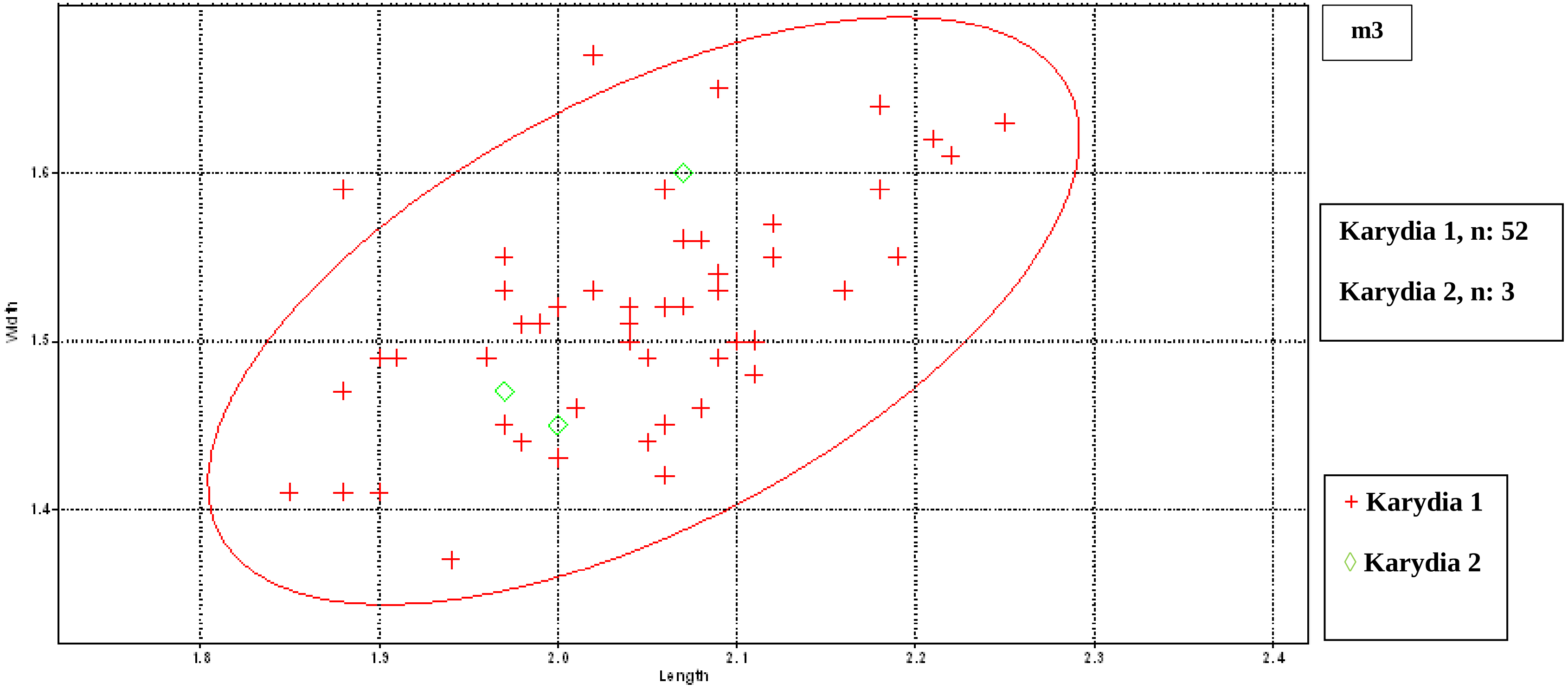


Figure 39. L/W scatter plot of the m3 from *Cricetodon aliveriensis* from Karydia 1, Karydia 2 and Karydia 3

The M3 (Fig. 36), m1 (Fig. 37) and m3 (Fig. 39) plots include mostly the samples from Karydia 1. The preservation of the third upper and first lower molars from the other two localities and their small sample size did not make it possible the obtain their 95% confidence ellipse. However, some of them were measured and were included in the plots.

6.1.2. Comparison of the *Cricetodon* teeth from Karydia with Aliveri and Anatolian rodent species

The diagrams of this section include the length and width values of the molars from the *Cricetodon* material from Karydia (Table 7) and from *C. aliveriensis* from Aliveri (Table 8) (Figs 40-45). In order to signify the differences of the *Cricetodon* of both Greek localities from eastern species, the minimum and maximum values of Anatolian Rodentia species were also included in the plots. All the plots below include well developed point clusters and their 95% confidence ellipse around them. The values of the two Greek cricetids are so close to each other, making their discrimination difficult with the confidence interval ellipses overlapping each other to a large percentage. However, the material from Aliveri is concentrated on the down - left side of the cluster.

	Length				Width			
	N	Min	Max	Mean	N	Min	Max	Mean
M1	82	1.9	2.88	2.5	108	1.39	1.9	1.65
M2	119	1.66	2.2	1.94	120	1.38	1.83	1.64
M3	66	1.48	1.93	1.74	67	1.35	1.66	1.52
m1	83	1.89	2.5	2.21	93	1.24	1.62	1.39
m2	86	1.7	2.23	1.99	97	1.44	1.86	1.6
m3	56	1.85	2.25	2.05	63	1.37	1.73	1.52

Table 7. Material and measurements of *Cricetodon* from the locality of Karydia (1+2+3) (mm)

	Length				Width			
	N	Min	Max	Mean	N	Min	Max	Mean
M1	13	2.23	2.52	2.35	13	1.46	1.63	1.53
M2	13	1.78	1.98	1.84	13	1.47	1.63	1.54
M3	15	1.51	1.71	1.63	15	1.39	1.53	1.45
m1	21	1.9	2.14	2.03	21	1.21	1.39	1.28
m2	9	1.72	1.94	1.84	9	1.41	1.54	1.48
m3	16	1.77	2.2	1.93	16	1.31	1.68	1.44

Table 8. Material and measurements of *C. aliveriensis* from the locality of Aliveri South Quarry (mm)

The rectangles represent the maximum and minimum length and width values of the Anatolian species of *Cricetodon kasapligili* from Yapinti, *C. versteegi* from Kinik, *C.* aff. *kasapligili* from Sabuncubeli, *C.* aff. *versteegi* from Kargi, *C. versteegi* from Kilçak 3a and *C. kasapligili* from Keseköy (Vasileiadou and Koufos, 2005; Durgut and Ünay, 2016; de Bruijn *et al*., 1992; Theocharopoulos, 2000; Theocharopoulos, 2000; de Bruijn *et al*., 2006; Durgut and Ünay, 2016; Kakali, 2013; de Bruijn *et al*. 1993; de Bruijn *et al*. 1993). The database tables for the scatter plots can be seen in Chapter 12. Some of the following diagrams do not include all of the aforementioned Anatolian species because their length or width values were not measured.

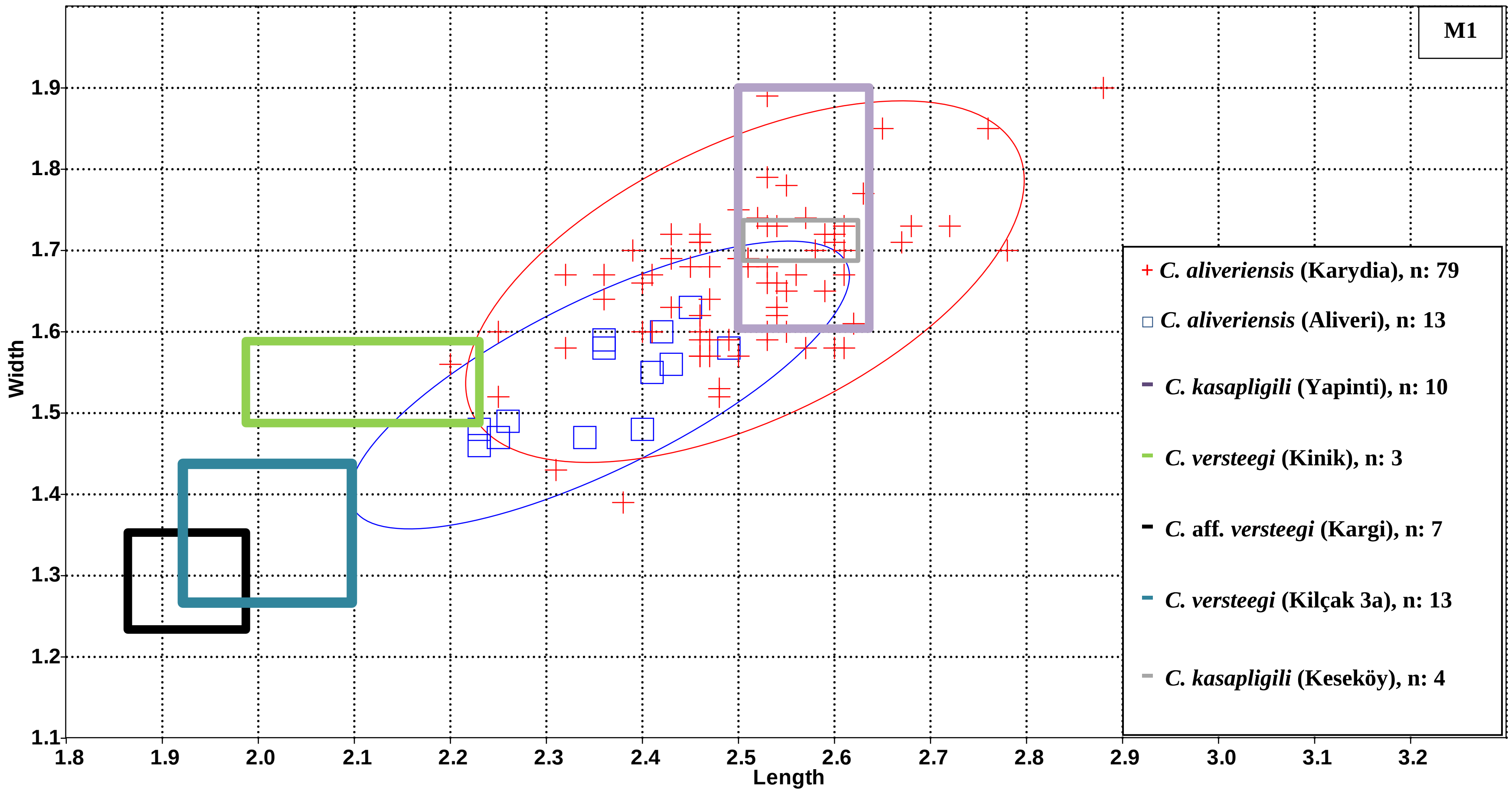


Figure 40. L/W scatter plot of the M1 from *Cricetodon aliveriensis* from Karydia and Aliveri (Hofmeijer and de Bruijn, 1988), *C. kasapligili* from Yapinti (Durgut and Ünay, 2016), *C. versteegi* from Kinik (Durgut and Ünay, 2016), *C.* aff. *versteegi* from Kargi (Kakali, 2013), *C. versteegi* from Kilçak 3a (de Bruijn *et al*. 1993) and *C. kasapligili* from Keseköy (de Bruijn *et al*. 1993)

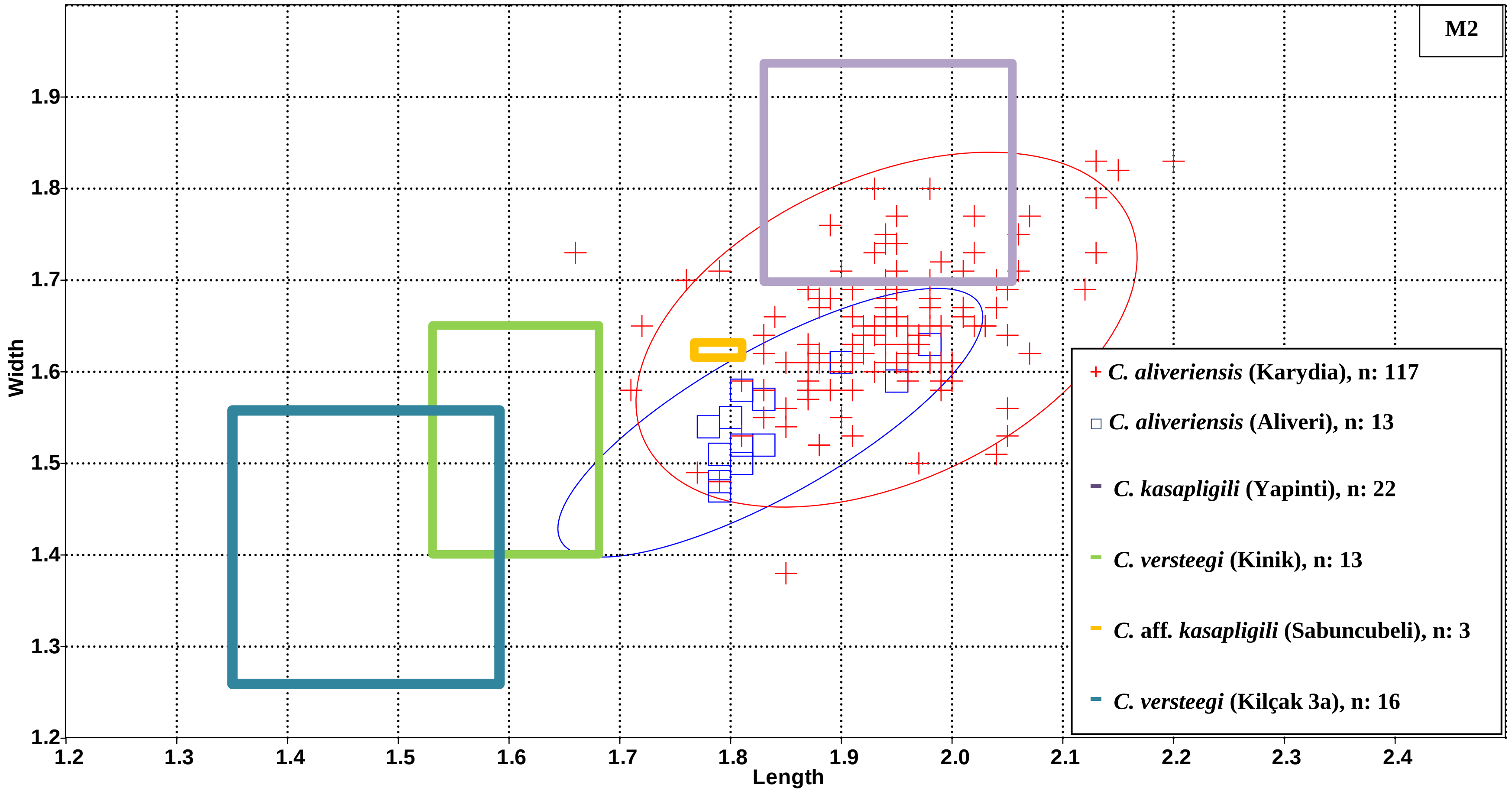


Figure 41. L/W scatter plot of the M2 from *Cricetodon aliveriensis* from Karydia and Aliveri (Hofmeijer and de Bruijn, 1988), *C. kasapligili* from Yapinti (Durgut and Ünay, 2016), *C. versteegi* from Kinik (Durgut and Ünay, 2016), *C.* aff. *kasapligili* from Sabuncubeli (de Bruijn *et al*., 2006) and *C. versteegi* from Kilçak 3a (de Bruijn *et al*. 1993)

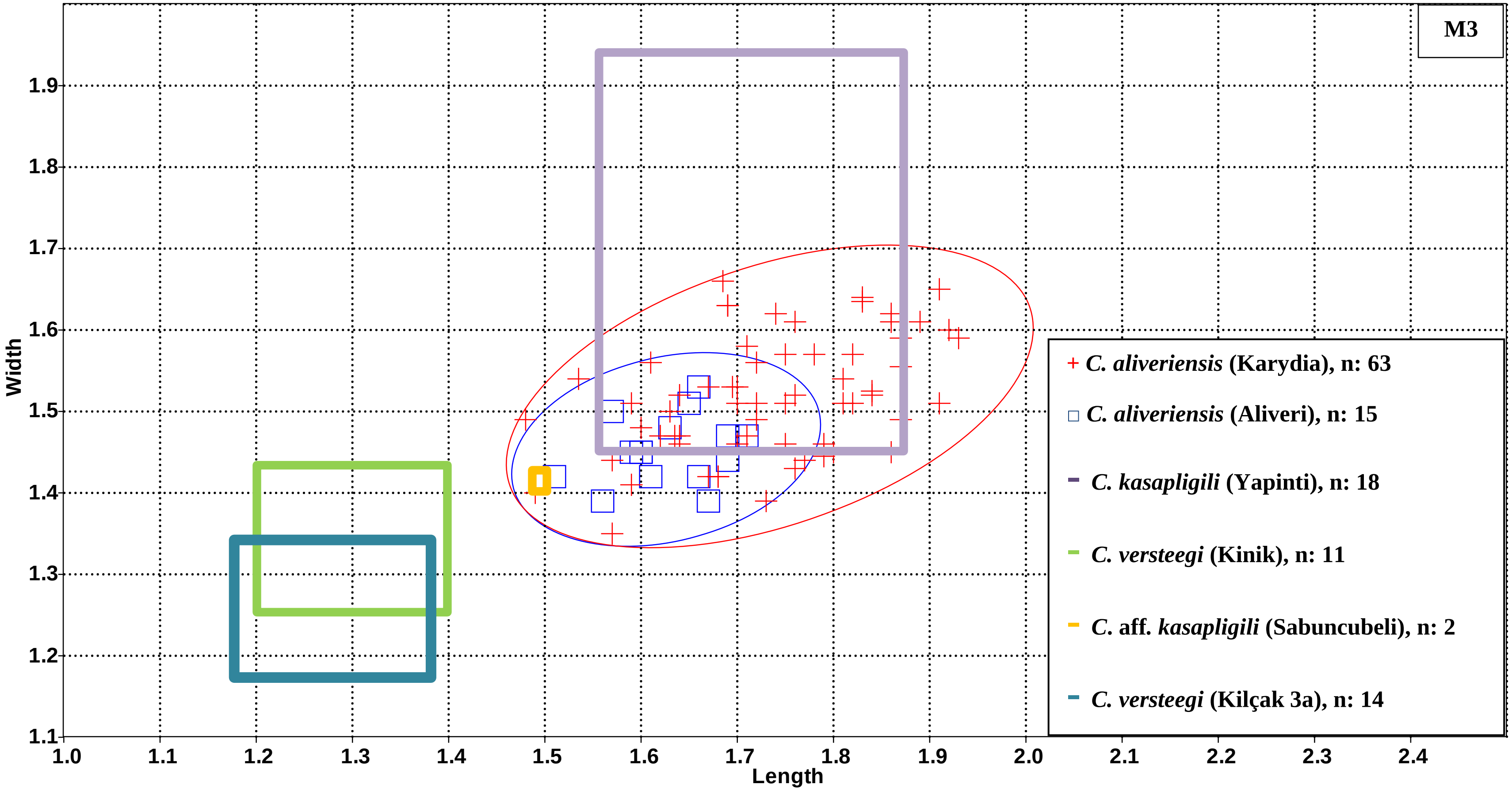


Figure 42. L/W scatter plot of the M3 from *Cricetodon aliveriensis* from Karydia and Aliveri (Hofmeijer and de Bruijn, 1988), *C. kasapligili* from Yapinti (Durgut and Ünay, 2016), *C. versteegi* from Kinik (Durgut and Ünay, 2016), *C.* aff. *kasapligili* from Sabuncubeli (de Bruijn *et al*., 2006) and *C. versteegi* from Kilçak 3a (de Bruijn *et al*. 1993)

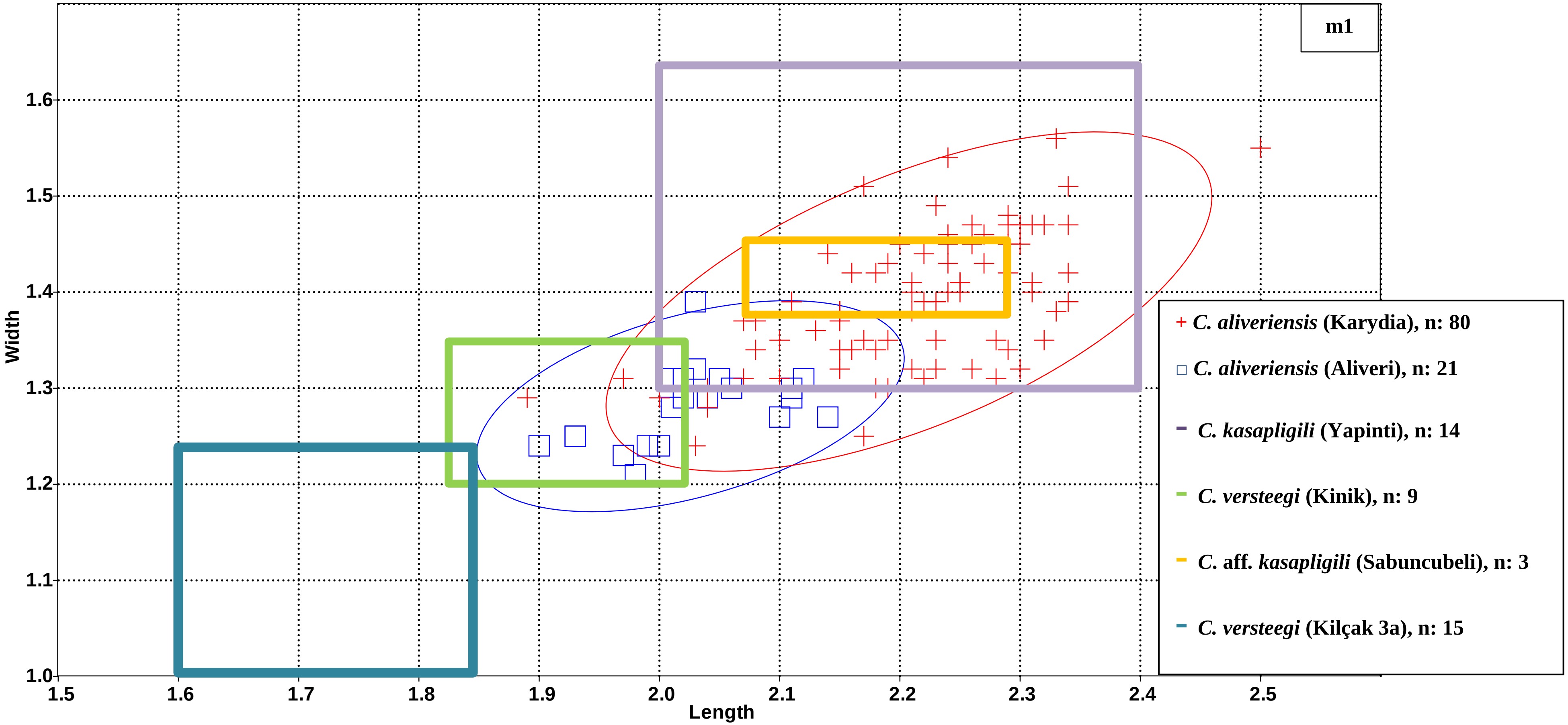


Figure 43. L/W scatter plot of the m1 from *Cricetodon aliveriensis* from Karydia and Aliveri (Hofmeijer and de Bruijn, 1988), *C. kasapligili* from Yapinti (Durgut and Ünay, 2016), *C. versteegi* from Kinik (Durgut and Ünay, 2016), *C.* aff. *kasapligili* from Sabuncubeli (de Bruijn *et al*., 2006) and *C. versteegi* from Kilçak 3a (de Bruijn *et al*. 1993)

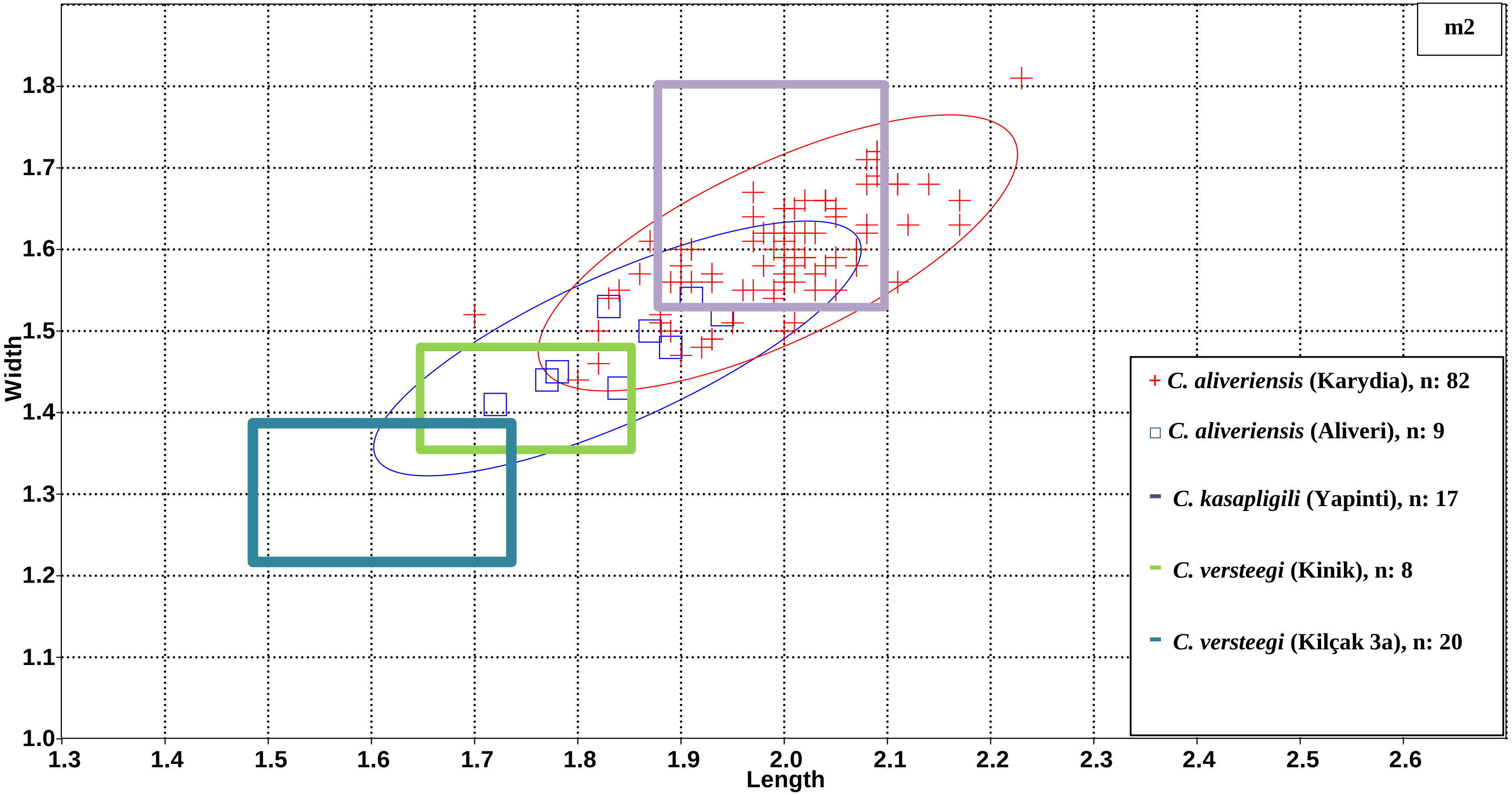


Figure 44. L/W scatter plot of the m2 from *Cricetodon aliveriensis* from Karydia and Aliveri (Hofmeijer and de Bruijn, 1988), *C. kasapligili* from Yapinti (Durgut and Ünay, 2016), *C. versteegi* from Kinik (Durgut and Ünay, 2016) and *C. versteegi* from Kilçak 3a (de Bruijn *et al.* 1993)

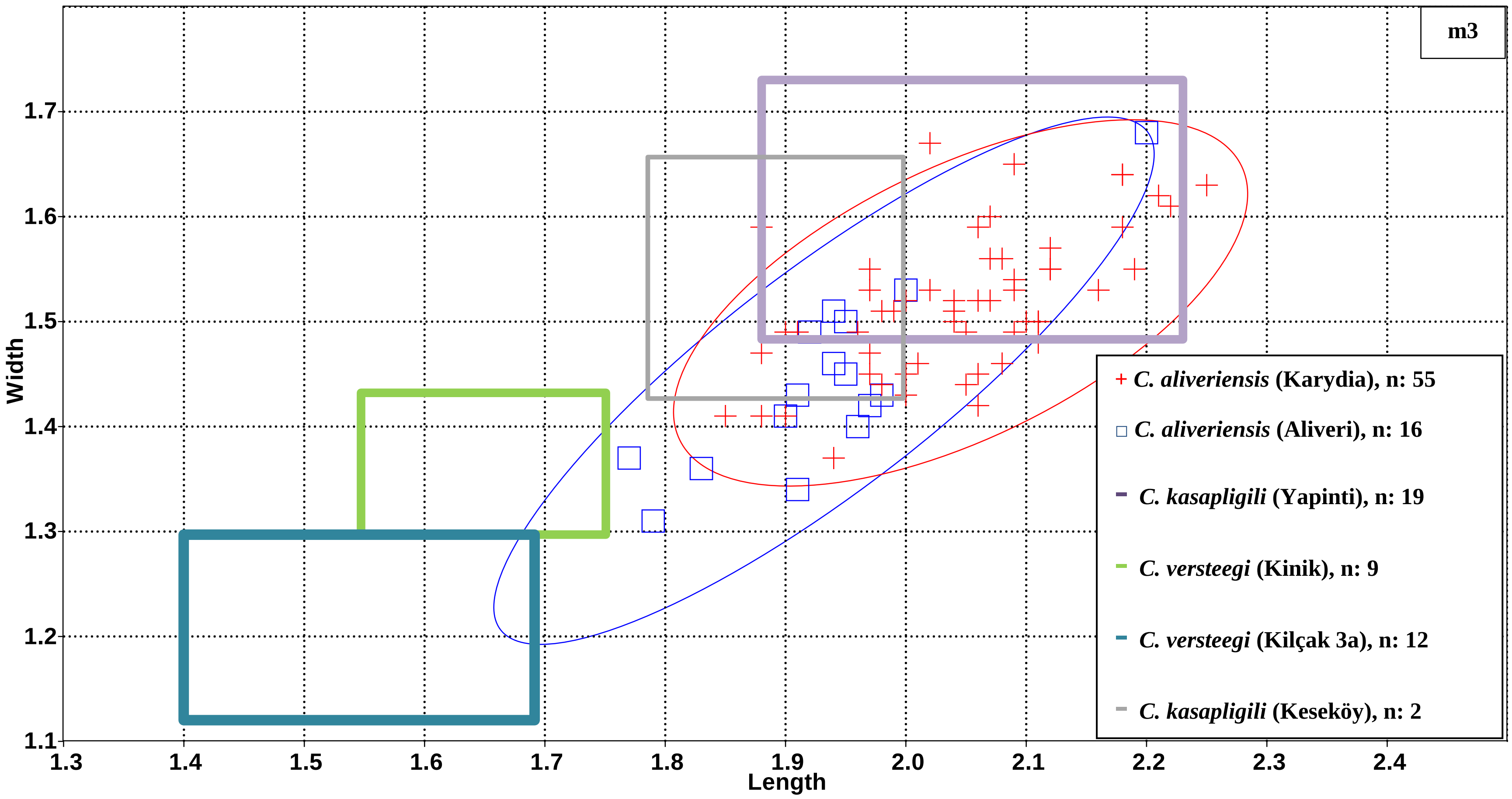


Figure 45. L/W scatter plot of the m3 from *Cricetodon aliveriensis* from Karydia and Aliveri (Hofmeijer and de Bruijn, 1988), *C. kasapligili* from Yapinti (Durgut and Ünay, 2016), *C. versteegi* from Kinik (Durgut and Ünay, 2016) and *C. versteegi* from Kilçak 3a (de Bruijn *et al.* 1993) and *C. kasapligili* from Keseköy (de Bruijn *et al.* 1993)

It becomes apparent that only *C. kasapligili* from Yapinti and Keseköy and *C.* aff. *kasapligili* from Sabuncubeli are comparable to the size range of *Cricetodon* from Karydia and Aliveri. More specifically, *C. kasapligili* is generally larger than *C. aliveriensis* (Figs 40-45). However, in some cases *C. kasapligili* (Figs 42, 43) presents a larger range but no further comments can be made due to the lack of data. Furthermore, the dimensions of *C.* aff. *kasapligili* from Sabuncubeli are included in the Aliveri's confidence interval ellipse (Figs 41-43). It appears to have a significantly smaller range but that may be a result of the small specimen number.

The dimensions of *C. versteegi* from Kinik and *C.* aff. *versteegi* from Kargi differ from the two Greek *Cricetodon* samples studied. The first one is close to the 95% confidence interval ellipse of Karydia's *C. aliveriensis* but their overlap is minimal (Figs 40, 41, 45) and in one case there is no intersection at all (Fig. 42). *Cricetodon* aff. *versteegi* from Kargi is very small and its square does not overlap with *C. aliveriensis* confidence interval ellipse (Fig. 40).

6.1.3. One way analysis of variance and Welch's t-test

At this point, to proceed in the comparison of the two *Cricetodon* samples from Karydia and Aliveri localities, it is essential to use the one-way ANOVA test (Table 9), in order to compare the tooth ratios (L/W). The tooth ratios depict the size and shape of each tooth. The morphological description of both Aliveri and Karydia material already suggests great similarity. Therefore, the size difference identified in Karydia (6.1.2) does not support the placement of this rodent to a different species. The null hypothesis (H_0) tested by the one-way ANOVA test is that the population means of the two samples are the same.

	One-way ANOVA	
Teeth (L/W)	**p**	**Levene's test**
M1	0.2307	0.045
M2	0.632	0.06079
M3	0.2085	0.05957
m1	0.6101	0.2045
m2	0.6567	0.2619
m3	0.5435	0.3898

Table 9. One-way Anova of the ratios (L/W) of *Cricetodon* from Karydia (1+2+3) and *C. aliveriensis* from Aliveri

According to Levene's test, the variances of all the teeth ratios do not have a significant difference (bigger than 0.05), except for M1 which is smaller than 0.05. Because of this result, the non-parametric Kruskal – Wallis test is used for the comparison of the M1's length and width mean values. The "p" value for the M1 is 0.153. Taken together, the results of the statistical analysis indicate that the ratio mean values of the two *Cricetodon* samples from Karydia and Aliveri are not significantly different.

Because of the great difference in the two sample sizes (Aliveri and Karydia) it is essential to use as well the Welch's t-test (Table 10), or unequal variances t-test, testing the same null hypothesis (H_o) that the population means of the two samples are the same. This test's results are more reliable compare it to the one-way ANOVA test.

	Welch's t-test
Teeth (L/W)	**p**
M1	0.087465
M2	0.37872
M3	0.109
m1	0.55089
m2	0.56833
m3	0.49226

Table 10. Welch's t-test of the ratios (L/W) of *Cricetodon* from Karydia (1+2+3) and *C. aliveriensis* from Aliveri

According to Welch's test, the variances of all the teeth ratios (L/W) do not have a significant difference because in all the teeth the "p" value is bigger than 0.001. Consequently, the ratio mean values of the two *Cricetodon* samples from Karydia and Aliveri are not significantly different

6.2. Teeth ratios

The following tables include the molar teeth ratios of *Cricetodon* from Karydia (1+2+3) and Aliveri (Hofmeijer and de Bruijn, 1988) localities (Chapter 3.1). These ratios are based on the mean values of the length (Table 11) and width (Table 12) of the molars examined. The difference between the ratios of the two *Cricetodon* species is minimal. For example, the length and width ratios of the first upper molar (M1) from Karydia are 1.29 and 1.01 and from Aliveri 1.28 and 0.99. As a result, the difference between them is 0.01 for the length and 0.02 for the width. A similar result is evident in all other molar ratios.

6.2.1. Teeth length ratios

	Cricetodon (Karydia)	*Cricetodon aliveriensis*, (Aliveri)
L(M1)/L(M2)	1.29	1.28
L(M3)/L(M2)	0.9	0.89
L(m1)/L(m2)	1.11	1.1
L(m3)/L(m2)	1.03	1.05

Table 11. Tooth-row length ratios of *Cricetodon* from Karydia and from *C. aliveriensis* from Aliveri

6.2.2. Teeth width ratios

	Cricetodon (Karydia)	*Cricetodon aliveriensis*, (Aliveri)
W(M1)/W(M2)	1.01	0.99
W(M3)/W(M2)	0.93	0.94
W(m1)/W(m2)	0.87	0.87
W(m3)/W(m2)	0.95	0.97

Table 12. Tooth-row width ratios of *Cricetodon* from Karydia and from *C. aliveriensis* from Aliveri

6.3. Divergence (%) of various cricetids from *C. aliveriensis* from Aliveri

These plots display the percentage difference of a number of cricetids from the Greek localities of Karydia (MN 4) and Antonios (MN 5), and the Anatolian localities of Yapinti, Sabunçebeli (MN 3) and Kargi, Kinik (MN 1) from *C. aliveriensis* from Aliveri. These diagrams (Figs 46-47) present the dimensional similarity of the *Cricetodon* species from Aliveri and Karydia. The zero axis represents Aliveri's molars.

6.3.1. Upper teeth

The first diagram (Fig. 46) of the upper teeth shows the close and parallel relationship of the mean length and width values of *C. aliveriensis* from Aliveri locality with the *Cricetodon* material from Karydia. Compared to the other species all the upper teeth of Karydia's *Cricetodon* and Sabuncubeli's *Cricetodon* aff. *kasapligili* are closer to the zero axis. However, the dimensions of *Karydomys symeonidisi* from Karydia are also close to *C. aliveriensis*, except those of the third upper molar where the divergence is bigger than 20%. Furthermore, the length of the second upper molars (M2) of *C. aliveriensis* from Karydia, *C. meini* from Antonios, *C. kasapligili* from Yapinti, *Mirabella tuberosa* from Aliveri, *C. kasapligili* from Keseköy, *K. symeonidisi* and *C.* aff. *kasapligili* from Sabuncubeli are similar and very close to *C. aliveriensis* from Aliveri.

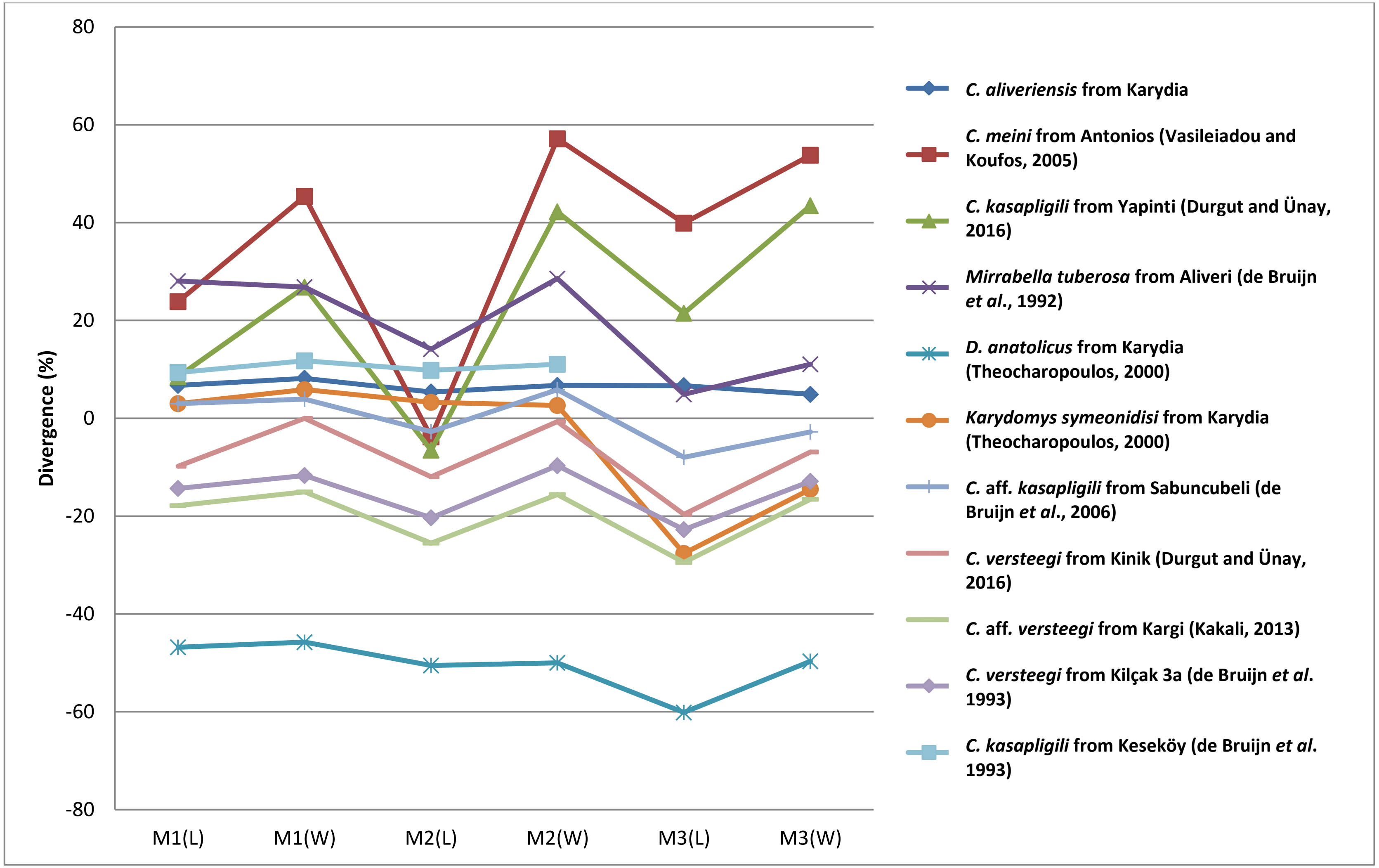


Figure 46. Percentage difference of the upper teeth between Greek and Anatolian Cricetidae and *Cricetodon aliveriensis* from Aliveri (standard)

6.3.2. Lower teeth

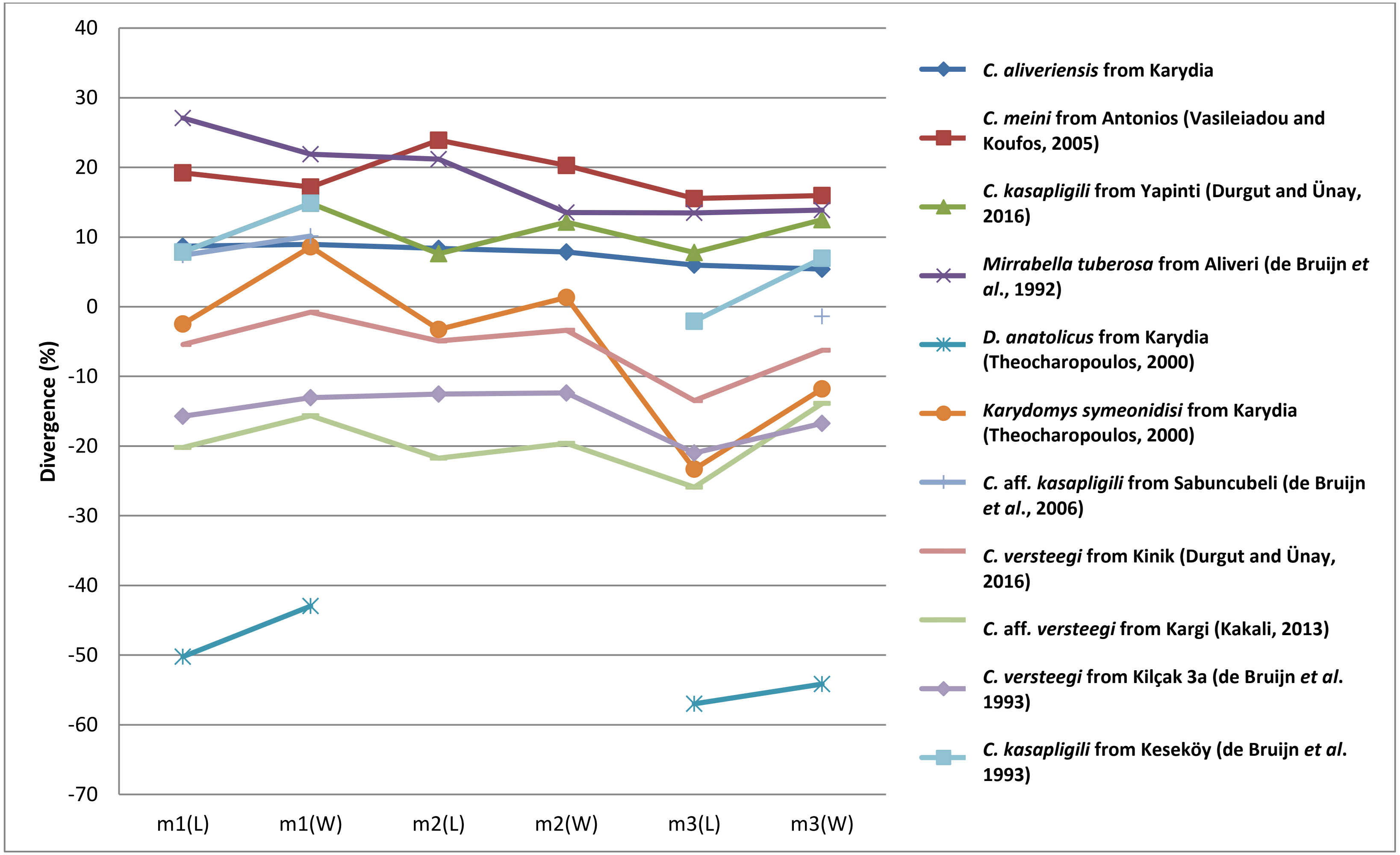


Figure 47. Percentage difference of the lower teeth between Greek and Anatolian Cricetidae and *Cricetodon aliveriensis* from Aliveri (standard)

The second diagram (Fig. 47) of the lower molars includes the same species as the former diagram of the upper teeth. However, here *C. aliveriensis* from Karydia is the closest species to the zero axis across the entire tooth row. All the other species in this diagram lack a proportional similarity with *C. aliveriensis* from Aliveri locality.

Both diagrams highlight one thing. The dimensions of all the molars of *Cricetodon* from Karydia are close to *C. aliveriensis* from Aliveri but slightly larger. This observation is better denoted in Figure 46 than in Figure 48 where the dimensions of Karydia's *Cricetodon* are nearly 10% larger than those from Aliveri.

6.4. Length and width range plots

These diagrams (Figs 48-49) denote the range of the length and width values of the *Cricetodon* molars from Aliveri and Karydia localities. The majority of the charts indicate that the dimensions of the molars from Aliveri are similar to the minimum values of Karydia's molars. However, they are still included in Karydia's range of values, especially those of the upper teeth.

It is essential to emphasize that the *Cricetodon* material from Karydia is comprised by 112 first upper molars (M1), 122 second upper molars (M2), 70 third upper molars (M3), 96 first lower molars (m1), 100 second lower molars (m2) and 64 third lower molars (m3). However, *C. aliveriensis* from the locality of Aliveri includes only 13 M1, 13 M2, 15 M3, 21 m1, 9 m2 and 16 m3 molars. Karydia has a proper number of molars to provide more accurate statistical results than Aliveri. This is the reason why different types of statistical methods and diagrams are used in this thesis but also why the comparison of *C. aliveriensis* from Aliveri and Karydia is also focused on the morphological description of their teeth.

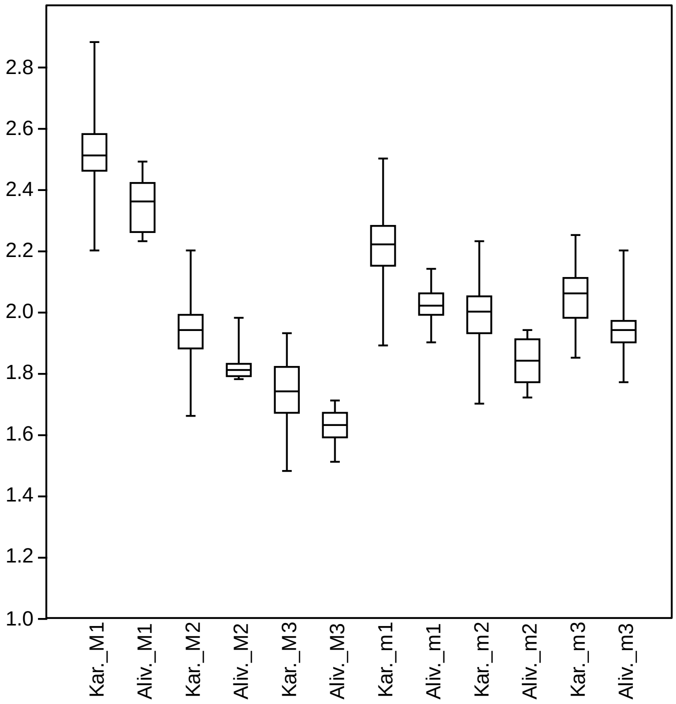


Figure 48. Box plot of the length of the upper teeth between *Cricetodon aliveriensis* from Aliveri (Hofmeijer and de Bruijn, 1988) and from Karydia (Kar. = Karydia, Aliv. = Aliveri)

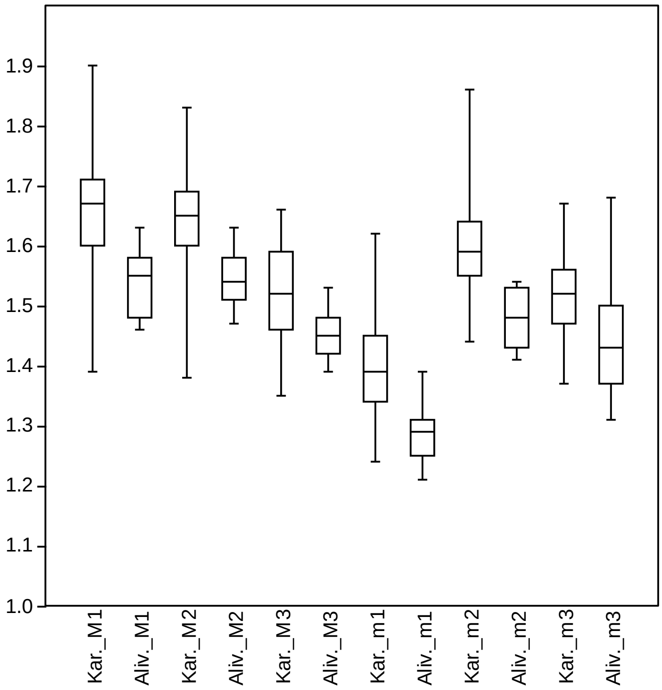


Figure 49. Box plot of the width of the upper teeth between *Cricetodon aliveriensis* from Aliveri (Hofmeijer and de Bruijn, 1988) and from Karydia (Kar. = Karydia, Aliv. = Aliveri)

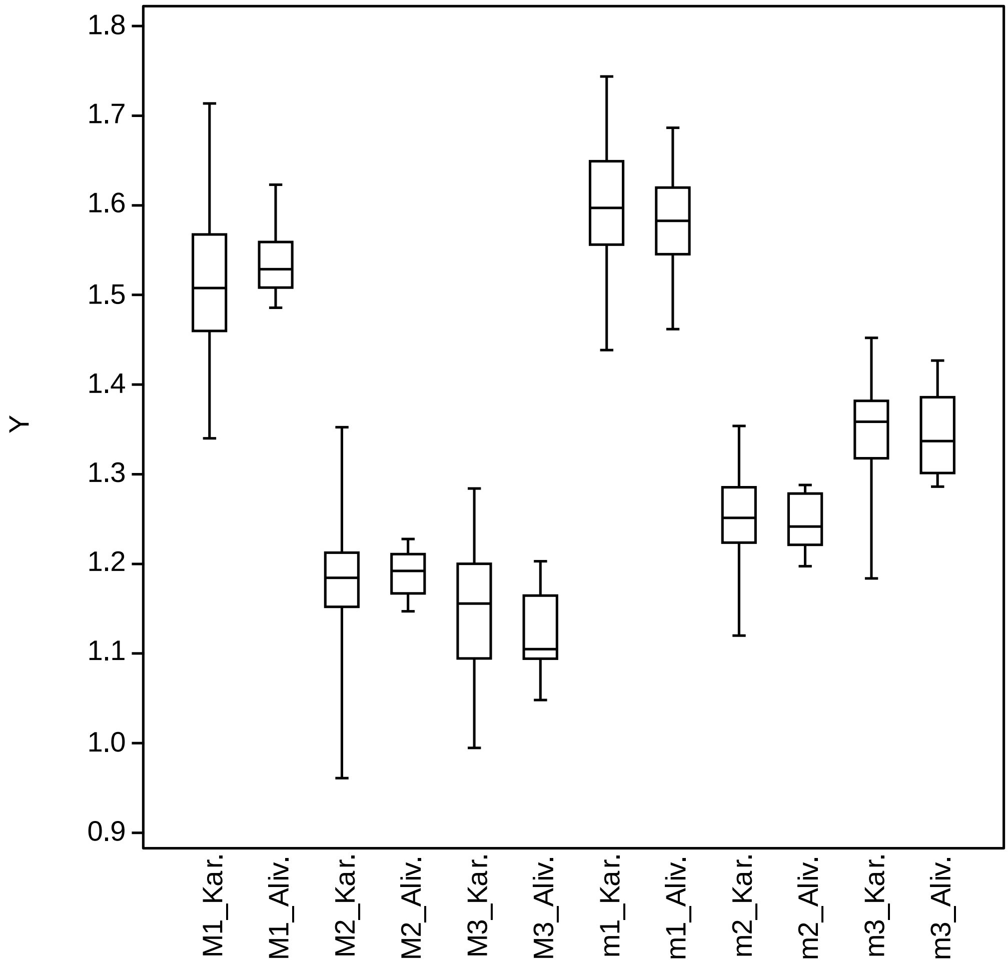


Figure 50. Box plot of the L/W of the teeth between *Cricetodon aliveriensis* from Aliveri (Hofmeijer and de Bruijn, 1988) and from Karydia (Kar. = Karydia, Aliv. = Aliveri)

Figure 50 presents the dimensional range of the ratio mean values (L/W) of both the upper and the lower teeth from the two Greek localities under study (Aliveri and Karydia). The range formed for each tooth is highly comparable for *C. aliveriensis* from Aliveri with the *Cricetodon* from Karydia. It is obvious that the rich material from Karydia presents larger range for each tooth, than the material of Aliveri. However, the ratio-values (L/W) of the *C. aliveriensis* from Aliveri are included in Karydia’s *Cricetodon* material range.

7. Discussion

The description of the molar morphology of Karydia's *Cricetodon* (Chapter 4) shows the great variation existing in Cricetodontini. The teeth morphology of the Miocene Cricetodontini has a mosaic character (Rummel, 1999). The cusp connection via ridges, the development of the metacone-metaconid and the different type of spurs vary. Primitive and derived characters can be found together, but in different proportions in different or same species of this time period. However, specific characters tend to change towards the Middle Miocene (Rummel, 1999; Theocharopoulos, 2000). The reduction of the enamel ridges and the size of the anteroconid, which also moves closer to the mesial cusps, the increase of the hypsodonty and the size of the teeth are some examples of such evolutionary trends (Rummel, 1999) (Chapter 2.6).

The plots of the localities Karydia 1, Karydia 2 and Karydia 3 (Chapter 6) include well developed point clusters overlapping each other (Figs 34-39). Moreover, the Welch's t-test indicates that the ratio mean values of the three *Cricetodon* samples are not significantly different. These results indicate that these three fossiliferous localities, include the same *Cricetodon* species. As a result, the *Cricetodon* material from the three localities of Karydia will be referred to as one.

In Chapters 6.1.2 and 6.3 the material from Karydia and *Cricetodon aliveriensis* from Aliveri have been compared with *C. kasapligili* from Yapinti, *C. versteegi* from Kinik, *C.* aff. *kasapligili* from Sabuncubeli, *C. versteegi* from Kilçak 3a, *C. kasapligili* from Keseköy and *C.* aff. *versteegi* from Kargi. There was not access to the raw material of these species and the usage of the rectangles was preferred by using the length's and width's maximum and minimum values from the literature (Vasileiadou and Koufos, 2005; Durgut and Ünay, 2016; de Bruijn *et al*., 1992; Theocharopoulos, 2000; de Bruijn *et al*., 2006; Kakali, 2013; de Bruijn *et al*. 1993). According to the plots of these chapters, *C. kasapligili* from Yapinti and Keseköy and *C.* aff. *kasapligili* from Sabuncubeli are near the range of *C. aliveriensis* of Aliveri and the *Cricetodon* material from Karydia. Their dimensions are similar but with *C. kasapligili* from Yapinti being somewhat larger. However, in all the plots none of them can approach the similarity degree of the two *Cricetodon* from Karydia and Aliveri. All three Anatolian species belong to the MN 3 (de Bruijn & Ünay, 1996; de Bruijn *et al*., 2006). According to de Bruijn and Ünay (1996) their morphological characters, when compared to the *Cricetodon* from

Aliveri and Karydia, suggest that they belong to different evolutionary stages (Cricetodontini type 2) with different characters (de Bruijn & Ünay, 1996). Some examples are the poorly separated anterocone in M1, the connection of the metaconid with the entoconid through the mesostylid, the absence of the posterior spur of the paracone (de Bruijn & Ünay, 1996). *Cricetodon* aff. *kasapligili* from Sabuncubeli is even more primitive than *C. kasapligili* from Keseköy and Yapinti and as a result more primitive than *C. aliveriensis* (MN 4) (de Bruijn *et al.*, 2006). All the other Anatolian cricetids display a significant smaller size compared to the *Cricetodon* material from Karydia and Aliveri (Chapter 6.1.2).

Furthermore, the core reason of this study was to compare the *Cricetodon* samples from Karydia to *C. aliveriensis* from Aliveri. The morphology of the molar teeth suggests that the two *Cricetodon* samples belong to the same species. The majority of the material's characters from Karydia are also present in Aliveri (Chapter 4). The lack of the ectoloph and the development of a double anterocone in M1 are some the mutual characters of the two cricetids (Chapter 4). Moreover, in most cases the dominant characters of Karydia's *Cricetodon* are also dominant in Aliveri's material with the allocation being the same or very close to each other (Figs 13-16, Fig. 19, Fig. 26, Fig. 28, Fig. 32). Besides the great morphological similarity of the two samples, *C. aliveriensis* in Aliveri appears to be more primitive than in Karydia. More specifically, the reduction or even disappearance of the ectomesolophid (Figs 28, 30), the reduction of the anterolophs (Fig. 17) and the increase of the teeth size in Karydia (Chapter 6) are some of the divergent characters of the specimens. Furthermore, the mosaic pattern of the Miocene Cricetodontini (Chapter 2.6) can be also identified with the increase of the mesolophids (Figs 29, 31, 33) in Karydia, which is contradictory to the general evolutionary trend.

Moreover, the length - width plots with their point-clusters also define the samples of Karydia as *C. aliveriensis* (Figs 40-45). The *Cricetodon* point-clusters from the locality of Karydia overlaps significantly those of Aliveri's *C. aliveriensis*. The one-way ANOVA and the Welch t-test showed no statistical difference in the mean values of the tooth ratios.

In addition, the divergence (percentage) of Karydia's material from Aliveri's *C. aliveriensis* (Chapter 6.3) is the smallest and the most uniform, compared to other species and genera from these two or other localities from Greece and Anatolia. The tooth ratios (Chapter 6.2) present minimal differences between the *Cricetodon* from Karydia and Aliveri. The box plots (Chapter 6.4) which visualize the median value and the length, the width and also their ratio (L/W) range from both localities also point to their great similarity. These plots also indicate that *Cricetodon* from Aliveri is in average dimensions slightly smaller than that from Karydia.

To sum up, the following questions have been assembled and tried to be explained. What is the species that the *Cricetodon* from Karydia belongs to? It has been defined as *Cricetodon aliveriensis*. The morphological similarities (Chapter 4) of the teeth and the statistical results (Chapter 6), which have been used to compare it with Aliveri's *C. aliveriensis*, has proved that they belong to the same species (Chapters 4 and 6).

Moreover, is *C. aliveriensis* from Karydia bigger than Aliveri? Even though the morphology of the molars and the statistical analysis of their dimensions (especially the scatters, the box plots) indicate that they belong to the same species they also suggest that *C. aliveriensis* from the locality of Karydia is probably bigger than Aliveri. In the diagrams above (Chapter 6), the material from Aliveri largely overlaps Karydia's but it is also concentrated on the lower parts of the clusters. However, the presence of a specific m3 specimen from Aliveri, which is comparable with the larger values of Karydia, probably indicates that larger *C. aliveriensis* were also present n Aliveri.

In Chapter 5 a m3 has been described but could not be taxonomically attributed to a species level. Does this third lower molar (m3) belong to a different species? Even though it has the dimensions (Chapter 12.2, pp. 112-113) and morphological characters similar to *C. aliveriensis*, it also has a character that all the other specimens from Karydia and Aliveri lack. There is an extra ridge that ends freely at the posterosinusid. It is the only specimen with this character. The other molars, from both localities, do not have even a fraction of that or even an underdeveloped similar character. This is the reason this molar is not included in the statistical analysis of this thesis. At this point, some possible reasons can be mentioned. First of all, there is a chance this molar being an extreme variation of the same species. Secondly, this tooth could be placed in a different species. Because of its other characters is it unlikely to belong to a genus other than *Cricetodon.*

Is the locality of Karydia similar to Aliveri? The flora and the sediments from the locality of Aliveri show a lacustrine environment (Chapter 2.4). Aliveri locality contains lignite deposits, about 3 km long and up to 60 m thick (Ioakim *et al*., 2005). Furthermore, in the locality of Karydia despite the fact that its lithostratigraphic data and its sedimentology record are poor or absent, all the elements of the fauna are associated with humid preferences (Doukas, 2003). As a result, all the data show a humid environment in both localities. Moreover, the pollen data of Aliveri, like *Pinus*, *Platycarya*, *Engelhardtia*, *Ulmus*, *Palmae*, *Cinnamomum*, *Myrica* and *Rhamnus* show a rich thermophilous open forest (Ioakim *et al*., 2005). This result agrees with the fauna of the locality. The “reign” of flying Sciuridae like *Aliveria brinkerinki*, *Aliveria luteijni*, *Miopetaurista dehmi and Blackia miocaenica*, indicate the presence of a forest. However, in the locality of Karydia the only Sciuridae are *Aliveria luteijni*, *Blackia miocaenica* and *Palaeosciurus* aff. *fissurae* (Doukas, 2003). From these three Sciuridae only the first two can fly. *Palaeosciurus* aff. *fissurae* is a ground sciurid. To summarize, in Aliveri lived four flying sciurids (*Aliveria brinkerinki*, *Aliveria luteijni*, Miopetaurista *dehmi and Blackia miocaenica*), one ground (*Palaeosciurus* aff. *fissurae*) and one sciurid that prefers both ways of life (*Tamias eviensis*). On the other hand, the locality of Karydia only has two flying sciurids (*Aliveria luteijni*, *Blackia miocaenica*) and one ground sciurid (*Palaeosciurus* aff. *fissurae*). The reduction of flying sciurids propably indicates a more open environment than that of Aliveri (Pijcke, 2014).

8. Conclusions

The main subject of this thesis was to record and describe the material of *Cricetodon aliveriensis* from the Greek locality of Karydia and to compare it with Aliveri's. The work above led to the identification of the species *C. aliveriensis* and *Cricetodon* sp. from Karydia. This thesis includes the first description of *C. aliveriensis* from the locality of Karydia. A variety of statistical methods has been used to verify its presence in this locality (Chapter 6). Furthermore, the morphological description and the statistical processing of Karydia's material also proved that *C. aliveriensis* from the locality of Aliveri is smaller than Karydia's. Moreover, *C. aliveriensis* from Karydia and Aliveri has been compared with the Anatolian species of *C. kasapligili* from Yapinti, *C. versteegi* from Kinik, *C.* aff. *kasapligili* from Sabuncubeli and *C.* aff. *versteegi* from Kargi. From these species, the dimensions of *C. kasapligili* from Yapinti and *C.* aff. *kasapligili* from Sabuncubeli are those more closely related to *C. aliveriensis*. However, all the species above are morphologically different from the *Cricetodon* of Karydia and Aliveri. To conclude, among the *Cricetodon* molars from Karydia, a morphologically distinct m3 has been identified. Even though it has the dimensions and morphological characters similar to *C. aliveriensis*, it also has an extra ridge that ends freely at the posterosinusid. Such a character has not been observed in any specimen from Karydia or Aliveri.

This thesis will help any future comparison with other species from Karydia or other localities so that the Early Miocene of Greece, especially in the study of micromammals, be described in more details. Karydia's *Cricetodon aliveriensis* will increase the paleontologists' database and will help to clear out the paleontological gap between Greece and Europe with Anatolia during the Early Miocene and to comprehend the migration events that took place between these geographical areas. The micromammal research of the Early Miocene of Greece will be continued with the search of more fossiliferous localities and their correlation with other Anatolian and European localities.

9. Περίληψη

Η συγκεκριμένη μεταπτυχιακή εργασία πραγματοποιήθηκε στα πλαίσια του Μεταπτυχιακού Προγράμματος Σπουδών με τίτλο "Περιβάλλοντα Ιζηματογένεσης, Οικοσυστήματα και Γεωβιοπόροι" του Τομέα Ιστορικής Γεωλογίας και Παλαιοντολογίας του Τμήματος Γεωλογίας και Γεωπεριβάλλοντος του Εθνικού και Καποδιστριακού Πανεπιστημίου Αθηνών. Μέρος της εργασίας πραγματοποιήθηκε στον Πανεπιστήμιο της Ουτρέχτης στην Ολλανδία μέσω του προγράμματος Erasmus+.

Στόχοι της συγκεκριμένης μεταπτυχιακής εργασίας είναι η καταγραφή και περιγραφή του υλικού του γένους *Cricetodon* από την απολιθωματοφόρα θέση της Καρυδιάς, στην Βόρεια Ελλάδα. Η συγκεκριμένη θέση που βρίσκεται λίγο έξω από την Κομοτηνή περιλαμβάνει απολιθώματα μικροθηλαστικών από το Κατώτερο Μειόκαινο, περίπου 17 εκ. χρόνια από σήμερα (MN 4). Επιπρόσθετα, πραγματοποιείται σύγκριση του μελετώμενου είδους με το *C. aliveriensis* από την περιοχή του Αλιβερίου στο νησί της Εύβοιας. Η θέση είναι σχεδόν ισόχρονη και χρονολογείται και αυτή στο Κατώτερο Μειόκαινο (MN 4). Στις μέρες μας η θέση του Αλιβερίου δεν διατηρείται λόγω αποκατάστασης του ορυχείου που λειτουργούσε στην περιοχή. Η μελέτη του υλικού της Καρυδιάς έγινε μορφολογικά και στατιστικά και οδήγησε στην αναγνώριση των ειδών *C. aliveriensis και Cricetodon* sp.

Η μορφολογική περιγραφή και η στατιστική ανάλυση στην παρούσα μεταπτυχιακή εργασία απέδειξαν πως το υλικό του *Cricetodon* από τις απολιθωματοφόρες θέσεις Καρυδιά 1, Καρυδιά 2 και Καρυδιά 3 ανήκει στο ίδιο είδος, το είδος *C. aliveriensis*. Μορφολογικά, το υλικό της Καρυδιάς εμφανίζει όλους ή σχεδόν όλους τους χαρακτήρες του αντίστοιχου είδους από το Αλιβέρι. Εντούτοις, αποδείχθηκε ότι αν και ανήκουν στο ίδιο είδος, το *C. aliveriensis* της Καρυδιάς φαίνεται να είναι μεγαλύτερο σε διαστάσεις καθώς και πιο "εξελιγμένο" μορφολογικά από αυτό του Αλιβερίου. Επιπροσθέτως, οι στατιστικές μέθοδοι επιβεβαίωσαν το παραπάνω συμπέρασμα και σε συνδυασμό με τη μορφολογία των δοντιών κατέστη δυνατή η διαφοροποίηση του *Cricetodon* της Καρυδιάς από άλλα, παρόμοιας ηλικίας Cricetidae από την Τουρκία, όπως το *C. kasapligili* από το Yapinti και το Keseköy, το *C. versteegi* από το Kinik και το Kilçak, το *C.* aff. *kasapligili* από το Sabuncubeli, το *C.* aff. *versteegi* από το Kargi αλλά και από το Αλιβέρι. Επιπλέον, ένας κάτω γομφίος (m3) ξεχώρισε μορφολογικά από το υλικό της Καρυδιάς. Παρά τον μεγάλο αριθμό δειγμάτων, το συγκεκριμένο δείγμα αποτελεί το μοναδικό δόντι με μία επιπλέον "ράχη" που καταλήγει ελεύθερη στο οπισθοκολπίδιο. Πρόκειται για ένα χαρακτήρα μοναδικό που δεν παρατηρήθηκε σε κανένα δείγμα του *C. aliveriensis*, ούτε από το Αλιβέρι ούτε από την Καρυδιά. Παρόλα αυτά, το συγκεκριμένο δόντι έχει όλα τα μορφολογικά χαρακτηριστικά και τις διαστάσεις που συναντώνται στο *C. aliveriensis*. Κρίνεται απαραίτητη, λοιπόν, η αναζήτηση και άλλων παρόμοιων δειγμάτων με το ίδιο ή παρόμοιο χαρακτήρα.

Συνοψίζοντας, η παρούσα μεταπτυχιακή εργασία περιλαμβάνει την πρώτη περιγραφή του είδους *C. aliveriensis* από την απολιθωματοφόρο θέση της Καρυδιάς στην Βόρεια Ελλάδα. Έως τώρα το συγκεκριμένο τρωκτικό, από την περιοχή της Καρυδιάς, αναφερόταν απλά ως *C. aliveriensis* (Doukas, 2003) αλλά δεν είχε μελετηθεί λεπτομερώς. Τώρα, μέσω αυτής της εργασίας επιβεβαιώνεται το είδος του συγκεκριμένου τρωκτικού της περιοχής καθώς και η εμφάνιση ενός επιπλέον πιθανού είδους, του *Cricetodon* sp. Η παρούσα εργασία θα βοηθήσει στη μελέτη του Κατώτερου Μειόκαινου στην Ελλάδα και γενικότερα στην ευρύτερη περιοχή της Μεσογείου, στην διεύρυνση των γνώσεων επάνω στις βιοζώνες του Μειόκαινου (MN zones) καθώς και των μεταναστεύσεων που πραγματοποιήθηκαν την ίδια περίοδο στο χώρο της Μεσογείου ανάμεσα σε Ευρώπη και Ανατολία.

10. References

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11. Plates

Plate 1

1-7: First upper right molars (M1), *Cricetodon aliveriensis* from the locality of Karydia.

Fig. 1: Sp. KR2, 1086

Fig. 2: Sp. KR2, 1090

Fig. 3: Sp. KR2, 1071

Fig. 4: Sp. KR2, 1091

Fig. 5: Sp. KR2, 1074

Fig. 6: Sp. KR2, 1082

Fig. 7: Sp. KR1, 1311

Plate 1

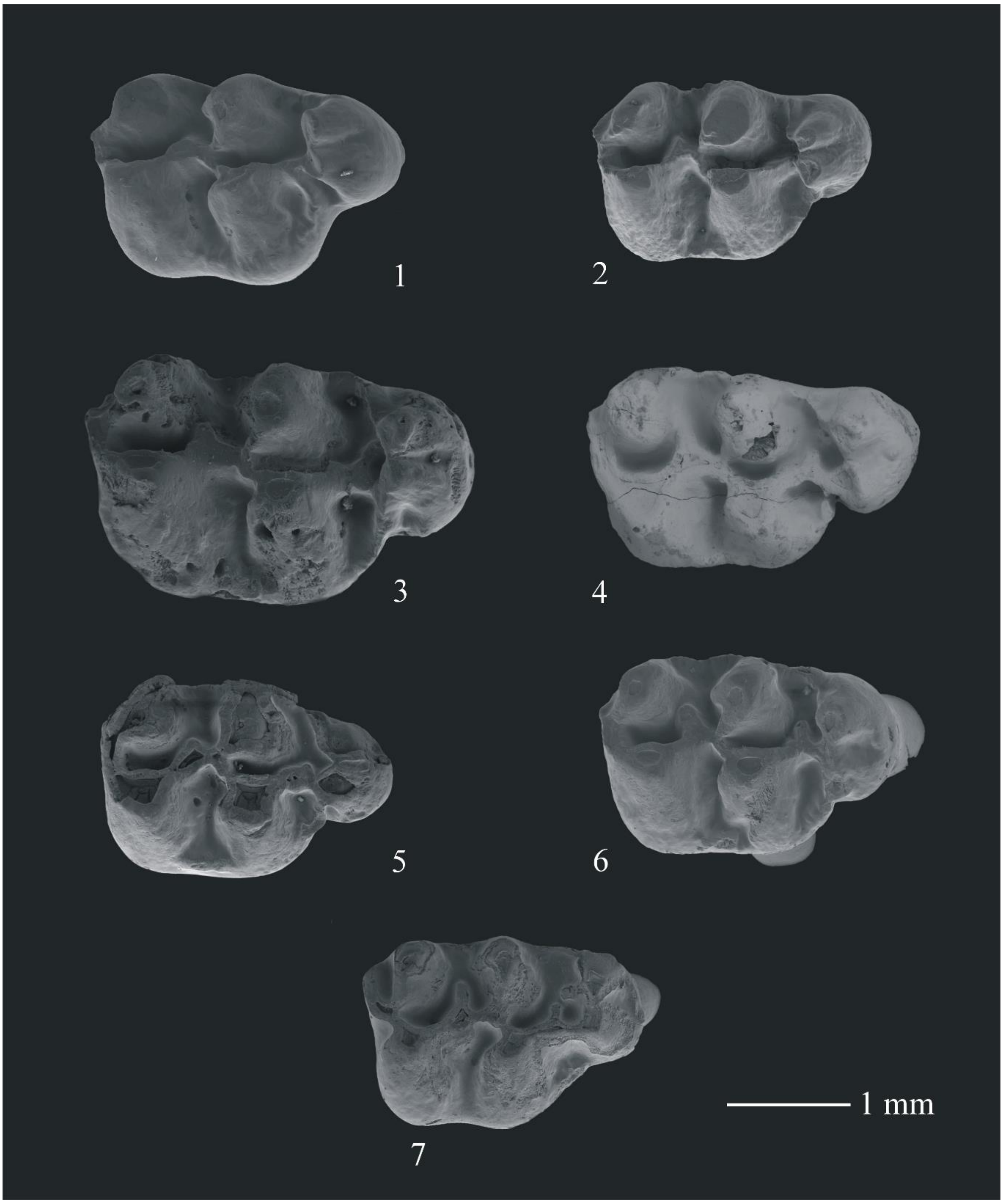


Plate 2

1-4: Second upper right molars (M2), *Cricetodon aliveriensis* from the locality of Karydia.

Fig. 1: Sp. KR 2, 1381

Fig. 2: Sp. KR 1, 1363

Fig. 3: Sp. KR 1, 1381

Fig. 4: Sp. KR 1, 1377

Plate 2

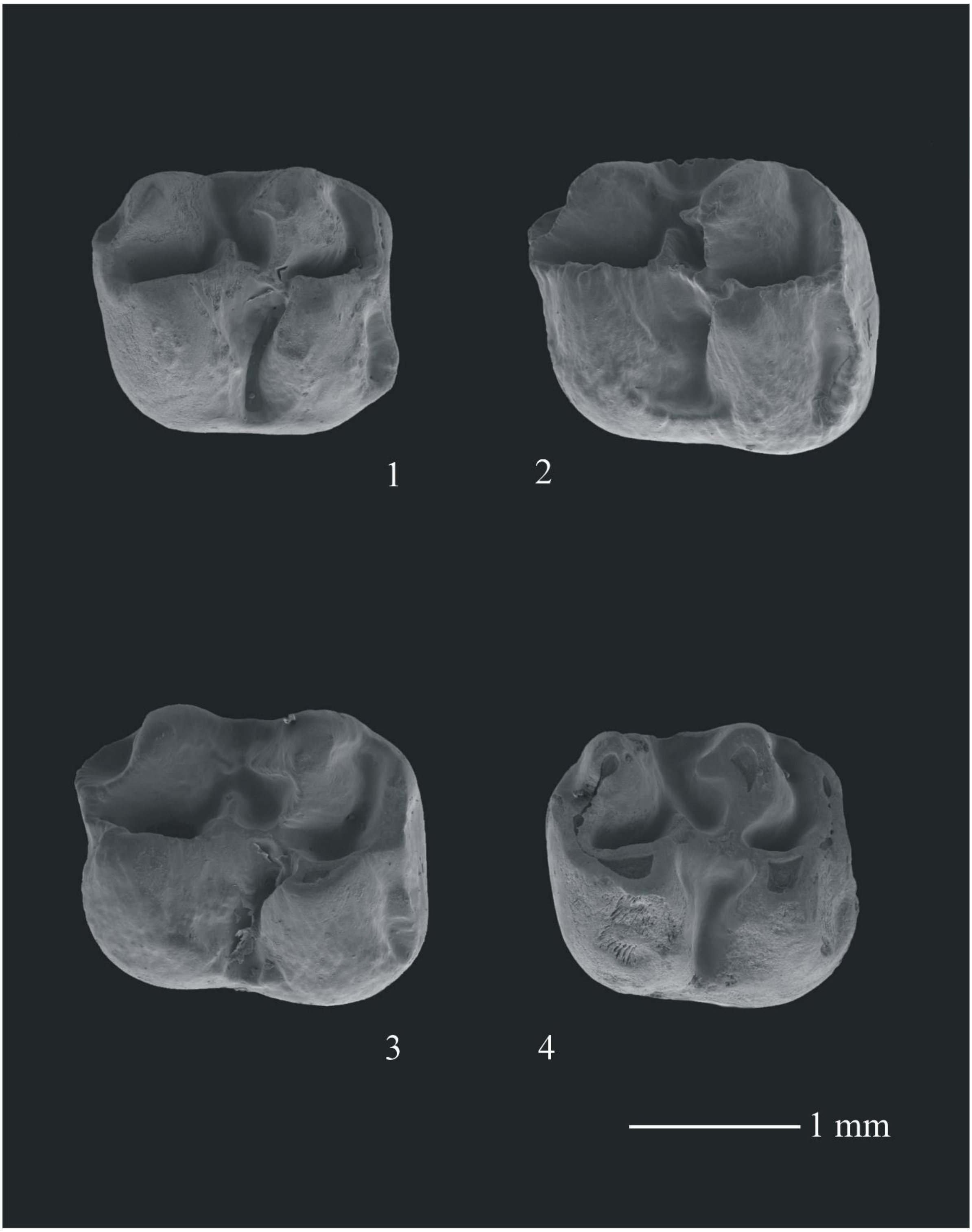


Plate 3

1-2: Second upper right molars (M2), *Cricetodon aliveriensis* from the locality of Karydia

Fig. 1: Sp. KR 1, 1382

Fig. 2: Sp. KR 1, 1183

Plate 3

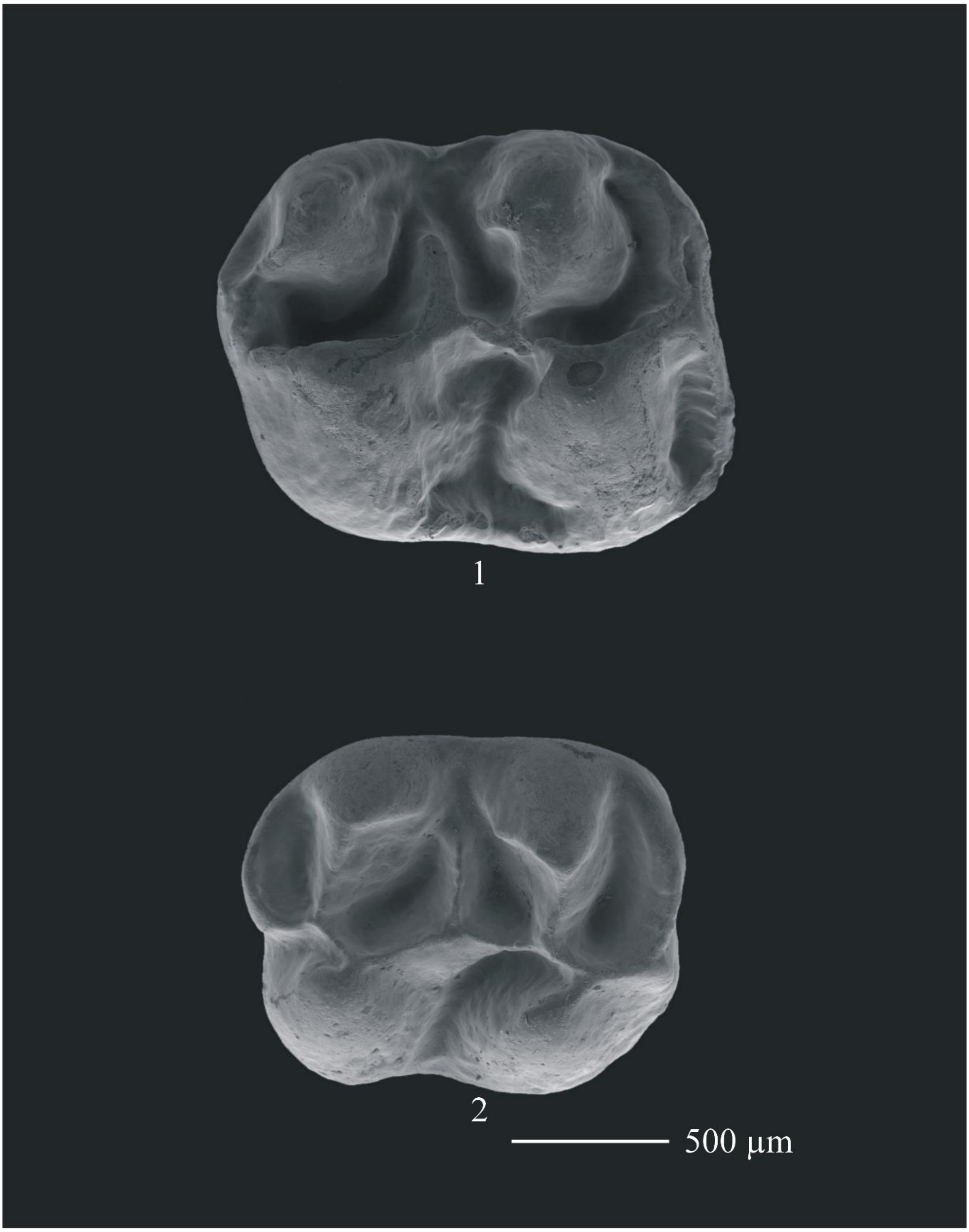


Plate 4

1-3: Third upper right molars (M3), *Cricetodon aliveriensis* from the locality of Karydia.

Fig. 1: Sp. KR 2, 1058

Fig. 2: Sp. KR 1, 1409

Fig. 3: Sp. KR 1, 1408

Plate 4

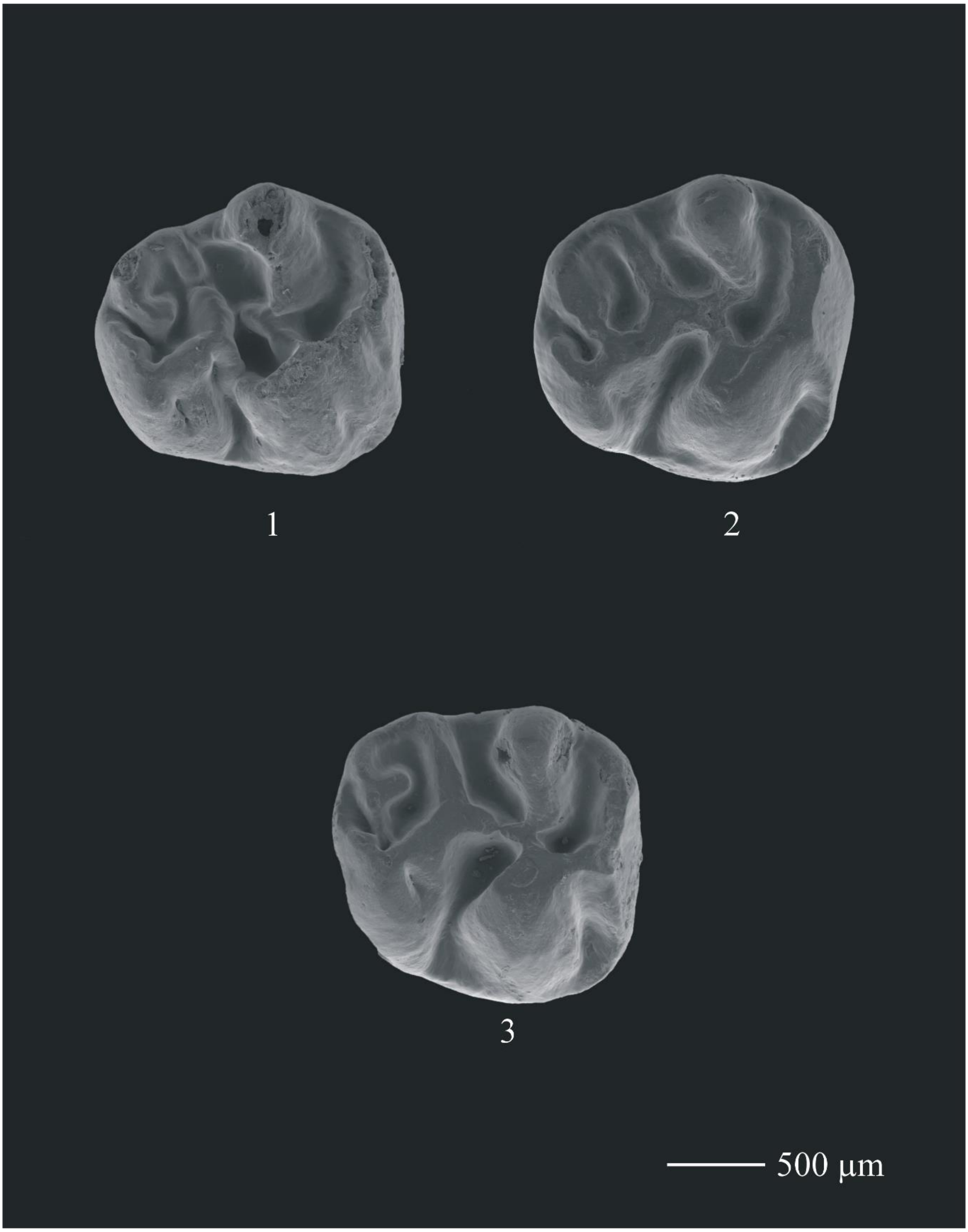


Plate 5

1-3: Third upper right molars (M3), *Cricetodon aliveriensis* from the locality of Karydia.

Fig. 1: Sp. KR 1, 1407

Fig. 2: Sp. KR 1, 1404

Fig. 3: Sp. KR 2, 1056

Plate 5

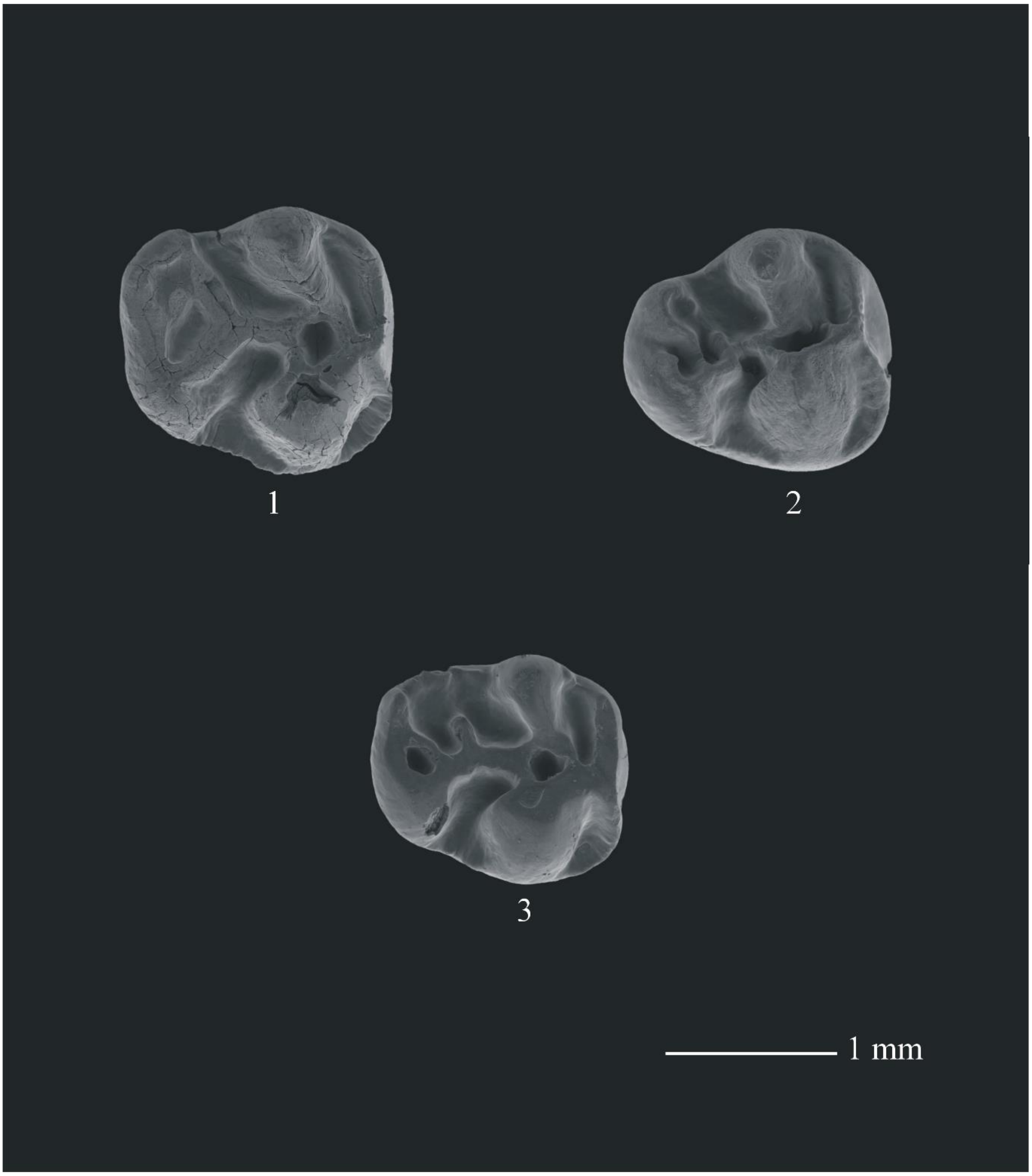


Plate 6

1-7: First lower right molars (m1), *Cricetodon aliveriensis* from the locality of Karydia.

Fig. 1: Sp. KR 1, 1105

Fig. 2: Sp. KR 1, 1118

Fig. 3: Sp. KR 1, 1106

Fig. 4: Sp. KR 1, 1108

Fig. 5: Sp. KR 1, 1185

Fig. 6: Sp. KR 1, 1116

Fig. 7: Sp. KR 1, 1103

Plate 6

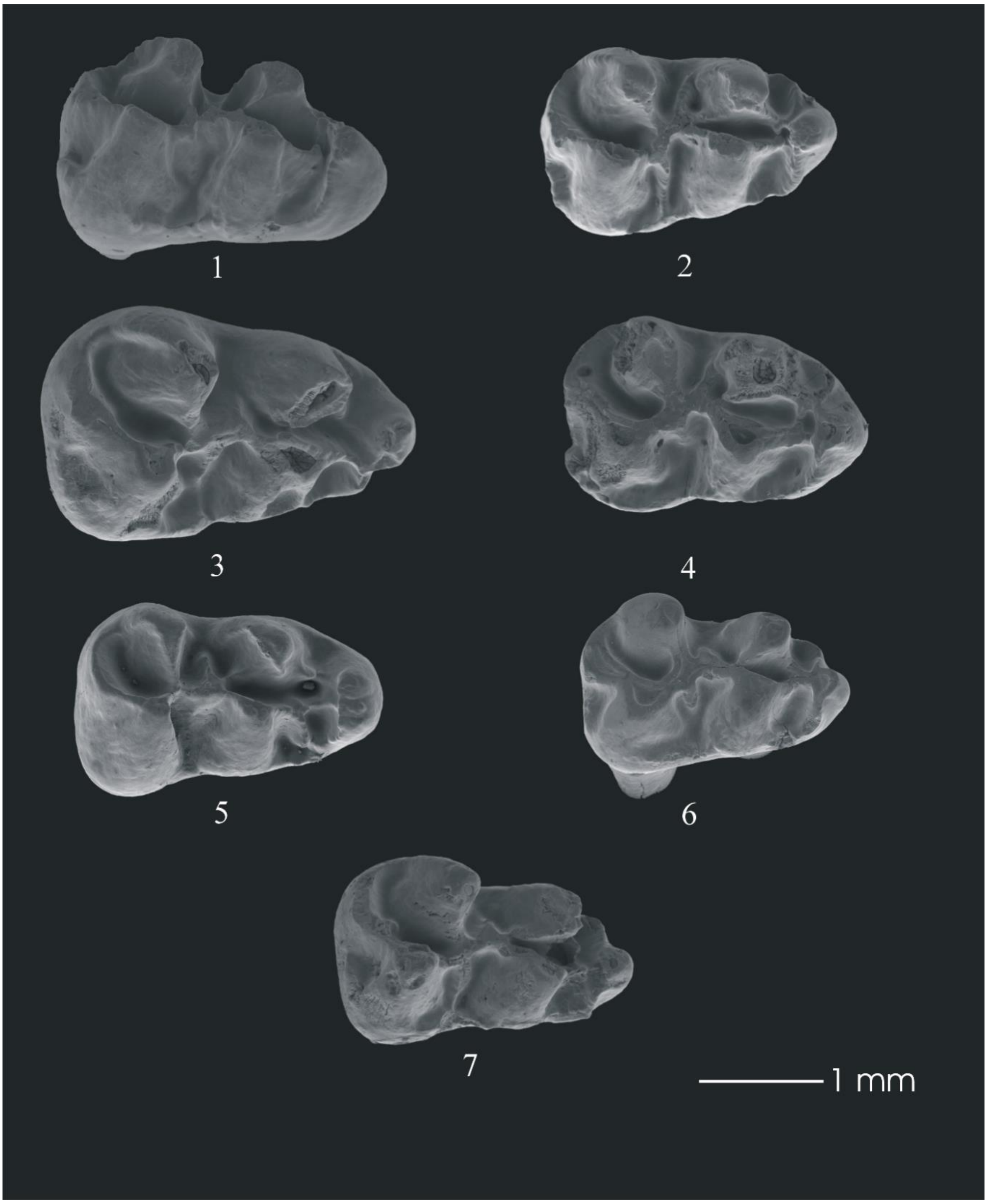


Plate 7

1-6: Second lower right molars (m2), *Cricetodon aliveriensis* from the locality of Karydia.

Fig. 1: Sp. KR 1, 1201

Fig. 2: Sp. KR 1, 1206

Fig. 3: Sp. KR 1, 1218

Fig. 4: Sp. KR 1, 1214

Fig. 5: Sp. KR 1, 1209

Fig. 6: Sp. KR 1, 1215

Plate 7

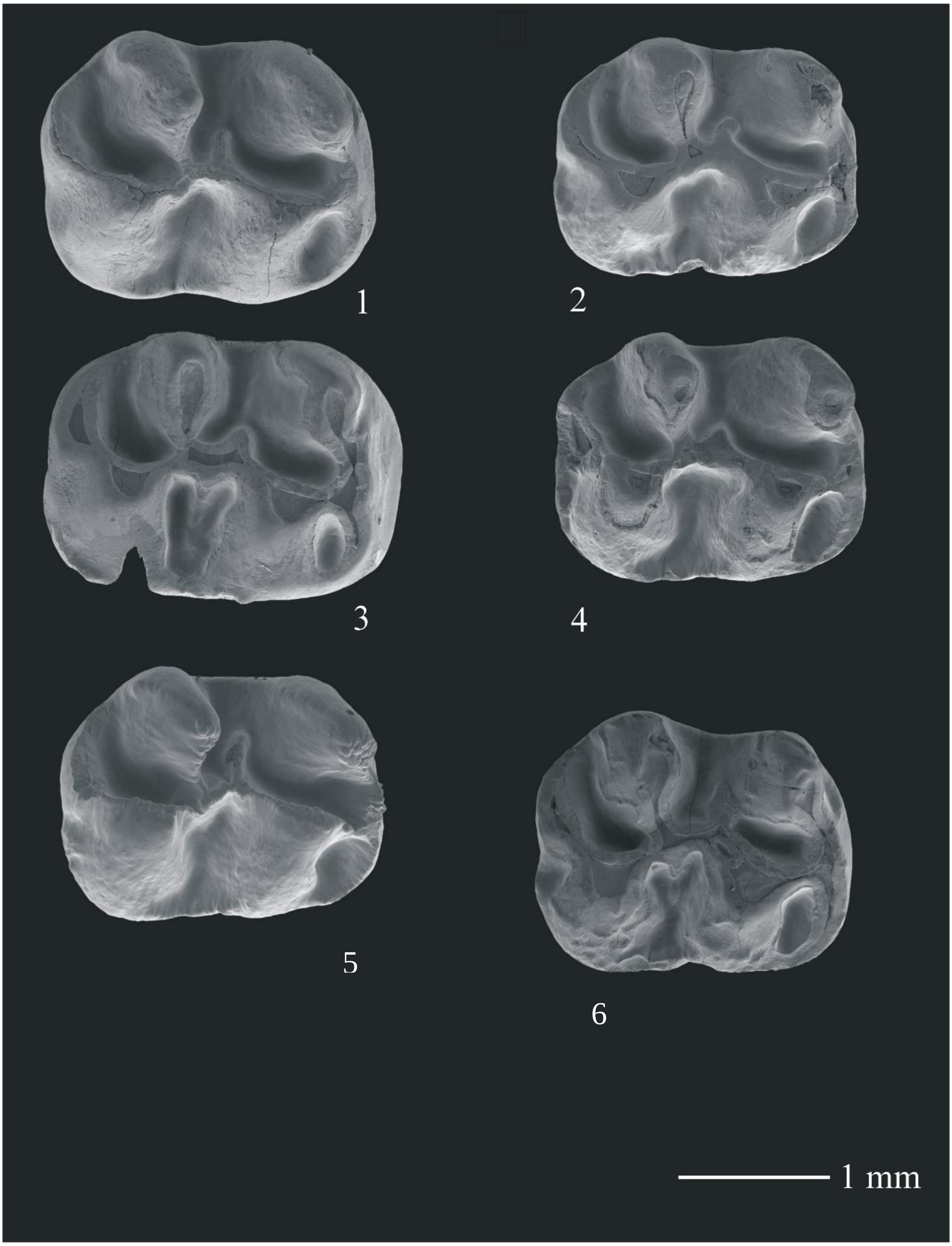


Plate 8

1-2, 4-6: Third lower right molars (m3), *Cricetodon aliveriensis* from the locality of Karydia.

3: Third lower right molar (m3), *Cricetodon sp*. from the locality of Karydia.

Fig. 1: Sp. KR 1, 1018

Fig. 2: Sp. KR 1, 1020

Fig. 3: Sp. KR 1, 1001

Fig. 4: Sp. KR 1, 1004

Fig. 5: Sp. KR 1, 1006

Fig. 6: Sp. KR 1, 1012

Plate 8

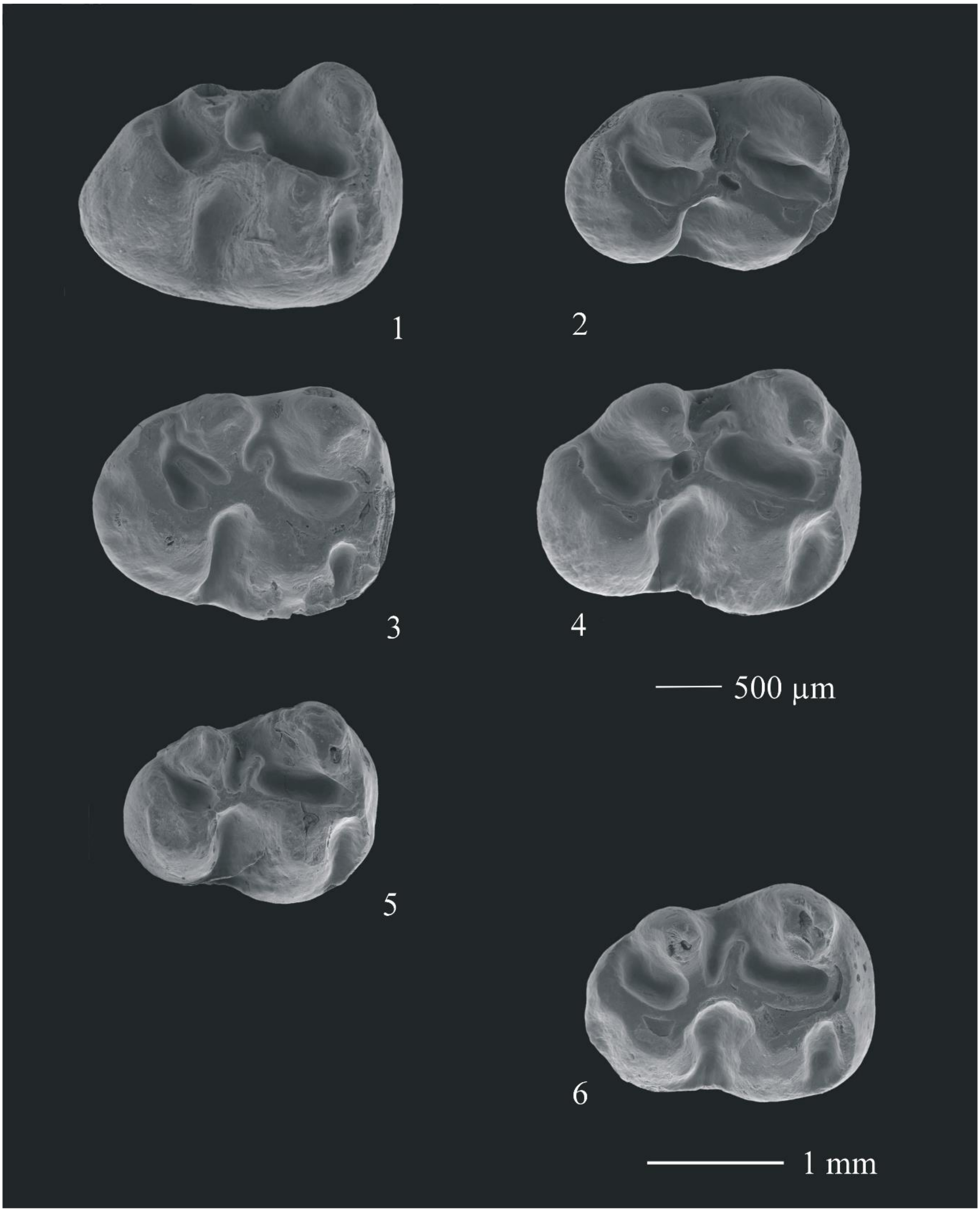


PLATE 9

Cricetodon aliveriensis from the locality of Aliveri (south quarry) (Hofmeijer and de Bruijn, 1988) (the picture has been mirrored).

Figs 1-3 left M1

Figs 4-6 left M2

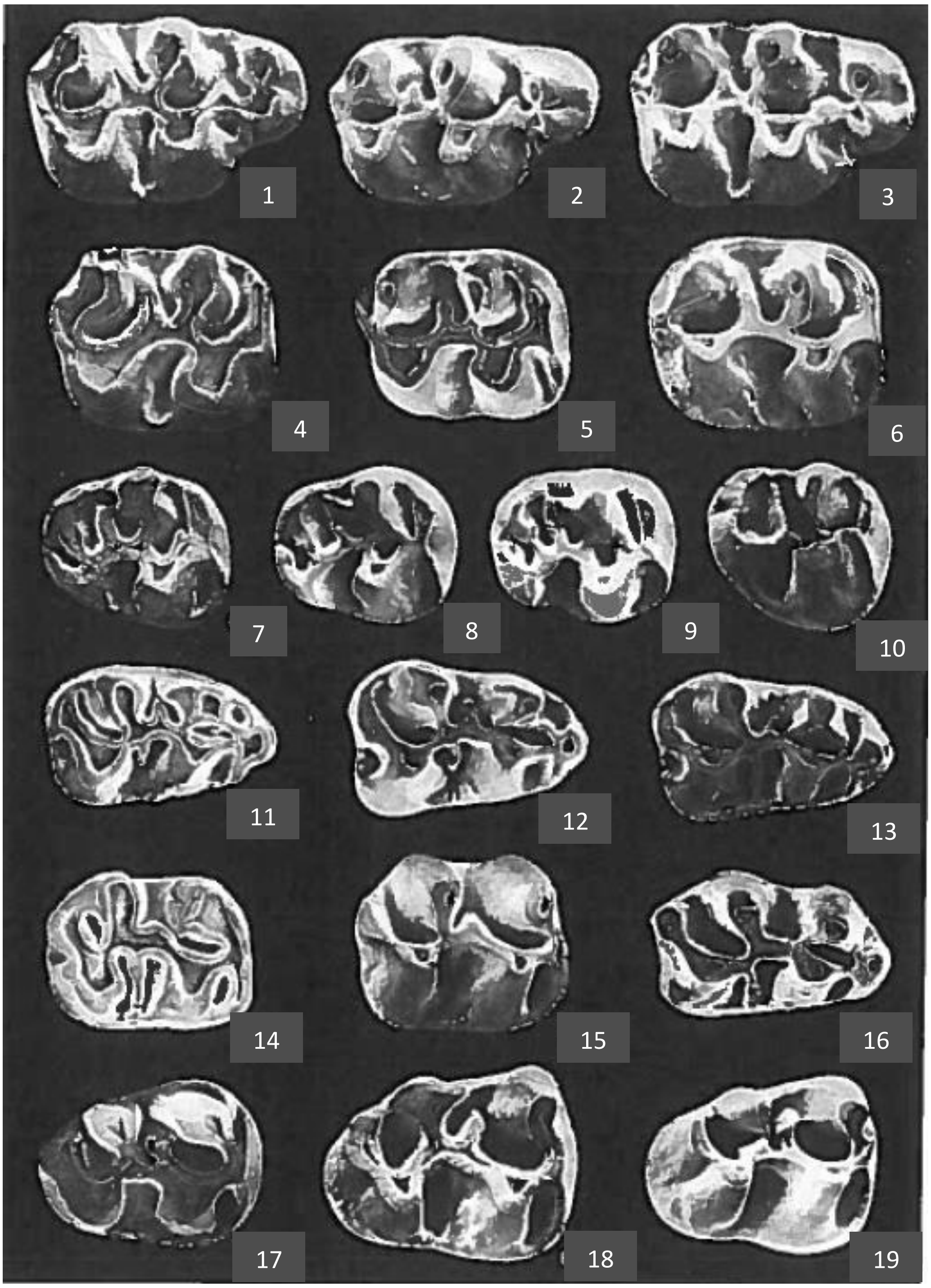
Figs 7-10 left M3

Figs 11-13 left m1

Figs 14-16 left m2

Figs 17-19 left m3

PLATE 9



12. *Cricetodon aliveriensis* material

Karydia 1

Sp. 1001 to 1050: m3
Sp. 1051 to 1100: M3
Sp. 1101 to 1190: m1
Sp. 1191 to 1270: m2
Sp. 1271 to 1290: m3
Sp. 1291 to 1340: M1
Sp. 1341 to 1390: M2
Sp. 1391 to 1430: M3

Karydia 2

Sp. 1071 to 1140: M1
Sp. 1141 to 1220: M2
Sp. 1221 to 1240: M3
Sp. 1241 to 1260: m1
Sp. 1261 to 1280: m2
Sp. 1281 to 1290: m3

Karydia 3

Sp. 502: m2
Sp. 512: m2
Sp. 518: m2
Sp. 521: m3
Sp. 528: m3
Sp. 535 to 538: M1
Sp. 541 to 542: M2
Sp. 551: M3

Aliveri

Sp. 541 to 547: M1
Sp. 551 to 556: M1
Sp. 561 to 568: M2
Sp. 571 to 575: M2
Sp. 581 to 587: M3
Sp. 591 to 598: M3
Sp. 601 to 620: m1
Sp. 661: m1
Sp. 621 to 623: m2
Sp. 631 to 636: m2
Sp. 641 to 655: m3
Sp. 660: m3

Appendix 1

C. aliveriensis from the locality of Karydia raw data

M1	*Cricetodon aliveriensis* (Karydia)		
Loc.	Specimen	Length	Width
KR1	1291	2.43	1.63
KR1	1292	2.72	1.73
KR1	1293	2.41	1.6
KR1	1294	2.57	1.74
KR1	1295	2.53	1.59
KR1	1297	2.54	1.63
KR1	1298	2.5	1.57
KR1	1299	2.46	1.59
KR1	1300	2.61	1.73
KR1	1301	2.36	1.67
KR1	1303	2.46	1.57
KR1	1304	2.4	1.6
KR1	1308	2.53	1.6
KR1	1309	2.51	1.69
KR1	1310	2.53	1.73
KR1	1311	2.2	1.56
KR1	1321	2.32	1.67
KR1	1322	2.5	1.69
KR1	1323	2.55	1.78
KR1	1326	2.46	1.71
KR1	1328	2.25	1.52
KR1	1335	2.65	1.85
KR1	1336	2.59	1.65
KR1	1337	2.54	1.73
KR1	421	2.58	1.7
KR1	422	2.56	1.67
KR1	423	2.76	1.85
KR1	424	2.61	1.67
KR1	425	2.57	1.58
KR1	431	2.39	1.7
KR1	432	2.46	1.71
KR1	433	2.43	1.72
KR1	435	2.31	1.43
KR2	1071	2.46	1.6
KR2	1074	2.25	1.6
KR2	1075	2.61	1.7
KR2	1076	2.53	1.79
KR2	1077	2.59	1.72
KR2	1078	2.78	1.7
KR2	1080	2.51	1.69
KR2	1081	2.4	1.66
KR2	1082	2.62	1.61
KR2	1084	2.48	1.52
KR2	1085	2.68	1.73
KR2	1086	2.6	1.71
KR2	1087	2.6	1.72
KR2	1088	2.88	1.9
KR2	1090	2.47	1.57
KR2	1091	2.67	1.71
KR2	1092	2.47	1.64
KR2	1093	2.61	1.58
KR2	1094	2.32	1.58
KR2	1095	2.54	1.66
KR2	1101	2.38	1.39
KR2	1102	2.47	1.59
KR2	1103	2.46	1.57
KR2	1104	2.47	1.68
KR2	1105	2.48	1.53
KR2	1106	2.53	1.89
KR2	1107	2.36	1.64
KR2	1108	2.45	1.68
KR2	1109	2.5	1.75
KR2	1110	2.51	1.68
KR2	1111	2.53	1.66
KR2	1112	2.55	1.6
KR2	1114	2.49	1.59
KR2	1115	2.63	1.77
KR2	1117	2.43	1.69
KR2	1118	2.41	1.67
KR2	1119	2.52	1.74
KR2	1120	2.53	1.68
KR2	1121	2.46	1.72
KR2	1122	2.46	1.62
KR2	1123	2.54	1.62
KR2	1124	2.55	1.65
KR2	1125	2.51	1.69
KR2	1126	2.41	1.6
KR2	1127	2.6	1.58
KR2	1128	2.5	1.69

Appendix Table 1. M1 measurements of *Cricetodon aliveriensis* from Karydia locality

M2	*Cricetodon aliveriensis* (Karydia)		
Loc.	Specimen	Length	Width
KR1	1341	1.98	1.65
KR1	1342	1.88	1.68
KR1	1343	1.83	1.62
KR1	1344	1.9	1.71
KR1	1345	1.89	1.68
KR1	1346	1.79	1.71
KR1	1347	1.85	1.56
KR1	1348	1.98	1.8
KR1	1349	1.84	1.66
KR1	1350	1.77	1.49
KR1	1351	1.99	1.59
KR1	1352	1.87	1.58
KR1	1353	1.91	1.66
KR1	1354	1.94	1.66
KR1	1355	2.13	1.83
KR1	1356	2.13	1.79
KR1	1357	2.05	1.69
KR1	1358	1.93	1.64
KR1	1359	2.05	1.56
KR1	1361	2.05	1.53
KR1	1362	2.02	1.73
KR1	1363	1.94	1.65
KR1	1364	1.95	1.66
KR1	1365	1.95	1.71
KR1	1366	1.88	1.62
KR1	1367	1.99	1.61
KR1	1368	1.87	1.61
KR1	1369	1.81	1.53
KR1	1370	2.02	1.77
KR1	1371	1.66	1.73
KR1	1372	2.01	1.67
KR1	1373	1.76	1.7
KR1	1374	1.85	1.38
KR1	1375	1.91	1.53
KR1	1376	2	1.59
KR1	1377	1.97	1.5
KR1	1379	1.9	1.6
KR1	1380	1.95	1.77
KR1	1381	1.94	1.75
KR1	1382	1.71	1.58
KR1	1383	2.07	1.77
KR1	1384	1.89	1.76
KR1	1385	1.83	1.58
KR1	1386	1.96	1.6
KR1	441	1.97	1.63
KR1	442	2.01	1.66
KR1	443	1.94	1.74
KR1	444	1.87	1.69
KR1	451	1.98	1.67
KR1	453	2	1.61
KR1	454	2.05	1.64
KR2	1141	2.04	1.67
KR2	1142	2.01	1.71
KR2	1143	1.87	1.63
KR2	1144	1.94	1.63
KR2	1145	1.95	1.69
KR2	1146	1.94	1.67
KR2	1147	1.98	1.61
KR2	1148	1.99	1.72
KR2	1149	1.9	1.55
KR2	1150	1.94	1.69
KR2	1151	2	1.61
KR2	1152	1.98	1.61
KR2	1153	1.9	1.61
KR2	1154	1.91	1.61
KR2	1155	1.98	1.7
KR2	1156	1.83	1.64
KR2	1157	1.94	1.68
KR2	1158	1.92	1.62
KR2	1159	2.04	1.7
KR2	1160	1.93	1.8
KR2	1161	2.06	1.71
KR2	1162	1.96	1.62
KR2	1163	2.13	1.73
KR2	1164	1.92	1.65
KR2	1165	1.95	1.61
KR2	1166	1.97	1.64
KR2	1167	1.87	1.59
KR2	1168	1.93	1.73
KR2	1169	2.06	1.75
KR2	1170	1.88	1.67
KR2	1171	2.12	1.69
KR2	1172	1.95	1.69
KR2	1181	2.07	1.62
KR2	1182	1.96	1.61
KR2	1183	2.02	1.65
KR2	1184	2.04	1.51
KR2	1185	1.94	1.61
KR2	1186	2.03	1.65
KR2	1187	1.88	1.61
KR2	1188	1.91	1.69
KR2	1189	1.88	1.52
KR2	1190	1.81	1.59
KR2	1191	1.79	1.48
KR2	1192	1.93	1.6
KR2	1193	1.96	1.65
KR2	1194	1.99	1.58
KR2	1195	1.85	1.61
KR2	1196	1.99	1.65
KR2	1197	1.91	1.58
KR2	1198	1.88	1.52
KR2	1199	1.91	1.63
KR2	1200	1.98	1.68
KR2	1201	1.96	1.63
KR2	1202	1.95	1.74
KR2	1203	1.96	1.59
KR2	1204	1.89	1.58
KR2	1205	1.85	1.54
KR2	1206	1.95	1.65
KR2	1207	2.03	1.65
KR2	1208	1.93	1.65
KR2	1209	2.2	1.83
KR2	1210	1.87	1.57
KR2	1211	1.92	1.64
KR2	1212	1.72	1.65
KR2	1213	2.15	1.82
KR2	1214	1.94	1.7
KR2	1221	1.83	1.55

Appendix Table 2. M2 measurements of *Cricetodon aliveriensis* from Karydia locality

M3	*Cricetodon aliveriensis* (Karydia)		
Loc.	Specimen	Length	Width
KR1	1051	1.67	1.42
KR1	1052	1.87	1.555
KR1	1053	1.535	1.54
KR1	1054	1.695	1.53
KR1	1055	1.72	1.56
KR1	1056	1.57	1.35
KR1	1057	1.72	1.51
KR1	1058	1.63	1.5
KR1	1059	1.89	1.61
KR1	1060	1.83	1.635
KR1	1061	1.91	1.51
KR1	1071	1.87	1.49
KR1	1072	1.74	1.62
KR1	1073	1.67	1.53
KR1	1074	1.64	1.46
KR1	1075	1.635	1.47
KR1	1076	1.84	1.525
KR1	1077	1.48	1.49
KR1	1078	1.685	1.66
KR1	1079	1.81	1.54
KR1	1080	1.82	1.51
KR1	1081	1.8	1.45
KR1	1082	1.64	1.52
KR1	1085	1.79	1.445
KR1	1086	1.81	1.51
KR1	1087	1.68	1.42
KR1	1088	1.86	1.45
KR1	1089	1.71	1.47
KR1	1090	1.82	1.57
KR1	1091	1.84	1.52
KR1	461	1.75	1.51
KR1	462	1.61	1.56
KR1	463	1.69	1.63
KR1	468	1.64	1.47
KR1	1391	1.75	1.46
KR1	1392	1.68	1.42
KR1	1393	1.86	1.61
KR1	1394	1.59	1.51
KR1	1395	1.75	1.57
KR1	1396	1.7	1.51
KR1	1397	1.76	1.43
KR1	1398	1.77	1.44
KR1	1399	1.62	1.47
KR1	1401	1.78	1.57
KR1	1403	1.57	1.44
KR1	1404	1.59	1.41
KR1	1405	1.69	1.63
KR1	1406	1.83	1.64
KR1	1407	1.76	1.61
KR1	1408	1.6	1.48
KR1	1409	1.7	1.53
KR1	1411	1.49	1.4
KR1	1413	1.92	1.6
KR1	1416	1.73	1.39
KR1	1417	1.72	1.49
KR1	1418	1.93	1.59
KR1	1419	1.86	1.62
KR1	1420	1.76	1.52
KR1	1421	1.91	1.65
KR1	1422	1.71	1.58
KR2	1232	1.87	1.59
KR3	551	1.7	1.46
KR3	552	1.79	1.46
KR1	1417	1.72	1.49
KR1	1418	1.93	1.59
KR1	1419	1.86	1.62
KR1	1420	1.76	1.52
KR1	1421	1.91	1.65
KR1	1422	1.71	1.58
KR2	1232	1.87	1.59
KR3	551	1.7	1.46
KR3	552	1.79	1.46

Appendix Table 3. M3 measurements of *Cricetodon aliveriensis* from Karydia locality

m1	*Cricetodon aliveriensis* (Karydia)		
Loc.	Specimen	Length	Width
KR1	1101	2.3	1.45
KR1	1102	2.31	1.41
KR1	1103	2.15	1.37
KR1	1104	2.16	1.34
KR1	1105	2.25	1.4
KR1	1106	2.29	1.34
KR1	1107	2.3	1.47
KR1	1108	2.32	1.47
KR1	1109	2.34	1.39
KR1	1110	2.23	1.49
KR1	1112	2.1	1.35
KR1	1113	2.17	1.25
KR1	1114	2.28	1.35
KR1	1115	2.13	1.36
KR1	1116	2.5	1.55
KR1	1117	2.21	1.38
KR1	1118	2.26	1.47
KR1	1119	2.22	1.39
KR1	1120	2.24	1.54
KR1	1121	2.33	1.56
KR1	1122	2.24	1.4
KR1	1123	2.24	1.45
KR1	1124	2.19	1.35
KR1	1125	2.04	1.3
KR1	1126	2.29	1.48
KR1	1127	2.07	1.31
KR1	1128	2.17	1.35
KR1	1129	2.15	1.32

m1	*Cricetodon aliveriensis* (Karydia)		
Loc.	Specimen	Length	Width
KR1	1130	2.23	1.32
KR1	1131	2.24	1.43
KR1	1132	2.3	1.32
KR1	1134	2.21	1.4
KR1	1135	2.18	1.34
KR1	1136	2.08	1.37
KR1	1137	2.33	1.38
KR1	1138	2.28	1.31
KR1	1139	2.27	1.43
KR1	1141	2.17	1.51
KR1	1144	2.15	1.38
KR1	1145	1.97	1.31
KR1	1146	2.29	1.45
KR1	1147	2.11	1.39
KR1	1148	2.18	1.3
KR1	1150	2.26	1.32
KR1	1151	2.25	1.41
KR1	1152	2.16	1.42
KR1	1154	2.22	1.31
KR1	1155	2.21	1.32
KR1	1156	2.26	1.45
KR1	1157	2.15	1.34
KR1	1158	2.19	1.3
KR1	1159	2.29	1.42
KR1	1160	2.08	1.34
KR1	1161	2.2	1.45
KR1	1162	2.1	1.31
KR1	1163	2.32	1.35

m1	*Cricetodon aliveriensis* (Karydia)		
Loc.	Specimen	Length	Width
KR1	1164	2.31	1.47
KR1	1165	2.23	1.39
KR1	1166	2	1.29
KR1	1167	2.34	1.42
KR1	1169	2.31	1.4
KR1	1170	2.27	1.46
KR1	1171	2.34	1.51
KR1	1172	2.25	1.41
KR1	1173	2.21	1.41
KR1	1175	2.23	1.35
KR1	1176	2.18	1.42
KR1	1177	2.11	1.39
KR1	1178	2.1	1.31
KR1	1181	2.15	1.38
KR1	1182	2.14	1.44
KR1	1184	2.34	1.47
KR1	1185	2.07	1.37
KR1	471	2.22	1.44
KR1	472	2.19	1.43
KR1	473	2.29	1.47
KR1	474	2.03	1.24
KR1	480	2.24	1.46
KR2	1243	2.04	1.28
KR3	501	1.89	1.29

Appendix Table 4. m1 measurements of *Cricetodon aliveriensis* from Karydia locality

m2	*Cricetodon aliveriensis* (Karydia)		
Loc.	Specimen	Length	Width
KR1	1191	2.09	1.72
KR1	1192	2.02	1.62
KR1	1193	2	1.59
KR1	1194	1.91	1.6
KR1	1196	2.12	1.63
KR1	1197	2.01	1.62
KR1	1198	2.01	1.6
KR1	1199	2.05	1.55
KR1	1200	1.93	1.49
KR1	1201	2	1.57
KR1	1202	2.02	1.59
KR1	1203	1.7	1.52
KR1	1204	2	1.59
KR1	1205	2.01	1.56
KR1	1206	2.05	1.59
KR1	1207	2.04	1.66
KR1	1208	2.02	1.66
KR1	1209	1.96	1.55
KR1	1212	2.1	1.68
KR1	1213	1.93	1.56
KR1	1214	2.08	1.71
KR1	1215	2.08	1.63
KR1	1217	2.07	1.6
KR1	1218	2.09	1.69
KR1	1221	2.03	1.55
KR1	1222	1.97	1.64
KR1	1223	2	1.65
KR1	1224	2.01	1.58
KR1	1226	1.9	1.6
KR1	1227	1.86	1.57
KR1	1228	2	1.62
KR1	1229	2.01	1.65
KR1	1230	1.89	1.5
KR1	1231	2.17	1.66
KR1	1232	2.17	1.63
KR1	1233	2.05	1.65
KR1	1234	2.11	1.68
KR1	1235	1.99	1.55
KR1	1236	2.01	1.51
KR1	1237	2.08	1.62
KR1	1238	1.99	1.54
KR1	1239	1.93	1.49
KR1	1240	1.88	1.52
KR1	1241	1.82	1.5
KR1	1242	1.8	1.44
KR1	1243	1.99	1.6
KR1	1244	2.03	1.62
KR1	1245	2.11	1.56
KR1	1246	1.97	1.61
KR1	1247	1.98	1.62
KR1	1248	1.82	1.46
KR1	1249	1.95	1.51
KR1	1250	1.93	1.57
KR1	1251	2.07	1.6
KR1	1252	2.04	1.58
KR1	1253	2.23	1.81
KR1	1254	2	1.5
KR1	1255	1.9	1.47
KR1	1256	2.07	1.58
KR1	1257	2.04	1.66
KR1	1258	1.91	1.56
KR1	1259	2.14	1.68
KR1	1260	1.89	1.56
KR1	1261	2.03	1.57
KR1	1262	2	1.56
KR1	1263	2.08	1.68
KR1	1264	1.83	1.54
KR1	481	2.02	1.59
KR1	482	2.09	1.72
KR1	487	2.04	1.66
KR1	488	2	1.61
KR2	1261	2.11	1.68
KR2	1262	1.91	1.6
KR2	1263	1.97	1.55
KR2	1265	1.98	1.58
KR2	1266	1.87	1.61
KR2	1267	2.05	1.64
KR2	1270	2.09	1.71
KR2	1271	1.99	1.62
KR2	1272	1.9	1.58
KR2	1273	1.9	1.56
KR2	1278	1.92	1.48
KR2	1279	1.97	1.67
KR2	1280	1.88	1.51
KR3	512	1.84	1.55

Appendix Table 5. m2 measurements of *Cricetodon aliveriensis* from Karydia locality

m3	*Cricetodon aliveriensis* (Karydia)		
Loc.	Specimen	Length	Width
KR1	1002	1.96	1.49
KR1	1003	2.01	1.46
KR1	1004	1.88	1.47
KR1	1005	2.06	1.45
KR1	1006	2.06	1.42
KR1	1007	2	1.43
KR1	1008	2.05	1.49
KR1	1009	2.05	1.44
KR1	1010	2.04	1.5
KR1	1011	2.09	1.54
KR1	1012	2.07	1.56
KR1	1013	1.9	1.41
KR1	1014	2.12	1.55
KR1	1015	2.07	1.52
KR1	1016	2.22	1.61
KR1	1017	1.99	1.51
KR1	1018	2.04	1.52
KR1	1019	2.18	1.64
KR1	1020	2.09	1.49
KR1	1022	1.88	1.59
KR1	1023	1.97	1.55
KR1	1024	1.9	1.49
KR1	1025	1.98	1.51
KR1	1026	1.97	1.45
KR1	1027	2.06	1.59
KR1	1028	2.02	1.67
KR1	1029	2.16	1.53
KR1	1030	2.11	1.5
KR1	1031	2.04	1.51
KR1	1032	2.02	1.53
KR1	1033	2.06	1.52
KR1	1034	2.08	1.56
KR1	1035	1.85	1.41
KR1	1036	2.09	1.65
KR1	1037	2.08	1.46
KR1	1038	2.11	1.48
KR1	1039	2.19	1.55
KR1	1040	2.09	1.53
KR1	1041	1.88	1.41
KR1	1042	1.91	1.49
KR1	1043	1.97	1.53
KR1	1044	2.21	1.62
KR1	491	2.1	1.5
KR1	492	2.18	1.59
KR1	493	2	1.52
KR1	494	1.94	1.37
KR1	1271	2.12	1.55
KR1	1272	2.25	1.63
KR1	1273	2.18	1.64
KR1	1274	2.11	1.5
KR1	1281	1.98	1.44
KR1	1282	2.12	1.57
KR2	1281	1.97	1.47
KR2	1282	2.07	1.6
KR2	1283	2	1.45

Appendix Table 6. m3 measurements of *Cricetodon aliveriensis* from Karydia locality

Appendix 2

C. aliveriensis from the locality of Aliveri raw data

M1	*Cricetodon aliveriensis* (Aliveri)		
Loc.	Specimen	Length	Width
AL.	541	2.49	1.58
AL.	542	2.45	1.63
AL.	543	2.41	1.55
AL.	544	2.4	1.48
AL.	545	2.42	1.6
AL.	546	2.23	1.48
AL.	547	2.36	1.59
AL.	551	2.25	1.47
AL.	552	2.36	1.58
AL.	553	2.43	1.56
AL.	554	2.23	1.46
AL.	555	2.26	1.49
AL.	556	2.34	1.47

Appendix Table 7. M1 measurements of *Cricetodon aliveriensis* from Aliveri locality

M2	*Cricetodon aliveriensis* (Aliveri)		
Loc.	Specimen	Length	Width
AL.	561	1.9	1.61
AL.	562	1.81	1.52
AL.	563	1.81	1.5
AL.	564	1.95	1.59
AL.	565	1.81	1.58
AL.	566	1.98	1.63
AL.	567	1.83	1.57
AL.	568	1.83	1.52
AL.	571	1.79	1.47
AL.	572	1.79	1.48
AL.	573	1.8	1.55
AL.	574	1.79	1.51
AL.	575	1.78	1.54

Appendix Table 8. M2 measurements of *Cricetodon aliveriensis* from Aliveri locality

M3	*Cricetodon aliveriensis* (Aliveri)		
Loc.	Specimen	Length	Width
AL.	581	1.63	1.48
AL.	582	1.56	1.39
AL.	583	1.69	1.44
AL.	584	1.51	1.42
AL.	585	1.65	1.51
AL.	586	1.6	1.45
AL.	587	1.66	1.42
AL.	591	1.59	1.45
AL.	592	1.66	1.53
AL.	593	1.61	1.42
AL.	594	1.67	1.39
AL.	595	1.71	1.47
AL.	596	1.69	1.47
AL.	597	1.57	1.5
AL.	598	1.6	1.45

Appendix Table 9. M3 measurements of *Cricetodon aliveriensis* from Aliveri locality

m1	*Cricetodon aliveriensis* (Aliveri)		
Loc.	Specimen	Length	Width
AL.	601	2.01	1.28
AL.	602	1.97	1.23
AL.	603	1.99	1.24
AL.	604	2.1	1.27
AL.	605	2.12	1.31
AL.	606	1.98	1.21
AL.	607	2.11	1.3
AL.	608	2.02	1.31
AL.	609	2.02	1.29
AL.	610	2.06	1.3
AL.	611	2.05	1.31
AL.	612	2.03	1.32
AL.	613	2.04	1.29
AL.	614	2.03	1.39
AL.	615	2.11	1.29
AL.	616	2	1.24
AL.	617	2.14	1.27
AL.	618	1.9	1.24
AL.	619	1.93	1.25
AL.	620	2.01	1.31
AL.	661	1.93	1.25

Appendix Table 10. m1 measurements of *Cricetodon aliveriensis* from Aliveri locality

m2	*Cricetodon aliveriensis* (Aliveri)		
Loc.	Specimen	Length	Width
AL.	621	1.77	1.44
AL.	622	1.87	1.5
AL.	623	1.83	1.53
AL.	631	1.84	1.43
AL.	632	1.94	1.52
AL.	633	1.72	1.41
AL.	634	1.91	1.54
AL.	635	1.89	1.48
AL.	636	1.78	1.45

Appendix Table 11. m2 measurements of *Cricetodon aliveriensis* from Aliveri locality

m3	*Cricetodon aliveriensis* (Aliveri)		
Loc.	Specimen	Length	Width
AL.	641	1.9	1.41
AL.	642	1.91	1.43
AL.	643	1.94	1.51
AL.	644	1.94	1.46
AL.	645	1.92	1.49
AL.	646	1.77	1.37
AL.	647	1.96	1.4
AL.	648	2	1.53
AL.	649	1.83	1.36
AL.	650	1.98	1.43
AL.	651	1.95	1.5
AL.	652	1.95	1.45
AL.	653	1.91	1.34
AL.	654	1.97	1.42
AL.	655	1.79	1.31
AL.	660	2.2	1.68

Appendix Table 12. m3 measurements of *Cricetodon aliveriensis* from Aliveri locality

Appendix 3

***C. kasapligili* from Keseköy**

***C. versteegi* from Kilçak 3a**

***C.* aff. *versteegi* from Kargi**

***C.* aff. *kasapligili* from Sabuncubeli**

***C. kasapligili* from Yapinti**

***C. versteegi* from Kinik**

	Length				Width			
	N	Min	Max	Mean	N	Min	Max	Mean
M1	2	2.51	2.63	2.57	4	1.68	1.74	1.71
M2	1	-	-	2.02	1	-	-	1.71
M3	-	-	-	-	-	-	-	-
m1	1	-	-	2.19	1	-	-	1.47
m2	-	-	-	-	-	-	-	-
m3	2	1.78	2	1.89	2	1.42	1.66	1.54

Appendix Table 13. Material and Measurements of *C. kasapligili* from the locality of Keseköy (mm) (de Bruijn *et al*., 1993)

	Length				Width			
	N	Min	Max	Mean	N	Min	Max	Mean
M1	7	1.93	2.1	2.01	13	1.26	1.43	1.35
M2	16	1.35	1.58	1.47	16	1.25	1.55	1.39
M3	14	1.17	1.37	1.26	14	1.17	1.34	1.26
m1	15	1.6	1.84	1.71	15	1	1.23	1.11
m2	20	1.48	1.74	1.61	18	1.21	1.38	1.30
m3	12	1.4	1.69	1.53	11	1.12	1.3	1.20

Appendix Table 14. Material and Measurements of *C. versteegi* from the locality of Kilçak 3a (mm) (de Bruijn *et al*., 1993)

	Length				Width			
	N	Min	Max	Mean	N	Min	Max	Mean
M1	6	1.86	1.98	1.93	7	1.23	1.35	1.3
M2	10	1.27	1.59	1.37	10	1.43	1.43	1.3
M3	12	1.06	1.27	1.15	12	1.32	1.32	1.21
m1	5	1.54	1.67	1.62	5	1.1	1.1	1.08
m2	7	1.4	1.52	1.44	7	1.26	1.26	1.19
m3	7	1.31	1.5	1.43	7	1.34	1.34	1.24

Appendix Table 15. Material and Measurements of *C.* aff. *versteegi* from the locality of Kargi (mm) (Kakali, 2013)

	Length				Width			
	N	Min	Max	Mean	N	Min	Max	Mean
M1	1	-	-	2.42	2	1.57	1.6	1.59
M2	3	1.76	1.81	1.79	2	1.62	1.63	1.63
M3	2	1.49	1.5	1.5	2	1.4	1.42	1.41
m1	2	2.07	2.29	2.18	3	1.37	1.45	1.41
m2	-	-	-	-	-	-	-	-
m3	-	-	-	-	1	1.42	-	1.42

Appendix Table 16. Material and Measurements of *C.* aff. *kasapligili* from the locality of Sabuncubeli (de Bruijn *et al*., 2006)

	Length				Width			
	N	Min	Max	Mean	N	Min	Max	Mean
M1	10	2.5	2.63	2.55	10	1.6	1.9	1.76
M2	22	1.83	2.05	1.94	22	1.7	1.93	1.82
M3	18	1.55	1.88	1.72	18	1.45	1.93	1.63
m1	14	2	2.4	2.19	14	1.3	1.63	1.47
m2	17	1.88	2.1	1.98	17	1.53	1.8	1.66
m3	19	1.88	2.23	2.08	19	1.48	1.73	1.62

Appendix Table 17. Material and Measurements of *C. kasapligili* from the locality of Yapinti (mm) (Durgut and Ünay, 2016)

	Length				Width			
	N	Min	Max	Mean	N	Min	Max	Mean
M1	3	1.98	2.23	2.12	3	1.48	1.58	1.53
M2	13	1.53	1.68	1.62	13	1.4	1.65	1.53
M3	11	1.2	1.4	1.31	11	1.25	1.43	1.35
m1	9	1.83	2.03	1.92	9	1.2	1.35	1.27
m2	8	1.65	1.85	1.75	8	1.35	1.48	1.43
m3	9	1.55	1.75	1.67	9	1.3	1.43	1.35

Appendix Table 18. Material and Measurements of *C. versteegi* from the locality of Kinik (mm) (Durgut and Ünay, 2016)