



Palaeoecological and biostratigraphical implications of the microvertebrates of Qesem Cave in Israel



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ABSTRACT

Microvertebrates are generally well suited for drawing inferences on past environmental conditions because they are closely bound to the areas in which they lived. In this paper, we discuss palaeoecological implications of two microvertebrate concentrations in the Middle Pleistocene site Qesem Cave in Israel. The ecological preferences of the nearest living relatives of the microvertebrate taxa recorded in Concentration 1 (squares L–N/13–15) and 2 (squares G–H/16–17) at Qesem Cave allow us to infer a mosaic of open palaeoenvironment with sparse vegetation, shrubland, Mediterranean Forest, rocky areas and riverbanks. Additionally, we infer palaeoclimate from the bioclimatic distribution of extant species using the Coexistence Approach. To our knowledge, this is the first time the approach has been applied to microfaunal assemblages. These data suggest cooler and slightly drier winters and somewhat lower seasonality than at present around Qesem Cave; the differences are more pronounced for the time covered by Concentration 2 than Concentration 1.

Among microvertebrates, micromammals are most suitable for biostratigraphic purposes. With the exception of *Rattus* cf. *haasi* and the *Myomimus judaicus/setzeri* group, the small mammal fauna of Qesem Cave comprises only taxa that live today in the Levant. *R. haasi* and *M. judaicus* have been found in Israel in the Early and Middle Pleistocene, and their latest known record was from the Acheulian site of Oumm Qatafa. Their presence in Qesem Cave extends the previously known stratigraphic range of these species. The absence of *R. haasi* in Mousterian sites is thus consistent with the pre-Mousterian age of Qesem Cave. Morphometric data on molars of Guenther's Vole show that the lineage segment preserved in Concentration 2 is more primitive than in Concentration 1, indicating that the former concentration is older. The evolutionary level of the sample from Qesem Concentration 1 is similar to Tabun D (boundary of Acheulo-Yabrudian Cultural Complex and Mousterian), and that from Qesem Concentration 2 similar to Tabun Eb (Acheulo-Yabrudian).

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1. Introduction

Qesem Cave is a very productive Middle Pleistocene archaeological site near Tel Aviv in Israel dated by various methods to 420–200 ka (Barkai et al., 2003, 2010; Gopher et al., 2010; Stiner et al., 2011; Blasco et al., 2013; Mercier et al., 2013; Rosell et al., 2015; Falguères et al., 2016). The site is a sediment-filled karst chamber cave some 20 × 15 m in size, which is located ~12 km east of the present day Mediterranean coast, at an altitude of 90 m on

the moderate western slopes of the Samaria hills. The cave is part of a larger karstic system within the limestone of the B'ina Formation of Turonian (Late Cretaceous) age. All layers of the more than 10 m stratigraphic sequence of Qesem Cave have been securely assigned to the Acheulo-Yabrudian Cultural Complex (AYCC) of the late Lower Palaeolithic (Barkai et al., 2003; Gopher et al., 2005; Barkai et al., 2009; Barkai and Gopher, 2011; Shimelmitz et al., 2011; Barkai et al., 2013).

The huge number of artifacts, large mammal bones (Stiner et al., 2009, 2011; Blasco et al., 2013, 2014), and human teeth (Hershkovitz et al., 2011) attest to the habitual presence of humans in the cave.

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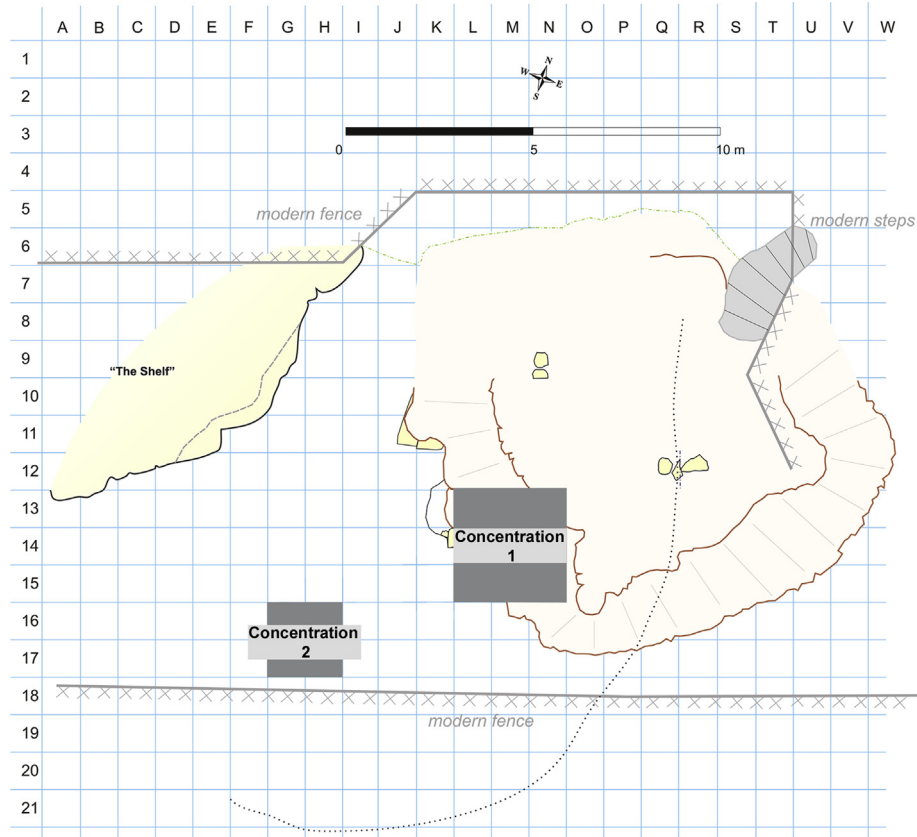


Fig. 1. Qesem Cave map of excavation squares with indication of Concentrations 1 and 2.

However, the environmental conditions under which the ancient humans lived remain poorly known. In order to advance knowledge of these conditions, we focus here on small terrestrial vertebrates: small mammals, amphibians and reptiles. These animals are generally well suited for drawing inferences on past environmental conditions, because they are closely bound to the areas in which they lived. Qesem Cave is very rich in microvertebrate remains (Maul et al., 2011; Horáček et al., 2013; Smith et al., 2013; Smith et al., 2016), which were retrieved from two distinct local concentrations: concentration area 1 in squares L–N/13–15 and concentration area 2 in G–H/16–17 (Fig. 1, for details see Smith et al., 2016).

The ecological implications of small terrestrial vertebrates are only meaningful insofar as they are securely dated. In addition to absolute dating methods, small mammals also provide useful information on the biostratigraphy of the locality under consideration. Although independent physical dating of the excavation areas is already available (Gopher et al., 2010; Mercier et al., 2013), biostratigraphic data from micromammals are important since they provide a basis for correlation with microvertebrate samples from other localities in which absolute dating is lacking. Moreover, the application of various dating methods offers the possibility to cross-check the results.

In this paper, we analyse the microvertebrate material from Qesem Cave in order to infer its age and the ecological conditions under which it was deposited. Initial implications on palaeoecology and biostratigraphy of concentration area 1 were discussed in previous papers (Maul et al., 2011; Horáček et al., 2013). However, there is now much more material available – particularly from Concentration 2 – and we apply more refined methods here. Finally, given differing palaeoecological conditions and stratigraphical age of the two concentrations, they were not accumulated at the same time but one after the other, results which would contribute new insights into intra-site processes and the history of deposition.

2. Material and method

2.1. Material

The microfaunal remains were collected mostly by screen-washing (mesh size 0.8 mm) and pre-sorting in the field. Some specimens were picked directly from the fossiliferous layer during excavation. Some 250,000 microvertebrate skeletal and dental remains have been collected so far from the two concentration areas. Some 16,000 remains have been identified to genus or species level (Table 1, for details see Smith et al., 2016).

Table 1

Microvertebrate taxa recorded from the Concentration 1 and 2 (see Fig. 1) of Qesem Cave.

	Concentration 1	Concentration 2
Vertebrata indet.	72,139	153,813
Actinopterygii		
Actinopterygii indet.	1	
Amphibia		
Ranidae indet.	24	5
Reptilia		
Testudines		
<i>Testudo (graeca)</i>	340	252
Squamata		
Squamata indet.	989	546
<i>Stellagama stellio</i>	543	883
<i>Chamaeleo chamaeleon</i>	2,695	4,806
Gekkonidae indet.	6	7
Lacertidae indet. (2 species)	20	13
Scincidae indet.	2	7
<i>Pseudopus</i> sp.	432	49
cf. <i>Eryx</i> sp.	1	1
Colubroidea indet. (3+ species)	35	50

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