

THE SITE OF AS-SALA‘: 2016 ARCHAEOLOGICAL CAMPAIGN

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Introduction

The site of as-Sala‘ (also known as Qal‘at as-Sala‘) is located 3km from modern Buṣayrā (Edomite Bozrah) and 10km from aṭ-Ṭafilāh, the modern capital of the eponymous administrative district located in southern Jordan (Fig. 1). as-Sala‘ is some 4km from the King’s Highway and about 50km north of Petra. The site stands on a rocky outcrop above two surrounding *wadis*: Wādī al-Ḥirsh and Wādī al-Jamal. These connect with the Wādī ‘Arabah through the Wādī Khunayzīrah (Fig. 2). The geographical coordinates of the centre of the site are 30°46’50”N, 35°34’30”E and the average elevation is 867m. The highest point of the promontory is 877m above sea level and the total surface area of the site is approximately 42 hectares (Da Riva *et al.* 2017).

2015 and 2016 Campaigns; Absolute Chronology from Samples Obtained in 2016¹

During our first campaign (2015) we undertook a survey of the site and produced a cartographic basemap for future studies. The work was carried out using case studies in the area, mostly in the vicinity of Buṣayrā, and archaeological maps and data archived in the JADIS (Jordan Antiquities Database and Information System) and MEGA (Middle Eastern Geodatabase for Antiquities) systems of the Department of Antiquities (DoA) of Jordan. The archaeological field survey of 2015 was non-intrusive and extensive (Da Riva *et al.* 2017).

The objective of the 2016 campaign in as-Sala‘ was twofold. The first part of the project

was a survey conducted to identify cisterns, channels and structures related to water use at the top of the mountain of as-Sala‘, using the 2015 survey map as a base. The second part of the campaign was devoted to the excavation of two areas near the entrance tower: Area G (grave area) and House 1 in Area F (Fig. 3). Three samples from timber recovered in layers 5, 6 and 10 of House 1 and a sample derived from dental remains from the grave area were sent to the laboratories of the Centro Nacional de Aceleradores (CNA) of the University of Seville in Spain (<http://cna.us.es>). From the wood the following absolute dates were obtained: sample 4194.1.1 from Layer 5 (1643-1682 cal AD); sample 4195.1.1 from Layer 6 (1486-1604 cal AD); sample 4196.1.1 from Layer 10 (1451-1529 cal AD). The dental remains (sample 4399.1.1) were recovered from Grave 7 (layer 17): 127-164 cal AD.

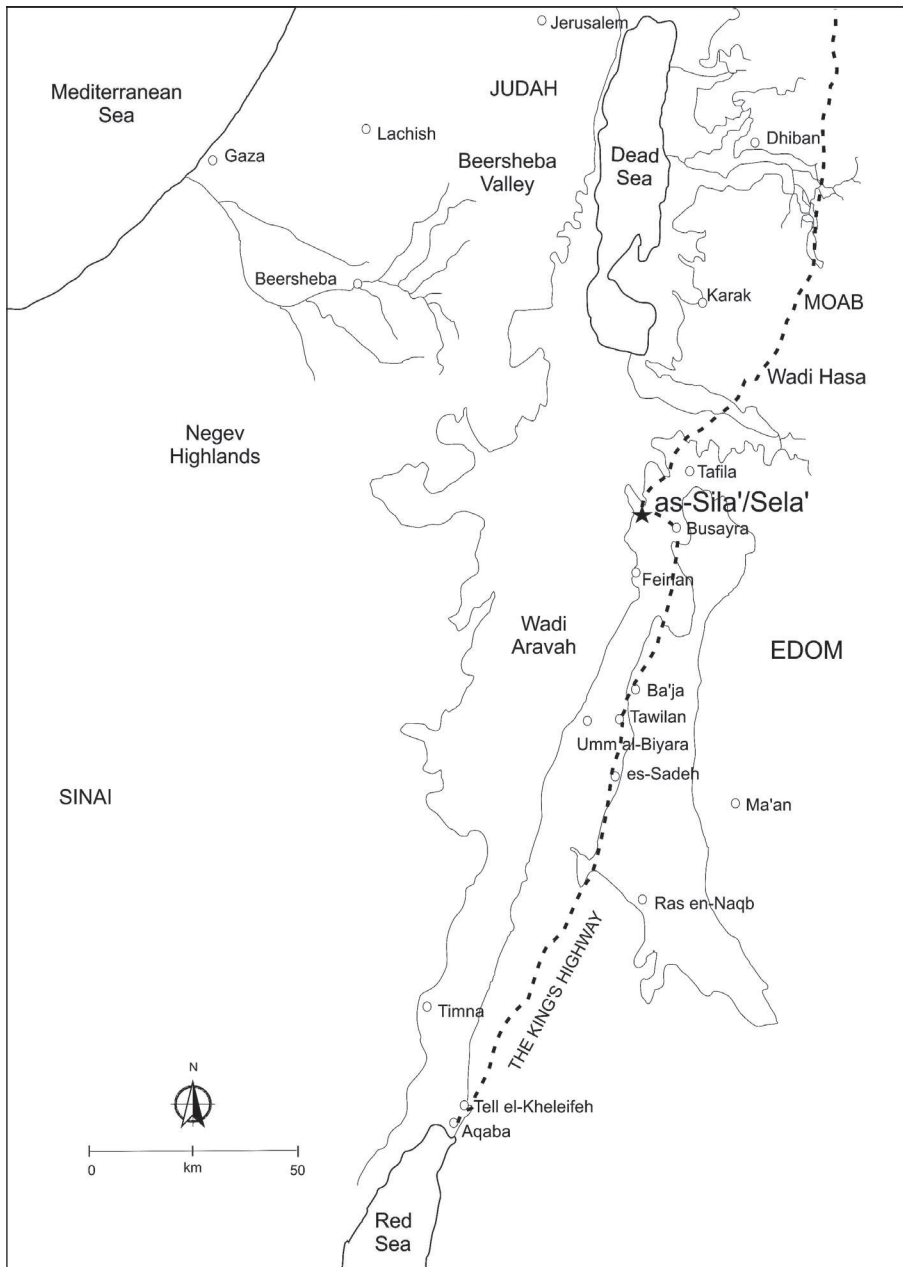
All project information has been placed at



1. General view of as-Sala‘.

1. We kindly acknowledge the permission granted by the Department of Antiquities of Jordan and its director for permission to work at as-Sala‘. The director of the 2016 campaign was Rocío Da Riva of the University of Barcelona. The campaign took place between 6 and 25 April 2016. Sponsors: Spanish Ministry of Education and Culture; ICREA; PALARQ. Institutional support: University of Barcelona. Team: Juan R. Muñiz,

Marta Corrada, Adrian Piñán, Roser Marsal and Eva Miguel. The team completed the work with the assistance of surveyor Ehab Jariri (Department of Antiquities of Jordan). The workers Riad Audat, Mofeed Audat, Hassan Audat and Ahmad Qatamine also collaborated in the project. DoA representative: Mr. Abdalla Rawashdeh, DoA office, aṭ-Ṭafilāh.



2. Map of southern Jordan.

the disposal of the DoA of the Ministry of Tourism and Antiquities, in the form of reports and site cards to be included in the MEGA Jordan database: <http://megajordan.org>

Archaeometric Characterization

In this section we present the results of the archaeometric characterization of 22 pottery sherds, most probably hand-made geometric-painted ceramics (HMGP). They were dated to the late Islamic (late Mamluk/early Ottoman) period on the basis of archaeological criteria and the radiometric dates from the house where the pottery was recovered (**Fig. 4**). The archaeometric results show two main groups (A and B).



3. House 1.

Group A may be the result of mixing two different clays (illitic and kaolinitic), a technique known from at least the Iron Age and documented in the Ṭawīlān area (Fig. 5). Group B is calcareous with a wide range of CaO values, probably indicating low standardisation of the preparation process (Fig. 6). Scanning Electronic Microscope (SEM) study permits identification of the microstructure of the sherds, which consists of a continuously vitrified surface with a high concentration of fine bloating pores of small diameter. This kind of microstructure is typically produced in a reducing atmosphere, by the fast heating rate when a bonfire or pit is used and fuel and pots come into contact with each other. Moreover, all samples show traces of the organic material that would have been used in the preparation of the paste, suggesting a similar tradition. Microanalyses of the decoration reveal the use of an iron-oxide base for the dark/reddish colour of the geometric patterns.

Wood Remains

The site has yielded 20 wood samples belonging to branches from House 1 (layers 5, 6 and 10). Taxonomic identification of wood remains must be carried out by the preparation

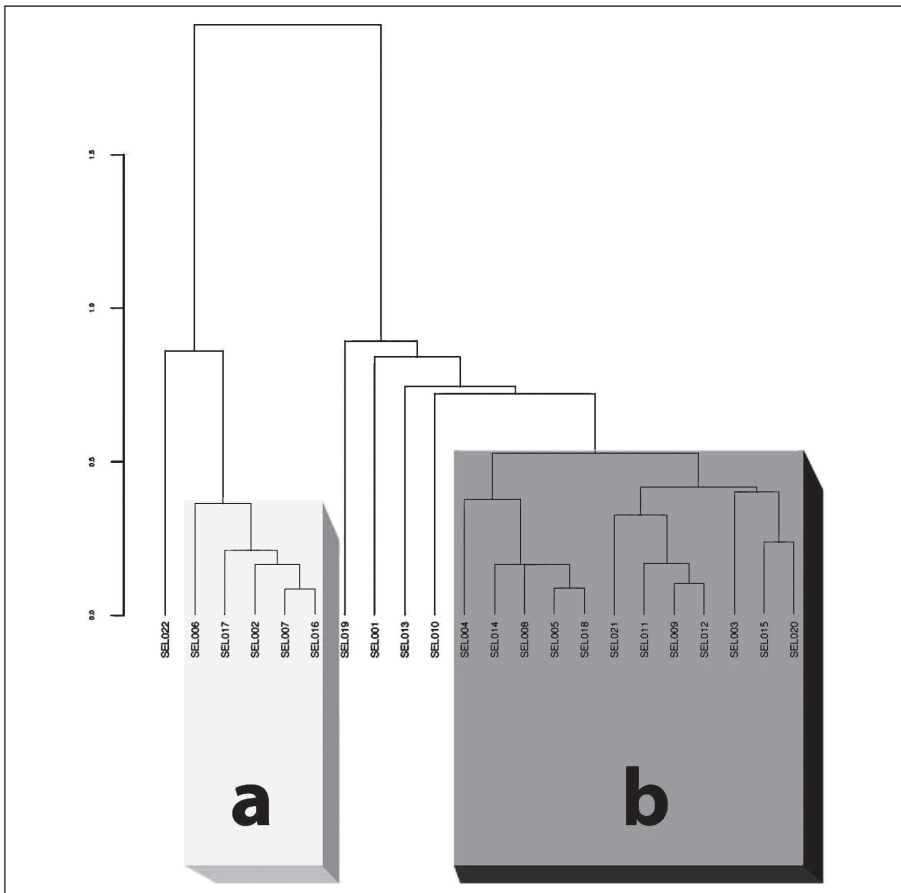
of xylological slides or by direct observation. In this case we performed direct observation by fragmenting a small piece by hand, taking care not to affect the wood remains. From each sample, we obtained three wood anatomy sections that permitted us to describe the cell structure. The wood fragments were observed using a metallographic reflected light microscope with dark and light fields, at magnifications of $\times 50$, $\times 100$, $\times 200$ and $\times 500$ (Olympus BX41). A digital microscope HIROX was used for taking images. For the identification we also used wood-anatomy atlases.

The wood remains were in an excellent state of preservation and were identified as *Juniperus* (juniper), a genus that comprises a large number of shrub or small-tree species living in different areas. In the area under consideration the most common is *Juniperus phoeniceae*, which is well adapted to dry-steppe environments.

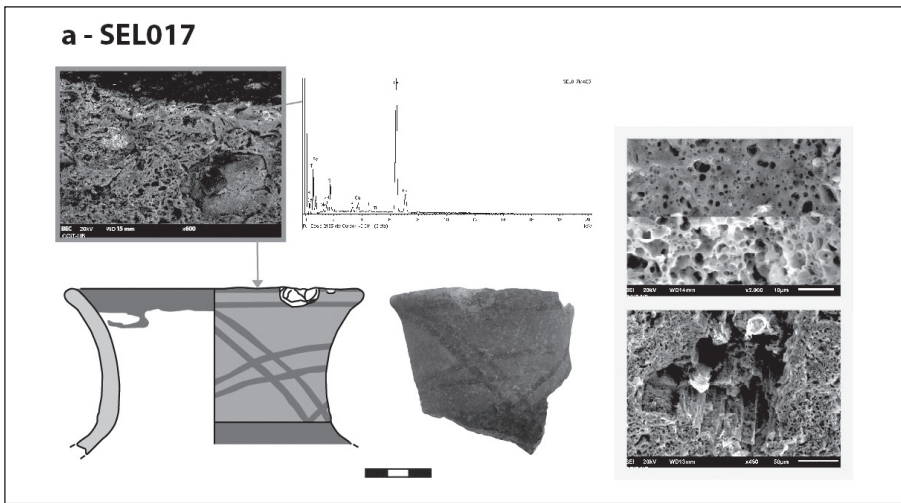
Further analyses of the morphology and dendrology showed modification patterns that may be related to the use of wood in structures (Figs. 7-10).

Inscription of Nabonidus

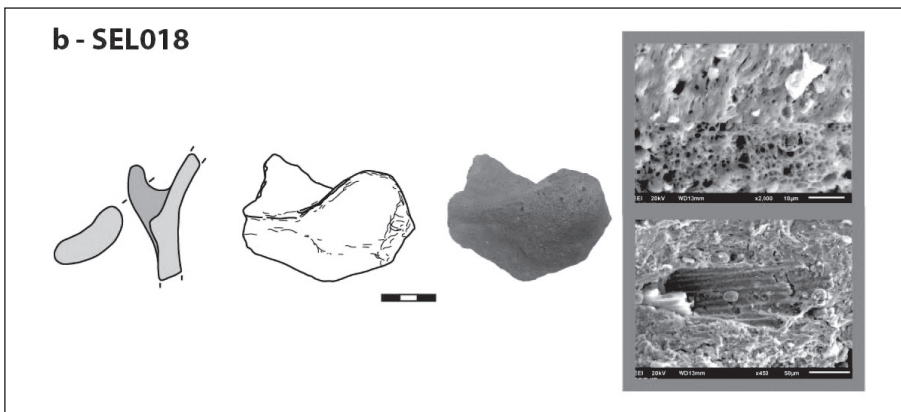
On the eastern slope of the promontory, just



4. Main groups of pottery from House 1.



5. Group A sample SEL017.



6. Group B sample SEL018.

southeast of the main stairway leading to the summit and about 120m from the ground, there is a carved relief framed by a niche. The relief depicts a standing human figure facing right. Three symbols are displayed in front of the figure: a moon, a solar disc and a star (**Fig. 11**). The figure holds a long staff in his right hand, while the left hand is lifted to the mouth in the well-known Mesopotamian gesture of prayer. The figure wears a long robe and a kind of conic crown or cap, the characteristic attire of a Babylonian monarch. Fragments of a cuneiform inscription can be seen to the right of the king, below the three symbols and on the right side of the relief. The human figure has been identified as the Babylonian king Nabonidus (556-539BC), because the relief resembles other representations of this king on stelae (Dalley and Goguel 1997) and because the inscription clearly refers to him (Schaudig 2001: 544). This monument is the only firm evidence of Babylonian presence in southern Jordan during the Iron Age and, at the same time, is a clear indication of as-Sala's importance during that period (Bienkowski 2014). It also suggests that the area was under Babylonian administration

at some point during the reign of Nabonidus, although we cannot conclusively confirm this.

Water-Management Systems

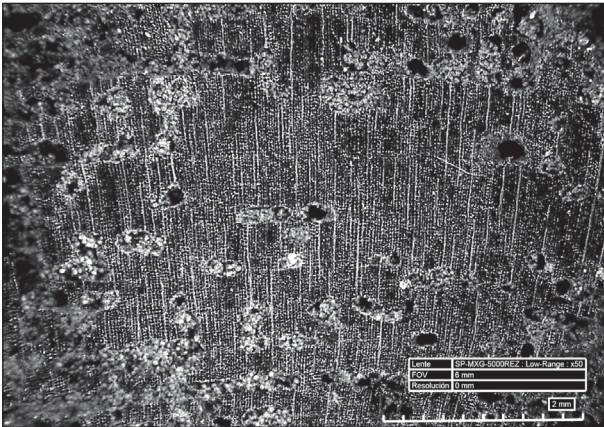
The archaeological survey carried out at the site of as-Sala' in 2015 and 2016 revealed a complex and sophisticated hydrological network at the top of the settlement. A great diver-



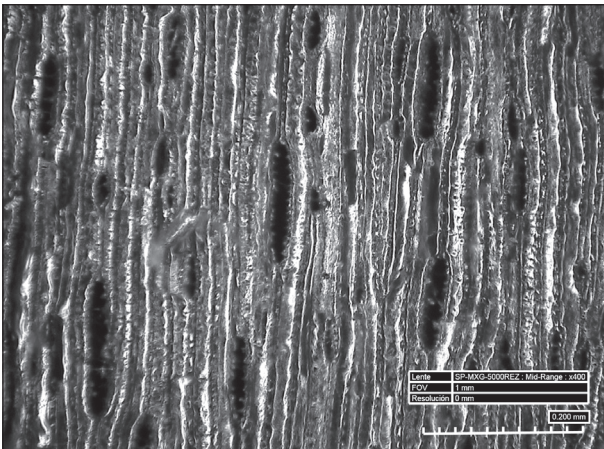
7. Digital microscope (HIROX) image from the IPHES technology laboratory; image shows radial section of one of the samples.

sity of water structures has been documented; these were carved into the sandstone and designed for the collection, storage, transport and distribution of rainwater.

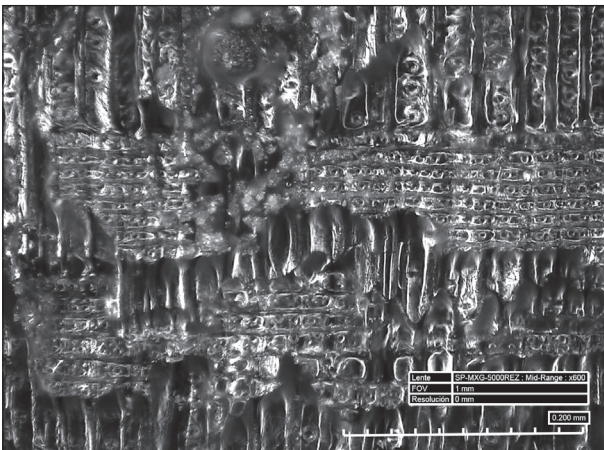
Most of the documented hydraulic structures are cisterns (Fig. 12), canals (Fig. 13) and - to a lesser extent - pools (Fig. 14) and sedimentation basins (Fig. 15) (see also Fig. 16).



8. Cross-sectional view showing the tracheids of and alterations to the wood cell structure.



9. Tangential section showing short uniseriated rays.



10. Radial section showing cross fields with cupressoid ray pits.

All structures were identified and described in the course of the total-station archaeological survey. The hydraulic structures were individually numbered, contextualized with regard to the different areas of the site, and linked to architectural arrangements. We also related the location of water structures to the topography and geology of the site in order to identify the general hydrological network. All identified water structures and their contexts were photographed.

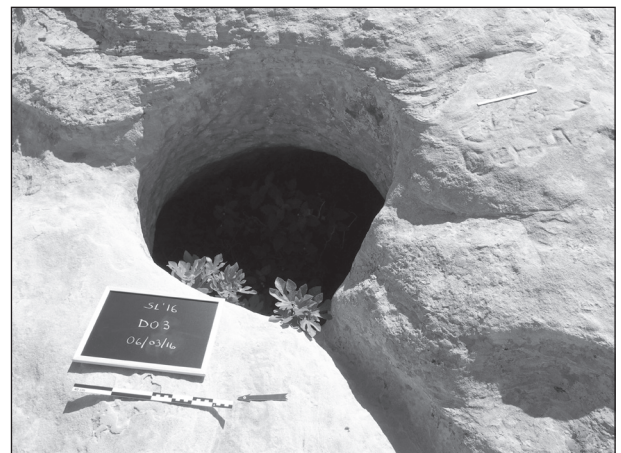
Study of the management of the as-Sala ' hydraulic resources is still ongoing and forms part of R. Marsal's doctoral thesis at the University of Barcelona.

Dental Remains

Dental remains belonging to five individuals were recovered from four graves. There are three adults, aged from 25 to over 40, and two children of around four years old at the time of their death (Fig. 17). There is scarce evidence of dental pathology. However, linear enamel



11. Inscription of Nabonidus.



12. Cistern D03 with two canals.

hypoplasia and slight to moderate dental calculus were recorded, in both the posterior and anterior teeth of adult individuals.

The adult individuals showed high occlusal dental wear, with molar enamel and dentine worn away in a concave pattern (A). The enamel is not sufficiently well preserved for detailed dental micro-wear analysis. However, under ESEM (Fei Quanta 600), occlusal and labial surfaces show antemortem enamel chipping (B), diet-related striations (C) and pits (D). The presence of dental calculus, the absence of

dental caries, and the macro and microwear dental features are indicative of a diet with abrasive and hard (intrinsic and extrinsic) items, compatible with a farming lifestyle (Fig. 18).

Faunal Assemblage

The faunal assemblage recovered during the archaeological excavations comprises 302 specimens from eleven archaeological layers (Fig. 19). It is completely dominated by ovicaprines (Fig. 20): six young and eight adult individuals were identified. Most of the animals



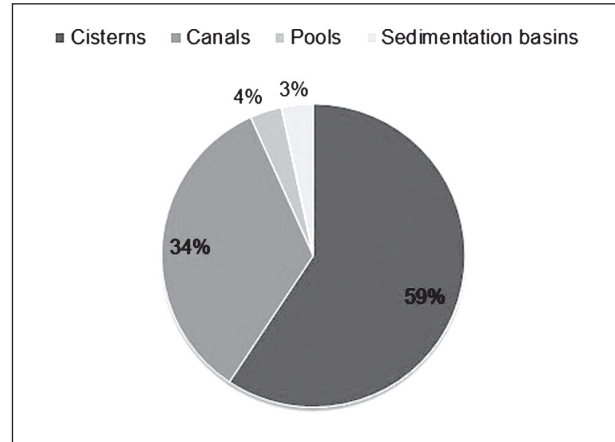
13. Canal C84.



14. Pool D61.



15. Sedimentation basin D112 with cistern and canal.



16. Proportions of the types of hydraulic structure found at the site.



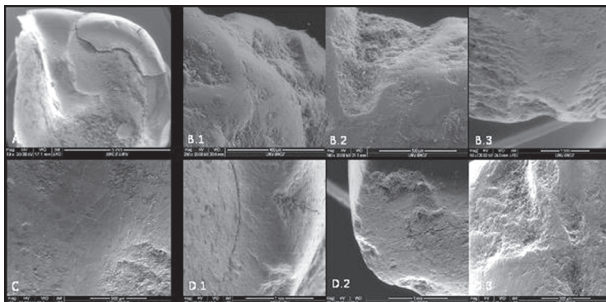
17. Grave at as-Sala'.

were killed after roughly two years of age. The high number of adults also suggests that the animals were mainly used for meat, although they may have been kept for their milk and wool as well. Secondary consumption of birds and, to a lesser extent, fish has also been observed (Figs. 21-23). As regards anatomy, the most common elements are the cranial skeleton and limb bones. The bird remains could not be identified taxonomically. However, in view of the chronology of the site and its location, one would expect the remains to be of domestic chicken (*Gallus gallus domesticus*). In addition, fish remains belonging to the class *Actinopterygii* were found, although their specific

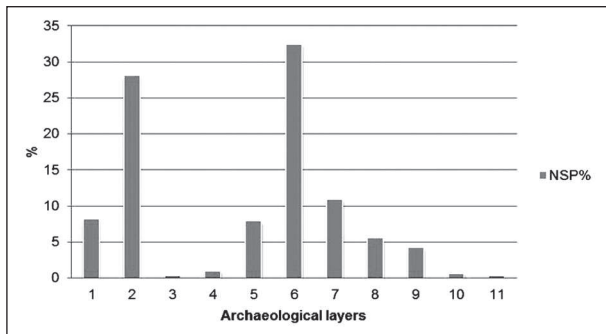
taxa could not be established. In sum, within this faunal assemblage the primary meat and protein sources come from ovicaprines, supplemented by small birds (for their meat or eggs) and, to a lesser extent, fish.

Conclusions

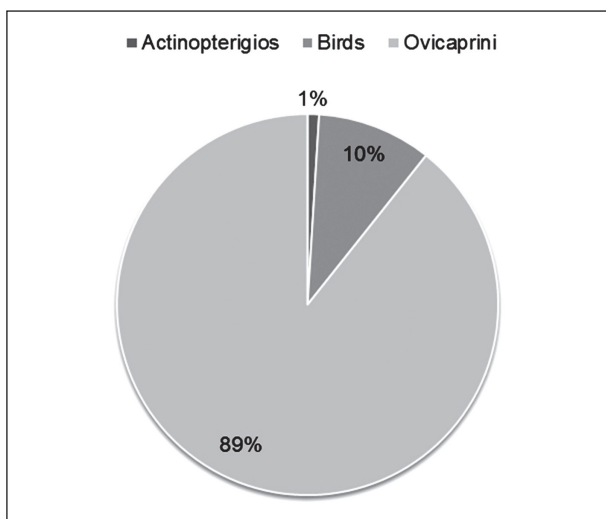
as-Sala' is a site in the at-Tafilah area with an astonishingly rich archaeological legacy and an imposing geomorphological heritage. Its extent, the presence of many architectural structures, the surface finds and its general layout bear witness to its enormous archaeological potential. The presence of many water-storage and water-management structures, as well as dwellings and fortifications, make it a unique site for studying the economic use and social relevance of water management on the Edomite plateau. With the information provided by surface surveys and radiocarbon analyses, we can affirm that as-Sala' was indeed occupied during



18. ESEM (Fei Quanta 600) images of dental remains.



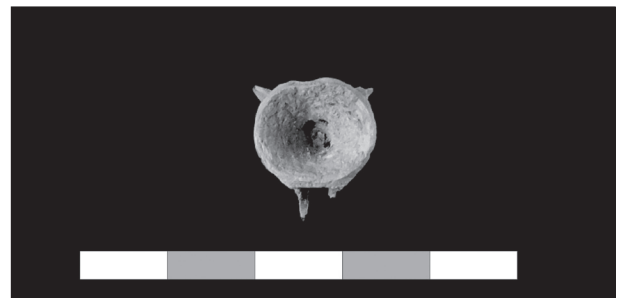
19. Faunal remains according to archaeological layer.



20. Taxonomic identification of faunal remains.



21. Hemimandible of a young ovicaprine.



22. Vertebrae of Actinopterygii.



23. Maxilla of an adult ovicaprine.

the Iron Age, Nabatean and Roman periods, and Mediaeval, Mamluk and Ottoman periods (12th-17th centuries AD). The topographic study and preliminary survey demonstrate the enormous potential of as-Sala' for contributing to our understanding of the past on the Edomite plateau and for helping us to solve questions regarding settlement patterns, water-control systems and economic activity.

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