'Atiqot 72, 2012

Was Shiqmona Devastated by an Earthquake in the Seventh Century CE?

Eldad Barzilay

Excavations at Tel Shiqmona have revealed that the Byzantine city was demolished in an abrupt and violent event during the seventh century CE. During excavations carried out southeast of Tel Shiqmona (see Torge and 'Ad, this volume: Fig. 1), some of the wall foundations were found twisted and deformed, and clearly could not support a superstructure. Therefore, the deformation was related either to the destruction of the site or to post-depositional processes. The nature of these deformations is described and evaluated in this paper. The limited extent of the excavation and the poor preservation of the walls make it difficult to describe the shape and function of the structures themselves.

The Geological Setting

Tel Shiqmona is located on a small tombolo rising a few meters above the sea (12.74 m asl). It is connected to the mainland by a strip of land 5 m in height. In this area, the foothills of the Carmel Mountains slope down to the sea, leaving only a narrow band of flat seashore several tens of meters in width between them and the Mediterranean Sea.

The Cenomanian limestone bedrock upon which Tel Shiqmona lies, is covered by heavy, brown, calcareous, vertic clay paleosol. This paleosol may have been a factor in the instability of the structures, due to its high clay content that includes mainly smectite, which expands when wet and contracts when dry. The process of expansion involves high mechanical pressure that produces characteristic vertic features, such as prismatic soil structures with open vertical cracks, crossing shear planes at an angle of 30º at a depth of more than 1 m below the surface, and coatings of soil peds along these planes and prisms. The continuous annual cycle of expanding and contracting could have caused the deformation of the structure's foundations over time.

The Structure in Area A

In Area A, located 200 m east of the tell, the foundations of the western section of a large building were excavated (see Torge and Ad, this volume: Plan 1). These remains include a 13 m long western wall (W8), preserved up to 2 m high, part of the northern wall (W1), and two inner walls to its south (W4, W5). The walls were built of regularly shaped, hewn stones (c. 0.3 × 0.3 × 0.7 m) and founded on the limestone bedrock. The massive northern wall, 1.4 m thick, had two faces of cut stones with a gray cement fill containing small stones. The inner walls (W4, W5) were built of the same cut stones (stretchers) above two courses of headers for better stability.

The floor elevation of the building remains relatively constant and as the bedrock drops, the foundations are deeper and more massive, and built of high-quality cut stones. Fieldstones were used only in places where the bedrock was just below surface (for further details, see Torge and 'Ad, this volume).

The ceramic and numismatic finds provide evidence that the building in Area A should be dated to the sixth–first half of the seventh century.

Earthquake Damage Patterns at Ancient Ruins

Devastation of ancient cities by earthquakes has usually been inferred on the basis of historical

accounts, as well as on the grounds of systematic collapse patterns. Nineteen distinct types of earthquake damage patterns were observed in the ruins of the Byzantine city of Shivṭa (Mazor and Korjenkov 1999), which comprise criteria to reconstruct the characteristics of the seismic event. The relevant patterns for the present discussion are the following:

(a) Systematic rotation of single stones, wall fragments, or entire walls around a vertical axis, indicating the arrival of seismic waves at a certain angle to the wall;

(b) Systematic collapse of walls and agricultural fences, indicating the general direction of seismic wave propagation;

(c) Single stones partially pushed out of walls, indicating a strong seismic event;

(d) A vertical joint passing through a few adjacent stones, indicating high earthquake intensity (minimum intensity I>7);

(e) Upper parts of buildings more damaged than the lower parts, indicating higher degrees of oscillation.

The Deformations at Shiqmona

The building in Area A reveals deformation in every excavated wall (see Torge and ʻAd, this volume: Figs. 3–6). In the northern wall, W1, the three upper stones of the northern (outer) face were rotated counter-clockwise around a horizontal axis. In the northern inner wall, W4, three upper stones were uplifted or rotated clockwise around a horizontal axis. In the other inner wall, W5, the upper four stones were also uplifted and a stone at the western end of the pilaster was rotated 20º eastward (around a vertical axis) from the general line of the wall. The western wall, W8, shows different types of deformation. In its northern section, between W1 and W4, only the two lowermost courses of headers are preserved. A plaster line along the wall indicates that the upper courses of stretchers were removed from their place, and that the surviving courses did not suffer any deformation. The upper stones between W4 and W5 lean or have rotated eastward from the line of the wall. The central section of the wall (five or six courses high) leans westward at an angle of 60º and is twisted. The upper three courses of the southern section of the wall were deformed into an arch, the stones are cracked and slide signs are visible on the base of the arch. The three upper courses of the southern wall, W11, lean northward and were rotated clockwise around a horizontal axis.

Discussion and Conclusions

It is clear that the building in Area A, as well as the structure in Area D/E (see Torge and ʻAd, this volume: Plan 4, Figs. 11, 12), suffered from severe earth movements that deformed their foundations and led to the destruction of the superstructure. However, it is uncertain whether this damage was caused by an earthquake or by the accumulative effect of the swelling and shrinking soil. However, soil movement due to the swelling and shrinking process is very slow and causes random damage, and repairs would probably be detected in various parts of the building. Based on the criteria presented above, the deformations are consistent with seismic damage.

In summary, previous excavations at Tel Shiqmona have indicated that the Byzantine city was constructed in the late sixth century following the destruction of an earlier city in the fourth century, and that an abrupt and violent event caused the demolition of Shiqmona again during the seventh century. According to the damage patterns, it is likely that the structure in Area A was devastated by an earthquake. If so, the local intensity of the earthquake would have been over I=7 (MSK-64 scale).

REFERENCES

Mazor E. and Korjenkov A.M. 1999. Earthquake Characteristics Reconstructed from Archaeological Damage Patterns: Shivta, the Negev Desert, Israel. *Israel Journal of Earth Sciences* 43:265–282.

Torge H. and ‘Ad U. This volume. Late Byzantine Buildings on the Eastern Fringes of Tel Shiqmona.