



New insights regarding the Akko 1 shipwreck: a metallurgic and petrographic investigation of the cannonballs

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ABSTRACT

The Akko 1 shipwreck constitutes the remains of a small Mediterranean naval vessel, discovered in Akko harbour, Israel, and excavated over three seasons between 2006 and 2008. Among the finds at the shipwreck site were eleven cannonballs. Two of them, a 9-pdr and a 24-pdr, were retrieved and studied using metallurgical and petrographic methods. The examination of the cast-iron was performed with optical microscopy, SEM–EDS, XRF and microhardness tests. The remains of the casting sand from within the voids in both cannonballs were studied by petrography. Combined with the archaeological evidence and the historical background, the metallurgical and petrographic testing may suggest that Akko 1 was a warship or an auxiliary naval vessel of similar size to, or slightly smaller than, sixth rate, and was in Akko harbour circa 1840.

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1. Introduction

1.1. Historical background

The city of Akko (Acre, St. Jean d'Acre) is located at the north end of Haifa Bay, in northern Israel. It is one of the oldest cities in Israel, with evidence of habitation since the Early Bronze Age (3300 BCE). It was connected to the sea by the Na'aman river (ancient Belus, see Josephus Flavius, *The Jewish War* 2.10.2). At sometime during the mid-first millennium BCE, the city was relocated to its present location on a promontory. Evidence of Phoenician harbour construction exists from this (Persian) period. Akko was conquered by Alexander the Great in 332 BCE and by the Arabs in 636 CE. In 1104 King Baldwin I and the Crusaders took Akko. It was conquered by Salāh ad-Dīn in 1187, and by Richard the Lionheart in 1191. The Mamelukes seized Akko in 1291 and destroyed the city and its harbour. The city was taken by the Ottomans in 1516. In the mid-eighteenth century the city and harbour were renovated by Daher al-Umar, its ruler from the mid-eighteenth century to 1775, and

after 1775 by Ahmed al-Jazzar Páshá, its governor until 1804 (Alderson, 1843; Cohen, 1973; Dichter, 1973, 2000; Dothan, 1976; Dothan, 1993; Makhoul and Johns, 1946; Raban, 1993; Rustum, 1926; Wilson, 1847).

Between the end of the eighteenth and the first half of the nineteenth centuries Akko was involved in three naval campaigns. Napoleon Bonaparte laid siege to the city on 19 March 1799. The besieged Turks, aided by a British squadron commanded by William Sidney Smith, fought back, and after 61 days of indecisive siege, the French retreated toward Egypt (Alderson, 1843, pp. 21–37; Anderson, 1952, pp. 372–373; La Jonquière, 1900, IV).

In 1831, Ibrahim Páshá, the son of Muhammad Ali—the ruler of Egypt, laid siege to Akko, aided by an Egyptian fleet composed of seven frigates, four corvettes, six brigs, a single bomb vessel and several transports. In December 1831, the Egyptian ships bombarded Akko heavily, but the engagement was not decisive. Gunfire from the city sank one gunboat and damaged the others. The Egyptian ships retreated to Haifa and later sailed back to Alexandria for repairs. However, the city was taken by the Egyptians six months later, on 27 May 1832 (Alderson, 1843, pp. 39–44; Durand-Viel, 1935, II, pp. 54–78; Rustum, 1926).

On 3 November 1840, a British–Turkish–Austrian fleet bombarded Akko. A shell hitting the main Egyptian arsenal resulted in an explosion which destroyed a section of the city. Akko was taken

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the following day (Alderson, 1843, pp. 46–48; Anderson, 1952, pp. 561–564; Durand-Viel, 1935, II, pp. 234–236).

In these naval operations, starting with Napoleon Bonaparte in 1799 through Ibrahim Páshá in 1831/2 and the conquest of the city in 1840, ships of various types, rates and classes from numerous western European or eastern Mediterranean fleets took part. From preliminary analyses of the archaeological data, it is believed that the Akko 1 shipwreck took part in one of these events.

1.2. The Akko 1 shipwreck

The Akko 1 shipwreck was excavated for three seasons (September 2006, June 2007 and June 2008), by an expedition headed by the Leon Recanati Institute for Maritime Studies at the University of Haifa. The wreck site (Fig. 1) is inside Akko harbour, 70 m north of 'The Tower of Flies', at a maximum depth of 4.0 m. The shipwreck remains were 23.0 m long from bow to the aft extremity, 4.38 m from the keel to the turn of the bilge, lying in a north-west to south-east direction. Only the lowest section of the port side of the hull has survived, including sections of the keel, false keel, bow timbers, hull planks, framing timbers, and ceiling planking, the majority of which were made from eastern Mediterranean hardwood (Cvikel and Kahanov, 2009, p. 40).

A variety of finds were discovered in the shipwreck including rigging elements and wooden artefacts, leather flasks, metal

objects, and ceramic ware. The majority of the metal objects were composed of cannonballs, lead bullets, muskets, brass cases and brass hooks. A total of eleven cannonballs were found, of which ten were inside the wreck (one of them is shown in Fig. 2) and one was found near the false keel (Fig. 3) under the bottom. The latter was 140.9 mm in diameter and 10.3 kg in weight, which suggests that it was a 24-pdr shot. Of the other cannonballs, one seems to be another 24-pdr, and the other shots were smaller, probably 9- and 12-pdrs (Cvikel and Kahanov, 2009, p. 51).

The surviving rigging elements found in the shipwreck: dead-eyes, blocks and sheaves, were thoroughly studied and compared with contemporary eighteenth and nineteenth century sources (Biddlecombe, 1848; Falconer, 1780; Lees, 1979; Lever, 1819; Marquardt, 1992; Rees, 1819–1820; Steel, 1794; Steel, 1805). The analysis of the rigging components suggests that Akko 1 was a three-masted sailing vessel carrying 14–22 guns. Reconstruction of the ship based on the hull remains suggests that she was about 28 m long. These assumptions of course require further research and proof.

Furthermore, the cannonballs, lead shot, muskets, and traces of fire on the hull timbers, provide abundant evidence for the ship being involved in warfare. Another possibility is that she could have been an auxiliary vessel shipping ammunition and armament to Akko. Using cannonballs as ballast was also known to have been practiced at the time (e.g. Hunter, 2004, p. 74; Lightley, 1976, pp. 311, 314–316).

1.3. Ships and armament

Starting in the eighteenth century, British navy warships were classified into six divisions according to the number of guns they carried. Only large ships of the first three rates carrying 100–120, 84–98 and 64–80 guns, respectively, were considered sufficiently powerful to be 'ships of the line'. Fourth, fifth and sixth rate ships were equipped with 50–60, 30–50 and 20–30 guns, respectively. Ships of the fifth and sixth rates were generally known as frigates. Smaller, unrated ships were defined by their purpose or rig, such as three-masted sloops, brigs, cutters, transports, bomb vessels and gunboats (Falconer, 1780, pp. 235–238; Kemp, 1976, p. 692; Lavery, 1987, 1989, pp. 120–123, pp. 40–57; Moore, 1926, pp. 4–5). In other navies, such as those of the Netherlands, France, Spain or Sweden, no systems of rating were developed (Glete, 1993, p. 82).

The early naval guns mounted on ships were either cast in bronze or made of wrought iron. Being expensive, bronze guns were gradually phased out of naval service in favour of cast iron. With improvement in the quality of gunpowder and cast-iron technology,

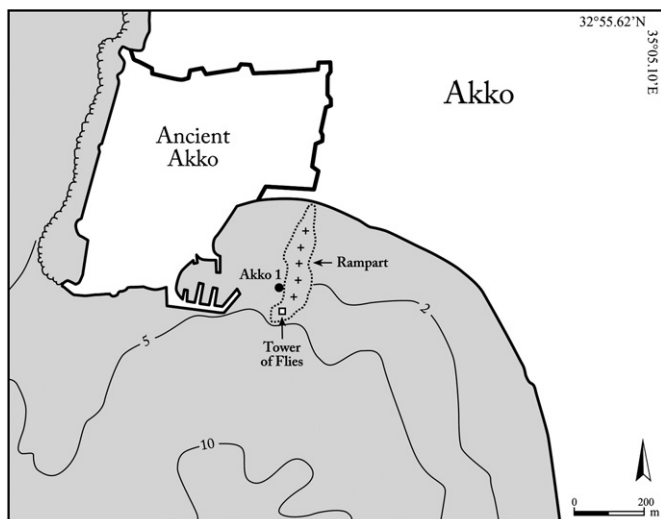
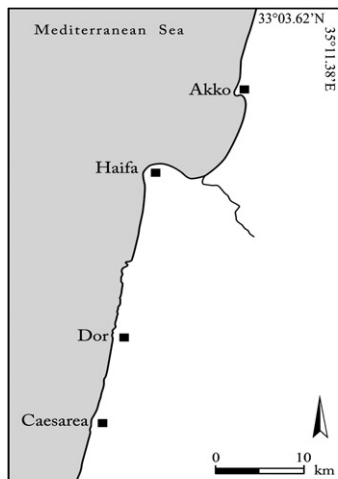


Fig. 1. Location of Akko and the Akko 1 wreck site.



Fig. 2. Akko 1, cannonball on frames.

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