

The Akko Marina Archaeological Project

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with contributions by

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COVER IMAGE *Medieval grapnel iron anchor from Akko. Photo: E Galili.*

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Anchors from the Akko Marina

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Key words: marine archaeology, Acre, stone anchor, lead anchor, iron anchor, Roman, Byzantine, Ottoman

Introduction

Anchors are the commonest archaeological find on the seabed. Generally water craft carry more than one anchor. In antiquity, ships sailing the high seas carried as many as 15 or more anchors (Galili 1985). Usually one or two anchors were used for routine work while others were stored below deck and held in reserve. Anchors made of stone and iron were retrieved during the Akko Marina archaeological project (Galili this volume a). They reflect extensive nautical activity in the harbor over the years. Two iron anchors with four particularly large arms (grapnels) were found ca. 1km south of the harbor.

Stone Anchors

Stone anchors may be roughly divided into weight anchors (stone perforated by a single hole, Fig. 1a) and composite anchors (stone slabs perforated by two or more holes, one for tying the rope and the others for inserting wooden pegs-Fig. 1b). Perforated stones or

stones circumscribed by grooves, for securing a rope, were used as weight anchors to secure water craft and fishing equipment beginning in prehistoric times, and are still used for that purpose. Weight anchors operate on the principle of holding in place the watercraft to which they are tied by causing friction between the tied stone and the seabed. Underwater archaeological studies of shipwrecks, and anchors discovered at shrines and cultic sites in a dateable archaeological context, allow the anchors to be dated and classified by type (Frost 1973). The most prominent characteristics of ancient stone anchors (as opposed to modern stone anchors) are the size of the anchor and the diameter of the hole to which the cable was tied. Traditional fishermen nowadays use stone anchors in anchoring small boats. These anchors are tied by thin, strong ropes and consequently, the hole diameter of a modern stone anchor is small compared to that of a similar-sized ancient anchor. Thus, larger, heavier anchors

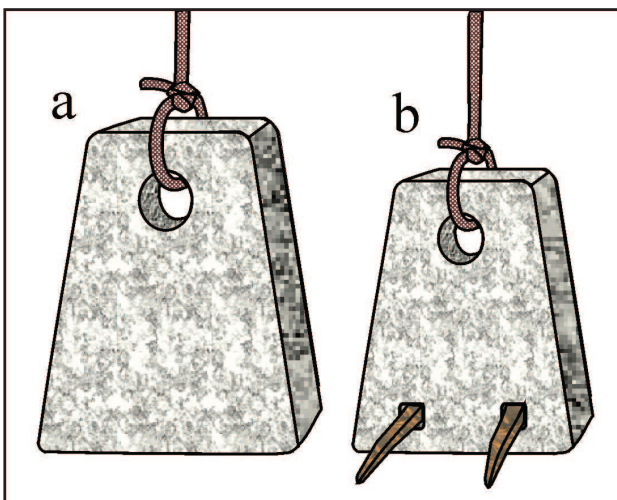


Fig. 1: Schematic drawing of stone anchors: A) one holed weight anchor, B) three holed composite anchors (S. Ben-Yehuda).



Fig. 2: Weight anchor (No. 001/3), scale = 5cm (E. Galili).



Fig. 3: Large weight anchor (No. 001/4) (E. Galili).

(50–300kg) with a large hole (7–15cm) are usually ancient. From the Late Bronze Age on, weight anchors were upgraded by inserting wooden pegs into holes at their bottom. These “composite” anchors increased holding power and allowed a reduction in the weight/mass, of the stone anchor.

Small Weight Anchor

A square *kurkar* slab with an 18cm hole (No. 001/3, weight 39kg, thickness 18cm (Fig. 2) was discovered on the seabed in the northeastern part of the eastern rampart.

Large Weight Anchor

This rectangular weight anchor was made of *kurkar* stone (No. 001/4, length 132cm, width 62cm, thickness 27cm, weight 280kg). It has one hole, 23cm in diameter (Fig. 3). It was discovered in the southwestern part of the harbor (see location in Galili this volume a, fig. 3: 22), during previous dredging. Stone anchors of this type were used mainly in the Late Bronze Age and many like them were discovered along the Israeli coast in shallow water (3–5m), especially in exposed areas (Raban and Galili 1985). The size of this anchor is unusual; it may have served as a mooring stone in the harbor.

Round Weight Anchor

A stone object was discovered in the northeastern part of Area D (see location in Galili this volume a, fig. 3), consisting of a round *kurkar* slab, 100cm in

diameter, 50cm thick, with a hole in the center, 20cm in diameter (No. 001/5). Its estimated weight is ca. 350kg. The shape of this object resembles a millstone, although it may have been used as a weight anchor or a mooring stone. It was left on the harbor bed.

Composite Stone Anchors

Three of these flat, rectangular stone slabs were retrieved. Each has two holes and weighs 4–5kg. Anchors of this size were used for small boats (3–5m long) or to anchor fishing gear. They are described in Chapter 12, under fishing gear. (see Galili and Rosen this volume c, fig. 5)

Iron Anchors

Iron anchors started appearing during the second century BCE and took the same form as the composite wooden anchors that were in use since the beginning of the seventh century BCE. Composite iron anchors were made of two parts that could be assembled or taken apart for storage. The anchor,

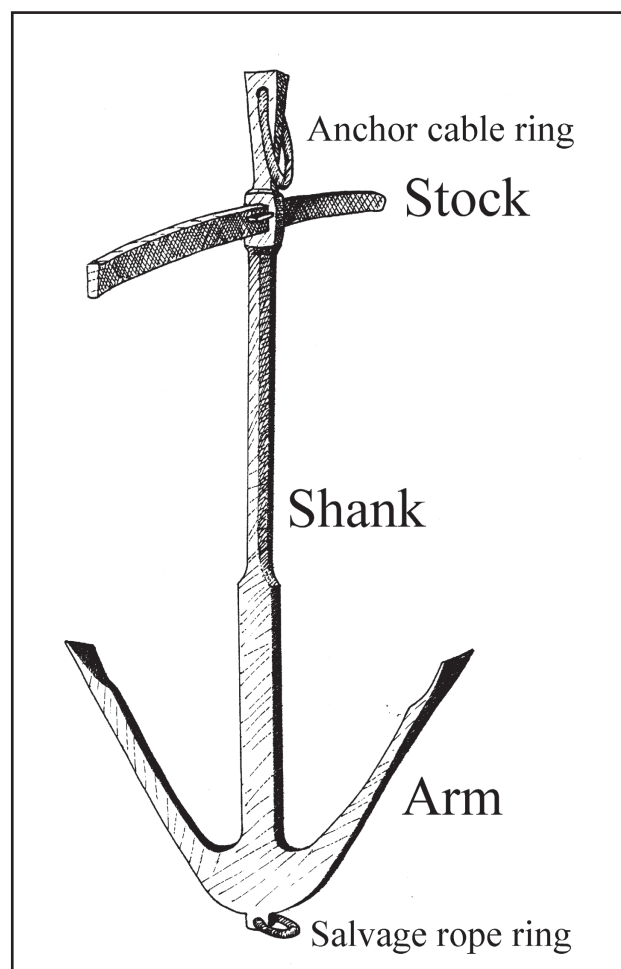


Fig. 4: Two-armed, iron, Roman anchor from Ashkelon (S. Ben-Yehuda, E. Galili).

forged as a single unit, consisted of a shank and one or two arms at the bottom. At the shank top were two holes, one to insert the stock and the other to hold a ring to which the anchor cable was attached. The stock (rectangular or round in section, having a stair in its center) was inserted into the shank top, at 90° to the arms, thus assuring that one of the arms would penetrate the seabed while anchoring (Fig. 4). The stock was secured by an iron pin or by a rope that was tied to a ring at it's end. In a number of cases, groups of iron anchors were found along the coast of Israel together with remnants of shipwrecks, which made it possible to date the anchors (Galili *et al.* 2014).

Middle Byzantine, Y-shaped Iron Anchor with Two Arms

This anchor (No. 002/1, length 147cm, reconstructed width ca. 110cm, weight of surviving portion 53.5kg), consisted of a round shank, at the top of which was a circular hole into which the vanished stock was inserted (hole diam. 6cm). Another hole at the shank top (diam. 3.5cm) was intended for a ring or a rope, which did not survive (Fig. 5 a, b). At the shank's bottom were two broad arms, rectangular in cross-section. One of the arms was preserved almost intact, but had been broken from the anchor. This anchor may be of Type E according to Kapitan's classification (1984: fig. 8). The arm may have been detached when the ship using it, was wrecked in a storm while in the harbor.

Similar anchors were found in shipwreck remains in the Marmara Sea (Günsenin 1999; Pulak 2007) and in a ship that carried a cargo of glass items, wrecked off the coast of southern Turkey (Bass *et al.*, 1984; Bass 1979). They were dated to the middle Byzantine period, the eleventh century CE. Several anchors of that type were discovered along Israel's coast, one in Ashkelon (Galili *et al.* 2000) and the other off the Carmel coast (Kapitan 1969-

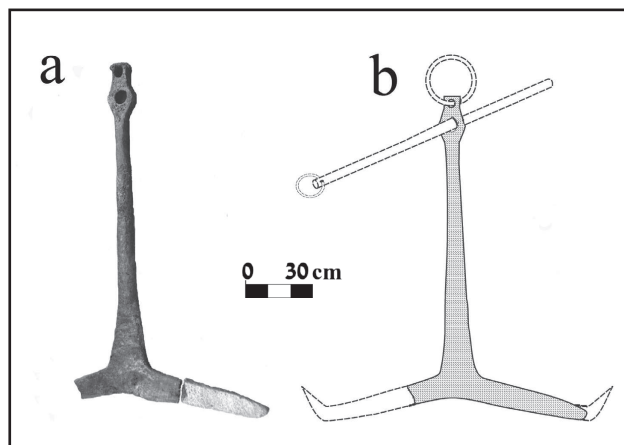


Fig. 5: A) Y-shaped, two-armed iron anchor from the Akko Marina (No. 002/1); B) Proposed reconstruction (S. Ben-Yehuda, E. Galili).

1971: 51–61, Pl. X: 6). The latter is displayed in the National Maritime Museum in Haifa (Inv. No. 613.6). A group of 13 anchors of this type were found at Haifa Bay ca. 3km south of Akko at a depth of ca. 11 m (A. Kotzer, pers. comm).



Fig. 6: A) Fragment of cross-shaped iron anchor from the Akko Marina (no. 001/2, E. Galili)

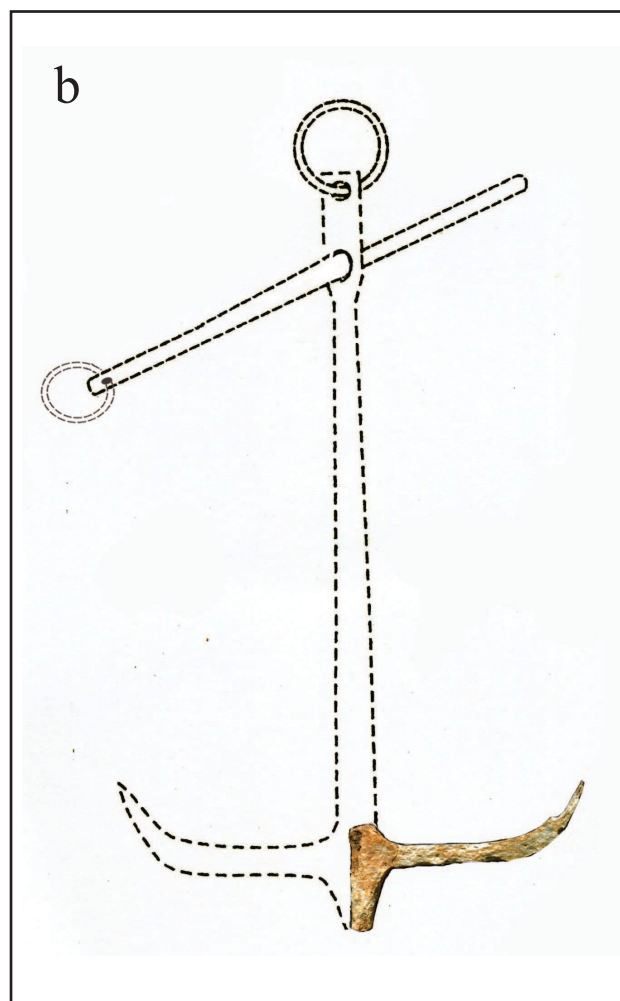


Fig. 6: B) Proposed reconstruction of the anchor (S. Ben-Yehuda, E. Galili).

Byzantine Iron Anchor with Two Arms in the Form of a Cross

Also recovered was a fragment of an anchor (No. 001/2, length?, reconstructed width 100cm, thickness 4.5cm, weight of surviving portion 9.8kg). One arm survived along with a part of the shaft (Figs. 6A, 6B). The 90° angle between the shank and the arm and its general form date this anchor to the Byzantine period (Kapitan 1984: fig. 8/D). That anchor type was common from the fourth to the seventh centuries CE. Dozens of similar anchors were found along the Israeli coast, mainly on the northern Carmel coast (between Atlit and Haifa), in the southern anchorage at Dor and in the anchorages of Apollonia, in Caesarea and Ashkelon.

Iron Anchors with Four Arms (Grapnels), found south of the Akko Marina

Following a report by the fisherman A. Kotzer, a particularly large iron anchor. (Figs. 7a, 8A, 8B), was discovered ca. 1,800m south of the Akko Harbor, about 800 m from shore, on the rocky seabed at a depth of 12m (N 32° 54' 12"; E 35° 04' 08"). The anchor, which has four arms, was 480cm long, and had a maximum width of 200cm, with a ring (diam. ca. 50cm) on the upper part. At the ends of the arms were four triangles (the bills) embedding the anchor into the seabed; they measured 50 × 50cm. The wide section of the anchor and the arms were found facing in a generally western direction (at an angle of 300°) and the ring to which the cable would have been attached was facing east. The underwater

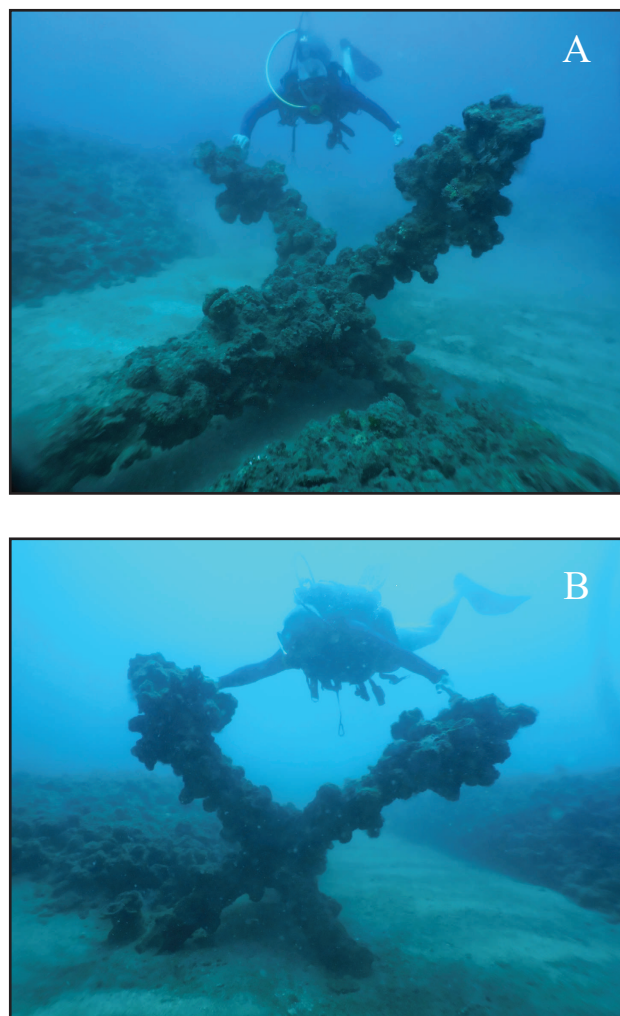


Fig. 8: A,B) Diver examining iron grapnel a (E. Galili).

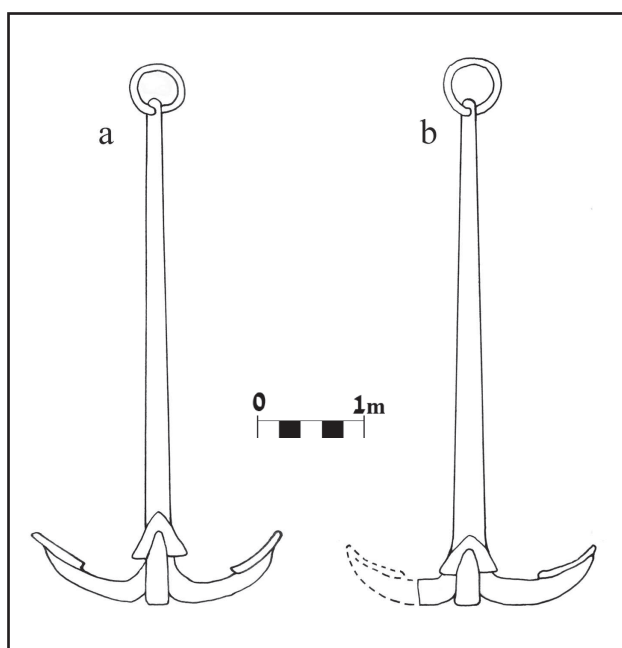


Fig. 7: Two iron anchors with four arms discovered south of Akko the Marina (grapnels) (E. Galili).

survey in this area in 2004 revealed another anchor 150m southeast of the first one, similar in size and shape (length 500cm, width 200cm); however, two arms were broken (Fig. 7b). The latter anchor lies in a general north-south direction (at an angle of 190°) with the arms to the south and the ring to the north. The arms seem to have been broken due to stress on the anchor in a stormy sea. Presumably both anchors were lost by ships during stormy weather. Such anchors were in use during the Crusader period and are usually dated to the tenth–fourteenth centuries (Jacoby 1985). Small anchors of this type (up to 1.5m long) are used on ships to this day and are known as grapnel anchors.

Discussion and Conclusions

The large stone anchor (001/4) was apparently used during an early period of the natural anchorage, prior to the construction of the southern breakwater. Although many of the finds discovered in the harbor are dated to the Hellenistic and Roman periods, no lead parts of wooden or iron anchors from these periods were

found in the harbor. It seems that in the Hellenistic and Roman periods the breakwater and the piers in the Akko Harbor functioned in a way that ensured safe mooring. Thus the use of anchors in the harbor in these periods was limited. There is a text written before the Arab conquest, which refers to a shipyard in Acre, implying harbor activity, and shortly afterward the harbor was used by the Arabs (Raban 1993). The iron anchors found in the harbor belonged to ships that anchored there during the Byzantine period. It is possible that during the Byzantine period the harbor was not properly maintained, the breakwaters were in partial ruin and anchoring conditions were poor. The iron anchors that were found in the harbor were apparently broken during attempts to heave them up after they had become embedded in the seabed during a storm, or during a storm that severely rocked the ship and thus broke the anchor. It is also possible that these anchors originate from ships wrecked in the harbor.

During the Crusader period the Akko Harbor was the main maritime gateway to the Holy Land and saw extensive military, civilian and commercial activity. That being the case, the small number of finds from the Crusader period in the marina is somewhat surprising. Historical document of that period describes the western basin as a shallow area unsuitable for anchoring large ships. It noted that the large ships anchored in the eastern basin (Jacoby 1985). That statement explains the scarcity of Crusaders remains in the western basin. However, the eastern basin was open to southwest winds, making it dangerous to anchor there during winter storms. Indirect evidence that anchoring conditions in the harbor were poor is provided by another historical document that mentions dozens of iron anchors sent from Venice to Akko by the Venetians to be leased to ship owners (Jacoby 1985; Galili and Rosen 2008). It has been suggested that the lack of suitable conditions for anchoring during severe winter storms forced ships to anchor in the open sea. That created a need for a large number of strong, reliable iron anchors that could hold to the seabed and prevent the ships from being swept ashore and wrecked. The pair of large Crusader iron anchors found about 1,800m south of the Akko Marina illustrates the problem of lack of safe haven for large vessels in the harbor during winter storms in that period. The position in which the anchors were found could indicate that they belonged to large ship(s) anchoring outside the harbor during a storm. It seems that two of the arms of the southern anchor broke during the storm. That caused the anchor to lose its hold in the seabed. Consequently the ship was swept eastward to shore where it was grounded or wrecked. In nautical charts from various periods, an anchor symbol appears in an area where these iron anchors were discovered (Galili *et al.* this volume a). The symbol indicated a preferred spot to drop anchor in the open sea and fits the historical descriptions and the archaeological finds.

Acknowledgments

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