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Aspects of Inter-relations between Land and Sea during the Crusader Period: Crusader Seamanship in the Southern Levant

Thesis Submitted for the Degree of Doctor of Philosophy

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To my friend and wife, Ronnie

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ABSTRACT

A great number of books and studies have been devoted to the Crusades and the Crusaders. Some works have discussed the religious aspects, some have studied the various Crusades as a social phenomenon, and others have endeavored to describe these waves of knights, soldiers and simple masses through the eyes of Muslim observers. The First and the Second Crusades travelled overland, but realized soon enough that maritime logistic support was of prime importance. The subsequent Crusades travelled mainly by sea, whether directly to the Holy Land or first to Egypt and some even to North Africa.

A number of scholars have devoted their research to logistics and to maritime aspects such as sailing, water supply, transporting of soldiers and horses and their extensive research resulted in a vast amount of information. However, although the declared purpose of the Crusades was the liberation of the Holy Land, there are questions relating to maritime aspects directly connected to this part of the world that may bear further investigation.

This dissertation attempts to study which sailing rigs were used on Crusader ships sailing to the Holy Land, and what kind of ships were used in conveying forces to the Holy Land, ships generally manned by Venetian or Genovese seamen. It also examines how and where the Crusaders landed forces and horses in the Holy Land, how the fleets were managed? How did they navigate? What was the connection between the Crusader castles and the sea in general and in the Holy Land in particular?

The castle and the maritime installation (port?) of Apollonia-Arsuf were found to be particularly intriguing and became the subject of a special case study, presented in

Part 2 of this dissertation, while Part 1 is devoted to some of the topics enumerated above.

In both parts I have attempted to raise issues that have been only partly discussed to date, and to advance some new interpretations. I have also tried to make use of my own sailing experience of over 60 years and local knowledge of the Mediterranean to understand some of the problems that Crusader mariners may have faced and I eventually took the liberty of disagreeing with some of the conclusions and published by researchers.

One suggestion proposed in this study is that areas where troops and/or horses were landed in the Holy Land were directly linked to the characteristics of the ships the Crusaders used. In fact, the Crusader fleets consisted of a variety of ships, including cargo and passenger sailing ships known as round ships as well as horse-carrying ships known as *huissiers* because they had a special opening (*huis*) for loading and unloading horses, whether at the stern or the side of the ship. The Crusaders also used oar-propelled ships known as *taride* or *tarida*, most of which could be assisted by a sail if the wind was convenient, often known under the generic name “galley.” Some Crusaders from northern Europe used vessels known as cogs. Other vessels were known as *buz*, *buza* or sometimes *buss*.

Most of the vessels of that era could not sail upwind. They could advance by sail only downwind, or at best with a beam wind, blowing at the side of the ship, if the sea was not too rough. The usual rig of the sailing ship was the triangular lateen sail suspended off a long yard supported by a short mast. The lateen sail is meant to be rigged in the fore-and-aft manner, parallel to the longitudinal axis of the ship, allowing it to sail upwind. However, since the Crusader ships could not sail upwind because of their shallow draft, this work proposes that the Crusaders often used the lateen sail as if it were a square sail, rigged roughly across to the ship. This theory is supported by substantial iconographic evidence, some of which is presented in this work.

The coast of the Holy Land had very few serviceable ports, if any. The only real one was the harbor or port of Acre and it could accommodate only a limited number of ships. If a fleet arrived in Acre, the ships had to drop anchor in the bay and await their turn, because of insufficient space near the piers. This work briefly studies all other possible mooring places along the coast of the Holy Land, none of them capable of accommodating fleets. This leads to the suggestion that landings of large forces and/or horses took place along beaches rather than at the single real port available. It is known, for example, that when Richard the Lionheart landed in Jaffa, on July 1192, he had to pull his galleys up to the beach, and that could probably be done only on the beach north of the mooring basin. The basin itself had no beach and could be entered through an opening between a chain of reefs and the rock known as Andromeda's Rock. This also leads to the assumption that vessels carrying horses were probably of the kind with a stern-opening gate. This would have allowed landing on a beach directly from the ship, even for knights mounted on their horses, rather than ships with an opening at the side, more suitable for ports with proper piers, as the unloading of horses and troops had to be made from an upper deck via a gangway.

Research for this dissertation was not limited to written and illustrated sources, whether secondary, primary or iconographic, but involved substantial field research. Part of the field research consisted of the author, in his own sailboat, following routes sailed by the Crusaders and, in particular, trying to emulate King Richard's voyage from Acre to Jaffa to save the Christians besieged there by the Saracens. This attempt was made on a date close to the one on which when the king sailed, in July, and along the same route (except for changes in Haifa bay due to modern structures and shipping). The results confirmed the possibility that the distance could indeed be covered in a 12-hour time frame, as related by Ambroise, the chronicler of King Richard's travels to the Holy Land.

The other part of the field research was conducted in the sea surrounding the so-called port at the foot of Apollonia-Arsuf castle, as well as in that marine installation itself. The research in the area surrounding the installation was conducted by using ground-penetrating sonar that scanned the sea bed, down to some depth beneath it. A number of possible targets were located by the sonar and water-jetting[1] was performed by divers, revealing some finds, located between 1 and 3 meters below the sea bed. The most interesting was an olive pit dated by ^{14}C to 880– 1020 CE and a piece of metal-impregnated wood dated to 1280–1400 CE. Granite columns were also discovered, about 150 meters offshore. Their origin, found to be from the province of Bergama in Turkey, can now shed new light on many similar columns in the castle itself which, to date, were believed to be of Egyptian origin.

Another element of the Apollonia-Arsuf field project was exploration of the marine installation with the assistance of 30 volunteers. The work consisted of removing debris from certain areas in the port (which measured approximately 30 meters wide by 80 meters long) allowing verification of its depth, and the measuring and drawing of the southern and northern ashlar walls (breakwaters?) delimiting the port. It also

[1] Water-jetting involves diving and directing a strong stream of water through a steel pipe connected to a hose which, in turn, is connected to a pump located on a boat. The pump sucks sea-water and redirects it to the hose. The diver pushes the steel pipe into the sea bed as far as it will go and any object located under the sea bed is pushed up by the water jet, emerges and is collected by the diver.

involved a study of the western – seafront – wall, which is in essence a natural reef. It was found out that the northern wall is mainly built of ashlars laid as headers,[2] typical of marine structures. We also discovered that the wall was built on a ramp, which proves that the intention of the builders was to create a deep pool.

In one part of the marine installation silt was sucked out in an attempt to reach bedrock, which was found at a depth of 2.40 meters below the present sea level. Over 70 probes were made by water-jetting which proved that the average approximate depth of the port's bottom to be about 2.40 meters below sea level.

However, although the signposts at the castle define the marine structure at the bottom of the cliff as the "Crusader Port," it is doubtful if it could be considered as such. Rather, it could have served as a small mooring basin, which may have assisted the inhabitants of the castle to use small boats for communicating with ships moored outside.

In sum, this dissertation attempts to describe the magnitude of Crusader seamanship, and the complexities of their major combined sea-land operations. It presents theories as to the type of rigs used to sail from Europe to the Levant, and their landing places in the Holy Land, as well has how they managed their vessels in terms of resolving the problems of victualing and especially watering entire fleets and horse carrying ships. In addition, research is presented to fathom the mystery of Apollonia-Arsuf and its connection to the sea.

2 Built at right angle to the direction of the wall.

Ignoranti quem portum petat, nullus suus ventus est [3]

Lucius Annaeus Seneca

INTRODUCTION

I take the liberty of commencing this introduction on a personal note: I grew up on the shores of the Mediterranean and for the last 60 years I have sailed across it and along most of its shores, except, where, unfortunately, I was banned because of my Israeli citizenship. I have sailed in and out through the Straits of Gibraltar, the Pillars of Hercules and crossed the Atlantic in my sailboat, sailed in the Pacific to and around Bora-Bora, cruised in Thailand, in the Sea of Andaman, sailed in a replica of a Viking boat in the Baltic Sea, got caught in fishing nets near Tangier and went deep-sea fishing on the Grand Banks of Newfoundland.

But for me, the Mediterranean – with its blue waters and fickle winds, the Aegean with its unpredictable, fierce Meltemi gusts, the Adriatic with its Bora, which blows without any prior warning, the Gulf of Lyon with its Mistral, or the Levanter that blows through the Straits of Gibraltar – is the king of all seas. It is because I became familiar with the difficulties that can be encountered in all these seas that I became so intrigued by the Crusades: How did they manage their extraordinary acts of seamanship – transporting tens of thousands of people, equipment, pilgrims, knights and their horses in the small ships at their disposal? Of these sailing vessels, some were propelled by oars, dependent on manpower and, occasionally assisted by sails, none of which could advance against the wind for any substantial period of time.

[3] If one does not know to what port he is steering, no wind is favorable
(Downloaded from http://www.brainyquote.com/quotes/quotes/l/luciusanna100585.html)

In the lines below I shall try to raise some questions that, to the best of my knowledge have not been addressed to date in other scholarly works, or, at least, have not been fully addressed, and to advance some theories in response to these questions.

*   *   *

Sailing across the high seas, rather than along the coast, from the late twelfth century, shortened the trans-Mediterranean voyage (Jacoby, 2007, 62), and this involved the question of navigation on the high seas, out of sight of land. This merits separate research and shall not be treated in detail in this work. Nevertheless, I will briefly describe the sea routes taken by the Crusaders, the fact that sailing also at night could not be avoided as related, for instance, by Ambroise in describing how Richard the Lionheart entered the sea, hoisted his sails to the wind and rushed during the night under the stars:

> Qui encore crt mult deshetiez:
> Entra en mer a lor congíez,
> E fist al vent lever les veiiles,
> E curut la-nuit as esteilles[4]   (Ambroise, 12288–12290)

The possibility that Crusader mariners made use of the recently introduced magnetic compass will be mentioned and proposals will be made concerning possible methods of dead-reckoning navigation, and celestial navigation that may have been employed by the Crusaders.

*   *   *

[4] Ambroise was probably a clerk, some say an itinerant musician. He was the chronicler of the Third Crusade, author of *L'Estoire de la Guerre Sainte*, which describes in rhyming Old French verse the adventures of Richard Coeur de Lion as a Crusader.
"…Took leave and lingering no more/ Boarded his ship and left the shore/with sails spread to the wind. That night/ He sailed having the stars for light." (Translation: Merton Jerome Hubert).

In November 1095, Pope Urban II preached his historic sermon in Clermont, calling for an expedition to liberate Jerusalem from the yoke of the Saracens and to save the Christians in the East. Western Christendom immediately heeded the papal call and between 1096 and 1099, the first expeditions set out overland, via the Balkans and Anatolia, for the East. However, soon enough the need for naval support became apparent. The navies of the Italian maritime cities played an essential part in the support of the military operations for conquest of the Holy Land (Dotson, 2006, 64; Balard and Picard, 2014, 58). It was only by the sea that forces could maintain contact with the West, receive logistical support, supplies, reinforcements and equipment and, at a later stage, horses and mounted knights. The Genoese, who arrived in Jaffa in June 1099 with a number of galleys, supplied the besiegers of Jerusalem with wood and equipment taken from their ships (Asbridge, 2010, 305; Balard and Picard, 2014, 58; Grousset, tome I, 1934, 215). They even supplied the Crusaders with food:

> The ships, laden with food, put an end to their hunger
> But could do nothing to extinguish their desperate thirst.
> (Sweetenham, 2005, 198)[5]

The conquest of Haifa, Caesarea, Arsuf and Acre (Jacoby, 2007, 58) could not have been achieved without the assistance of the Italian fleets, which were given many privileges in compensation, in some cases one third of the conquered cities.

Once the coastal area was taken, the Italian vessels remained for surveillance and to help counteract the Egyptian fleet based in Ascalon until the conquest of that city in 1153.

While the first two Crusades chose the land routes as the main avenue of approach and had to cross the Balkans and Anatolia, by the end of the twelfth century

[5] Quotation from Robert the Monk, History of the First Crusade, Book IX.

transport by sea was preferred not only for logistic support but above all, for the passage to Outremer of major manpower. In the Third Crusade, in 1191 Philippe-Auguste approached Genoa to transport his troops, whereas Richard the Lionheart used the English nefs, cogs from northern Europe, the *busses* from Marseilles and the galleys of Genoa and Messina. In 1203 Venice built and armed approximately 230 vessels in order to fulfill its obligations under a contract concluded with the delegates of the Fourth Crusade. Frederic II used the naval resources of Puglia (Apoulia) and of Sicily for his expedition of 1227–1229. In 1247 Louis IX (Saint Louis) appointed two Genoese admirals to negotiate the charter of ships he required for his Egyptian Crusade. All these maritime projects enhanced ship-building in the maritime cities of Marseilles, Genoa, Venice and, to some extent, also Pisa. These activities and mass travel to Outremer generated profits for the maritime cities and to their ports, as well as to the ports in Puglia and Barcelona.

The requirements of the Crusades also generated new navigational techniques and new organization and management of the various fleets, which some scholars describe as a maritime revolution (Pryor forthcoming).[6] Ships with greater carrying capacity began to be built in the second half of the twelfth century.

Much research has been done about the Crusades, including the study of transport by sea of horses, pioneered by Pryor, or Dotson.[7] However, it seems that some questions concerning Crusader seamanship remain unanswered. For example, Ambroise and others describe that Richard the Lionheart, in his attempt to save the

6 The beginning of this introduction is based on the chapter entitled *Les croisades et la mer* in Balard and Picard, 2014, 58–59.

7 For example: J. E. Dotson, "Ship Types and Fleet Composition," *Logistics of Warfare in the Age of the Crusades*, ed. by J. H. Pryor, Aldershot, 2006, pp. 63–75. Or J. H. Pryor, "Transportation of Horses by Sea during the Era of the Crusaders: Eighth Century to 1285 A.D.," *Mariner's Mirror* 68.1, 1982, pp. 9–27. 68.2, 1982, pp. 103–126.

Christians from Saracen massacre, sailed from Haifa to Jaffa in 12 hours only. They even describe how he removed his leg armor and jumped into the water, which reached up to his belt (or groin, depending on the version). But how did Richard manage to sail from Haifa to Jaffa within approximately 12 hours? And where in Jaffa did he land? The beach is now and probably was then north of the port.

Among the questions research has not sufficiently answered is how horses and knights were transported from ship to land. Clari describes how the mounted knights descended from their ships during the invasion of Constantinople (Clari, 1966, 68) but there is little information on how such landings took place in the Holy Land and which ports, if any, were able to accommodate the huge Christian fleets. A theory shall be advanced in the present work.

Despite the extensive study of the port of Acre it seems that some issues about that city have yet to be addressed. For example, how could such a small port accommodate a fleet of many dozens of galleys, assuming that each galley or "Round Ship" measured over 30 meters in length, and a fleet consisted of thirty to fifty galleys and round ships bringing the total length of the vessels to more than one kilometer?
The so-called "Port of Apollonia" may have played an important role in establishing a connection between the Crusader castle and the sea, and it was, therefore, suggested to study this so called "Port" as a test case. But what was the Port's role? And was it indeed a port?

A substantial research project in and around the Port of Apollonia used boat-mounted, ground-penetrating sonar to locate underwater findings in its vicinity. An additional underwater research involving more than 30 volunteers was performed inside Apollonia-Arsuf 's so-called "port" itself.

Answers to some of these and other research questions can be found only by actual experience at sea. For example, I endeavored to simulate King Richards's voyage from Acre to Jaffa in a sailboat, during approximately the same dates and covering the same distances, absolutely avoiding the use of an engine, in order to examine the veracity of the story, as told by Ambroise, at least in terms of the amount of time Ambroise said it took.

I studied ancient texts and illuminations to understand the use of various rigs, modes of fleet operation and the use of small vessels. I tried to reach conclusions by studying medieval pictures and illuminations as, for example, the illumination of a fleet sailing to conquer Troy:

Fig. 1. *A fleet sailing to conquer Troy, (14th century)*
Les Livres des Histoires du commencement du monde.
British Library, Stowe 54, fol. 82 verso.

This medieval painting has, obviously, nothing to do with Troy and is the fruit of the imagination of the medieval artist. But it does contain substantial information concerning the rigs (lateen or square), structure of rudders (stern rudder as opposed to rudders mounted on the quarter), towing of small boats and so forth.

I attempted to trace the use of floating sea anchors, or regular anchors meant to dig into the seabed in ancient writings. I found it astounding that the seamen, manning the ship in which the Apostle Paul was transported, to Italy, took action similar to what modern sailors would take when facing the risk of running aground.

> Because they were afraid they would run aground on the sandbars of Syrtis, they lowered the sea anchor and let the ship be driven along.…
> (*Acts* 27:17, New International Version)[8]

On the other hand, when faced again with the danger of being smashed against the rocks, these ancient sailors preferred to anchor with the stern facing the elements, a choice that would seem strange to the modern skipper:

> And they took soundings and found *it* to be twenty fathoms; and when they had gone a little farther, they took soundings again and found *it* to be fifteen fathoms. Then, fearing lest we should run aground on the rocks, they dropped four anchors from the stern, and prayed for day to come. (*Acts* 27:28)

The episodes described in the Acts took place well before Crusader times but they serve as an examples of ancient seamanship, which developed slowly until it reached the sophisticated capabilities of the medieval seaman. The storms suffered by the Apostle Paul were typical to the area and may be similar to those that dispersed the fleet of Richard the Lionheart when he sailed to Cyprus.

It is known that medieval ships could not sail against the wind. Actually, even modern sailing yachts cannot sail directly against the wind, but they can advance in the general direction against the wind by tacking: sailing with the bow of the ship at a certain angle to the wind and altering course right and left, thus zigzagging forward.

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8 Although in some versions, as, for example, in the New English Bible, they lowered the sail rather than a floating anchor: "Then, because they were afraid of running on the shallows of Syrtis, they lowered the mainsail and let her drive." Or, in the French translation: "… dans la crainte de tomber sur la Syrte, on abaissa les voiles" (La Sainte Bible, Paris, 1954).

Medieval ships could only sail with the winds behind them or, in the best case, with the wind abeam. So how did they reach their destinations in the Mediterranean, where the winds are notoriously unstable? How much could they advance by rowing? What kind of sails did they have? Did they use small boats for assisting them in their maneuvers?

The main topics discussed in the present work shall therefore be as follows:

Part 1 shall deal with the following points:

- A general discussion of sea-going vessels used by the Crusaders.
- The Third and the Fourth Crusade.
- A study of iconographic sources reflecting various kinds of maritime transport, which will also present a theory concerning the rigging methods, use of small liaison boats.
- A sailing trip simulating descriptions from primary sources of Richard the Lionheart's voyage from Acre to Jaffa.
- Crusader fleet seamanship and management.
- Naval support of land operations, landing and beaching techniques and their applicability to Holy Land ports.
- The landing of the Crusaders' horses and its reflection on both vessel construction and choices of landfall in the Holy Land.

Part 2 is devoted to the "military port" of Apollonia-Arsuf and presents the following information and discussion:

- The maritime structure located at the foot of the Apollonia-Arsuf Castle, otherwise known as the "military port" of Apollonia- Arsuf. Discussion includes:

- The maritime structure located at the foot of the Apollonia-Arsuf Castle, otherwise known as the "military port" of Apollonia-Arsuf was the subject of the following studies:
- General description and photographs, including GIS scans and drawings.
- Sub-bottom profiling with a ground penetrating Sonar near the reefs surrounding the "port."
- Water-jetting targets located by the sonar, and sending finds to ^{14}C examination, which revealed interesting results.
- Clearing debris in the port by volunteer divers, measuring and drawing the built walls surrounding the "Port".
- Studying two granite columns found underwater off the shore, and discussing petrographic analysis performed in Italy.

Part 1

Of Ships, Seamanship and Fleets

FOREWORD

One of the longest frontiers of the Holy Land is the sea shore. An efficient way to transport troops, provisions, horses and pilgrims from Europe to the Eastern Mediterranean was by sailing across the sea from any European port, be it Marseille, Aigues Mortes, Sicily or even Constantinople.

This became obvious even during the First Crusade, though most of its forces marched overland (Dotson in Pryor, 2006, 64). It quickly became evident that any long term Western presence on the Eastern shores of the Mediterranean would require a reliable maritime supply (ibid.).

In modern times, ships are divided into three main categories: warships, cargo ships and passenger ships.[9]

The fleets that transported the Crusaders were rather a mixed lot, relying mainly on ships supplied by the Italian maritime states. Some of the Crusaders came from countries that were not classically seafaring in nature, for instance, Germany. The Crusaders themselves were rarely seamen. It is actually a paradox that operations often grouped under the collective name "Passage d'outre mer"[10] involved tens of thousands of landlubbers (Mollat, 1967, 345; Rubenstein, 2011, 55–79; William of Tyre, second book and many others). Some did not have the financial means to travel by sea. Some resented travelling over the water.

Nevertheless, over the years, a multitude of ships was used to ferry the Crusaders and those accompanying them. And, indeed, since the religious principles of the Crusaders obliged the knights to allow various crowds to accompany them, they

9 Although World War I and II saw the introduction of 'Merchant Cruisers' – cargo ships equipped with guns for self-defense, and the East Indiamen were well known for being able to defend themselves (http://en.wikipedia.org/wiki/Armed_merchantman).

10 Passage beyond the sea.

had to travel in company with numerous pilgrims and penitents (Grousset, 2006, Vol. II, 223). Women also were not excluded. A slightly humorous note can be detected in the *Chanson d'Antioche*, a rhymed epic poem of the first Crusade describing how young virgins accompanied their fathers who caused them to be born.

> Beaucoup de dames prirent la croix
> Et les nobles pucelles que Dieu a bien aimées
> S'en furent avec les pères qui les ont engendrées'[11]
> (*Chanson d'Antioche*, 50)

We should therefore visualize a great mixture of ships, which necessarily sailed at different speeds, used different means of propulsion and defense, and possessed different capabilities of withstanding difficult seas and bad weather, all this combined with the inherent difficulty, not to say impossibility, of sailing upwind.

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[11] "Many ladies took the cross/ and the noble virgins that were beloved by the Lord/ went away with the fathers that created them."

CHAPTER 1 – TYPES OF SHIPS

Many sources refer to various ships used to transport troops, pilgrims,[12] (including women), luggage and horses: de Sandoli, 1978, II, XI, refers to the fast-running dromons which he describes as measuring 40 meters long, 7 meters wide and 5 meters high with 25 oars on each side and one or two masts, capable of carrying over fifty men and women with their luggage, and sporting two castles of wood on the bow and the stern. De Sandoli also refers to a type of ship called a *buza* used for transportation, but the most famous are the *galera*, *galea* or galley for fighting, that could also carry 157 men besides horses, women and other staff. The rostrate, which means a boat or ship having a beak-like part extending from the bow used to ram enemy ships, was also used, beside many other types of craft, such as the gate (also called *catte*), as well as the *gulafri*.[13] Another ship often referred to in various manuscripts is the *tarida* or *taride* – a shallow craft, propelled by oars and or by sails on two masts, used for transporting goods, troops and horses (Jabour, 2012, 11).

Saewulf, a pilgrim who made his way to Jaffa on or about 1102, recounts his horrible landing in the Holy Land when about thirty ships anchored opposite Jaffa "port" dragged their anchors in the storm[14] and were wrecked on the beach. Some of these ships, as he writes "are commonly called Dormundi, others Gulafri and others

[12] The term *peregrini* covered both pilgrims and Crusaders, as is seen for instance, with respect to the passengers of the ship *St Victor* in 1250. Occasionally, though, the former were distinguished from the latter, called *milites peregrini* or *peregrini crucesignati. Peregrini* sailing with their horses were obviously Crusaders. (Jacoby, 2007, 58–59).

[13] This probably refers to various kinds of boats, as described in *Saewulf*, p. 26
"…miserunt quamplures perierunt perpauci quippè proprià virtute confidentes ad litus illesi pervenerunt Igitur ex navibus tri ginta maximis quarum quaedam dormundi quaedam vero gulafri quaedam autem catti vulgariter vocantur omnibus oneratis palma riis vel mercimoniis antequàm a litore discessissem vix septem il lesae permanserunt Homines verô diversi sexûs plusquàm mille die illâ perierunt majorem etenim miseriam unâ die nullus vidit ocu lus sed ab his omnibus suî gratiâ eripuit me Dominus cui honor et gloria per infini ta secula amen."

[14] A ship "drags the anchor" if the pressure of the wind and or the waves is so strong that the anchor loses its grip and is pulled out from the seabed.

Catti" *(Saewulf*, 1892, 8). The footnote to his tale qualifies the Dormundi as similar to the "Dromones." The "Catti," Saewulf states, "were probably similar to the Norwegian colliers, having a narrow stern, projecting quarters, and a deep waist," whereas the "Gulafri" were probably some form of galleys" (Saewulf, 8, footnote 1). Rather similar remarks are made in a different version of Saewulf's story:

> Thus of thirty ships of largest size, of which some were 'Dromonds' (that is to say, having two tiers of double oars), 'Gulafri' (a sort of Galley) and 'Catts' (vessels narrowing at the stern, with overhanging quarters and a deep waist). (Boulting, 2001, 81).

However, apparently very big ships came into service for transporting goods during the second half of the twelfth century, before the Third Crusade. This is illustrated in March 1173, when Romano Mairano, a Venetian merchant, undertook to transport 1,400 trunks from "from Verona," and 600 planks of fir from Venice to Alexandria, the weight of which may have reached 450 metric tons. Mairano operated a three-masted ship, probably one of the largest vessels sailing the Mediterranean at the time (Jacoby 2005, 110).[15]

The first two Crusades marched overland, while the Third Crusade was the first in which troops were carried overseas by ships. I will, therefore, briefly discuss the composition of the fleets of the Third and Fourth Crusades. Relevant information will also be presented with regard to the Fifth and Sixth Crusades, for example, the naval operations for the attack on Damietta during the Fifth Crusade, as well as, in the Seventh Crusade, the special horse-carrying vessels of Louis IX.

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[15] Although apparently Muslim ships of the eleventh century and first half of the twelfth century were generally bigger and could carry a few hundred passengers, there is no evidence of Christian ships of corresponding size (Jacoby, 2008, 82).

The literature about the Sixth Crusade, also known as "the Crusade of Frederic II" reveals no special phenomena relative to seamanship, over and above what was mentioned briefly in the introduction. One noteworthy fact concerning the departure of the fleet, in the summer of 1227, at Brindisi, the intense heat, the problem of potable water and disease struck down many of the Crusaders, so a good portion of the army returned home. Also significant is that the emperor himself did not depart (Madden, 2006, 158). He landed in Acre only on September 7, 1228 (Mayer, 1991, 235), and finally managed to regain control of Jerusalem.

The Ships of the Third Crusade

Three fleets transported participants of the Third Crusade to the Holy Land: One of King Richard the Lionheart, one of the King of France, Philippe Auguste and the third fleet, from northern Europe, directed by Danes and Frisians. This fleet consisted of fifty cogs carrying 12,000 armed warriors, which arrived in time to assist the forces attacking Acre but then found themselves surrounded by the Turks (Nicholson, 1997, 71–72). The cog was a typical northern European ship, probably with straight stem and stern, with a deep draft which allowed it to sail better than flat-bottomed ships (Landström, 1969, 77).

The two other fleets, that of Richard and of Philippe Auguste started their trip from Messina. After its arrival in Messina, King Richard's apparently magnificent fleet was described as "la merveille des enekes"[16] (Ambroise, 535). Richard's war horses were apparently brought to Messina by dromons, as Ambroise described: "Issi

16 Probably meant to be *sneckas* (Nicholson, 1997, 174), the *snecka* or the *knorr* being long and narrow boats associated with the Vikings.

vint li reis el rivage/Si ot encontre lui son barnage/Ses biaus destriers lui amenerent/ Qui en ses dromonz venu erent" (Ambroise, 595).[17]

In Messina Richard the Lionheart met with King Philippe Auguste. They wintered in Messina and the French king set out directly for Acres on March 30, 1191. However, King Richard was not yet ready:

Li reis Richarz ne pot movoir
Kari l n'ot prest son estoveir,
Ses gales ne ses uissiers
A porter ses coranz destriers
E s'armeure e sa vitaille. (Ambroise, 1025–1030)[18]

Richard had also been waiting for his future wife Berengaria (Nicholson, 1997, 174). He finally set out 17 days after the French king.[19]

These few lines by Ambroise reveal a great deal of information about Richard's fleet: It has galleys, and horse-carrying vessels (*uissiers)* showing that the king intended to ship horses. The fleet also had at least one ship known as a buss, a large transport ship, since the Queens Joanna and Berengaria arrived at Limassol aboard a *buss* (Nicholson 1997, 178). It appears from various sources that King Richard's fleet contained between 39 and 52 galleys (Pryor, forthcoming, and the sources cited there, 8).

We do not know exactly the composition of the French King's fleet, but, apparently, part of it consisted of *busses* – (Nicholson 1997, 177). From 1189 to 1190 Philippe Auguste appointed the noble Hugues III of Burgundy to negotiate with Genoa the supply of transports for 650 knights, 1,300 squires (*écuyers*) and 1,360

[17] "When the king's ship approached the bank/His barons and his knights of rank/Met him and led his steeds of war/Which transport-ships had brought before." (Translation: Merton Jerome Hubert.)

[18] "King Richard cannot move from there/ for still unready is his gear/ The ships and galleys that he needs/ For transport of his battle steeds,/ His armor and supplies as well." (Translation: Merton Jerome Hubert).

[19] The exact date of Richard's departure is not clear. Ambroise simply says that he set out on Wednesday of Holy Week, for the glory of God. "Co fud la semaine penose… Al sucurs Deu e a sa gloire. Le mescredi de la semaine" (Ambroise, 1186). This may not necessarily be correct.

horses (Sivéry, 1993, 105). A fourteenth-century miniature[20] that depicts King Philippe Aguste awaiting his fleet, shows rather big, two-masted ships.

The Ships of the Fourth Crusade

The appendix to Clari's *Conquest of Constantinople* entitled "Note on the Fleet and the Forces" reads as follows:

> Contemporary accounts of the expedition generally agree in describing the fleet as made up of three types of vessels: galleys (galee, galiae), 'ships' (nes, naves), and horse transports (uissiers, usariae). The galleys were the fighting convoys, long narrow vessels propelled by oars, with auxiliary sails. The galley of this time was about 100 feet over all, and it carried a crew, mariners and rowers, of more than 100, and a certain number of marines, largely archers and crossbowmen. The ships were the large merchant vessels or freighters, converted into transports. They were sailing vessels, usually two-masters and two-deckers, broad in the beam and capable, some of them, of carrying a thousand passengers or more….We need not suppose that all the transports supplied by the Venetians were as large as this. Probably there were only a few of these great ships, built especially for the leaders….the Aquilla mentioned by Danulo….there were only four or five ships in the fleet that were high enough to reach the wooden towers which the Greeks built on the walls.[21] The horse transports, or uissiers (so called from the huis or door in the side), belonged, it seems, to the general type of the galley; they were long narrow vessels propelled by oars, with space in the shallow hold for a number of horses. Jal reckons that the uissier of this time carried about 40 horses and 80 squires, in addition to the crew.
> (Clari, 1996, 132)[22]

Jal, however, speaks about different kinds of horse transports (*usiae, ussaria, usserius, user*, *huisserius*) (Jal, 429), He quotes Joinville who explains how after the

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[20] See below, Fig. 16.
[21] Of Constantinople.
[22] De Clari refers to Archéologie Navale of Jal, vol. 1 p. 480. I did not find it on this page but rather, various references to *huissiers*, which he spells with an H at the beginning.

horses were placed on board the gate or door at the stern had to be waterproofed "like a barrel." In Joinville's ancient French:

> Acelle journee que nous entrames en nos nez fist l'en ouvrir porte de la nef et mist l'en touz nos chevaus ens que nous devions mener outré mer, et puis reclost l'en porte et l'enboucha l'en bien aussi comme l'en naye un tonnel. (Joinville, 220)[23]

Jal also distinguishes between horse-bearing vessels propelled by oars, and round ships propelled by sails only, which needed tugs (*remorques*), probably in order to facilitate maneuvering, especially when landing horses (Jal, 431). With regard to the size of the horse-carrying vessels, Jal thinks that the transports chartered by Louis IX from the Venetians (in the Seventh Crusade) could carry 50 horses each[24].

The use of the horse-bearing ships with an opening door that becomes a bridge (most probably in the stern, as discussed below) is documented by Clari who describes the first landing of the Venetian forces near Constantinople:

> As soon as they had made land (the ships carrying the knights), the knights issued forth from the transports on their horses; for the transports were made in such a way that there was a door that could be opened and a bridge thrust out by which the knights could come out and land all mounted. (Clari, 68)

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23 "On that day, when we have entered our ships, the door of the ship was opened and all the horses that we had to carry beyond the sea [*outre mer*] were put on board. Then the door was closed and sealed as one would seal a barrel."

24 Each horse was accompanied by two squires and one knight, in addition to the mariners, crew etc.

CHAPTER 2 – BETWEEN TEXT AND IMAGES

Maritime Transport in the Crusader Period

Pictorial evidence is one of the sources that may help us in our attempt to understand, reconstruct, or at least to try to imagine, the shape, structure and functioning of ships and boats used by the Crusaders. While proportions are often distorted it seems that the description of the rigs is consequential, and leads to the proposals concerning the shape of sails and the manner they were used. However, before proceeding some attention should be paid to the problems and risks inherent to using iconography as a direct source of information. Illuminations, obviously, are not and never were an exact reproduction of reality, and, as aptly put by Burningham and de Jong:

> However, these artists obviously satisfied their audience. The ships they drew must have been recognized as representing …. ships of the time. As with caricatures, many relative dimensions will be accurately represented even though the overall form is distorted.
> (Burningham & de Jong, 1997, 288)

Flatman argues that:

> Manuscript illuminations provide detailed and often relatively accurate depictions of crafts like shipbuilding, structures like wharves and revetments, and activities like rowing, sailing and steering. (Flatman, 2004, 1276).[25]

Thus, some of the texts quoted below may be considered confirmed by many of the illuminations that follow. According to Lilian Ray Martin the majority of medieval Mediterranean ships had lateen rigs (Martin, 2001, 141)[26]. Before the advent

[25] See also Tzalas, 1990, who describes how even a modern iconography recently executed, depicting the modern replica of the ancient Kyrenia ship, deviates from a realistic representation.

[26] A lateen rig consists of a triangular sail hung off a long inclined yard supported by a relatively short mast, and it is essentially a "fore-and-aft" sail, rigged in a manner parallel to the axis of the ship (see Figs. 10a and 10b).

of this sail most sailing vessels were square rigged. There are many theories as to the origin of the lateen sail in the Mediterranean. Lateen-rigged vessels sailed in the Pacific Ocean as well, where this rig probably developed independently. As for the Mediterranean, most researchers think that the lateen-rigged vessels that navigated it developed in the Indian Ocean (Campbell, 1995, 4). The lateen sail is widely regarded as the sail of Arab seafarers, and some scholars attribute its diffusion to the expansionism of Arab sailors (ibid.). However, based on further research, Campbell argues that the lateen sail developed in the Mediterranean and in the Indian Ocean independently:

> It seems, therefore, that there is no longer basis for deriving the European fore-and-aft sail from the Arab expansion into the Mediterranean Sea. The fact is that both in the Mediterranean and the Indian Ocean, the Arabs learned the use of the Lateen sails from those who were on the sea before them. (ibid., 12)

In his foreword to Martin's book[27], Marco Bonino, explains that our knowledge of ancient[28] ships in the Mediterranean region resulting from archaeological sources has advanced in recent years more than our knowledge of ships and shipping of the Middle Ages in that region. Hence the importance of evidence from complementary sources, literary as well as iconographic.

In this section I shall try to analyse iconographic evidence, and, where possible, compare the pictorial evidence with the relevant sections in a contemporary medieval text such as William's of Tyre *A History of Deeds Done Beyond the Sea*, otherwise known as *History of Outremer.*[29]

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[27] Martin, 2001, Foreword.
[28] That is, before the Christian Era or the first centuries of the Christian Era.
[29] Hereafter, in the present chapter, referred to as *History*.

Crusader Ships Could probably not Sail Upwind

In order to be able to efficiently sail upwind, which means sailing with the bow of the ship at an angle to the wind which is less than 90 degrees, the ship needs two prerequisites: A relatively aerodynamic sail plan, and an underwater configuration that allows some kind of lateral resistance, such as a keel or, at least, a deep enough draft. Failing this even if the ship manages to claw its way upwind it will be pushed sidewise, or, in other words, incur a leeway, (sidewise movement), that would cancel out any forward movement. This would become even more dramatic when trying to make way against the waves. My contention is that, due to their hull shape, medieval ships could not make way against the wind in any substantial way, if at all. So, assuming that the lateen sail could theoretically enhance the upwind performance of a vessel, due to its aerodynamic qualities[30], it would be of no avail and no assistance to the medieval ship, which would slide to leeward because of its lack of lateral resistance to such movement. Without a deep keel a boat would drift sideways because of the pressure of the wind (Whitewright, ibid.). Most Crusaders ships, whether round ships or galleys did not have a deep draft.

Therefore, I suggest that, although most medieval vessels during the time of the Crusaders were lateen-rigged, they usually used their sails as if they were square sails, having the yard of the sail rigged across the vessel, and not lengthwise, in the "fore-and-aft" manner, as one would normally do with a lateen sail. Since sailing in these times was generally downwind, there was no reason to do otherwise, and no point in

[30] Some researchers cast doubts on the degree of superiority of the lateen rig over the ancient square rig (Pryor, 1988, 33). Others concluded that there is virtually no difference in the potential performance of the square rig and the lateen rigged vessel (Whitewright, 2011, 92).

using the lateen sail rigged in a fore-and-aft manner. It was also more convenient to have the yard of the lateen sail rigged across the ship, especially because changing the tack or jibing a square sail[31] is much easier than doing so with a lateen sail. The illustrations and illuminations shown below seem to prove this.

It is not without interest to quote William of Tyre, when describing the Egyptian ships, which harassed Frankish coastal navigation in around round 1151–1153. He wrote that they were well handled, well rigged and, when sailing before the wind, had the yards of their sails crossed, which means they did not have their sails rigged 'fore-and-aft' but across the ship, or athwart ship In in his own words: "La navie d'Egypte emmi la mer, qui avoit si bon vent que ils venoient a pleines voiles croisées."[32]
Sample of lateen sails rigged across rather than fore-and-aft can be seen in many of the visuals below.

In the following picture, Fig. 2, Bohemond and Daimbert are depicted twice: Once leaving the Levant (St. Simeon?), and once arriving in Apulia (Folda, 2008, 131):

[31] Changing a tack or tacking means altering the course of the ship by bringing its bow across the wind, as opposed to jibing or wearing ship, which involves changing its course by bringing the stern across the wind.

[32] Guillaume de Tyr, XVII, 85, apud. Mollat, 1967, 348.

Fig. 2. *History of Outremer.* William of Tyre, Book 11

The picture shows a merchant ship, probably Venetian,[33] with a sail which is depicted as triangular, attached to a cross yard on top of a single mast. One can note that, in the top drawing, where the ship sails away from the castle, the sail is, apparently, attached to the yard with two lengths of line, looped around the yard, corkscrew fashion, and threaded through eyelets or grommets in the sail, in two different directions: On the starboard side of the yard and on the port side of the yard. In the bottom drawing, where the ship reaches Apulia, the sail is attached to the yard by one single line, looped on the yard and threaded through grommets in the sail, in one single length, from starboard to port, revolving in the same direction.

This distinction might, obviously, be disregarded, arguing that the painter is not an expert on sails, and had not intended to be realistic. However, other illuminations in the same manuscript, by artists working in the Franco-Byzantine Crusader style (Folda, 2008, 131 and 143) show the sail as an extension of the yard, without going

[33] Although it seems not devoid of resemblance to Viking ships.

into detail regarding manner of the sail's attachment to the yard (Fig. 3). Indeed most of the representations shown below – except for Fig. 4, *The Voyage to Alexandria* – show the lateen sails being used as square sails. Fig. 4 shows the sail typically used as a fore-and-aft lateen-rigged ship (although the mast rake [inclination] seems to be rather exaggerated (Martin, 2001, 51). The inclined mast is typical of the lateen sail configuration, where the mast is often inclined but is often un-stayed (lacking ropes supporting the mast to the front and to the back – fore-and-aft), relying on shrouds only (which are ropes supporting the mast to the right – starboard – and to the left – port side). The present boat is lacking shrouds or stays.

However, Fig. 3 proves that if an artist wanted to depict a ship, sailing under a lateen sail rigged fore-and-aft, he knew how to do so. Therefore, when the visuals show a triangular sail, rigged across the ship, square sail fashion, one can assume that visual does indeed reflect the manner in which the sail was used.

Fig. 3. *Louis IX sailing east.*
History of Outremer, William of Tyre, Book 34

Fig. 4. *Vita of St. Mark: The Voyage to Alexandria (c. 1275).*
West Vault mosaic, Zen Chapel, San Marco, Rome

Fig. 5 depicts the same event: Bohemond leaving Syria (Antioch?) sailing in a quite similar ship, although, apparently two-masted, with the second (port) quarter rudder visible. [34]

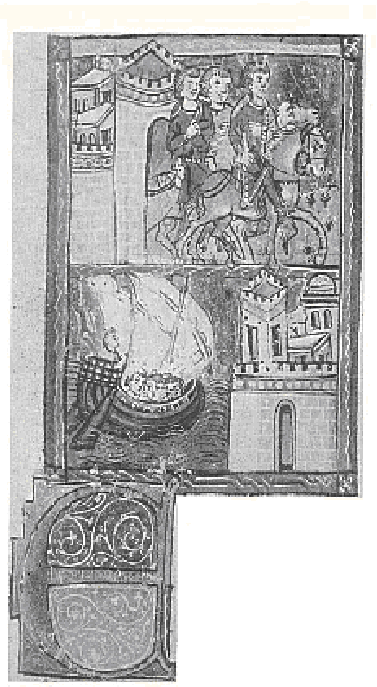

Fig. 5. *History of Outremer*.

[34] The part of a ship generally known as "quarter" is its side, toward the back. Hence: "quartering wind" – a wind that blows from the stern (back) of the ship, not directly but rather at an angle.

William of Tyre, Book 11. Fol. 73r

The same event, of "Bohemond going west," which was described in *History*, appears in a different illumination (Fig. 6):

Fig. 6. *Retour de Bohémond 1er en Italie.*
Bnf, Ms fr. 9084

In all these drawings the ships are depicted with a rounded hull, with a steep sheer at bow and stern. In some of them the stern is higher and appears to support a quarter deck and or a castle (figs. 5 and 6).

The ships in figs. 2, 4, 5 and 6 carry sails that seem to be triangular (but possibly are not – see below) and in Fig. 6 the structure of the sail, composed of vertical strips, is very clear. The ship in Fig. 5 seems to carry lateen sails.

However, the ship in Fig. 6 features what could be seen as irregular elements: Although the forward rake of the foremast denotes a lateen rig, the mizzen (aft) mast has a brailed up sail. This actually could not be done on a lateener (Martin, 144; Pryor, 1984, 360). Such brailing up of the sail is typical of square rigs, and is the standard manner of reefing (reducing the area of the sail) when the wind picks up, or when anchoring or mooring the ship. In case of stronger wind the lateen sails were not reefed but rather were replaced by smaller sails, a very cumbersome and difficult operation when done during a blow.

When anchoring or mooring, the lateen sails were neither reefed, nor brailed up, but taken off altogether.

When King James I of Aragon sailed to Majorca, the sail-master anticipated sudden gusts of wind

> And he ordered the sailors to be prepared, some at the climb, some at the poop, and some others at the prow….and when the wind came, the sailmaster cried "Lower sail! Lower sail!"….And the ships and galleys that went around us found themselves in great travail and in great difficulties trying to lower.
> (Smith and Buffrey, 2003, 81)

This account reveals that King James' fleet practiced the reduction of sails appropriate to the lateen rig with a triangular sail, lowering the sail with its yard, rather than brailing it up, as is the usual method with a square sail. All the ships in the above visuals have roughly similar hulls, but the one in Fig. 6 has better details of the strakes, curving upwards toward both ends and, perhaps clinker-built, with the strakes slightly overlapping each other, like tiles on a roof, somewhat reminiscent of Viking ships. Indeed, some scholars think that the Viking ship tradition was carried on for several centuries (Bass, 1972, 196) and that representations of ship types descending directly from Viking merchant ships or warships appear in manuscripts of the twelfth and thirteenth centuries.

Fig. 7. *Miniature from an Apocalypse Norman, C. 1200*

The foremast (if there are two masts), or the single mast, in all six ships (Figs. 1–6), has a slight rake forward, as is typical of lateen rigs, in order to compensate for the lack of a forestay (the rope leading from the mast's top to the bow). On the double-masted ship in Fig. 6, the sail on the mizzen (aft) mast is brailed up, which is much more typical of a square sail, although there is a famous example of a partially brailed-up sail on a lateener (Pomey, 2006, 329), in the fifth-century ship mosaic, from Kelenderis in Turkey, where a ship is shown entering the harbor.

Fig. 8. *Kelenderis harbour scene (4th-6th century)*

Nevertheless, the customary way of reducing sail area in a lateener is to drop the yard to the deck, take off the large sail and replace it with a smaller sail, rather than reefing or brailing up the large sail (Casson, 1995, 268–269), and vice versa, if it is necessary to increase the sail area exposed to the wind.

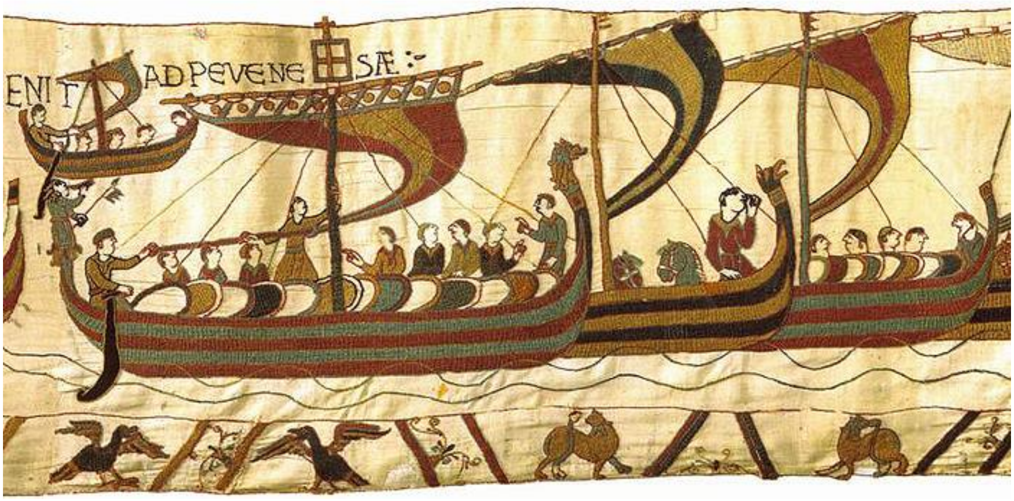

Fig. 9a. *The Bayeux Tapestry c. 1080, (detail)*

Fig. 9b. *The Bayeux Tapestry (detail)*

Fig. 9c. *The Bayeux Tapestry (detail)*

The Bayeux tapestry (details in figs. 9a–9c) relates to the historic events of 1064–1066, culminating in the Battle of Hastings, preceding the Crusades by about a century. It depicts ships with very similar attributes to the Crusader ships in figs. 2 and 6. Some researchers agree that the Bayeux ships, being of Norman origin, might have been influenced by the Viking square-sail tradition, and this might have affected both hull shape and sail shape. This could hardly apply to Crusaders' ships, mainly operated by Venetians or Genovese, nor to the Pisan merchant ships.

Sails on Crusaders' ships, which seem to be triangular, are often attached to horizontal yards. In some illustrations the yards appear to be noticeably shorter than the length of the ship (even if taking into account the painter's angle of view), as opposed to lateen sails where the yard is rather long, and normally consists of at least two, or even three sections tied (or "fished") together. This can be seen in the following examples:

Fig. 10a. *Lateen sail*

Fig. 10b. *The Caravelle "Bartolomeu Dias"*

Fig. 11. *Civitas Jerusalem by Erhard Reuwich, c. 1480,* (Detail)

In view of the above one may think that, maybe, the ships depicted in the illuminations of *History* are not real lateeners, but, may have been ships using square sails, that are depicted as triangular either because it became a convention to do so, or because when one looks at the bottom of the sail, which is pulled into the ship, and is seen in profile, it seems triangular, although in fact it is square. This becomes very clear if one compares drawings 8b and 8c, of the Bayeux Tapestry, where one can see what is probably the same sail depicted once as triangular and once as a square. Alternatively, considering that the illuminations show ships that are not otherwise typically lateen, but seem to have triangular sails. Such sails ,may have been used in a way that imitated the square sail, namely – positioned mainly across or "athwart" the ship and not in the fore-and-aft fashion typical of the lateener (see below). My view may be supported by the fact that when an artist wanted to paint lateens, he did so, as illustrated, for example, in Figs. 2 and 3 above.

However, the painting of King Louis arriving in Cyprus, before going back to Aigues Mortes one year later, is interesting: "En l'an apres que cil furent venus en Chipre, le roi se parti de France por passer en Aigue Morte."[35]

Fig. 12. *Arrivée de Louis IX à Nicosie. (1330-1340)*

[35] Recueil, 1854, 436. Translation by the author: "One year after having arrived in Cyprus the King left for France to arrive in Aigues Mortes."

BnF, MS Français 5716, FOL 40

Here, the painter clearly depicts a horizontally suspended sail, which does look like a square sail squeezed together at the bottom, perhaps in order to make room in the picture for the king and his entourage. Still, these sails may be triangular, in accordance with the usual custom of having lateen sails on Crusader ships.

Thus it may sometimes be difficult to distinguish between square and lateen sails. However, this is not the case for the ship illustrated in Fig. 13: It's sail is, obviously, square.

Fig. 13. *Vegetius, De Re Militari (c. 1270)*

Some examples below illustrate lateen-rigged vessels sailed using a square sail technique.

What seems to be clear is that even if the sails were triangular and designed as lateen sails, they were often not used as such, but rather as square sails. Some of the reasons for this practice have been discussed above. All the Crusader ships had great difficulties in sailing to windward [36] (Palmer, 2009, mainly 323–325). The lateen sail, being a "fore-and-aft" sail, is supposed to enhance the upwind capability of the ship, but the hull shape of the round ship – naves or *salandria* – was poor, as far as lateral

[36] With the direction of the ship's movement against the direction of the wind, or, facing the wind.

resistance to drift or leeway is concerned. Such ships could not really make use of the advantage supposedly offered by the lateen sail. Trying to use following winds, the Crusaders often used the triangular lateen sail as if square-rigged. This is what Ibn Jubayr called "al-salibiyah" (cross-like) (from Pryor, 1984, Part III, 379). This could also explain why so many illustrations, illuminations or other visuals depict Crusader ships as having triangular sails attached to horizontal, or oblique yards.

In the following picture one can see a ship apparently going upwind, since the pennant is blowing directly backward. The waves also seem to be moving against the direction of sailing, judging by the bow wave breaking against the ship's stem. The ship is lateen-rigged: The sails are triangular and the masts slant typically forward. However, the sails are not sheeted in tightly, as one could expect from a ship clawing its way upwind, but fully billowed in order to take advantage of a following wind. The yards are not installed diagonally with the fore low corner of the sail (the forefoot) nearly at deck level, which would help the ship advance upwind. This confusing state might explain why two sailors are shown applying their full body weight on the lines meant to bring down the yard of the main mast. One of the sailors is even shown hanging from the line after having jumped down from the aft castle (Fig. 14).

Fig. 14. *Bohemund and Daimbert, Patriarch of Jerusalem, sailing for Apulia, in a ship flying the cross of St. George (c. 1232–1261)*

Martin defines a lateen rig as: "The arrangement in which a three cornered sail is attached to a yard that obliquely crosses a low forward-racking mast" (Martin, 2001, 219). However, some of the ships are of "mixed breed" with a triangular (or perhaps rectangular) sail attached to a cross yard, on vertical masts, in square-sail fashion. This can be seen in the following illumination (Fig. 15) from the British Library, of the king of France and his crusading army approaching a fortress manned by Saracens:

Fig. 15. *The king of France and his crusading army approaching a fortress manned by Saracens (c. 1340)*

Apparently triangular sails attached in square-sail fashion are seen even more clearly in a miniature of the French king, Philip Auguste, awaiting his fleet (Fig. 16).

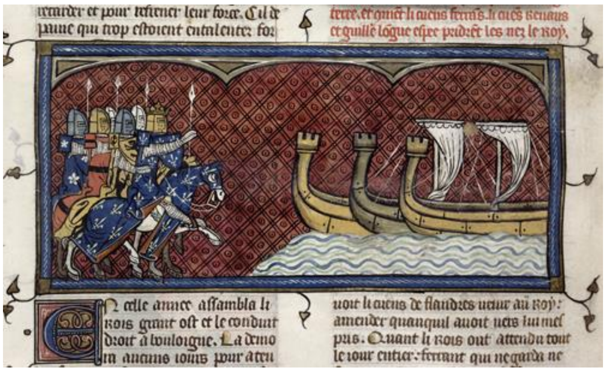

Fig. 16. *Philippe Auguste awaiting his fleet.*
Chroniques de France ou de St Denis, British Library Royal, MS 16 G VI, fol. 373.(After 1332, before 1350)

In the painting *St. Ursula teaching the virgins to sail* (Fig. 17), due to the following wind (indicated by the position of the flag) the skipper does not use the sail nor the yard in the lateener fashion, i.e., with the front part of the yard attached to a point near the bow of the ship, but rather as a square sail, with the yard being nearly horizontal.

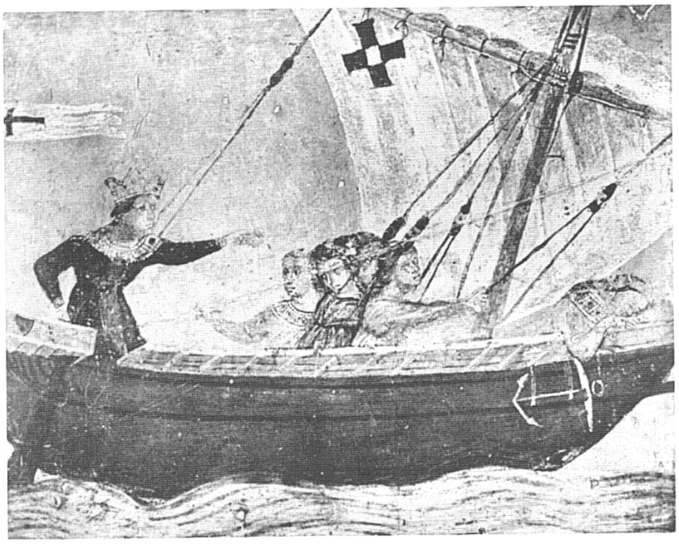

Fig. 17. *St. Ursula teaches the Virgins to sail, by Paolo Veneziano, (14th century)*

Fig. 18 shows a galley sailing with a following wind (as shown by the direction of the flags and ensign). It has the typical yard of two components fished together, and could easily have proceeded with the yard set obliquely with the front end attached or close to the ship's bow. However, the skipper apparently preferred to have the yard set athwart ship, as if it were a square sail, the slight slant of the yard in the painting probably resulting from the need to draw it in perspective. Since the drawing dates to the early fifteenth century, the galley already has a stern rudder, along with at least one quarter rudder.

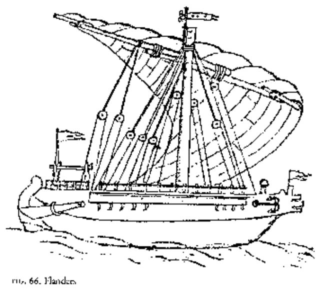

Fig. 18. *Galley under sail, Flanders, dated 1410*

Many medieval illuminations support the theory that the Crusaders have mostly used lateen-rigged ships, but used the sails as regular square sails, cross rigged athwart ship, although they were triangular sails with the apex pointing downward, since their ships were not built in a manner that would allow them to benefit from a fore-and-aft rigged sail. However, square sails have probably not ceased to exist during the Crusaders' period[37].

[37] See also Bellabarba (1999, 81). There he disagrees with theory advanced by some scholars claiming that the Lateen sail was the only sail in use in the Mediterranean until around 1300. I tend to accept his argument that "would it not be surprising if the square sail was not conserved at least for small craft navigating in internal waters" (82). Around this period there appeared also what Ballabarba calls a "quadra-latine", a hybrid two masted vessel with a square sail on the main (front) mast, and a lateener on the mizzen (rear) mast (86).

Rudders and Maneuverability

The ship in Fig. 2 is shown as having one rudder, mounted on its starboard (right) side, and there is no evidence of the existence of a second rudder on the port side. It may just be hidden because the ship is drawn in profile and we only see its starboard side. However, the existence of two quarter rudders (attached to the ship's side, near the back – quarter) may be very important for enhancing the manoeuvrability of the ship, as noted by Joinville:

> Dans ces vaisseaux de Marseille il y a deux gouvernails, qui sont attachés à deux barres si merveilleusement, qu'aussi vite que l'on aurait tourner un roussin, l'on peut tourner le vaisseau à droite & à gauche.
> (Joinville, 1995, 535)[38]

On the other hand, it may also be that one of the two quarter rudders was swung up out of the water, at certain points during the voyage: In order to minimize the drag and water résistance, the windward oar was raised as far out of the water as possible (Pryor, 1984, Part II, 283). According to Martin, a pair of steering oars or rudders were set on the quarters of all but the smallest medieval vessels (Martin, 2001, 162). Fig. 2 does not specify how the rudder was attached to the hull, although this could be done in several different ways. Rather the steering oar is merely shown protruding through the hull. This may have been the case if the rudder was mounted through the hull by a *lucatorio*, a wooden or iron ring through which the loom (handle) of the oar passes inboard (ibid., 162 and 163, drawings G, H and I). However, Joinville's description seems to call for a more sophisticated means of attachment.

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[38] "In these vessels of Marseille there exist two rudders, which are attached to two bars [or 'rods'] in such a marvelous fashion, so that one could turn this ship right and left as fast as one could turn a horse" (author's translation).

CHAPTER 3 – A MODERN-DAY SIMULATION OF RICHARD THE LIONHEART'S PASSAGE FROM ACRE TO JAFFA

In order to test some of the descriptions of various Crusader maritime actions, this author attempted to emulate a well-documented sea journey of Richard the Lionheart's passage from Acre to Jaffa to save the besieged Christians of that city. This journey offers a concise example of a trip undertaken over a short and precisely defined distance, within a specific time frame, at a known time of year. Moreover, this trip of Richard the Lionheart, is part of the historical epic *L'Estoire de la Guerre Sainte*, a poem written in ancient French by one Ambroise, who apparently accompanied the king during his adventures.[39]

On July 1192 Richard was about to set sail for home, via Beirut:

> Avait ja pris congie al Temple
> E al Hospital el contemple,
> E aveit veu ses gualees,
> Qu'eles fussent bien atornees:
> A lendemain se devait metre
> Por aler s'en, co dit la letre,
> Par Barut…
> (Ambroise, 10945–10952)[40]

As Ambroise writes, the king's ships, galleys, were already equipped and ready to sail, and he had taken leave from the Temple and the Hospital (in Acre). However, Richard's plans were foiled by the arrival of messengers from Jaffa, requesting urgent assistance and imploring the king to assist the Christians besieged in the citadel of

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[39] Ambroise, the editor of *L'Estoire De La Guerre Sainte.* Gaston Paris is certain that Ambroise was an eye-witness to many events, and accompanied the king in his travels but did not return with him to Europe (*L'Estoire* vii).

[40] Even Richard himself, the king/With our own eyes we saw this thing/Take place-had taken leave of all/The Temple and the Hospital/And viewed his galleys to make sure/And on the morrow without fail/So says the book he was to sail/For Beirut with his retinue… (Translation: Merton Jerome Hubert).

Jaffa, facing death by the Saracens. These requests were received on the eve of July 28 (Gillingham, 1999, 212). Richard, accompanied by Pisans and Genoese set out immediately, with a fleet which, according to Baha' al-Din (the biographer of Ṣalāḥ ad-Dīn) comprised 15 swift galleys and 35 other ships (Gillingham, ibid.).

As urgent as this voyage was, Richard's fleet could not advance because of contrary winds, and was stuck near Haifa for three days.

> Devers la mer d'un vent contraire
> Noz autres genz sont destorbees,
> E li rois e ces des gualees,
> Si que de treis jorz ne se murent
> De soz Chaiphas ou il jurent,
> E qui li reis diseit: Merci.[41]
> (Ambroise, 11016–11021)

Having lost his patience Richard prayed: "Deu! Por quoi me tenez ici?/Ja vois je en vostre servise!" (Ambroise, 11022–11023). [42]

According to the Ambroise's account, Richard's prayer was answered:

> Mais Dampnedeus par sa franchise
> Lor envoya un vent de boire,
> Qui le mena o tot s'estoire.[43]
> (Ambroise, 11024–11026).

Why Was Richard Stuck Near Haifa?

Assuming that Richard had, indeed, started out from Acre on July 28, it can be suggested that the king managed to have his galley rowed out of the Acre harbour during the evening (Gillingham, ibid.), when the wind is usually calmer, or blowing

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41 "Such strong winds smote the band/Upon the ships that were going to bring/The king's companions and the king/That for three days they had to stay/ Neath Caiphas, and there they lay/And the king cried 'Mercy O Lord!'" (Translation: Merton Jerome Hubert).

42 Why do you hold me and retard/ Me when I go upon your quest?" (Translation: Merton Jerome Hubert.)

43 "The Lord God then did manifest/ His favor sending a north wind" (Ambroise 11015-11025). (Translation: Merton Jerome Hubert).

from the east. He may have sailed or rowed toward Haifa, but then became caught in Haifa Bay, with a contrary wind, and become embayed there for three days, finding it impossible to sail around the tip of Mount Carmel where it extends into the sea and navigate around the reefs and shallows to its west.

It should be borne in mind, as noted above, that sailing ships cannot sail against the wind. A modern sailing vessel can tack upwind, which usually means sailing at an angle between 50–60 degrees off the direction of the true wind. A very modern competitive racing yacht can sail at about 40 degrees close to the true wind. However, the ships of the eleventh and twelfth centuries could sail only with the wind from astern, or nearly so, or a quartering wind, which blows roughly half way between the stern and the beam, about 45 degrees off the stern. Some could sail with the wind abeam, perhaps somewhat upwind, but not very effectively if at all (Palmer, 2009, 322–324; Whitewright, 2011, 7–9).

Galleys, were long and narrow with a low freeboard[44] and they could not be effectively rowed against the wind for long periods of time (Dotson, 1999,166; 2006, 74), especially if the waves or the swell were greater than 1–1.4 meters from trough to peak. Galleys also sailed well with a following wind from dead astern, according to Dotson (ibid.), could not handle a quartering wind, blowing from the quarter, and beam sea, where the waves hit the ship on its side. However with respect I tend to disagree with Dotson as far as quartering wind or even beam sea are concerned: from my sailing experience with long narrow boats, such as whalers, and even with replicas of Viking boats, quartering wind and beam true wind would permit the galley to sail adequately if the sea is relatively calm and the waves not too strong.

[44] Freeboard: the distance between the waterline and the top part of the ship's side.

Figure 19 shows a possible initial course taken by Richard, which he could have achieved with a northwestern or even a western wind, in order to get out of the Acre Harbor (or anchorage), and proceed to Haifa as shown below:

Fig.19. *King Richard's probable course from Acre to Haifa*

However, with any of the usually prevailing winds, northwestern, or western he could not have cleared the tip of Ras Carmel. A south-southwestern wind might help him clear the Ras, but would then make sailing south toward Jaffa nearly impossible. The swell worked up by a western wind or, more so, by a northwestern wind, may have become substantial, so a galley would have difficulties rowing through it, and a transport ship could not sail close hauled, pointing upwind. Richard, therefore either had to wait for an eastern or southeastern wind, which is very rare in July or, more probably, for the wind to shift more to the north and thus allow him, with some difficulty, to weather Ras Carmel.

A wind favorable for a boat embayed near Haifa is statistically rare in both July and August. The table below shows percentages of prevailing winds in July and August, according to records from Haifa in 1937.[45]

[45] There is no reason to believe that the wind patterns have changed between the twelfth century and today. This is further confirmed by Murray, W. M., "Do Modern Winds Equal Ancient Winds?" *Mediterranean Historical Review* 2, 1987, pp. 139–167.
Changes in climate have been discussed by Papageorgiou (2009, 200–201, for late Neolithic [5300–4500 BC]); Mantzourani and Theodorou (1989, for the Bronze Age), Murray (1987, for the fourth–third centuries BCE), Pryor (1995, 208, for the Middle Ages), and Power (2002, Middle Ages,

	North	NE	East	SE	South	SW	West	NW	Calm
July	3	1	2	3	16	27	17	9	22
August	2	4	2	2	15	23	17	9	26

Table 1: Percentages of prevailing winds in July and August, according to records from Haifa in 1937

It is clear, therefore, that King Richard could have been helped out of his predicament by a wind with an eastern component, preferably northeastern, which is, as noted, rare. A south-southeastern wind would get his ships out of the bay, but then would prevent him from reaching Jaffa as quickly as he did. The low percentage of winds with an eastern component to replace the contrary winds described by Ambroise explains why Richard's fleet was embayed for three days. In conclusion, since Richard's trip to Jaffa was successful, and rather fast, as described below, a south-southwester probably helped him to weather the Ras, and, after shifting to the north helped him along his way to Jaffa.[46]

Some Questions as To King Richard's Timetable

After Richard managed to clear Ras Carmel a few points have to be clarified:

As mentioned above, Richard started his trip on July 28, in the evening, immediately after having received the bad news from Jaffa. July 28, 1192 fell on a Tuesday. According to Ambroise, Richard's fleet arrived at the port of Jaffa late Friday night,

North Atlantic). It is agreed that present weather conditions can be used for interpreting earlier sailing conditions as phrased by McGrail (2001, 89): "In the absence of more detailed knowledge of earlier Mediterranean environments, it thus seems valid to use modern data on winds, currents, tides, and coastlines to deduce the context within which Mediterranean mariners voyaged from, say, 5000 BC…until more detailed palaeo-data become generally available."

46 Although, according to Ambroise, Richard was helped out of his predicament by a northern wind, sent by the Lord.

July 31: "Al port de Jaffe el vendresdi/ Tart par la nuit; le samedi"[47] (Ambroise, 11027–11028).

It would have taken Richard a good few hours to get his fleet organized and sail from Acre to Haifa (6.8 nautical miles). A wait of three days would include July 29, 30 and 31. Even if he had managed to sail the approximately 50 miles from Ras Carmel to Jaffa at a very good speed of 5 knots, somewhere, a mistake may have been made: Either the messengers from Jaffa arrived earlier than July 28, or Richard was not held near Haifa for three days, or else he arrived near Jaffa only after midnight Friday or early Saturday morning. Even an arrival early Saturday would have required swift sailing with a favorable wind.

Assuming that the fleet as a whole sailed at an average approximate speed of 4.5–5 knots (Casson, 1951, 147; Whitewright, 2011, 13), and considering the approximately 50 nautical miles from Ras Carmel to Jaffa, the trip should have taken at least ten hours under favorable conditions.

The Simulation

In order to examine probable sailing conditions of the period, I attempted to simulate this trip, in a modern yacht, although it can sail upwind much better than an ancient sailing vessel. I tried not to make use of this advantage, once out of Haifa Bay.

We used the engine in the yacht at the fishing port of Acre, on August 9, 2014, at 05.00, just get out of the harbor.[48]

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[47] "They reached Jaffa late, when day/was done, on Friday. Saturday." (Translation: Merton Jerome Hubert.)

[48] I had to assume that the king's galley was rowed out of the port, and that at least part of the fleet was moored in the bay near Acre and not in the port itself. This is obvious, since, if the fleet consisted of 50 ships, the average length of which would have been 25–40 meters, if the ships

At the Tower of Flies we turned off the engine, and did not use it again until we reached Jaffa. A 12-knot wind was blowing from the west, with a slight southerly component and in order to clear Ras Carmel we had to sail on a port tack (i.e., with the left side of the boat to the wind), as sharply upwind as we could, at a speed of approximately 4.5 knots, at a course of 304°, at about 55 degrees to the true wind. With the occasional puffs we progressed faster than 5 knots. In this respect we did not emulate Richard's course, as his fleet could not have sailed upwind as sharply as we did. Even a galley which, theoretically, could be propelled upwind by oars, would find it difficult if not impossible to be rowed against the wind for any extensive period of time. Moreover, even if Richard's galley could be propelled by oars and clear Ras Carmel, which is doubtful, one should remember that it was part of a fleet which consisted of different ships, some of which could not have been rowed around Ras Carmel.[49]

At 06.00, in a position well to the west and slightly to the north of Acre (32° 55,1'N; 035° 02,8'E) we felt that we have gained enough sea-room to clear Ras Carmel and altered our heading to course 214°, with the wind still west, but now with a slight northerly component, blowing at 10.2 knots. From here on we sailed a course that could be held by a medieval fleet (Whitewright, 2011, illustration on page 14).

At 07.45 (32°50,2'N; 034°57'E) the wind still blowing from the west, with a slight northerly component, we altered our course to 208°.

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moored alongside, the fleet would require a pier about 1.5 kilometers long. This is much longer than any pier or quay that could be accommodated in ancient Acre. For length of ships see: John H. Pryor, *The Naval Architecture of the Crusader Transport Ship*, In Mariner's Mirror, 1984, Michael of Rhodes, 2009, 214).

49 We could have precisely emulated King Richard's course and sailed toward Haifa, and then turn to starboard (right), and tack upwind, instead of remaining stuck in Haifa Bay. Richard could not sail upwind, and near the city of Haifa there are now two ports, and many ships anchored in the bay, so we preferred to tack upwind near Acre. From the point west of Ras Carmel we followed the course probably taken by Richard's fleet, except opposite Atlit, as explained below.

At 09.20 Atlit was a beam (32°43,4'N; 034°53,8'E). We had to sail further west than required in order to maintain our distance from the military base located there, which King Richard obviously did not have to do (However, if his captain was a good seaman, he may have decided to sail as far as possible from the coast at this point to have a better chance of advancing to Jaffa in case the wind turned southwest.) Our sailing speed was 4 knots, the wind still westerly with a slight northerly component. The fact that the wind did not back to southwest at this time of the year and at this hour was unusual, but we had enough distance from the coast to allow us to cope with a southwesterly, so we altered course to 191°, which was about 100° off the true wind. This course was also convenient in view of the coastal configuration: Jaffa is west of Acre and the coast slopes from northeast to southwest, at an azimuth of approximately 200°.

At 12.15 we were opposite Caesarea. We sailed at 4.5 knots, wind 11.5 knots northwest, the course still 191°.

At 16.30, we approached Apollonia-Arsuf, and tried to sail closer to the shore to have a better view of the castle. The wind was blowing at 13 knots from 330° and our speed exceeded 5 knots.

At 18.00, the wind died down as was expected: it became northerly 2– 4 knots.

At 18.20, the wind picked up somewhat. We were opposite Jaffa Harbor, at Andromeda's Rock. The entrance between the present breakwater and the Andromeda's Rock is easy to see, but to make sure it is advisable to have two minarets seen from the sea, one close to the shore and one which is far away, lined up or "in transit." Following this line will take the boat clear of the rocks at the port's entrance.

However, Richard probably did not land at the "Jaffa Port," but rather on the beach north of the port. The picture below shows our progress.[50]

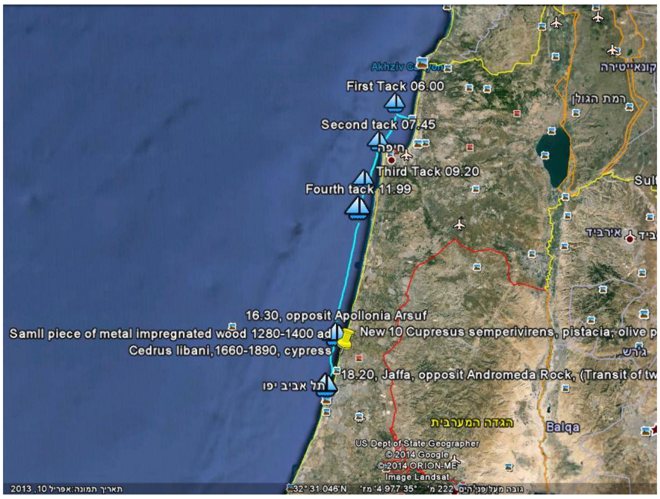

Fig. 20. *Progress of author's trip simulating King Richard's sail from Acre to Jaffa*

The map below (Fig. 21) shows our course in greater detail, with the direction of the wind at various hours represented by light blue arrows:

50 The yellow marker shows the location where we discovered underwater evidence of what might be a wreck (see below).

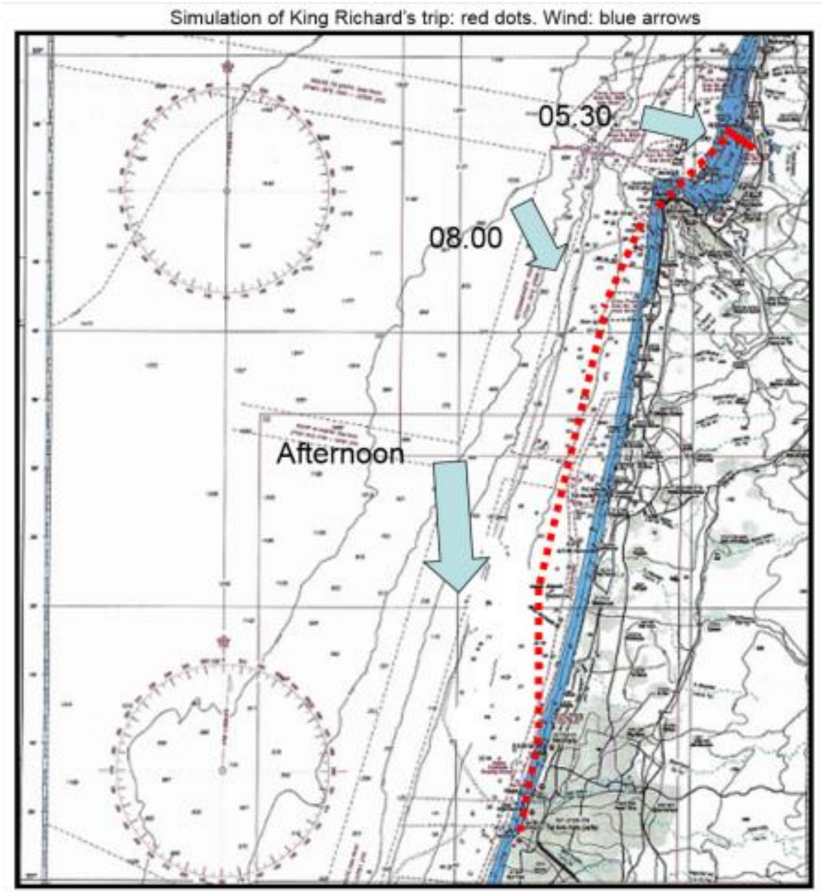

Fig. 21. *Progress of author's trip simulating king Richard's voyage from Acre to Jaffa with reference to winds (on marine chart)*

If the story told by Ambroise is more or less correct (and the major facts are corroborated by Baha' al-Din), then this brief voyage proves King Richard's skills of fleet management, his fleet consisting of Genovese, Pisans and, perhaps seamen who came with the King from England. It may be deduced that substantial fleets could have been launched on their way at short notice, stayed in close formation (since many ships arrived in Jaffa at the same time, as described below) and cover substantial distances in a relatively short time.

The fact that King Richard's galleys reached Jaffa after about ten hours of sailing from Ras Carmel, disproves the supposition that Crusader ships could sail properly only with a following wind dead astern (Dotson, ibid.). According to all the available data (for example Watts, 1975, 568), as well as this writer's experience, it is unlikely that Richard enjoyed a pure northerly wind throughout the whole trip. Winds always shift, and since Richard arrived late at night, it is possible, but, obviously not certain, that at least for a few hours the wind may have had an easterly component.[51] The conclusion should therefore be that the galleys, as well as the other ships in King Richard's fleet, could have advanced reasonably well during the voyage from Ras Carmel to Jaffa with any kind of a following wind and, to some extent, also with a beam wind.

This simulation trip also proves that given the same circumstances, and a bit of luck with the winds, average sailing vessels can achieve the same results today as 800 years ago.

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Landing in Jaffa

When the Turks saw the galleys approaching the port: "Eht vos li Turc qui apercurent/Les gualees qui el port furent"[52] (Ambroise, 11079 –11080).

They, the "Turks" rushed to the shore with buckles and shields, by foot and on horseback, to forestall Richard's landing (Ambroise, 11080–11083; Nicholson, 1997, 355).

It should be noted that the first ships to approach the shore in order to land were indeed galleys, and not cogs, round ships or other transport vessels. It is true that the

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51 The usual prevailing winds along the coast of today's Israel, in July and August are a slight easterly after sundown, a southwesterly during the morning, shifting to westerly toward noon, and to a northwesterly in the afternoon, with a lull toward evening.

52 "The Turks observed the port, and they/Could see that there the galleys lay." (Translation: Merton Jerome Hubert.)

word galley was sometimes used generically for all kinds of ships, but Ambroise knew the difference. When he chooses to describe a ship other than a galley he uses the term *nef*: "E a lor nefs a plein alouent" (Ambroise, 10943) or *barge*: Eth vos une barge abrivee/ Venir a Acre e arrive (Ambroise, 10958 –10959).

It is also obvious that the first ships that made it to Jaffa and landed were galleys, which could be beached, and the king jumped off his ship into the water, after having taken off his leg-armor ("the leap which won him a place in Paradise," Gillingham, 1999, 213) and waded ashore, the water reaching up to his belt, as described by Ambroise:

> Lors fist traire avant ses galees;
> Ses jambes totes desarmees,
> Sailli des ci qu'a la çainture
> En mer o sa bone aventure
> E vint a force a tere sesche
> Secont ou prims, ço fu sa teche [53] (Ambroise, 11127–1132).

Entering Jaffa's so-called "port" with the fleet would be impossible, because of the port's small size, and the difficult and dangerous entrance (Mirkin, 2010, 33–38). In order to enter the port, ships had to be propelled by oars only, or else towed, which, for vessels other than galleys, would be extremely difficult if not impossible. The conclusion therefore is that when King Richard, and probably most other Crusaders, refer to landing at the "Jaffa Port" they probably landed on the beach, north of the mooring basin. In this area the beach slopes gently, and the approach from the north is free of rocks, whereas to the south of the port there was a line of rocks. This line begins with the Andromeda's Rock, continues south (under the present-day

[53] "He sent the galleys closer. Stripped/ The armor from his legs and Leaped/ Into the sea, which came waist-high/ By happy chance. So to the dry/ Land he pushed boldly on in front/ second or first, as was his wont." (Translation: Merton Jerome Hubert.)

breakwater built over the rocks during the British Mandate in Palestine), and then farther south beyond the present-day breakwater.

The fact that the water reached up to Richard's belt proves that the ship that landed him was quite close to the beach, where the water was about one meter deep; some sources note that the water reached up to his groin (Nicholson, 1997, 355).
After wading in the water the King arrived on dry land, and was followed by Geoffrey du Bois, Peter de Preaux, and by all the rest:

> E vint a force a tere sesche
> Secont ou prims, ço fu sa teche.
> Giefroi del Bois e de Preials
> Pierre, li preu e li reaus,
> E tuit li autre après saillirent.[54] (Ambroise, 11131 – 11135).

Another description of Richard's landing appears in the Itinerarum: "Galeis igitue regis ad imperium versus littus propulsis" (Itinerarum, Liber VI, Capitulum XV, 408). Or, in translation: "The word was forthwith given, the galleys were pushed to Land" (Itinerary, Book No. six, chapter XV, 264). In a different translation: "…the galleys were driven towards the shore" (Nicholson, 1997, 355). The latter seems to agree more with the Latin text.

Such a forceful landing, which, as Ambroise relates, managed to chase away the Turks who had occupied the shore, could only be made by beaching the galleys on the shore, and, probably awaiting further forces on other ships to be landed by skiffs and other small craft.

May we deduce that this was the usual method the Crusaders used to create a bridgehead on a hostile shore?

[54] "Geoffrey du Bois went too, also/The King's good man, Pierre de Preaux/And all the rest were not far back;/They came together to attack." (Translation: Merton Jerome Hubert.)

CHAPTER 4 – CRUSADER FLEET SEAMANSHIP

Keeping Order

Very little is known about the actual seamanship of the Crusader fleets and the conduct and management of fleets at sea. We can only study this either by examining materials from a later date, for example, the 15th century *Book of Michael of Rhodes*, or from descriptions of Crusader activities other than those relating to the Holy Land, mainly their actions against the Saracens in Spain, the Balearic Islands, or Constantinople.

The chronicler in the *Book of Deeds of James I of Aragon* (late 13th century) devotes special attention to the "manner the fleet should proceed" (Smith and Buffrey, 2003, 79):

> At the front Bovet's ship...was to serve as a guide, and had to carry a lantern as light; whilst Carros's ship had the rearguard and carried another lantern...And the galleys had to go around the outside of the fleet, in such manner that if another galley came it would encounter our galleys' (ibid., 79). The fleet itself was composed of 'twenty-five full ships, eighteen tarides and twelve galleys, and one hundred buzas and galliots. And so there were one hundred and fifty big vessels, without counting the small barques. (ibid., 78)

Keeping order in the fleet was, and still is, of prime importance. This was certainly difficult in a fleet composed of various kinds of ships as, for example, King Richard's fleet sailing from Messina to the East, when:

> The king had laid down that as far as possible the ships should never be separated, unless they were scattered in a storm. So the galleys deliberately reduced their speed in an attempt to stay with the flotilla of slower transport vessels (Nicholson, 1997, 174).

The task of keeping together obviously became more difficult at night time, so ships had to carry lanterns. It was King Richard's custom to:

> …have in his ship an enormous lighted candle in a lantern, which was placed aloft to give light to all around and show the sailors the way.[55] (ibid, 175)

Lantern signals were probably also the basic means of conveying orders by night. This was valid in the fifteenth century, when Michael of Rhodes[56] wrote, in his instructions:

> Sailing by night
> And he commands that if he wishes to set the large sail he will make two fires on the fireplace, one on each side. And if he wishes to set the middle sized sail he will like-wise make three fires on the hearth and all galleys mast respond to these signals under penalty of hundred soldi, and let no one dare pass the captain, under whatever penalty shall please him.
> (Long, McGee and Stahl, 2009, Vol. II, 329)

As noted little is told directly about how such fleets were organized, how the mixture of types of vessels carrying mounted knights and their horses were able to coordinate with galleys that were propelled by sails or by oars. Did fleets manage to stay in formation in spite of the fact that the round ships could probably withstand rough seas much better than galleys, and big ships had to keep the same pace as small ships?

However, tight cooperation was essential and was implemented, as, for example, in the campaign of James I of Aragon for the conquest of Majorca: Oar-propelled galleys towed *tarides* which (as opposed to the *tarides o*f Charles I of Anjou) were propelled by sails only:

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55 It seems that King Richard who wanted to have "light all around" was not unduly worried about night blindness. In later years as, for instance, during the Napoleonic wars, the British Navy always used shaded lanterns for such purposes.

56 *The Book of Michael of Rhodes, A Fourteenth Century Maritime* Manuscript, edited by Pamela O. Long, David McGee and Alan M. Stahl, Vol. II.

> And when it was midnight you would have said that in our entire fleet not a sound was heard. And each of the twelve galleys left, towing its taride, and they continued towing the tarides from the port little by little. (Smith and Buffrey, 2003, 83).

The story of the war against the Saracens in Almeria, Spain, during the Second Crusade can serve as an example of the way a fleet was handled: for example the account of the Genoese expedition to Spain during the Second Crusade, which was written very soon after the events in question. The author, Caffaro di Rustico (1080–c.1164), was one of the leading men of Genoa. He served as one of the consuls of the city six times between 1122 and 1149, and, as consul, commanded a naval expedition to Minorca in 1146.

In 1147 the Genoese were ordered to prepare for war against Almeria, which was the principal port for Cordoba, the traditional capital of Islamic Spain. Almeria is located about 170 kilometers east of Malaga and its possession would give the Genoese a base for penetrating the markets of Al-Andalus. The Genoese started their journey with 63 galleys and 163 "other vessels." Caffaro does not specify which other types of watercraft were part of this huge fleet but

> …after they had come at Porto Maone, the consul Balduino went ahead to Almeria with fifteen galleys as an advance guard until the fleet should arrive as a body. The Genoese arrived at Cape de Gata but not finding the 'emperor' [57] they waited there for a month in a state of great fear, since they were outside the port.
>
> (Caffaro di Rustico, 2009, 3).

[57] King Alfonso VII of Castile (1126–57), who claimed to be Emperor of all Spain, had concluded an alliance with Genoa in September 1146, to the effect that they would jointly besiege Almeria in the following May, and contributing 10,000 *marobotini* towards the costs of outfitting the Genoese fleet, *Codice diplomatico della repubblica di Genova dal (dcclviii al mclxiii*, ed. C. Imperiale di Sant'Angelo (Fonti per la storia d'Italia, Rome 1936), 204–9 nos. 146–7. In fact the attack took place in August 1147, and Almeria was captured on October 17. Cf. Caffaro di Rustico, 2009, 3.

Fleet action apparently could involve combined sea and land operations, as can be learned from the following.

> The consul Balduino, who was on guard with his galleys, then ordered his companions, namely Oberto Torre and Philippo and Ansaldo Doria, to come and make war against Almeria. These companions were unhappy about [doing] this, until some troops should arrive. Meanwhile the Count of Barcelona came with a great ship, bringing soldiers with him, including fifty-three mounted knights. (Caffaro di Rustico, 2009, 4). They sent a message to Balduino that he should arrive at the mosque with his galleys at daybreak and make a demonstration of wishing to do battle, so that the Saracens should leave the city for this, for the count and his knights would be at the river at dawn, on land. The fifteen galleys would be outside the Lena [River] and one galley would be stationed at the mouth of the Lena. After the Saracens came out to fight, that galley would give the signal to the knights and the fifteen [other] galleys. And so it was done. [58]

Caffaro continues his description of the combined operations: sea, land and mounted knights arriving by sea in the following passage:

> Once the Saracens saw the men from the fifteen galleys going ashore, apparently intent on doing battle, they were afraid that there were others hiding in secret. Thus they sent two soldiers, one white and one black, to climb up onto a hillock and reconnoiter the surrounding area. They did not spot the soldiers who were in hiding, and so they made a signal with flags for the Saracens to sortie from the city and come to do battle. Forty thousand armed men promptly emerged and began to fight with the men from the fifteen galleys. The Genoese then boarded the galleys and remained there, with eight of their men being killed. Meanwhile the consul Ansaldo Doria, on the one galley that was on watch, made the signal, even though it was not at the proper time. Twenty-five galleys and the knights all set off as one, and these galleys came across others, took them along with them and acted in unison. The consuls Oberto Torre and Philippo, who were off Capo de

[58] This text was translated from Annali Genovesi di Caffaro e de'suoi continuatori, *i*, ed. L.T. Belgrano *(*Fonti per la storia d'Italia, Rome 1890*)*, pp. 79–89, by G.A. Loud. There exists also a different translation, by Martin Hall and Jonathan Philips, in *Caffaro, Genoa and the Twelfth-Century Crusades I.* Dorchaester, 2013, 127–136. However, the translation by Loud somehow seems more antiquated and seems to reflect better the flavor of the original text.

> Gata, set sail with the whole fleet. They sailed forwards with twelve galleys as a vanguard, while on land the knights [marched off]. These twelve galleys made contact with the others which were at the mosque, and they moved forwards to the coast. The knights then encountered the Saracens who had left the city, and fortified by Divine assistance, they manfully attacked them. For fear of the galleys the Saracens wished to turn back, and they started to retreat towards the city, with the knights following them. … The aforesaid consuls promptly went ashore with the men from one galley to fight the Saracens, and the men who manned the galleys near the mosque also landed. They and the knights killed more than five thousand Saracens and left them laying dead along the shore. The galleys that were out to sea also joined the battle and they killed the Saracens fleeing to seaward...
> After some discussion, the consuls decided that the galleys should be beached on the shore at Almeria, and after this had been done they gave instructions for the preparation of siege engines, towers and 'cats'…"
> (Loud in Jansen, Drell and Andrews, 2009, 119–120)

All of the above obviously show a high degree of capability of coordination, transmission of orders and discipline. It can also be deduced from the text that coordination existed between naval forces and the mounted knights, and that beaching the galleys was a common practice. In addition it can be understood that there were means to disembark knights and horses without a harbor, at the mouth of the [Lena] River.

The above, however, does not specify at all how horses were landed and troops disembarked; it simply seems to take for granted that such operations were carried out without specifying the manner. We will deal with this question below.

Skiffs and other Small Boats

Whatever fleet management method was adopted, nothing could be accomplished without massive use of small boats. It is obvious that whatever the vessel – oared galley, round ship or dromon – it was often accompanied by small boats, whether on board, towed behind or alongside, or both.

Some galleys could land on shore, being relatively light and shallow vessels. They could also approach a pier or a jetty, whether alongside or, perhaps even in what is called today: 'Mediterranean style' – stem or stern on toward the jetty, and the other end held by anchors or anchor to seaward. However, large ships could hardly land on the beach, and if they did, it is not clear at all how they could be towed back to the deep. (This shall be discussed further in the section dealing with landing or beaching). Many ports were small and not accessible to ships and even to galleys, except for very small skiffs, as, for instance, the so- called "Port" of Apollonia-Arsur (or Arsuf). Lacking the maneuverability of an oared galley, a pure sailing vessel must have loaded and unloaded horses, and even people or merchandise by lighter, a difficult operation to carry out in a hostile harbor or beach (Martin, 2002, 242).

Ample reference to the use of skiffs or other small boats is found in many texts referring to maritime action by Crusaders: When Richard the Lionheart fought Isaac Dukas Comnenus, pretender to the title of emperor of Cyprus, Richard was offended by Comnenus, who had scorned his emissaries, and immediately shouted an order to all his forces: "to arms."

> They immediately obeyed. When he was armed he and all his people rode forward in small boats called 'Snekas' to seize the port.[59] (Nicholson, 1997, 183–184)

However, the battle was not quickly resolved, and after an initial success Richard's men came under severe attack by crossbows.

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[59] Ambroise calls them "*eneckes*" or "*sneckas*", a word derived from the term *snekkar*, a long and narrow Scandinavian vessel with 20 rowers (Nicholson, 1997, 155, footnote 44).

> The king, realizing that our people were not bold enough to get out of the skiffs and advance on the shore, took the lead himself in jumping out of his barge into the sea, and boldly attacked the Griffons. (ibid., 185).

Even modern sailing yachts need an auxiliary engine to enter a marina, or go alongside a pier, although they are much more maneuverable than the medieval ship. A vessel could enter a bay, the Acre Bay, for example, spill the wind from its sail, or turn into the wind, and drop an anchor or anchors. However, without assistance it could not safely negotiate the entrance to a port or approach a quay or a wharf without damaging itself or other vessels or installations.

Small Boats in The Seventh Crusade

In fact, "small boats" were not always that small, and, by comparison with boats that served other known ships, it can be deduced that some of the boats ordered as ships' boats for a ship ordered from Genoa by Louis IX, could have measured more than 10 meters, and carried 52 oars (Pryor, 1984, 372). Since such ships' boats could not be carried on board, the contract for building the flagship of Louis IX, the Paradisus, specified that the cable to tow the ship's boat should be a new one (Pryor, 1984, 373) obviously because a new cable would be more resistant to wear and tear involved in towing. Other boats, such as the gondolas, or the *barca de parischalmo* were indeed smaller and therefore must have been carried on board. (Pryor, ibid.).

Among the many tasks allocated to boats towed behind the ship was also that of a prison. According to Joinville, Louis IX instructed that some sons of a certain "Bourgeois," be imprisoned on the *barje de cantier* a boat towed behind the ship, because they delayed the fleet's departure from Panteleria by eating "fruits des jardins." The youths started to cry pleading not to be placed in the boat where "les murtriers et les larrons were imprisoned"[60] (Joinville, 1867, 432). The custom of towing a ship's boat was not typical of Crusaders only: When Ibn Jubayr sailed out of Acre in 1184 one of the ship's spars broke and fell into the sea. The long boat tied to the ship, was manned by sailors and used to retrieve it (Broadhurst, 1951, 328).

In conclusion, it is clear that small craft, whether carried on board or towed behind the mother ship served multiple purposes: They were absolutely necessary for watering the ships, bringing water from a well, spring or other source to a ship anchored offshore, they acted as landing craft, they were used for communication among the ships in the same fleet, they may have acted as lifeboats and the *barje de cantier* even had a cauldron installed.

Jacques de Vitry (c.1160–1240), who was appointed bishop of Acre, encountered some very rough seas during his trip to the Holy Land. In a letter describing his adventurous trip and the storm which menaced to sink the ship in which he sailed he wrote:

> quidam autem nautarum michi compatientes et deferentes ut navem parvam, que magne navi alligata erat de quidam autem nautarum michi compatientes et deferentes ut navem parvam, que magne navi alligata erat.[61]

This demonstrates the custom of towing a boat behind the ship, as can be seen in Fig. 22, fifteenth-century miniature**:**

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[60] Murderers and thieves.

[61] "Some of the sailors, feeling sorry for me and showing their respect, tried to persuade me to enter a little boat that had been attached to the great ship, but I absolutely refused to comply because of the bad example [that this would set], for I wanted to experience the common danger with the others" *(Vitry,*1960, 44*)*.

Fig. 22. *Departure of Ulysses, Ricc 492, Publio Virgilio Marone, Bucolian, Georgian Aeneis, Sec. XV, sesto decennio*

Use of small boats to unload equipment and chests to a military campsite, along a shore or a beach devoid of any quay, wharf, pier or installation is described in Fig. 23, depicting the landing of Hannibal in Africa:

Fig. 23. *Debarquement de Hannibal en Afrique (1493?). BnF, MS Français 366, fol. 114*

Whereas the following illuminations (Figs. 23 and 24), the siege of Orikos by Philippe of Macedonia and the Romans, or the debarkation of the Greeks in Troy, show the use of small boats for debarkation of troops on a hostile beach (Fig. 24):

Fig. 24. *Siege of Orikos by Philippe of Macedonia (1493?).*
BnF, MS Français 366, fol. 54v

Fig. 25. *Le débarquement des Grecs à Troie, (1400?).*
BnF, Français 301, Folio 58v

Small boats were also used to send messengers, as, for instance when King Baldwin, approached Jaffa. The top half allegedly depicts Baldwin's battle in Ramla). The small boat, apparently sent by the mother ship flies a white flag (Probably the flag of the Kingdom of Jerusalem which was white with a yellow Cross, and four crosslets (Fig. 26).

Fig. 26. *King Baldwin's battle in Ramla (top) approaching Jaffa (bottom) (1474), BnF, MS Français 5594, Fol. 109*

Use of small boats as life boats was mentioned in many chronicles, such as Felix Fabri's *Book of Wanderings of Brother Felix Fabri,* when his ship was wrecked near the coast of Dalmatia:

> …and there was a great crush on the companion ladders and a hurried rush of everybody towards the stern to get into the boats which had been launched.
> (Fabri, 1896, 43)

In addition to all these tasks, the small boats could act as an 'auxiliary engine' for those ships not equipped with sweeps or oars. Ship's boats could even be used to tow the ship around a headland, if there is no wind, or, sometimes, even against the wind, if the conditions allow and the rowing crew is very strong.[62] The small boats

[62] Eighteenth-century ships were known to be towed by their boats for days when caught in the Doldrums without wind.

could assist the mother ship in sailing out of a congested harbor, moving away from a pier and, in some cases, helping it not to be dragged to a lee shore.

They could also assist in maneuvering, laying or retrieving anchors and so forth as, for instance, in Fig. 27:

Fig. 27. *Small boat helping to retrieve anchor*,(c. 1250-60)
Bodleian Library Auctarium MS D 4.17, Fol. 1v

A substantial number of small oared craft was essential to the functioning of any kind of fleet.

According to the chronicler John de Columna, the mariners of Louis IX who waited in Cyprus for the Crusade to be launched, spent the winter of 1248–1249 in repairing and building small boats for landing operations (Wolff, 1969, 494).

Figs. 27–33 are medieval illuminations and miniatures dating between twelfth and fifteenth centuries showing combinations of sailing vessels and small boats which, either assist people in landing, or are towed behind sailing ships, or help to load or unload ships or accompany bigger vessels.

Fig. 28 shows how a small boat helps King Louis descent from his ship:

Fig. 28. *Louis of France arriving in England,* (c. 1240-53)
From Matthew Paris OSB, Chronica maiora II. Corpus Christi College in Cambridge, MS 161 Fol. 46v (new folio number f 50 v)

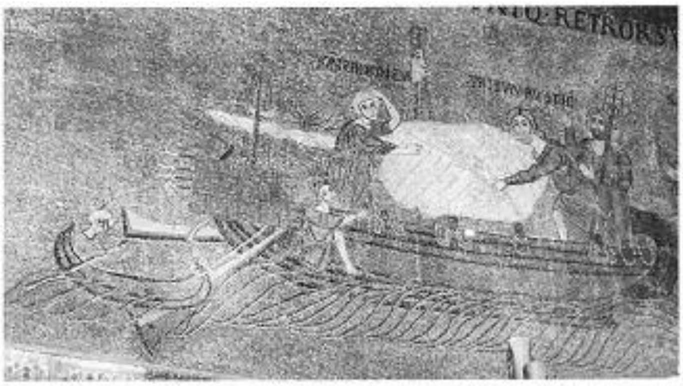

Fig. 29. *Loading of St. Mark's relics in Alexandria.*
Saint Clemente Chapel, San Marco, Rome
(first half of the twelfth century)

Fig. 30. *Loading ships for the Crusade 1352.*
BnF, MS Français 4724, fol. 6

Fig. 31. *Edward III sets sail to relieve Thouars.*
Chroniques Jean Froissart (1410). The Hague, KB, 72 A 25 Fol. 349v

The following three illuminations, Figs. 31–33, demonstrate the fact that ships were often accompanied by small boats, which, are seen here floating near the ships, so one can assume that they were being towed or about to be towed.

Figs. 32–34. *The three above miniatures, early fifteenth century.*
British Library, Harley 4431, The Book of the Queen, fol. 196v

Naval Support of Land Operations

All the countries in the Levant, including Palestine, have long sea-coast frontiers. Hence, while roads were not always good, sometimes traversing dangerous narrow passages, like between Ras Carmel and the coast, swamps and other obstacles, the sea offered an open area where troops and siege engines, as well as mounted knights could be carried without much hindrance. Similar to air supremacy today, one could say that the ruler of the sea also ruled the coast. And the ruler of the coast also controlled to some extent, the important access points to the interior of the country, such as Jaffa and Acre.

Advancing and holding the coast could not be accomplished without close cooperation between land and sea forces. Thus, the Crusaders failed when such cooperation was lacking, as, for example, in Arsuf in 1099, Caesarea in 1102 and Ascalon in 1106. They succeeded in Arsuf in 1101, with the support of the Genovese fleet, and in Caesarea in 1102, when the king (Baldwin of Jerusalem) came with all his forces by land, and the ships proceeded along the coast.[63] They also succeeded in Haifa (Caiffa) in August 1100, when the Venetian fleet overcame the resistance of the town's defenders (Grousset, 1934, Vol. I, 258). The Hospitaller fleet probably assisted and transported men and provisions of its order to the vicinity of Acre, which was then besieged by the Christian forces of the Third Crusade (Jacoby, 2007, 58).

On his march to Arsur, Richard the Lionheart advanced from Caesarea south along the coast and received supplies ferried by sea (Erlich, 2014, 115) and his forces were repeatedly resupplied by the fleet, which sailed southward in parallel to them (Kedar, 2015, 118).

The role played by naval forces was also reflected in works composed after the fact, for example, *La Chanson d'Antioche*, now known in a version composed about 1180 for a courtly French audience and embedded in a quasi-historical cycle of epic

[63] "'Le roi vint avec tout son ost par terre, et la navie l'aloit costoiant par la mer,'" Guillaume de Tyr et ses continuateurs" (Mollat, 1967, 347). \

poems, inspired by the events of 1097–1099, the climax of the First Crusade. It describes the conquest of Antioch and Jerusalem and the origins of the Crusader states. The *Chanson* was later reworked and incorporated in an extended Crusade cycle, of the fourteenth century, which embroidered the events to a great extent.

The *Chanson d'Antioche* can illustrate the importance of the Crusaders' naval support as seen through the eyes of the Saracens, albeit with a slight exaggeration: Garsion, the King of Antioch sends his son, Sansadoine, to the King of Soudan to ask for help, since, apparently "no French Christians remained anywhere that are not in the ships assisting in the siege of his city":

> Tu lui diras qu'il vienne me secourir avec son armée
> Car il n'est pas resté des Français dans la chrétienté
> Qui n'est passe outre-mer sur des navires
> Ils ont assiégé Antioche, la belle cité
> Ils seront assez puissants pour aller jusqu'à la Mecque.
> (*Chanson d'Antioche*, Chant XVIII, 220)[64]

In order for the king of Soudan to believe that the message is genuine, so says the story, Garsion shaved one side of his own beard and gave it to his son, as a proof of its veracity.

The naval support was essential to many, if not all, land operations; thus they were recounted not only in legendary epics, but also by chroniclers:

The leaders of the First Crusade chose the land route, but even they needed marine or naval help, not only for crossing rivers or the Bosphorus but also, on a more minor scale, for military operations: When they attempted to conquer Nicée (Nicaea,

[64] You will tell him to come and save me with his army
Because no Frenchman remained in Christendom
Who did not cross the Outremer aboard ships
They laid siege to Antioch, the beautiful city,
They will be powerful enough to go on to Mecca
(translation by the authoruthor).

probably Iznik of today) located about 100 kilometers southeast of Constantinople, at the time the capital of the Sultanate of Rüm, their attempts were foiled by the fact that the Turks brought supplies across the lake that borders the city from the west. The Crusader leaders asked the emperor to send boats to the port of Civitot, located in the south-eastern corner of the Sea of Marmara and, from there the boats were dragged by bulls, approximately 15 kilometers to lake Iznik, where the Crusaders used them to stop the Turkish shipping and conquer the town. This story is told by the anonymous author of the History of the First Crusade:

> Tunc nostri majores, consiliati in unum, miserunt nuntios Constantinopolim, dicturos imperatori ut faceret naves conduci ad Civitot, ubi portus est, atque juberet congregari boves qui eas traherent per montanas et silvas approximent lacui. (Histoire Anonyme, 40)[65]

The author of the *Itinerary of Richard* recounts the importance of the naval assistance in a chapter entitled "How our ships brought us provisions from Acre to Joppa."

> The army remained outside the walls of Joppa, and refreshed themselves with abundance of fruits, figs, grapes, pomegranates, and citrons, produced by the country round: when lo! The fleet of King Richard, with other vessels, which accompanied the army and went to and fro between Joppa and Acre, brought us necessaries, much to the annoyance of the Turks, because they could not prevent them.
> (*Itinerary*, Book IV, Chapter XXV, 189)[66]

Combined sea and land operations are well described by Guillaume de Villehardouin, when he writes about the conquest of Constantinople. It was agreed

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[65] "Then our leaders (or elders) consulted and sent a messenger to Constantinople and asked the emperor to send boats to Civitot, from there they were dragged by bulls across mountains and forest, and assembled and brought to the proximity of the lake" (translation by the author).

[66] The full title of this work is: *Richard of the Holy Trinity, Itinerary of Richard I and others to the Holy Land* (formerly ascribed to Geoffrey de Vinsauf).

that the French would attack by land, and the Venetians by sea, because the city is like a ship's sail (*"voile de nav"*), one part is on land and the other on the sea (Buchon, 1845, 13). The details are interesting because, as Villehardouin explains, the sea is deep there so the ships can directly approach the walls of the city:

> Donc, pour ce que la mer est si profonde que les navs viegnent rez a rez de terre, si s'ariverent li Venicien…et venoient droit sus les murs de la ville.
> (Buchon, 1845, 88).[67]

Villehardouin renders a vivid description of the importance of naval forces when planning the conquest of Monemvasia (Malevesie) and Naples (probably today's Nau[v]plion), both in the Peloponese. Both are important harbors that had to be conquered due to the grief they caused the Crusaders as bases for the Greek navy:

> Mais encore avons à conquester deux forteresses, les quelles nous grièvant moult en cest pays; c'est le chastel de Naples qui cy pres de nous est, et Malevesie; car ce sont li maistre port et l'escale des vaisseaux des Grex.
> (Buchon, 1845, 88)[68]

Guillaume goes on to say that if these strong places are not taken and are besieged by land only, it would be a lost effort because they (the besieged) will have all they want from the sea:

> …li chastel estoient si fort, qui les assiegeroit par terre, que ce seroit paine perdue, pour ce qu'il auroint par mer toutes leyrs volantés. Mais qui à droit les voudroit assiegier, il convendroit mettre le siege par terre et par mer; et ainsi porroit on venir à son entendement.
> (Buchon, 89)[69]

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[67] "So, since the sea is so deep that if the ships come to the level of the land, if the Venetians arrive they will come directly to the walls of the city" (translation by the author).

[68] "But we still have to conquer two fortresses that cause us a lot of grief in this country; It is the castle of Naples which is near us, and Malevesie; because these are the master harbors and stop-over of the Greek vessels" (translation by the author).

[69] "The castles are so strong, that to lay siege to them by land will be a lost effort, because they shall be able to receive all that they desire by sea. But he who would like to besiege them properly, the

June 1191 found King Richard the Lionheart after his victorious sojourn in Cyprus. Knowing that Acre was besieged and perhaps about to fall to the Crusaders (Nicholson, 1997, 196), he made haste to sail there so that the conquest of Acre would not take place without him. On his way he encountered a very large Saracen ship, which tried to hide its identity by a *ruse de guerre*, pretending that it was a Genoese vessel heading for Tyre. When the ruse did not work a battle developed between Richard's galleys and the Saracen ship, but the latter was so large that the galleys could not overcome it. The only solution was for some of Richard's sailors to dive under the ship and tie its rudder with ropes, which slowed the ship down, and probably caused it to sail around in circles:

> Cil saillirent come tempest,
> Si se plungierent cors e teste,
> Par de soz la nef trespasserent
> E repaiererent e ralerent:
> As governels liierent cordes,
> Por els destorbere plaisier
> E por la nef plus abaissier[70]
> (Ambroise, 2229–2235)

In the ensuing battle, after overcoming fierce resistance, the Saracen ship was rammed and sunk, and Richard explains that if this had not happened – and the Saracen ship (which carried elite troops and, among other things 200 deadly serpents), Acre could not have been taken: Se fust en Acre la nef mise/Jameis ne fust la citié prise[71] (Ambroise, 2277–2278).

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siege should be laid by land and by sea; and thus one could reach the desired goal" (translation by the author).

70 "Then like a tempest on they drove/And headfirst in the water dove/ Beneath the ship; on the other side/ They swam back, and deftly tied/ The ropes that to the helm were bound/ Of the pagan ship, so to confound/ The infidels, to make them steer/ Awry, and cause their craft to veer." (Translation: Merton Jerome Hubert).

71 "Had the ship come to Acre, `tis plain/ The town would never have been ta'en." (Translation: Merton Jerome Hubert).

The conquest of Acre with the help of naval forces can be seen in Fig. 35, below.

Fig. 35. *Crusaders attack Acre, Florence.*
Bibl. Medicea-Laurenziana, fol. 292r, Book 24, ch. 1 (1291)

A Spectacular Naval Attack in the Fifth Crusade

Many attempts were made to conquer the city of Damietta, located in the Nile Delta, in Egypt. Amalric invaded Damietta during the Second Crusade on 1164, and again during the Third Crusade (1196–1197). A very well-documented attempt to conquer Damietta took place during the Fifth Crusade. Initiated by Pope Innocent III, this Crusade was intended to travel by sea. The pope recognized the prime importance of avoiding the problems of the Fourth Crusade, and thus caused a truce to be made between Venice and its old adversary Padua, which freed the Venetians to transport large numbers of Crusaders from two different starting points: Messina and the Apulian coast of Italy, thus avoiding too much strain on one single maritime port.

Innocent also issued a declaration that "Corsaires, pirates and others guilty of molesting and despoiling pilgrims en route to the Holy Land were to be excommunicated" (Sterling, 2003, 110). Innocent died on July 16, 1216, one year before the Crusade was scheduled to depart, while working on a political dispute between Genoa and Pisa, and his successor, Honorius III, although dedicated to the Crusader effort, was unable to foster real peace and unity among all the contingents (Sterling, 2003, 110). Nevertheless at a crusading army, commanded by John de Brienne, consisting of warriors of many European countries was assembled in Acre, and a decision was reached to first attack Damietta. The idea behind this was that in order to acquire Jerusalem and the rest of the Holy Land one should first conquer the powerful Ayyubid state in Egypt.

What followed led to one of the most spectacular feats involving ships and war techniques: Perhaps the most striking defensive feature of the riverine approach to Damietta was a tower located on an island facing the city walls from which there stretched a bridge of boats and a giant iron chain designed to bar traffic on the Nile (Sterling, 2003, 116; Grousset, 2002, 241). A first attempt to capture the tower was made by joining two ships that carried scaling ladders and a third ship with a small fortress on top of the mast while a trebuchet hurled stones at the walls. This was prepared by the Duke of Austria and the Hospitallers (Sterling, ibid.).

Fig. 36. *Siege of Damietta, 1248, Mathew Paris.*
Chronica Maiora Folio 59V, MS 16II

However, the attempt failed, because the depth of the river, prevented a closer approach to the tower, and the topography around the city made it impossible to besiege it and starve out the inhabitants. Undermining the walls was also impossible because of the roughness of the water (Oliver of Paderborn, Sterling, 2003, 117).

These conditions required a new device, never before used: A floating tower was created by lashing two ships together, and then raising four masts and the same number of sail yards, setting up on the summit a strong fortress joined with poles and a network fortification (Paderborn, ibid).[72] The whole contraption had to be dragged upstream by a small boat and moored against the northern wall of the tower (Sterling, 2003, 118). The battle was finally won, the chain was destroyed, and the Crusaders were able to sail up the river to Damietta.

Mooring, Anchoring Landing or Beaching

At the beginning or the end any maritime voyage, contact has to be established between the vessel and the land. This can, obviously, be done in one of many ways: In a bay, a harbor, at a port along a pier, a wharf or a quay, or by simply landing on a beach. In some cases troops, merchandise and equipment can be transported directly to the quay or wharf, or, in the case of a ship anchoring off shore or off the pier, with the assistance of lighters or small boats. Animals in our case, mainly horses, apparently had to be loaded or unloaded at a pier, or directly on the beach, as described below. It is difficult to imagine how a horse weighing between 500 kilograms to nearly a ton, and which would naturally be fidgety and nervous, could be handled from a ship to a lighter or even a big skiff, although there is some evidence to

[72] Although a tower mounted on a Pisan ship was used against the defenders during the battle of Acre.

the contrary, since, according to Joinville, he managed to transport eight horses to his small ship, "petite nef" (Joinville, 1995, 237).

Landing from the stern of the ship, with a door or gate opening to form a gangway, was probably more convenient than landing from the side, especially so if horses were to be landed.

The landing in Constantinople in order to conquer the city was described by Robert of Clari as follows:

> As soon as they had made land (the ships carrying the knights), the knights issued forth from the transports on their horses; for the transports were made in such a way that there was a door that could be opened and a bridge thrust out by which the knights could come out and land all mounted (Clari, 1996, 68).

Horses could, perhaps have been transported for relatively short distances in open or semi-open boats, like in the Bayeux Tapestry, and could simply jump off the boat. But it is difficult to see how horses could be transported across the Mediterranean, and then landed on beaches, and especially so with knights mounted on their backs in full armor, unless special landing doors were practiced at the stern.

When landing in order to disembark troops and mounted knights from the stern opening, a ship had to sail backward toward the beach. This could be done with difficulty, but without assistance if the wind was blowing directly onshore. The technique would be to sail bow-on toward the beach, estimate the distance of approximately five times the length of the vessel from the beach (depending on how steep is the beach shelf), drop an anchor or anchors, and then let the wind turn the ship around, weather-vane like, toward the beach, allowing as much anchor cable as necessary until the vessel is safely beached. This could obviously be done if the sea bottom was sandy or consisted of mud and had a relatively mild slope. It could not be performed on a rocky beach.

However, if the wind was blowing off the beach, or parallel to it, such a maneuver would not be possible. A ship attempting to make a landing would drop an anchor at a reasonable distance from the shore, and then have her boats pull her into position with the stern toward the beach, or else land people on the beach by means of the small boats and have them haul the ship in with long ropes. This could not be done without using row boats (or at least, in some cases, a strong swimmer).

CHAPTER 5 – PORTS OF THE HOLY LAND AND RESULTING INFLUENCE ON CHOICE OF SHIPS

The Holy Land Coast Does Not Facilitate Landings

In order to try and visualize how the Crusaders managed to cope with the problems of loading and unloading along the coast of the Holy Land, we shall try to make a list of the various places known as ports, or areas suitable for anchoring, with a brief description of the characteristics of each such place.

It should be noted that even as recently as the nineteenth century the whole Syrian coast, including the Holy Land/Palestine, was considered unhealthy by seamen, as was aptly described by a British naval officer:

> The most frequented ports and trading places are, the unhealthy and dilapidated Iskanderun; Swaidiyah on the Nahr-el-A`si (Orontes); Lataki (Laodicea ad Mare); the fair town of Tarabulus (Tripolis), or Tripoli, in the East; Beirut (Berytus); Saida (Sidon); Sur (Tyr); Akka or Acre (Ptolemais); Kaipha, under Mount Carmel; Kaissariyah (Caesaria), a tolerable anchorage under a heap of ruins; Jaffa (Joppa), the port of the Western pilgrims of the Holy Land; Scalona [Ascalon] and Ghazza [Gaza], which is backed by very fertile grounds. These places are resorted to by small craft only, in the fine season, for the whole is a dreaded lee-shore in Westerly gales. (Smyth, 1854, 84)

The usual ports of embarkation and disembarkation in the Holy land were Acre and Jaffa, although Jaffa was not really a port in the true sense of the word, but just a mooring basin, poorly protected by a chain of reefs and the Andromeda's Rock, with a dangerous entrance (Mirkin, 2010). In any event, most of the Italian merchants were not attracted to Jaffa. The more attractive cities for merchants were Tyre, Antioch, Tripoli, and, during certain periods, Acre (Prawer, 1985, 103, 183). Merchants also sailed to Alexandria in Egypt.[73] An obvious route to arrive at the Holy Land was to sail from Europe to Cyprus, from there to the coast around Tripoli or Beirut, and then down the coast to Acre or Jaffa, since this shortens the open sea passages out of sight of land.

As far as the Holy Land itself was concerned, the number of real ports, capable of offering shelter, landing piers and services was minimal, if there were any at all – except for Acre, which also had its limitations.

Port of Acre (Akko)

Acre was an important port and, during the Crusader period, was the country's major port (Galili et al., 2010, 205). In one of the books dedicated to Venetian commercial documents (Morozzo Della Rocca and Lombardo, 1940) Acre appears approximately 100 times under various names: Acri, Acchon, Accaron, Accharon, Accon, Acon and Acre, depending on the document's author. The documents include requests for transporting merchandise to Acre only, to Acre and Tyre, or vice versa, bills of maritime exchange, documents pertaining to property in Acre and so forth.

The importance of the port of Acre to the Venetians is further illustrated by the fact that 30 to 40 anchors delivered by the state arsenal in Venice were transferred to Acre in August 1288 to be leased in case of bad weather to Venetian ship operators (Jacoby, 2007, 405, "A Venetian Sailing to Acre in 1282…"). Some of the profit-yielding ventures involving commerce with or to Acre were performed by state-

[73] In later times, in the nineteenth and early twentieth centuries, most ships that went to Jaffa first sailed to Alexandria. Sailing to the Holy Land through Alexandria was also a route for fifteenth-century Jewish pilgrims, such as Meshoulam of Voltera (Eisenstein, 1926, 89).

owned *naves*, actually competing with private enterprise, which shows the crucial importance of Acre within Venice's trading network (Jacoby, ibid.).

Many researchers think that the western basin had silted up by Crusader times therefore ships with deeper drafts had to anchor in the eastern basin, or further out in the bay (Galili, ibid; Gertwagen, 2002, 114).

Various translations or interpretations of the original text of William of Tyre may have caused confusion as to the nature of the western or "inner" harbor of Acre, leading to the understanding that the port was within the city walls. Researchers were, therefore, looking for a harbor within the city walls, for example, near the location of the arsenal in the old city.

However, the Latin text of William of Tyre reads as follows:

Portum habens infra moenia et exterius, ubi tranquillam possit navibus praebere stationem (Guillaume de Tyr, Guizot 1824, Liber Decimus, Caput XXVI).

The English version of the same text is: "Its double port, lying both inside and outside the walls, offers a safe and tranquil anchorage to ships" (William of Tyre, 1976, Vol. I, 453).

The French translation of Villiam of Tyre'sell text is slightly different, speaking about Acre or, rather, about Ptolemais it says: "Elle a en dedans et en dehors de ses murailles un port, dans lequel les vaisseaux trouvent une station commode et tranquille." (Guillaume de Tyr, Guizot 1824, Livre Dixième, Chapitre XXVI).[74]

It seems, therefore that the French translation which speaks of "ses murailles," "Its walls," or the English version, which refers to the port as "inside…the walls" may

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[74] During the time of great sailing ships vaisseau in French meant "ship of the line" – a great ship. Such ships did not exist during the Middle Ages.

have led researchers to mistakenly assume the existence of a harbor within the city walls.

Moreover, one may presume that if Guillaume of Tyre had wanted to refer to the walls of the city, he would have written "**eius** moenia." It may therefore be reasonable to argue that when Guillaume of Tyre referred to a port "between the walls" he meant between the walls of the breakwater. This is further supported by the fact that the entrance to the "interior" port was made between two watchtowers, one the Tower of Flies and the other at the end of the western breakwater, the remnants of which can still be seen in a photograph made by the German air force, in 1918, or, later, by the RAF.[75]

Fig. 37. *Acre, January 4th, 1945.*
The right arrow points to the Tower of Flies; The left arrow points to the remnants of the watchtower

Another, more contemporary view (Fig. 38) shows the suggested layout of the Acre port and its protective chains:

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[75] RAF: British Royal Air Force.

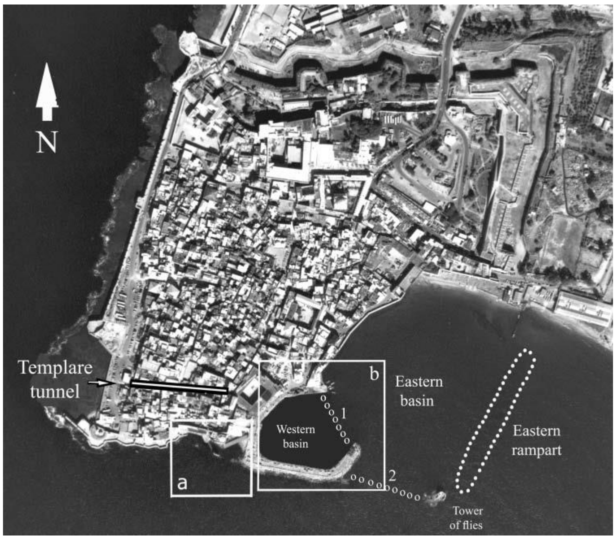

Fig. 38. *A – Seafront of the Pisan Quarter. B – Western basin. 1, 2 – supposed location of chains*

Remnants of a thirteenth-century wooden pier located under water, beyond the location of the western watch tower, may confirm the suggestion that there was no access to the inner harbor for deep-drafted vessels and that ships had to be anchored in the bay and could not use the quay, if such existed. The wooden pier also constituted a kind of island, not directly attached to the mainland. This meant that loading and unloading had to be performed by means of small boats or lighters, or, in the case of horses, by trying to beach the ships stern-on to the northern sandy shore, approximately at the present location of the Nautical School, also known as "Hof Hasousim."[76]

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[76] "Horses Beach," (in Hebrew), apparently so-named because local inhabitants used to wash their horses there.

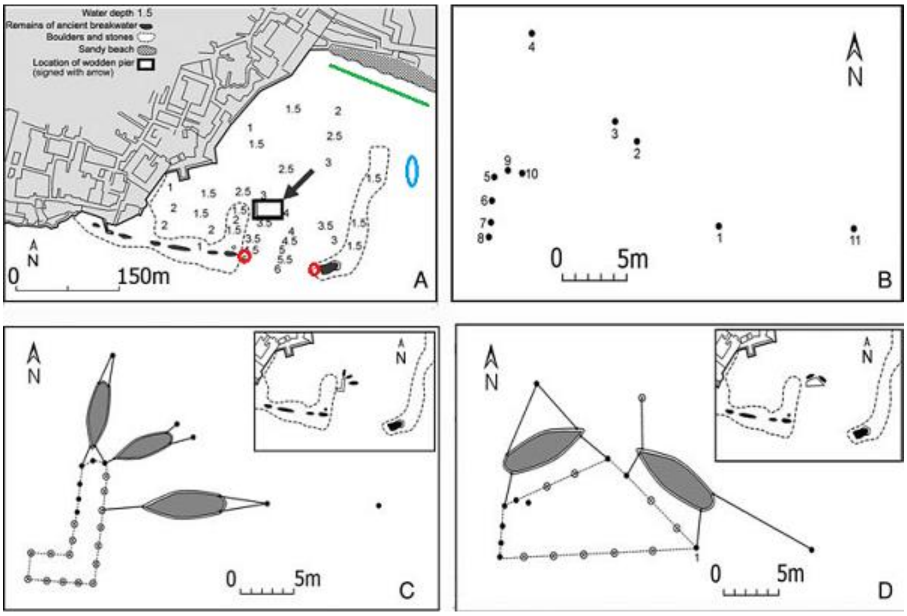

Fig. 39. *A – Acre. Location of the thirteenth century wooden pier. B – Location of pier wooden columns, C and D possible reconstructions of the wooden pier and of moorings.*
The red circles are the probable location of the western watchtowers, still visible on aerial photographs taken at the beginning of the twentieth century, and of the eastern watchtower located on the Isle of Flies. The blue elliptical circle marks the approximate location where an assortment of Crusader ceramic bowls, as well as an encrusted horseshoe and animal bones, were found underwater by Prof. Michal Artzy in 2012 (Artzi, 2012-2013, 12). The sandy shore is the gray area in the top right corner above the green line.[77]

In conclusion it seems that even the port of Acre, which was the best, and, actually, the only real port of the Holy Land, was not adapted to handling of cargoes such as horses, which required access to piers, and that these were probably landed by beaching the horse-bearing *huissiers* on the northern beach of the bay of Acre, as shown in Fig. 39.

[77] The original drawing is from Ehud Galili et al. 2010. The colored markings were added by the author.

Other Ports and Anchorages along the Coast

Atlit

South from Acre, the next point to be discussed passing Haifa Bay which was not a port, is Atlit. Known to the Crusaders as Château Pèlerin, Atlit had two ports: The important one was the Phoenician port in the northern bay of Atlit (Raban and Linder, 1992). The other port was located adjacent to the southern side of the Crusader castle and is known as the Crusader Mole. It is difficult to understand why the Crusaders chose to create a mole on the southern side, considering that the prevailing storms along this coast usually come from the southwest. In any event, no significant finds of Crusader shipping were found in the Phoenician harbor of Atlit. We found no written reports of items discovered in near the Crusader Mole. According to interviews with military divers from the Atlit naval base, many ancient stone anchors were found near the Crusader Mole, which conform to findings from the Phoenician harbor (Raban, 1995–1956). However, proper research cannot be undertaken because Atlit is an active naval base.[78]

Fig. 40. *The southern bay in Atlit, and the Crusader Mole*

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[78] Permission to visit the Southern Port in Atlit was granted by the military authorities, in principle, but due to bureaucratic reasons did not materialized by the time this dissertation was written.

Dor

Dor, approximately eight kilometers south of Atlit was probably not used by the Crusaders as a port, although they built a fortress there, the remnants of which were still very much in evidence in the nineteenth century (Wilson, 1881, 105). A number of wrecks were discovered in the lagoon of Dor, but none was related to the Crusaders, (Wachsmann and Raveh 1984, 233–241).

Caesarea

The Herodian port of Caesarea, about 10 kilometers south of Dor, was built between 22 and 10 BCE. It had been gradually sinking and was virtually destroyed by an earthquake in around 128 CE. Attempts to repair the port carried in the Late Roman era and during the Crusader period were not successful (Raban, 1992, 1369–1390). Substantial buildings and fortifications were erected in Caesarea after its conquest by the King Baldwin I in 1102, and it was further fortified by Louis IX beginning in1251; however, despite the importance of the port in antiquity, we found no indication of use by the Crusaders of Caesarea's port, or what was left of it.

Apollonia-Arsuf

The so-called "Apollonia Port" or "Military Harbor" is located at the foot of the Apollonia-Arsuf Crusader castle, about two nautical miles north of the modern city of Herzliya, 30 kilometers south of Caesarea. The enclosed basin of Apollonia-Arsuf, which will be discussed in detail below, was most probably used in some way by the inhabitants of the castle. However, vessels bigger than small oared craft could not enter into the basin.

Jaffa

Jaffa was considered the port of Jerusalem since very early times, when the King of Tyre told King Solomon: "And we will cut wood out of Lebanon, as much as thou shalt need: and we will bring it to thee in floats by sea to Joppa; and thou shalt carry it up to Jerusalem" (2 Chronicles 2:16).

The Genoese beached their galleys in Jaffa in 1101 (Gertwagen, ibid., 107).

Richard the Lionheart landed in Jaffa, in 1192, as described above. Pilgrims to the Holy Land embarked or disembarked in Jaffa although it lacked accessible quays and was hardly, if at all, protected by reefs, among them the Andromeda's Rock (Mirkin and Goren, 2012, 135).

Yavne Yam

The next anchorage, approximately 20 kilometers south of Jaffa, Yavne Yam or Yavne Maritima, is a slightly protected inlet, somewhat less than a cove, located between a cliff and *kurkar* reefs, which afford some protection. Many artifacts were discovered during underwater surveys, among them, three-holed stone anchors, which contained remnants of the wooden spikes or wedges used in such anchors. Some of these were dated to the tenth–thirteenth centuries – the Crusader era (Galili and Sharvit, 2005, 308).

Ascalon

Another very important port, but without any real port to speak of is Ascalon (now known as Ashkelon). Aptly described by William of Tyre:

> Ascalon derives no advantage from being situated on the seacoast, for it offers no port or safe harbour for ships. It has a mere sandy beach and the violent winds make the sea around the city exceedingly choppy so that, unless the sea be calm, those who come there are very suspicious of it. (William of Tyre, Chapter 6)

Even Ambroise describes the difficulty of handling ships near "Escalone"

> Escalone siet sor la mer
> De Grece, issi l'on nomer,
> N'onques ne vi a me devise
> Nesune citié mielz assise,
> S'il eust port ou entree,
> Car trop i ad bonne contree;
> Mais la mer est si turmentuse
> Llloc endreit e perilluse
> Que nuls veissels n'i puet durer;
> E por ço covint endure
> La a noz genz tel mesestance
> Que onques uit jorz sanz dotance
> Par mer n'i pot veissel venir
> De vitaille a lost sustenir,
> Ne onques de rien n'i gusterent. (Ambroise, 78977911)[79]

Although devoid of a port or harbor, the connection to the sea played a very important role in Ascalon. One of the four gates of the city was called the Sea Gate, "because the citizens can pass through it to the sea" (William of Tyre, ibid.).

Hence, when Baldwin III laid siege to the city, on January 25, 1153 (Grousset, 2006, 339), it was extremely important to extend the siege to the sea as well:

> The lord Gerard of Sidon, one of the leading barons of the kingdom, commanded the fleet of fifteen beaked ships which were ready to sail, so that they could blockade the city by sea and both prevent those who wished to enter from getting in and also stop those who wished to leave from getting out. (William of Tyre, ibid.)

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[79] Now Ascalon lies on the sea/Of Greece. Thus was it named to me./ I never saw a town located/ Fairer, or better situated,/ If only it had port or entry,/ For round about is all good country;/ But the water is so perilous/At that point, so tempestuous,/ That no vessel could ride secure/ Therein. Our men must needs endure/ Therefore hardship and suffering,/ Because no ship could come and bring/ Supplies and food into the place. (Translation: Merton Jerome Hubert).

Reinforcements, a mixture of pilgrims and military men arrived at Ascalon:

> About Easter time the usual passage arrived, which brought in a crowd of pilgrims. A council was held and men were sent from the army to forbid the sailors and pilgrims, on royal authority, to return. They promised them pay and invited them all to participate in the siege and in the work which was so acceptable to God. They also brought ships, both large and small. Thus it happened that quickly, within a few days, because of a good wind, all the ships which had come over on the passage appeared before the city and a tremendous host of pilgrims, both knights and sergeants, joined our expedition.
> (William of Tyre, ibid.)

Passages like this one show once again that the Crusaders managed to conduct naval operations along the coasts of the Holy Land without having recourse to ports, harbors, wharfs or piers, and developed the necessary techniques for loading and unloading equipment, troops, and, sometimes, horses as well.

Landing on Beaches

As described above, port facilities were not available along the coast of the Holy Land, except in Acre, where also during the Crusader period, only a limited number of ships could be accosted to a wharf, if at all. This will be discussed further below.

Side (Quarter) or Stern Doors?

There exists some discussion as to the location of the gates or doors used for embarkation and disembarkation of troops and horses: Was the door or the gate located in the side, on the quarter, or the stern, or even, as was suggested by Bonino, near the bow?

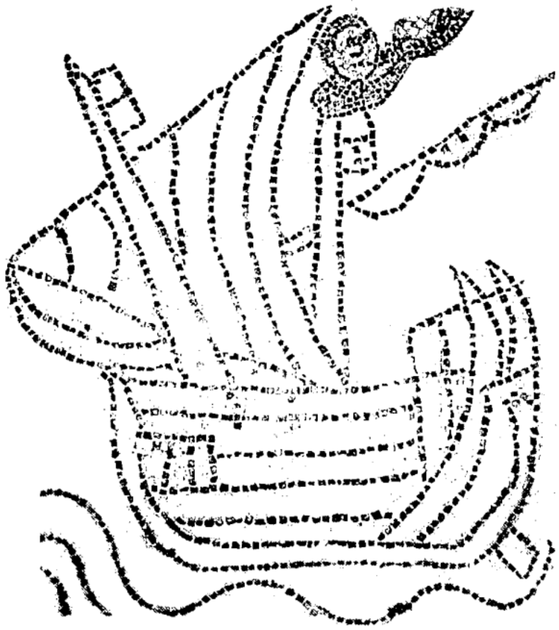

Fig. 41. *Crusader transport ship, originally part of floor mosaic (1224). Displayed on wall, San Giovanni Evangelista, Ravenna*

While discussing this question, reference shall be made again to the question of landing, discussed above, since there is a close relationship between these two subjects.

According to Martin (ibid., 244) Bonino[80] has interpreted the three vertical and two horizontal lines forming the rectangular feature at the bow (Fig. 41) as a horse port and the uprights at the stern as supports for the yard when lowered. Yet, says Martin, the bow seems an unlikely position for cutting a door in the hull.

Indeed, the bow is an unlikely place for creating an opening in the ship, but the quarter also seems a less favorable position for cutting a door, unless the ship can be moored, loaded and unloaded alongside a wharf, which is not the situation along the coasts of the Levant, and especially not along the shore of the Holy Land.

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[80] In Martin's (2002) bibliography: Bonino, M., 1978, Lateen-rigged medieval ships. New evidence from wrecks in the Po Delta (Italy) and notes on pictorial and other documents. *IJNA*, 7.1, pp**.** 9–28, on p. 12.

If the loading, and more so, the unloading, is made through a side opening then the ship has to be beached in a manner parallel to the shoreline, thus with its side to the sea. It would then be much more vulnerable to the waves, and to the surf. Additionally, if the ship is beached stern-on (or even bow-on), there is a chance that only its end would be entrenched in the sand, and the other end would remain in deeper water. This obviously depends on the configuration of the shore, and how close to the shore the water deepens. But, if the ship is beached alongside the shore, it will necessarily touch bottom along its whole underbody, and be more difficult to sail back into the sea once the operation is finished.

Martin writes that the opening for discharging horses were probably located on the side of the ships:

> In their accounts of Crusades (1248–1254), both Villehardouin and Joinville indicate that horse ports on their particular transports were at the side of the ships (probably at the quarters). Joinville details the departure of St Louis and his men on neis, sailed round-ships.
> (Martin, 2002, 241)

In reaching this conclusion Martin relied on the translation of Joinville and Villehardouin, by Shaw, whom she quotes:

> We went aboard our ship at the port of Marseilles in the month of August (1248). On the day we embarked the door on the **port**[81] side of the ship was opened, so that all the horses we wanted to take with us oversea could be put into the hold. As soon as they were inside, the door was closed and carefully caulked, as is done with a cask before plunging it into the water, because, once the ship is on the high seas, that door is completely submerged (Joinville, trans. Shaw, 1970, 196).[82]

81 Emphasis by the author.
82 In Martin's bibliography: Shaw, M. R. B. (trans.), 1970, *Chronicles of the Crusades*. New York.

Martin seems to have relied on a translation error by Shaw. The original text, in ancient French, from which Shaw probably derived his translation reads as follows:

> Au mois d'aoust entrames en nos nez a la Roche de Marseille. A celle journee que nous entrames en nos nez fist l'un ouvrir la **porte** de la nef et mist l'en touz nos chevaus ens que nous devions mener outre mer, et puis reclost l'en la **porte** et l'emboucha l'en bien aussi comme l'en naye un tonnel, pour ce quant la ne fest en la grant mer toute la porte est en l'yaue. (Joinville, 1995, 220)[83]

It seems, therefore that the use of the French word "porte" for door caused Shaw to confuse "**porte**" in French and the **port side** of the boat, thus mislead Martin.

With respect, Martin was once again misled by Shaw who translated Villehardouin as follows:

> The trumpets sounded. Each transport was attached by a tow-rope to a galley, so as to reach the other side more easily . . . The knights disembarked from the transports; they leapt into the sea up to their waists, fully armed, with helmets laced and lances in hand. In like manner our good archers, sergeants, and crossbowmen, each in his company, landed as soon as their ship touched ground . . . The sailors now began to open the doors **at the side** of the transports and lead out the horses. The knights mounted quickly, while the divisions began to draw up in due order.[84] (Villehardouin, trans. Shaw, 1970, 66)

But the original text of Villehardouin (converted into modern French), does not speak at all about doors at the side of the transports:

> On sonna les trompettes; et chaque galère est liée a un huissier pour passer outre plus facilement …les chevaliers sortirent des huissiers; et ils sautèrent dans la mer jusqu'a la ceinture, tout armés, les heaumes lacés et la lance à la main; et les bons archers aussi et les bons sergents, et les bons arbaletiérs, chacun avec sa compagnie, là ou elle aborda…Alors **les mariniers commencent a ouvrir les**

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[83] Emphasis by the author.
[84] Emphasis by the author.

> **portes des huissiers, et a jeter les pons dehors**; et on commence à tirer les chevaux; et les chevaliers commencent à monter sur leurs chevaux; et les corps de bataille commencent à se ranger.
> (Villehardouin, 1870, 53–54).

No mention at all is made whether the knights disembarked and the horses were pulled out (rather than "led" out, as in the translation) from one of the sides or from the stern. However, mention is made of "bridges" (*"pons"* – "*ponts"* in contemporary French) that were launched. It is probably more convenient to launch a bridge from the stern than from the side or quarter of a ship, especially when horses are concerned, since a side door would hardly be installed at sea level, but rather at the level of an upper deck, whereas a stern opening would probably have its bottom part somewhere above the waterline, when, as Joinville describes, it was "sealed as a barrel." It seems, therefore, that Martin may have again been misled by Shaw's translation of Villehardouin (Martin, 2002, 241).

It is also interesting to note the preparation of the ships and of the towing galleys before landing before landing:

> …les chevaliers furent tous sur les huissiers avec leurs destriers; et ils furent tout armés, les heaumes lacés, et les chevaux couverts et sellés. Et les galères furent tout armées et préparées.[85] (Villehardouin, ibid.)

It seems that the galleys that towed the *huissiers* – the transport ships with the opening (*huis*) – gave cover to the knights who alighted from the transports, before they mounted their chargers.

When discussing the disembarkation via a stern or a side opening it would be helpful to examine again Joinville's statement according to which when the ship sails

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[85] "The knights were all on the *huissiers* with their chargers; and they were all armed, and the helmets laced, and the horses covered and saddled. And the galleys were all armed and readied."

the whole door is submerged. This led to a debate between Pryor and Fourquin, as reflected in Martin's article (Martin, ibid, 241). Fourquin wrote that as an ex-captain of a roll-on roll-off ship, known as a "ro-ro" he would never go to sea with the door still underwater, even in a modern ship. Pryor countered by saying that what Joinville meant was that "they were hit by following seas and perhaps submerged somewhat when the ship heeled" (Pryor, 1982, 390).

This question can be resolved in two ways, one from the point of view of seamanship, and the other by pure logic. As far as seamanship is concerned, every sailor knows that when a boat sails, the stern has a tendency to somewhat settle down. Thus, the door or gate constructed in the stern, while above the waterline, or nearly so, when the ship is being loaded, may become partly submerged when the ship sails, and even wholly submerged for short periods, when a following sea breaks on the poop. As opposed to Pryor's argument, if the door is located in the stern some heeling would hardly affect it since it remains on the center-line of the vessel. If the door is in the side, or the quarter, then if the vessel heels to the side where the door is located, it would be partly or wholly submerged.

But simple logic would prove that the door could not be wholly submerged all the time while sailing, since, in such a case, the door would be at least partly submerged, or nearly wholly submerged while loading or discharging as well, which would render those operations impossible. One cannot load or unload, and certainly one cannot caulk a door even if it is only partly submerged. If a stern-opening door would be high enough to accommodate a knight on his horse (2.25 meters, Pryor, 1982, 106), it would actually cover the whole or a substantial part of the stern. If it was totally submerged at sea, it could not rise above sea level while in port. This also stems from Pryor's reply to Fourquin's note (Pryor, 1982c, 390).

Joinville's description may have been somewhat exaggerated, an exaggeration typical of a landlubber describing fearsome maritime matters.

It seems, therefore, that the preferred landing craft would have been a shallow–draft, oar-propelled *taride* about 18 *canne* long and 14 *palmi* wide[86] at the waterline[87]. The draft, according to a reconstructed drawing (Pryor, 1982b, 117– 118) would be about 3 *palmi.* This corresponds to a length of 37.73 meters by 3.54 meters wide at the floor level of the ship, which is usually slightly below the water level, and which is therefore slightly less than the dimensions at the waterline. The draft of the *tarida* is estimated at 78 centimeters. However, all the Angevin texts specify that ships ordered by Charles I of Anjou, King of Sicily, should have stern-opening doors. If the ships were not equipped with stern-opening doors then troops would have to alight from a side-opening door, jump overboard, or be transported by small boats, unless the ship was moored near a wharf.

It is well known that not only oar propelled *tarides* were used for transporting horses. Contracts signed between Louis IX and Venice called for supply of large ships, sometimes huge ones. Pryor estimates that fifteen ships could carry

> ..no more than 1,450 complete knight's entourages, i.e. 1450 horses and the same number of knights, 2,900 attendants and 1,450 grooms a total of 1,450 horses and 5,800 Crusaders (Pryor, ibid, 108).

This means a slightly fewer than 100 horses per vessel.

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[86] Approximately 3.6 meters wide by 37.8 meters long.
[87] An average taken from texts extracted from the Angevin archives, cited by Pryor, 1982, 114– 115.

But *tarides* were not always oared and some relied on sails only, and had to be towed when the wind was lacking, or near the shore (cif. Conquest of Majorca, above). In the *Lliber dels Fets* of James of Aragon we can read the following description:

> E Don Rodrigo Liçana feu noliejar una taride daqeles que hauia estades al passage de Maylorques… E la taride era bona per adur los cauals…
> (Llibre des Fets, 153, section 104)[88]

Assuming that this was the same kind of *taride* as those that were towed, one could deduce that in medieval Europe there existed two kinds of *tarides* capable of carrying horses: one that used sails and, when necessary, oars, and one that relied on sails only.

Huissiers were not only oared *tarides* but also sailing transport ships equipped with openings to allow unloading of horses. However, being sailing ships, not propelled by oars, sometimes they needed to be towed. Villehardouin specifically writes that they were attached to galleys and towed in order to reach "the other side": "et chaque galère est liée a un huissier pour passer outre plus facilement."

On the other hand, oared *tarides* need not be towed: They had sails that enabled them to tackle long distances, but also oars that enabled them the maneuver. Also, shallow *tarides* (approximately 76 centimeter draft), could approach the beach more closely, so the knights would not need to be submerged up to their belts in water when jumping off the ship. However, not only shallow drafted *tarides*, but also stern-opening sailing transport ships, which were probably some kind of a round ship, like

[88] And Don Rodrigo Lizana chartered one of the *tarides* that had taken part in crossing to Majorca,… and the *taride* was good for carrying the horses. (Translation from Catalan, Smith and Buffrey, 120).

the one illustrated in the mosaic in San Giovanni Evangelista, Ravenna, participated in landings in general, and in the landing described by Villehardouin in particular. Such ships indeed required the assistance of oared galleys in order to turn around and approach the beach stern-on, but probably could not approach the shore too closely due to their deeper draft.[89]

Another kind of horse-carrying craft is the *sallandrum* built by the Genovese shipwrights for Louis IX, about 30 meters in length, and 6.60 in the beam, capable of carrying horses with a crew of 29 seamen (Balard, 1986, 151). The interesting point about these kind of ships was that they were rigged with two masts, seven *antennes* and five sails (Balard, ibid.).[90]

How to Get Off the Beach

Landing troops is only half the problem. Once the soldiers, knights, grooms, horses and equipment were landed, ships had to be returned to the sea, either without the troops, or with them or, at least, with those that had survived. This would not constitute a major problem in the Atlantic or the British Channel, because the technique could be to land on the beach just before the ebb (low tide) and get off at high tide. In the Mediterranean most of the time the tides are not significant; they vary around 8–15 centimeters between low and high tide, the maximum being around 40

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89 Interestingly, ancient galleys were sometimes equipped with ladder-like gangways in the bow or stern, and some carried two landing ladders hanging off the stern (Casson, 1995, 251).

90 *Antenn*e is French for a yard used on a lateen-rigged ship. It is the long spar, usually made by lashing two or even three spars together, to which a triangular sail is attached. The fore end of the *antenne is* low and attached to a point near the bow or the deck, and the aft end is much higher than the mast, which supports the spar near its center (see, for example, Figs. 10a and 10b). It is, therefore, difficult to understand how one single ship, which has two masts, could be equipped with five sails on seven *antennes.*

centimeters between the low low tide and high high tide,[91] known as Neap or Spring tides. So the tide variation in the Mediterranean can help or hinder but usually cannot be counted on to change matters radically.

In order to pull a ship off the beach one would normally try to take off any superfluous weight. Obviously, once troops, horses and weapons have alighted from the ship it draws less water, and the amount by which the ship rises can be calculated according to the TPI formula (Tons per Inch Immersion). This equals roughly the length of the ship at the water level (in meters) multiplied by the beam at water level (in meters) multiplied by the Waterplane Coefficient (CWP) and multiplied by 0.01, in order to obtain the result in centimeters. This can enable one to calculate how many tons charged on board would sink the ship by one centimeter. It can also work the other way around – it can calculate how many tons would be lifted off the ship to raise it in the water by one centimeter.

The Waterplane Coefficient is the ratio between the vessel's area at water line and a rectangle of the same length and breadth as the ship. Therefore the Waterplane Coefficient of a square-ended barge would be approximately.1.0 or 0.9. For comparison's sake, the CWP of the battleship Bismarck was 0.66.[92]

We do not have a precise drawing of a *tarides* seen from above in order to calculate the CWP so I shall assume it is 0.7 for such a long narrow vessel with sharp ends.

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[91] Data taken from Israel Oceanographic and Limnological Research. (From: http://isramar.ocean.org.il/isramar2009/TideHadera/default.aspx)

[92] Taken from: http://www.kbismarck.com/genedata.html, retrieved October 28, 2014

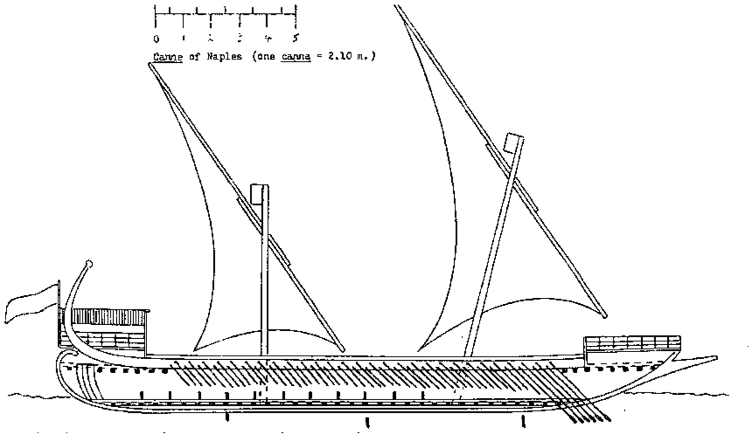

Fig. 42. *Longitudinal section of the taride built at Brindisi in 1278 for Charles I of Anjou, King of Sicily.*

I would assume the CWP of a round ship to be 0.6.

The dimensions of a *taride* of King Charles I, at the floor (the lowest deck) were 37.73 meters by 3.93 meters (Pryor, ibid. 118).

The calculation of the TPI would be: length at water line multiplied by beam at waterline, multiplied by CWP, and then multiplied by 0.01 in order to receive the result in centimeters: 37.73 × 3.93= 148.27; 148.27 x 0.7=103.79; 103.79 x 0.01= 1.04

This means that taking one ton off the *taride* would make it rise in the water one centimeter.

We now have to calculate the weight of the horses that alight from a *taride*, with knights, grooms and so forth. Clari speaks about 40 horses in one *huissier* (Clari 1966 133). Marino Sanudo Torsello (2011) speaks about a fleet of 24 galleys embarking 400 horses, which would make less than 20 horses per vessel (Pryor, 1982. 109). Various estimates are given ranging from the fantastic (15 ships – 4,000 horses, Pryor, ibid., 108) to 15 ships carrying 1,450 horses, and the "same number of knights, 2,900 attendants and 1,450 grooms" (ibid.), which would make nearly one hundred horses per ship, in addition to their paraphernalia.

I propose to be more modest in our calculations and count 30 *destriers* (i.e., war horses) per ship, plus 30 knights, 30 grooms and 60 attendants. Various sources assume that the *destrier* weighed 1200 pounds, approximately 540 kilograms, and the knight 54 kilos.[93] The armor weighed another 50 kilos. Let us assume knight, horse and armor weighed 650 kilos. Multiplied by 30 (the proposed number of knights) equals 19 tons. Ninety attendants and grooms would add another 5 tons. Add mariners, equipment, arms, perhaps food etc. and we arrive at approximately 25 tons. If this weight was removed, a *taride* would rise by 25 centimeters.

With regard to a Round ship, Marco Bonino's reconstruction puts the length at 33.2 meters and the beam at 9.6 meters, at deck level (Martin, 2001, 47). As a ship has "overhangs" it is longer and wider at the deck level than at the waterline, so in order to reach the dimensions at the waterline, one has to deduct approximately 2 meters from the overall length, and, approximately 0.6 from the beam.

This calculation is as follows: 31.2 x 9 = 280; 280 x 0.6 =168; 168 x 0.01= 1.68; thus taking 1.68 tons off a round ship would cause it to rise one centimeter and taking 25 tons off a round ship would cause her to rise approximately 14 centimeters.

Before beaching with the stern (or bow) on, an expert seaman would drop an anchor a good distance off the beach. Thus the angle of the anchor cable would be as shallow as possible, and the cable as horizontal as possible in order to afford a more efficient purchase and angle of tow. The crew can then try to pull the boat off by

93 For example: http://www.horsemanmagazine.com/2009/08/war-horses-and-medieval-knights, retrieved October 28, 2014.

pushing by hand, and by trying to use the ship's capstan to take as much strain as possible on the anchor

Incidentally, I encountered no descriptions or commissions for a capstan on the *huissiers* or *tarides* but, it is known that ancient, even Greek, sailing ships had capstans mounted near the bow (Casson, 1995, 252). And the fifteenth-century sailor, author and naval researcher Michael of Rhodes, in his specification for building and equipping a "galley of Flandre," specifies a capstan, and gives its dimensions (Michael of Rhodes, 1992, Vol. 2, 441). The fifteenth-century traveler Meshoulam of Voltera tells how the ship on which he traveled was nearly sunk near Alexandria, but the Genovese came from Alexandria, dropped anchors and by force of a capstan (or windlass) managed to save the ship (Yaari, 1977, 117–118).

If the Greeks had capstans, and sailing galleys or other ships in the fifteenth century had them as well, one could assume that the Venetians and Genovese who supplied ships to the Crusaders also had capstans, and that these could help in pulling the ships off the beaches.

Proposed conclusion: The majority of ships sailing to the Holy land, unloading troops or troops and horses would probably be stern opening meant to land on beaches. Other ships may have openings at their side or no opening at all, discharging from the deck.

As related above, a stern opening ship may have difficulties loading or unloading at a wharf, unless the wharf is low, nearly at water level, The reason being, obviously, that when the stern gate opens to form a gangway it is hinged at the bottom part of the stern and thus is probably located nearly at the water level.

On the other hand, a door practiced at the side of the ship is probably at the height of the deck, or at least somewhat higher than the floor, otherwise it would be inconvenient to load and unload, and would be too vulnerable to the waves.

The conclusion I propose is that the ships intended to carry Crusaders to ports known for having convenient wharfs or piers may have had side opening doors. Those destined to sail to the Holy Land and designed to carry horses were most probably stern-opening ships.

The following illuminations demonstrate the difficulties that may be incurred by using regular gangways. These illuminations, mostly from the fourteenth and fifteenth centuries, depict people, mostly notables, such as kings, alighting from ships anchored near the shore.

In Fig. 43, below, King Louis alights from the bow of a ship, directly to the shore. The angle of the gangway on which he walks is steep showing that from the ships side it is attached at the level of the deck, without any opening.

Fig. 43. "Arrivée de Louis IX à Limassol."
BnF MSS Français 2634, fol. 411 (c. 1310)

The same also applies to Normans disembarking in France (Fig. 44) although, since the angle of the gangway is not so steep, one can assume that either the ship was lower, or the shore, at the foot of the castle, was somewhat higher than the level of the sea. In both cases the water is rather deep next to the shore.

Fig. 44. *Débarquement des Normands en France (c. 1375).* BnF, MS Français 2813, fol. 165

The following two illuminations (figs. 45 and 46) show a gangway arranged from the deck to river bank, which acts like a wharf or a pier. Again, no special arrangements or special openings for disembarking are shown.

Fig. 45. *Crowning of Louis IV (Left), assassination of Guillaume Longue Epée (right).* BnF, MS Français 6465, fol. 159v (1455?)

Fig. 46. *The Naval Battle of Cadsand.*(c.1408)
BnF Français MS 2643 Fol. 42v

The following illumination, Fig. 47, contains three pictures. At top right a vessel is anchored lengthwise along the shore, with two gangways, at very steep angles, denoting the lack of a pier of wharf. The bottom picture could not conform to reality, because the gangway is attached to a ship with a fully inflated sail. According to the state of the sea and the sail the wind is quite strong, so the only explanation might be that the ship was depicted sailing away in haste; a figure in a small boat made fast to the ship seems hurriedly trying to climb on board, In such a situation, the gangway would subsequently fall into the water and be left behind.

Thus is can be concluded that if there were no horses to unload, but rather only troops, no special openings were made in the vessels, astern or on the side, and sailors often arrived side-on to the beach, bank or shore, relying on the possibility of refloating the ship and bringing it back out to the sea.

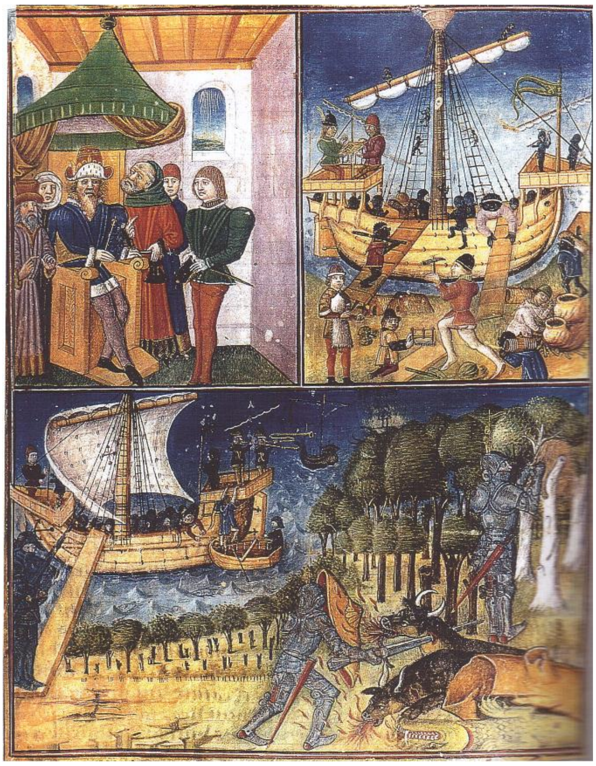

Fig. 47. *Romance of Destruction of Troy (late fifteenth century).*
Bodleian Library Douce MS 353, fol. 31

The painting below, Fig. 48, shows a boat approaching the shore without any arrangements for landing (or perhaps to prevent the rebels on the shore from mounting on deck). The boat lacks masts and sails and is, therefore, probably some kind of a river boat propelled by oars.

Fig. 48. *Richard II meeting with rebels, (beginning fifteenth century).*
BnF, MS 2644, fol. 154v

So, one could propose that horse-carrying ships sailing to the Holy Land would have an opening on their sterns, meant to offload horses and troops on convenient beaches, and not necessarily in a port.

Part 2 of the present work shall be devoted to a particular case: the study of the so called "Military Port" at the foot of the Apollonia-Arsuf Crusader Castle.

Part 2

Apollonia-Arsuf

A Maritime Installation Below the Castle

CHAPTER 1 – GENERAL DESCRIPTION AND RESEARCH PROJECT

Apollonia-Arsuf in the Crusader Period

On June 7, 1091 Richard the Lionheart sailed with 25 ships from Tyre to Acre. This was only part of his fleet; most of his transports, carrying many barons, their entourages and much of his siege equipment, was detained in Tyre because of contrary winds (Gillingham, 1999, 159).

Ambroise describes this:

> E li manda que son barnage
> Ne s'estoire n'iert pas venu,
> Einz l'aveit uns tens detenu,
> Que l'em claime li venz d'Arsur,
> E l'avait arrestee a Sur.
> (Ambroise, 4610–4615)[94]

Ambroise called this contrary wind "the wind of Arsur,[95]" in June 1091, a good few months before the famous Battle of Arsuf took place. Thus, clearly, he wrote *L'Estoire[96] De La Guerre Sainte, Histoire En Vers De La Troisième Croisade* (1190–1192) after the fact; he could not have foreseen the Battle of Arsuf while describing King Richard's trip from Tyre to Acre. Some scholars think he wrote it after he returned to Europe (Introduction to *L'Estoire,* p. IX).

But the fact that he described the southern wind as "the wind of Arsur" proves the importance of this site, as either a fortress, a town, or perhaps an important maritime location.

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94 "He sent word thereof to the King/ And that fleet, which was to bring/ His barons to him still remained/ At Tyre, because it was detained/ By what is called the Arsur wind." (translation: Merton Jerome Hubert).

95 Arsur is another medieval name for Apollonia-Arsuf.

96 Further referred to as *L'Estoire.*

The so-called port or military harbor of Apollonia is located at the foot of the cliff on which the Crusader castle, stands about 2 nautical miles north of the modern city of Herzliya. This built installation is rectangular, measures about 80 meters from north to south and 33 meters from east to west. It has walls[97] at its northern and southern sides, and the western side is protected by a *kurkar* ridge with a building on the top. There were round structures (watchtowers?) at the seaward ends of the walls, and there may have been an entrance at its southwestern corner.

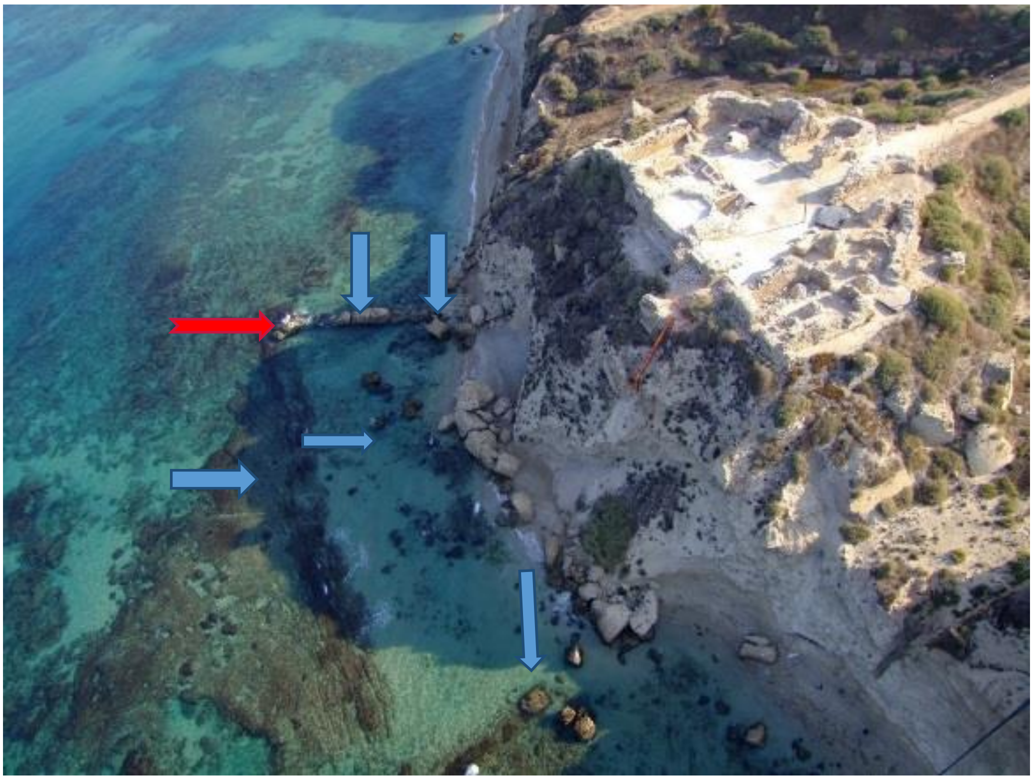

Fig. 49. *Aerial picture of the Apollonia-Arsuf port today.*
The blue arrows indicate the walls (breakwaters?) and the red arrow - the remnants of the northern watchtower

[97] These walls actually act as breakwater, whether this installation was meant to be a port, or just an installation designed to protect the cliff.

The photograph below (Fig. 50) taken in the mid-twentieth century, as well as a GIS of the "Port" made recently can give us an idea of the appearance of the watchtowers before their destruction.

Fig. 50. *Remnants of the southern watchtower, 1953*

A detailed view of the remnants of the northern watchtower, and part of the northern wall can be seen in the following GIS.

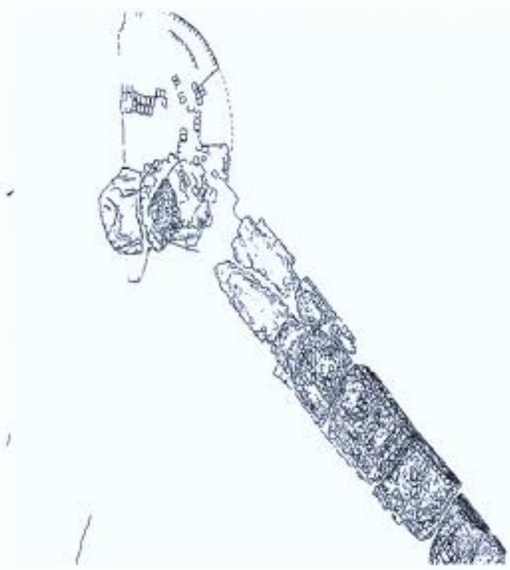

Fig. 51. *GIS of part of the base of the northern watchtower of the "Port" and part of the northern wall*

Fig. 52. *Remnants of the northern watchtower*

Opinions differ as to the true nature of the site and whether it was a real port or harbor[98]. Was it just a mooring basin for small craft? Or, as some scholars claim, was it just an installation designed to prevent an approach from the coast to the cliff on which the castle itself stood? The field work described in this part was performed within the port itself as well as in the deeper waters surrounding it, attempted to elucidate these questions.

Apollonia, or as it was called in medieval times, Arsuf or Arsur, is frequently mentioned in reference to the various Crusades. One of the better-known references is to the Battle of Arsuf, in the Third Crusade, in which Richard I of England (Richard the Lionheart) defeated Saladin on September 7, 1191.

Between 1187 and 1191 the site was still under Ayyubid control; yet an important Crusader town located near the sea in that area, had probably established some means of direct contact with the sea in the twelfth century, be it for logistical support or maritime communication with other entities having access to the sea.

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98 For the purpose of convenience this maritime installation shall, sometimes, be further referred to as the port. This, however, should not be deemed as a confirmation whether this installation was or was not a port.

It is well known that the Franks attempting to conquer Arsuf were assisted by Italian fleets (Asbridge, 2010, 123). Indeed, as one of the main and basic problems of fleets in those days was a supply of fresh water, it can be safely assumed that Arsuf's two springs (one of them active to this day) certainly enhanced the importance and attraction of Arsuf to foreign fleets. One of the springs was described in the 1881 survey by the Palestine Exploration Fund[99] (Conder and Kitchener, 1882, 138), and both are depicted in the drawing made by the surveyors (Fig. 53).

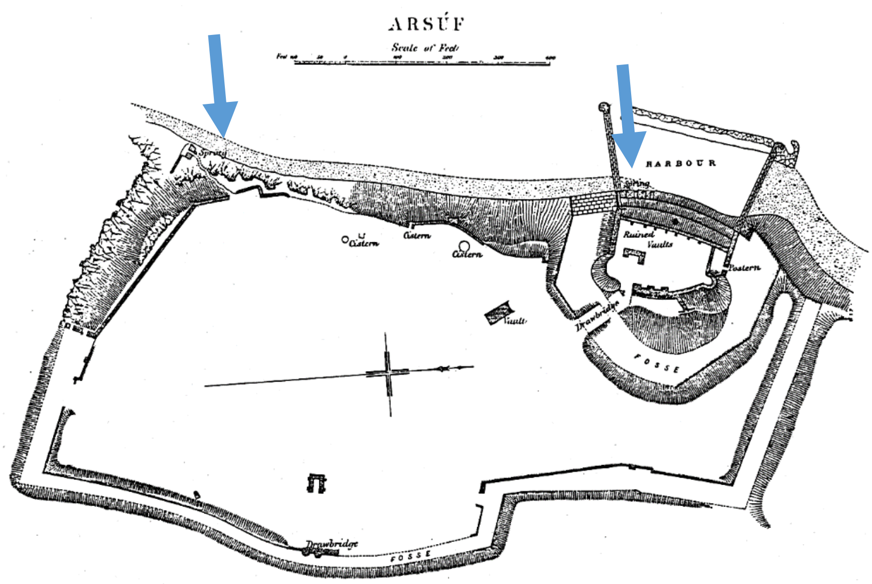

Fig. 53. *Survey of Arsure, PEF 1881, Survey of Arsure, PEF 1881. The blue arrows indicate the springs.*

Evidence of Use as a Maritime Installation In Crusader Times

In the middle of the last century one could still climb up from the beach to the fortress through a tunnel let into the face of the cliff. The location of the tunnel is still known, although it is now blocked by debris.[100] One may assume that inhabitants of the

[99] Palestine Exploration Fund, created 1865.

[100] Interview with Prof. Emeritus Dan Jacobson, Tel Aviv University, who says that he used to climb through the tunnel in his early teens, which was considered as an act of bravado.

fortress in the mid-thirteenth century CE had the means to go down to the shore, and may also have used this or another direct means to get access to the shore. The ongoing digs are still trying to locate a direct link between the castle and the shore.

It is, therefore, not surprising that, apparently, sea transport was used to communicate with the thirteenth-century castle, and probably its twelfth century predecessor. One known example refers to Baldwin I, King of Jerusalem, in the early stages of Crusader rule. He found refuge in Arsuf, after the debacle of the Battle in Ramla, on May 1102, when the King's small army of mounted knights was defeated by a superior number of Egyptian troops.

Desiring to join his troops in Jaffa, King Baldwin was picked up from Arsuf by the pirate Goderic, and managed to escape or avoid Egyptian ships trying to encircle Goderic's ship, referred to as a *buza*[101], as recounted by Albert of Aix:

> Verum dehinc septem diebus evolutis, rex ab Assur exiens, navem, quae dicitur buza, ascendit, et cum eo Godericus pirata de regno Anglia[102]

There seems to be no other evidence describing the use of Arsuf as an embarkation point. The story does not specify how Goderic entered the water off Arsuf in order to pick up King Baldwin, whether the king swam out to meet the *buza* in the open sea (which also defies imagination) or, more likely, the king, or Goderic himself used a small boat to row the king out to sea and meet the ship.

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[101] It is not clear whether the *buza* is a craft known in the Middle Ages as *buzza*, *bucia* or *bucius*, developed from the Viking long ships. Lilian Ray Martin refers to *buzo nave, buzus and buzusnavis* (Martin, 2001, 175) as merchant or transport ships current in the thirteenth century.

[102] Albert of Aix, *Hiestoria Hierosolymitanae Expepeditionis,* Liber IX, Cap. IX.
"After the passage of seven days, the King exited from Assur and boarded a boat called *buza*, with Godericus a pirate of the kingdom of England."

The text tells us, however, that Goderic's boat was light and agile and thus managed to avoid 20 galleys and 13 barks of a type that the Saracens called *cazh* and "in Portu Joppe, delusis hostibus, subito adfuit"[103] (ibid.).

The Research Project

This episode spurred us to study the later, mid-thirteenth century structure of the "Port" of the Arsur castle, which, if it did serve as a maritime installation, would have most likely facilitated logistics in loading and unloading people, animals and cargo alike.[104]

The port as stated above is some 80 meters long by 33 meters wide, and its four cardinal points are:

1. Northwest corner 32°11'45.18" N; 034°48'21,25" E
2. Southwest corner 32°11'41,90" N; 034°48'19,29" E
3. Northeast corner 32°11'44,52" N; 034°48'22,27" E
4. Southeast corner 32°11'42,04" N; 034°48'21,53" E

Judging by aerial photographs one suspects immediately that the walls or breakwaters surrounding the port are manmade. The presence of such manmade structures obviously leads to the question of their purpose. Were they built to create a

103 "Having deluded or [deceived] the enemies, all of a sudden they [or "it"] found themselves [or "itself"] in the port of Jaffa" (translation by the author).

104 The study of the installation was pioneered by Prof. Nicholas Flemming and the late Prof. Avner Raban, who wrote: "It is not possible to say whether this structure was a landing stage, part of the city fortifications, or a harbor basin. The last-mentioned seems unlikely in view of the small size, shallowness, and lack of entrance" (Flemming and Raban, 1978, 66). Dr. Eva Grossman investigated the Installation in her Ph.D. dissertation (Grossmann, 1995) which was later published as a monograph (Grossmann, 2001): Some of the finds she published, such as a three-hole anchor, also appeared elsewhere, e.g., Grossmann and Kingsley, 1996.

mooring area? Or an installation intended to facilitate communication with vessels anchored out side in deep waters? Or perhaps, as some researchers suggest, the structure's only goal was to protect the cliff (Flemming and Raban, ibid.)?

Sub-Bottom Sonar Scan

To attempt to trace maritime activity around the port, it was decided to proceed with an underwater sonar scan. Two experts were engaged to conduct underwater and ground penetrating research in the area surrounding the installation: Dr. K. Storch the inventor and longtime user of a special sediment sonar, of the firm SoSo, and Dr. Hanz Günter Martin, of the firm Abatonos (see Appendix A). The scans were performed between September 30, 2010 and October 6, 2010 mainly around the port, partly close to the shore, the "Inner Area," and in the area located more to seaward, the "Outer Area." Very little work could be done within the port itself, since its bottom was almost completely covered with stones and debris that had fallen from the fortress on the cliff top, and effectively blocked the penetrating capacity of the sonar.

The sediment sonar used was a perpendicular bifrequential sonar. The transducer produces two signals of constant strength and the reflections were measured. This allowed under most circumstances to penetrate the sediment to a certain depth and to locate all hard findings or objects lying in there. The positioning was done by a combined DGPS[105]. All positions were given in dd.dddd (decimal points to the fourth place) in WGS 84 (World Geodetic System 84). The scanner itself was mounted on the stern of a small 'RIB' (rigid-bottom rubber dinghy) with a 10 HP Yamaha outboard engine. The required electric power was supplied from a car

[105] A regular GPS which uses an additional antenna emitting a signal, located at some distance from the GPS itself and, in our case, on the cliff top. This allows for more precise GPS data.

battery. The accompanying computer was protected in a metallic box, and the DGPS additional antenna was erected on the cliff.

The dinghy was launched from the beach, often having to first cross the surf and was usually operated by two people: Dr. Stork, who operated the sonar, and another person who drove the dingy, trying to follow a pattern of overlapping lines to cover each search area.

The primary result of the scan before being deciphered translated itself to 39 plates, such as those presented below (Fig. 54, 55):

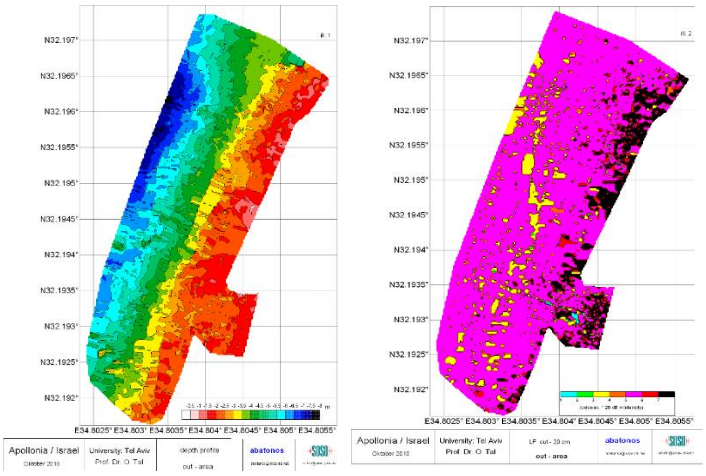

Fig. 54. *'Outer Area'*

Each plate represents a different depth of penetration; when a certain phenomenon repeats itself on different plates, as, for example, indicated by the blue arrows below in Fig. 55, (the yellow line of dots on the dark pink background versus the green line of dots on the yellow background), this may be indicate the presence of an item that might require further investigation ("target").

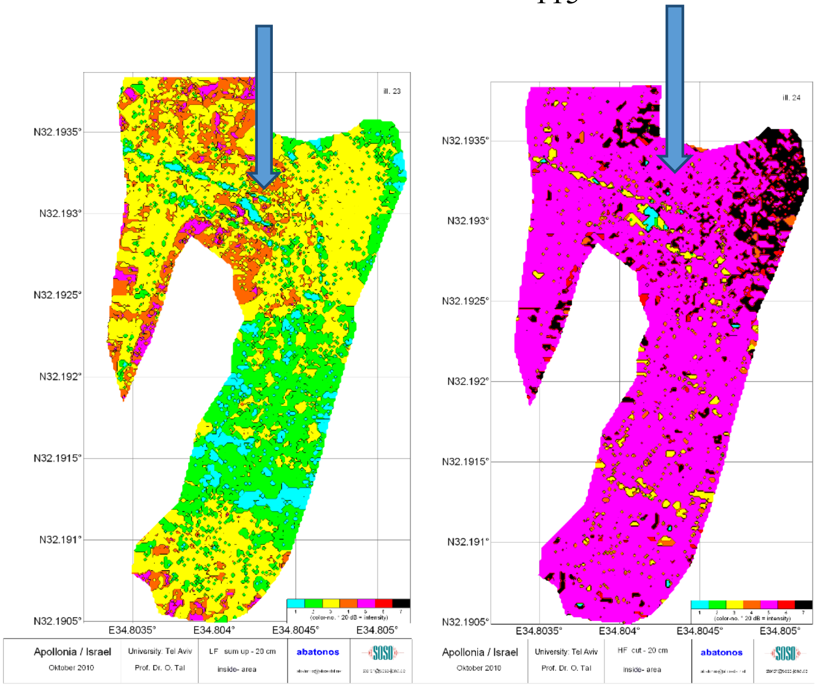

Fig. 55. *'Inner Area'*

After deciphering, Abatonos prepared tables of possible targets as shown in Fig. 56:

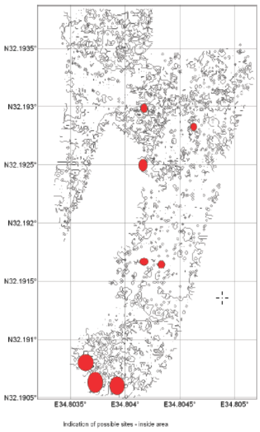

Fig. 56. *Targets in the 'Inner Area'*

For the convenience of plotting on a marine chart, the coordinates of the various points were translated from the decimal system to the minutes and seconds system:[106]

[106] The whole report is attached as Appendix A to the present work. The coordinates of the various targets are enclosed as Appendix B.

The possible targets were also positioned on a Google aerial photograph and given names commencing with 'Apo 1' etc.

Fig. 57. *The targets are marked by yellow pins on a Goog;e Earth map*
The green dot near Apo2 is where a piece of *Cedrus Libani* was found. The red dot is where an olive pit was found and the light blue dot, near Apo 10 is where a piece of metal-impregnated wood was found.

Water-jetting attempt 1

On June 19, 2011, a first attempt was made to water-jet some of the targets. Water-jetting involves mounting a portable, engine-operated pump on a motor boat, which sucks sea water and directs it through a pipe to a steel nozzle, creating a strong and concentrated stream. The water jet is operated by a diver. It penetrates the sand on the seabed and any objects located under the sand are projected to its upper surface. The samples are collected by the diver and brought up to the boat. For various reasons the attempt failed to reveal any findings.

Water-jetting attempt 2

One June 11, 2012 at 06.30 we started from the Marina in Herzliya on a boat supplied by the Reef Diving Club equipped with a reliable 75 HP Mercury engine, a 2-inch pressure pump connected to a 15-m long fire hose, connected in turn to a 3-m long steel pipe, 3/4 inches diameter. On board, in addition to the author, was the boat's skipper, a diver himself and three more divers. Targets were located with a GARMIN 550 GPS equipped with a camera.[107]

First point: New 1; Lat: N32.1906; Long: E 034.8039; time: 07.15

The points where the water jetting was performed were identified as New 1, New 2 etc.

Depth of water in New 1 was approximately 1.80 m. Water-jetting was carried out to the depth of 3 meters through the sand down to a rocky bottom; there were no findings.

Second point: New 3; Lat: 32.19080 N; Long: 034.80360 E; Time: 08.45

Depth of water: approximately 2 meters. Depth of sand, approximately 4.5 meters. At the depth of 3 meters a non-porous piece of wood was found. Approximately at 09.45 at the depth of 4.5 meters under the sand more porous pieces of wood were found, along with what appeared to be an olive pit. A much eroded jar handle (Hellenistic?) was also found.

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[107] Although plotting on marine charts is usually done using the degrees, minutes and seconds system, the readout in the GPS was converted the decimal system to conform to the Abatonos report, and avoid conversion mistakes, using the international in WGS 84 datum used by GPS.

The exact point where the pieces of wood were found was marked in the GPS as NEW2FOUNDWOOD, and its precise location was Lat: 32.19089 N; Long: 034.80354 E.

Third point: New 9: Lat: 32.19650 N; Long: 034.80470 E; Time: 11.00

This point is located seaward of the reef line. Depth of water approximately 5.5 meters. Pieces of wood were found under 1 meter of sand.

Water-jetting Attempt 3

June 18, 2012

First point: Monday 2; Lat: 32.11550 N; Long: 034.48247 E; Time: 06.45

Depth of water: 3 meters. This point was very close to the reef which is located to seaward of the port; strong swell prevented possibility of work.

This was significant not only as far as water-jetting was concerned, but because it proved the difficulty that ancient sea-farers may have encountered while approaching the port. The ancient navigator had to thread his way through a series of reefs if he wanted to approach the port.

Second point: New-10; Lat: 32.11832 N; Long: 034.48234 E. Time: 07.45

Depth of water: 5–7 m. The following findings were located on the seabed after water-jetting the sand to a depth of approximately 2.5 m: The abovementioned olive pit, sharp at both ends, another item resembling an almond, as well as a bigger pit, which looked like a peach stone, were found. In addition, some pieces of wood including one, about 8 centimeters long, which looked somewhat newer, were found.

Each of the findings was inserted into a small plastic bag, marked with the name of the point where it was found and numbered sequentially within that point. The name of the point was written in pencil on a piece of cardboard and inserted into the same bag. This work was supervised by Dr. Nili Liphschitz an expert in dendroarchaeology and dendrochronology, and by the archaeologist Prof. Oren Tal. The findings were sent to the ETH Laboratory of Ion Beam Physics in Zurich, for radiocarbon dating, accompanied by a list (Appendix C).

Significant ^{14}c Results

The results of the dating which were found to be significant are listed in Table 2 below:

ID No.	**Site**	**Tree species**	**Calib. ETH 14C (at 95% probability)**
ETH-46902	New 3-3	Pistacia sp. metal impregnated	1280–1400 CE 95%
ETH-46903	New 9-1	*Cedrus libani* A long piece	1660–1890 CE 78% 1900–1950 CE 16.7%
ETH-46909	New 10-1	*Cupressus sempervirens* Piece of wood	1640–1690 CE 33.7% 1730–1810 CE 46.7% 1930–1960 CE 15%
ETH-46910	New 10-3	*Olea europaea* stone	880 CE–1020 CE 95.4%

Table 2: *Significant radiocarbon dating results from the June 18 water-jetting.*

The findings represent three different time periods and might indicate the possible location of a ship wreck or wrecks at some of the sites.

Further water-jetting in the areas suggested in the sonar research report will be conducted in order to try and locate additional finds.

The Excavation

In order to determine whether the port could indeed have served as a harbor for sea-going vessels a few questions must be answered:

- Are the entrances to the port practicable, and, if so, under what sea conditions?
- What is the depth of the port assuming that it is free of debris and silt?
- How were the walls built? What kind of stones was used and what are their sizes?
- Was the sea level substantially different in Crusader times than in the present day?

It was decided that in order to obtain at least partial answers, the port would have to be partially dredged to remove at least some of the silt, stones that had fallen from the castle and other debris, which would allow the port's depth to be ascertained. Water-jetting would have to be performed in many points to try ascertain depths and also to locate findings, if any, beneath the seabed.

In order to protect the cliff against erosion by the sea waves, in the winter of 2009, huge limestone boulders were placed on the narrow sandy beach, to the south and north of the ancient port, at the foot of the castle and to its west, making approach by foot from the south extremely difficult and hazardous. As for the approach from the north, the beach cannot be accessed by vehicle, making overland transport of excavation and dredging equipment such as water-pump, dredgers, and dive gear impossible. Hence, there was a need to find a solution to transport the equipment by sea.

Fig. 58. *The dredging pump mounted on the rubber dinghy, with a divers' flag, moored in the port*

The dredging pump, which weighs approximately 250 kilograms, was installed on a wooden platform on a rubber boat (Fig. 58), which was sailed to the site from the Herzliya Marina. The operation was done very early in the morning when the sea is relatively calm because the boat, being very top heavy, was not designed for such work and any beam wave could have capsized it. Shallow rocks at the entrance to the site required that the boat's outboard engine be raised, and it was rowed in. The rest of the equipment – air-tanks, dredgers, fire hoses, pipes, dive gear, office supplies, food etc. – was transported on a flat-bottomed motorboat that was walked into the port, through the narrow entrance in the reef, which forms the port's western, seaward 'wall' or breakwater (?) (Fig. 59). A temporary camp was established on a small beach at the foot of the cliff. Electricity and water were brought down by long hoses and cables from Apollonia National Park, located at the top of the cliff, and a tent was erected for a guard who remained on the site during the entire operation, which lasted five days, from November 3 to November 7, 2013.

Fig. 59. *Walking the boat in*

Except during the first stage of installation and later, when the camp was dismantled, the motorboat remained outside the reef and air-tanks and provisions were rowed into the port on a kayak (Fig. 60).

Fig. 60. *Rowing out with empty air tanks*

Many pieces of machinery, diving and water-jetting equipment and so forth were delivered to the camp site. For the detailed list see Appendix D.

Workforce

A notice calling for volunteer divers was published at the universities of Tel Aviv and Haifa, as well as on the Internet, and more than 60 people applied. They were vetted by the dive-masters of the Leon Recanati Institute for Maritime Studies, University of Haifa. The approximately 30 applicants admitted were divided into several groups, each group consisting of two or three divers, one supervisor of the dredger pump (to be able to stop it in case of emergency), and one person on shore to count the divers for safety purposes as they went in and came out of the water, so as to make sure that nobody remained underwater entangled in the dredging hoses. In addition, at least two people performed the water-jetting, and one or two made drawings under or above the water.[108]

Tasks

The work was divided into two main areas: first, studying the northern and southern built walls, as well as the western wall, consisting of a natural reef with some remnants of masonry, and, second, studying of the seabed. A total of 119 dives took place under the supervision of the Maritime Workshop of the Leon Recanati Institute for Maritime Studies, University of Haifa. The work included clearing of stones and rubble, excavation of trenches, water-jetting and documenting the constructions on the site in the attempt to understand whether they were indeed meant to act as breakwaters, protecting a harbor or landing stage, or part of the city's fortifications.

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[108] The work was supervised by Prof. Y. Kahanov, Dr. D. Cvikel of the University of Haifa, and the author.

Clearing the Seabed

The first stage involved mainly clearing stones and rubble scattered on part of seabed in the port, most of which, as noted, had fallen down from the castle over the years. This was done to create areas of clear seabed that could later be cleared of silt to verify the depth of the port (Fig. 61).

Fig. 61. *Diver Clearing debris*

The stones, generally ashlars measuring about 40×30×25 centimeters were collected into crates, dragged under water and deposited outside the northern wall. When a substantial area of the northwestern part of the port was cleared of heavy rubble and stones, the excavation commenced, employing two dredgers. It was decided to first try to dredge a deep trench, in order to examine the foundation of the northern wall (or breakwater), and the western reef and when the trench reached the depth of about 1.5 meters divers were instructed not to excavate under the wall so as to avoid danger of collapse. After the foundation of the wall or breakwater and of the northern watchtower was examined, it was decided to extend the trench eastward, toward the shore. At a later stage the trench was extended southward and deepened.

Because part of the area of the "Port" was covered with large sections of the fallen castle wall, and since the excavated trench proved that the bedrock is much deeper than was first realized (about 2.5 meters rather than approximately 1 meter) it was decided that better knowledge could be gained by water-jet probes in many areas of the site, and then measuring the depths of the seabed (Fig. 62).

Fig. 62. *Water-jetting*

Seventy-four probes were carried out, with 2 meters intervals between each probe. Some of the probes were so deep that the probe itself, about 2.5 meters long, was sunk completely into the seabed. Some probes hit rocky bottom at a shallow depth. The probes were performed along four lines (marked in red on Fig. 63).

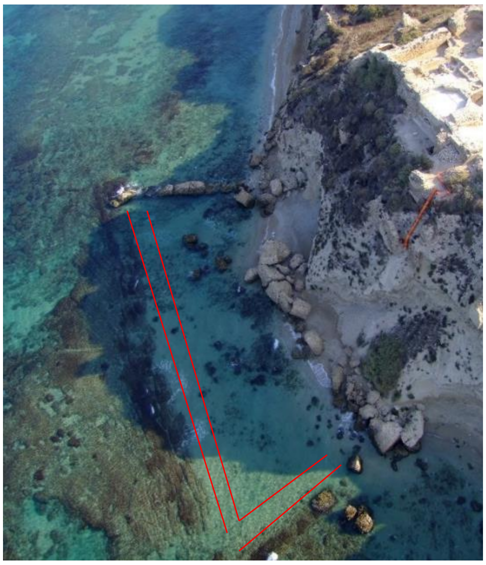

Fig. 63. *Water-jetting was performed along the lines marked in red*

Each water-jetting point was logged, and two figures were recorded: the upper one – the depth of the water at that particular point, and the lower figure: the depth of penetration of the probe until it hit hard bottom, rock, or, in some cases, sank its entire length into the sea-bottom without encountering resistance. See Appendix E for the original log with headings in Hebrew and annotations in English added by hand.

CHAPTER 2 – FINDINGS

The Northern and Southern Walls (Breakwaters?)

Until the research was carried out (2013) it was believed that the site was surrounded by manmade masonry and by a natural reef (Flemming & Raban, ibid.). It was apparent that the northern and southern walls were manmade. The lowest layer of the stones constitutes a protruding ledge, slightly wider than the upper part of the wall (Fig. 64). However, it is not certain that this protrusion was intended to be a ledge or, whether perhaps, the whole construction was wider, and part of it, above the ledge, had disappeared over the years, leaving the ledge-like wider section.[109]

Fig. 64. *Protruding ledge.*

The northern wall was built on a soft *kurkar* ramp (Fig. 65). This may help to uphold the theory that the port was deeper than previously assumed and that the

[109] Similar construction in larger and smaller stones is evident in the castle itself.

builders found the need to create a ramp and build a stone breakwater on its upper part to withstand the waves.

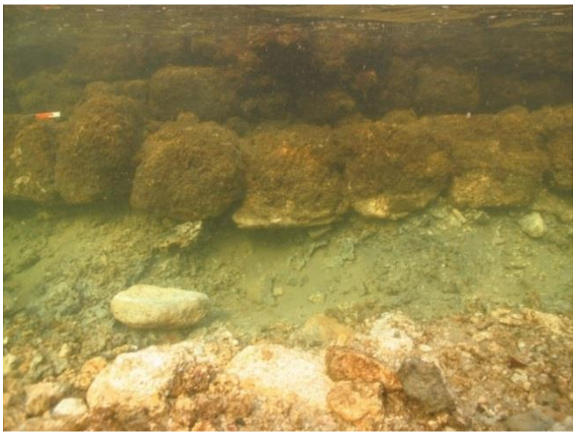

Fig. 65. *Headers on a ramp*

Excavation of the trench eased access to the base of the northern wall. Work then proceeded with the drawing and photographing of structures, over and under water, for example, a drawing of a part of the northern wall (Fig. 66), a photograph of an area close to it (Fig. 67), a photograph of staircase-like part of the northern wall, from the north (Fig. 68), and a photograph of the trenches indicating their depth below water level (Fig. 69).

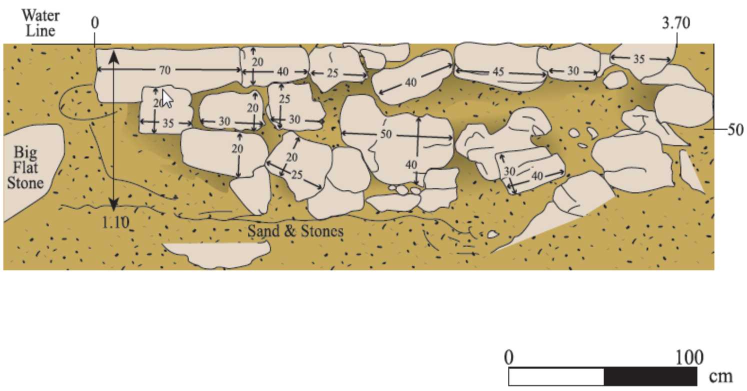

Fig. 66. *Western section of the northern wall.*

Fig. 67. *Western section of the northern wall.*

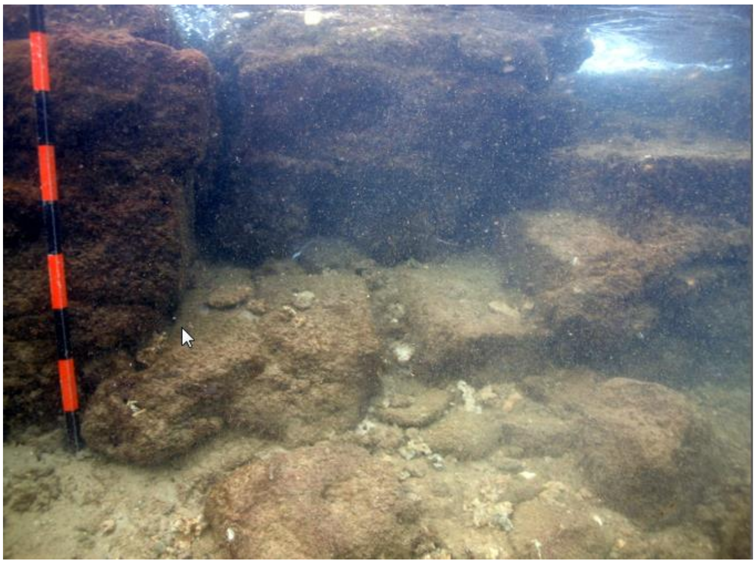

Fig. 68. *Western section of the northern wall,*
taken from the north, with staircase-like ashlars

Fig. 69. *The trench at 1.2 meters below water level.*

Fig. 70. *Headers on a ramp acting as foundation*

At the base of the northern wall, the trench reached a depth of 2.4 meters newly uncovered stones, which were "clean" as opposed to the upper courses that were found covered by marine fouling (Fig. 71).

Fig. 71. *"Clean" stones recently uncovered*

The Western Seawall

The western seawall consisted of a reef that may have acted as a foundation for a manmade wall that had apparently disappeared over the years. Having carefully studied the western wall, which consisted of a long reef on a roughly south-north axis, it is now certain that it consists partly of natural rock. The builders of the port apparently made clever use of the natural reef, constructing the northern and southern walls roughly on an east-west axis, connecting the reef and the shore at both the northwestern and southwestern corners of the port. Round structures presumed to be watchtowers were built at the corners where the southern and the northern walls meet the natural reef.[110]

Remains of the northern watchtower could still be seen at the beginning of the last century (Fig. 52) and its base can still be seen today.

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[110] The direction of the northern structure (breakwater?) from the shore seaward is 317°, and that of the southern structure is 259°.

As for the western wall of the port, the natural reef there is ample proof that an attempt had been made to enhance its quality as a wall: On the reef itself is a narrow, shallow trench (Fig. 72), very probably manmade, which seems to have served as the foundation for a structure.

Fig. 72. *The shallow trench on the reef*

Part of the structure erected on the reef, which constitutes the western wall of the port, still exists today (Fig. 73).

Fig. 73. *Remnants of structure on the reef*

It is difficult to explain why these break-water(?) would have been built in regular masonry style, with the ashlars laid lengthwise, parallel to the reef, in a manner making them most vulnerable to attack by waves and in an area most exposed to the breakers. It is especially strange since it is clear that the builders of the port were familiar with the header construction method – presenting the narrow face of the stone to the sea – as seen in the placement of the *kurkar* ashlars in the northern and southern structures which are built from *kurkar* ashlars, many of which were laid at a 90-degree angle to the wall.

We took samples of the joints between some stones on the reef to be chemically and petrographically tested for cement residues. If such residues are found and analysis reveals that the cement used was hydraulic, this might shed some light on the intention of the builders, which, meanwhile remains unclear in this respect.

Some pottery fragments, including the spout of a Gaza-type jar of the sixth and seventh centuries CE and other ceramic fragments were found (mostly medieval in date). Those were archaeologically insignificant. A modern piece of jewelry as well as a modern Israeli coin were found about 1.5 meters under the sandy seabed, slightly to the east of the northwestern corner of the installation, which proves that sand silting at the site was ongoing over the years.

Depths

It was generally thought that the site is too shallow to have been anything but a basin that could be used only in a calm sea, which is quite rare along the open coast of the Eastern Mediterranean. The probes and the excavated trench proved this to be wrong; the average depth of the sand, except where the probe hit rocks or sunken building stones, was 1.75 meters, and often more, and at maximum depth some of the trenches reached hard rock at 1.0– 2.6 meters deep below sea level. The average depth of the water was approximately 90 centimeters.[111] If indeed the water was as deep as the probe went in and the trench excavated, then theoretically small to medium-sized vessels could have been moored in the port.

However, if the depth of the sand is disregarded and only the depth of the water measured,[112] then the port was rather shallow, especially since sea level during the Crusader period was approximately 45 centimeters lower than at present according to the latest measurements (Toker et al., 2011). If, on the other hand, one assumes that accumulated silt did not exist during the Crusader period, and, considering that the debris that fell from the cliff was obviously absent, then the depth of the port seems to be more reasonable, at least for small craft.

Nevertheless, the question of the shallow entrance still needs to be addressed.

Entrances

The shallow entrance by which our supplies were ferried to the excavation area in small craft most certainly would have also precluded use of the site by large vessels of any kind. However, a small boat (or, maybe, even a small galley) could be "walked" or rowed in during an exceptionally calm sea, the depth of the water above the reef being about 60 centimeters at medium tide.

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[111] The water depth measurements were carried out at low tide. However, in this part of the world, the difference between high and low tide rarely exceeds 40 centimeters, and only during Proxigean Spring Tide, which occurs once every one and a half years. The difference between high and low tide during the research period was approximately 40 centimeters. The tide table for local waters at the relevant period is shown in Appendix G.

[112] In Acre and Dor it is customary to measure the depth of the water and disregard the depth of the sand on the seabed.

Fig. 74. *Supply boat walked out after dismantling the camp*

A geodetic surveyor was engaged to perform total station measurements in order to include all the recorded remains in the GIS site map, which resulted in the following diagram (Fig. 75):

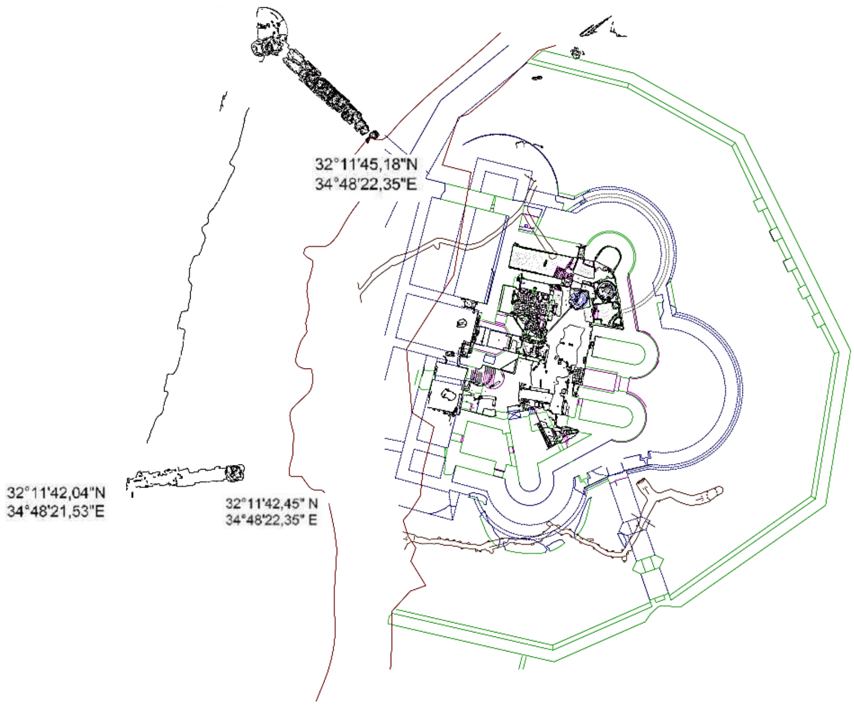


Fig. 75. *GIS map of the castle and outline of the installation completed June 16, 2014.*

The GIS map (Fig. 51), when enlarged, permits detailed study of the arrangement of stones and the base of the northern tower that was built on the northwestern corner of the port, the remnants of which can still be seen in photograph taken about 100 years ago (Fig. 52).

Evidence of Sea Traffic near Apollonia-Arsuf

Marine traffic usually does not take place without leaving some signs, be they shipwrecks or articles fallen from ships such as utensils or ceramics. The following table presents various items, including sherds and glassware, found underwater by Dr. Ehud Galili of the Israel Antiquities Authority. All these items were stored in cardboard boxes in the Authority's compound in Caesarea, meticulously numbered and classified.

Dr. Galili's findings originating in the area of Apollonia-Arsuf are presented in the following tables. A color-coded chart and a small map (Fig. 76) show the areas where these findings were discovered:

Period	**Where found**	**Number of item in diving report**	**Diving report No.**	**License No.**	**Photograph**	**Description**
Crusader	Apollonia (green)	20	2	53/95		Two parts of a jug's neck.
Crusader	Apollonia (green)	16				Jug
Crusader	Apollonia (green)	17	2	53/95		Jug

Crusader 13th century	Apollonia sea			Apollonia Galili Survey 2001 19/9	 	Fragment of casserole
Roman-Byzantine	Apollonia sea			Apollonia Galili Survey 19/9 2001		Amphora toe
Gaza, 4th–5th century	Apollonia (red)	4	3	26/92		Jar
	Apollonia (red)	3	3	26-92		Casserole
Crusader	Apollonia (blue)	2	2	53/95		Bowl
Crusader	Apollonia (blue)	2	13	53/95		Bowl
Crusader	Apollonia (blue)	2	6	53.95		Bowl
12th–13th century	Apollonia (blue)	2	1	53/95		Bowl Bi-chrome glazed
Crusader Mamluk	Apollonia (blue)	2	16	53/95		Lamp
St. Simeon 12th century	Apollonia (blue)	2	11	53/95		Bowl

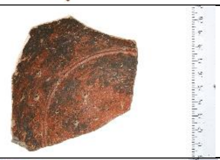
St. Simeon 12th century	Apollonia (blue)	2	11	53/95		Bowl
St. Simeon 12th century	Apollonia (blue)	2	14	53/95		Bowl
Syrian import S. Graffito 11th–12th centuries	Apollonia (blue)	2	15	53/95		Bowl
Late Muslim	Apollonia (blue)	2	10	53/95		Lamp
	Apollonia (blue)	2	4	53/95		Tile
Proto-Maiolica	Apollonia (blue)	2	3	53/95		Krater
	Apollonia (blue)	2	12	53/95		Bowl
Late Roman	Apollonia (blue)	2	5	53/95		Lamp
Late Roman-Byzantine	Apollonia (blue)	2	7	53/95		Mold-made lamp
Late Roman-Byzantine	Apollonia (blue)	2	8	53/95		Mold-made lamp
Late Roman-Byzantine	Apollonia (blue)	2	9	53/95		Mold-made lamp

Table 3: *Underwater finds at Apollonia-Arsuf*

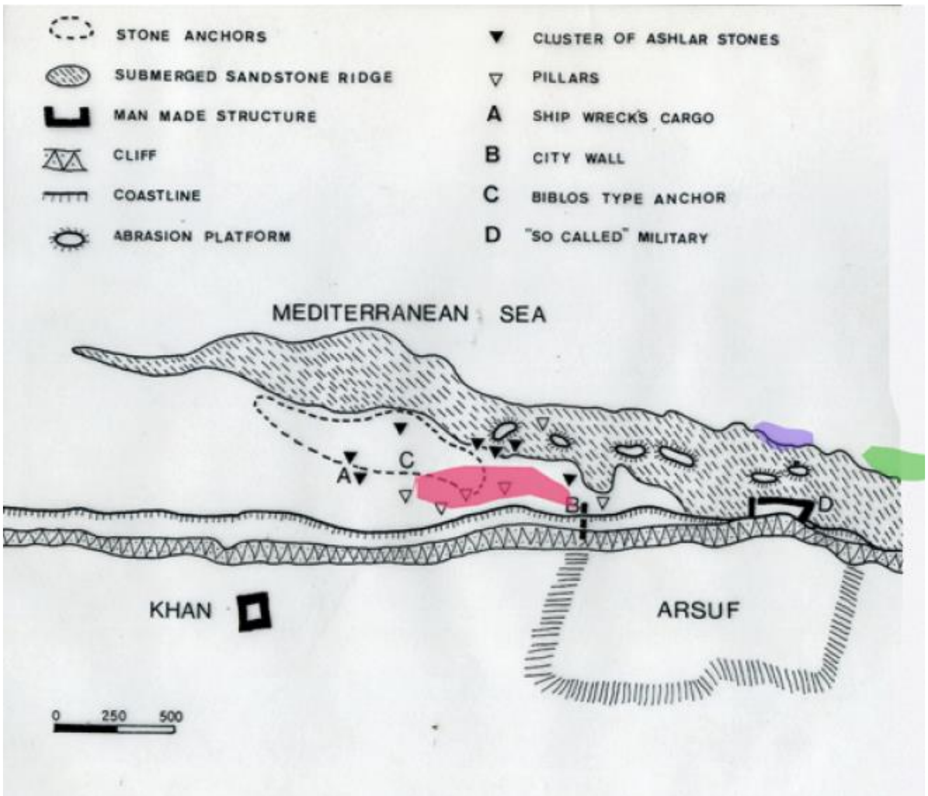


Fig. 76. *Chart showing location of ceramic and glass finds near Apollonia-Arsuf*

Survey report 26/92/3

Ceramics report 53/95/2

Glassware Northern Area report 53/95/2

A comparison of the above finds with those discovered in a trove of ceramics found underwater by Prof. Michal Artzy (Fig. 77) in the presumed anchoring area of Crusader ships in the port of Acre (Akko) reveals obvious similarities between the two assemblages.

Fig. 77. *Underwater trove of ceramics – Acre port*

Some of the finds in the Apollonia-Arsuf Castle:

Fig. 78. *Some ceramic finds in Apollonia Castle. Scale 1:5*

The similarity among all these finds, which are typical of the Crusader period, indicates robust maritime Crusader traffic in the vicinity of Apollonia-Arsuf. These include finds that reveal the foundering of vessels near Apollonia-Arsuf, or deck cargo that fell into the water.

While snorkeling off the Apollonia-Arsuf coast, on September 2010 about 100 meters off the shore (Lat: 32º 11' 36" N; Long: 34º 48' 15.6" E) the author and a friend found a few pieces of a column (Fig. 79) approximately 40 centimeters in diameter. One piece was about 1.5 meters long and the other was half buried, which made it difficult to measure. On November 10, 2010, two samples were taken, one of each column. The samples were analyzed by Professor Lorenzo Lazzarini of the Applied Petrography Department at the University IUAV of Venice. His microscopic examination of a thin slide prepared from the sample revealed that the sample (Fig. 80) is Mysian granite originating in Kozak Dag, in the province of Bergama, Turkey.

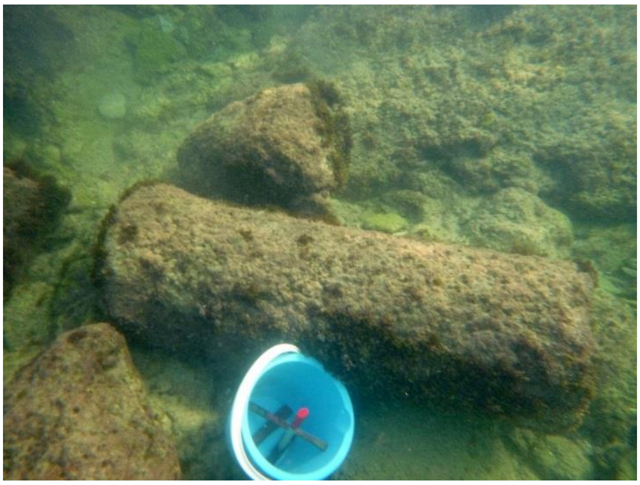


Fig. 79. *One piece of the column found under water near Apollonia-Arsuf*

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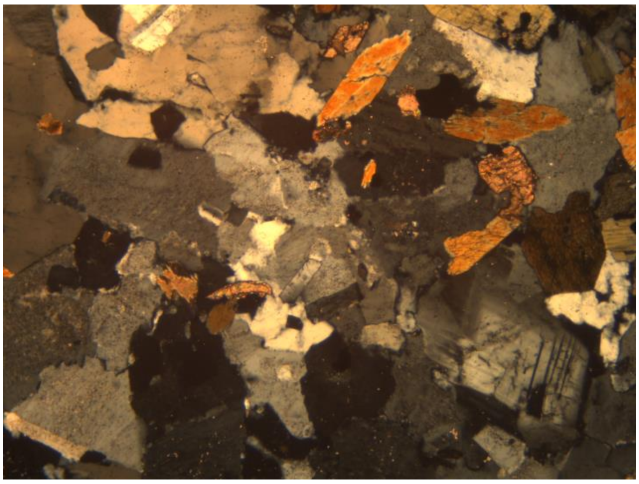

Fig. 80. *Slide prepared by Prof. Lorenzo Lazzarini from sample taken of same column*

This finding, in conjunction with the pieces of wood and the olive pit found near the installation, or the "Port" tend to confirm that the area in general, and the port area in particular, were visited by ships.

It is important to note that so far it has generally been assumed that granite columns found in Apollonia were imported from Egypt. The fact that the columns analyzed from the Apollonia port were made of Turkish granite may cast a different light on various thoughts concerning the origin of other stones and pieces of marble from the castle of Apollonia-Arsuf.

Was Apollonia-Arsuf a Port?

It is tempting to call the maritime installation located at the foot of the Apollonia Arsuf castle a "port." Indeed, the explanatory sign directing visitors to the castle refers to the installation as a port without casting the slightest doubt, in fact, calling it "the Crusader Port." In her Ph.D. thesis (ibid.), Dr. Eva Grossmann included an artist's rendering showing sailing vessels moored in the so-called port. With respect, this seems to venture too far afield.

Still, whether the installation was built as a port, harbor or extension of the castle, its builders were familiar with marine building techniques. And the small and difficult entrance notwithstanding, once a boat had managed to find its way into the area protected by the walls, it was relatively safe. The results of the above project show that shallow craft could be "walked in" into the port, albeit with difficulty, and that it may have been deeper about ten centuries ago and most probably free of the debris that clutters it today. However, a real port it could not have been, although the PEF surveyors did not hesitate to label it 'HARBOUR' (see Fig. 53 above and an enlarged section below, Fig. 81).

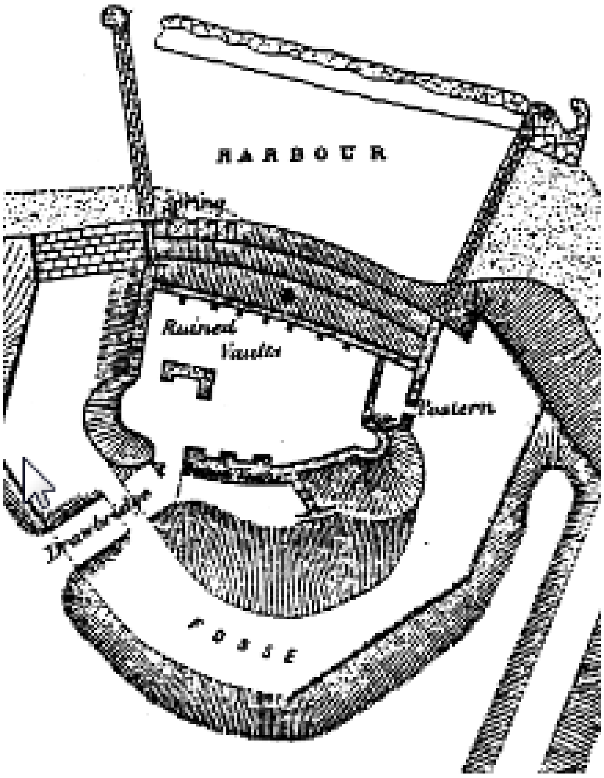

Fig. 81. *Section of PEF survey with the word "HARBOUR" marked*

In conclusion, debate over whether the installation at Apollonia-Arsuf actually served as a mooring basin, or not has yet to be resolved, and there are valid points to be made in both directions. However, most probably it could hardly qualify as a port.

SUMMARY AND CONCLUSIONS

A great number of books and studies have been devoted to the Crusades and the Crusaders. Some works have discussed the religious aspects, some have studied the various Crusades as a social phenomenon, and others endeavored to describe the waves of knights, soldiers and simple masses through the eyes of Muslim observers.

A number of scholars have devoted their research to logistics and to maritime aspects such as sailing, water supply and transporting of warriors and horses. However, although the declared purpose of the Crusades was the liberation of the Holy Land, some questions relating to maritime aspects directly connected to this part of the world justifies further research and responses to various questions. How and where did the Crusaders land forces and horses in the Holy Land? What sailing rigs were used on their ships, and what kinds of ships were used in conveying forces to the Holy Land? How were the fleets managed? How did they navigate? What was the connection between the Crusader castles and the sea in general, and in the Holy Land in particular?

The marine installation (anchorage? port?) at the foot of the cliff of Arsur (Apollonia-Arsuf) is particularly intriguing, given its limited chronological frame (1241–1265 CE) and the relative difficulty in conducting research there. It, therefore, became the subject of a special case study.

Thus the thesis consisted of two parts: Part 1, which is more general, devoted to some of the topics enumerated above, and Part 2, specifically devoted to Arsur (Apollonia-Arsuf). In both parts I raised several points which, as far as I know, have not been discussed to date, and I attempted to advance new proposals or interpretations.

In order to try and respond to at least some of the abovementioned research questions I have used a three-pronged approach:

First was the study of primary material, for example, the poem *L'Estoire De La Guerre Sainte* of Ambroise or *La Chanson D'Antioche* of Richard le Pelerin. I also devoted substantial attention to medieval visual material and iconography, and attempted to draw conclusions from these sources mainly concerning rigs and the use of small boats. From these I have tried to formulate theories on subjects that have not previously been a focus of detailed study by scholars.

Secondly, I studied books, articles and proceeds of scientific conferences devoted to the subject and drew my own new interpretations from the vast knowledge contained therein. I have also incorporated into this research my own sailing experience of over 60 years and knowledge of the Mediterranean, as well as sailing trips along Crusader routes to better convey and understand some of the problems that may have been faced by Crusader mariners. I eventually took the liberty of disagreeing with some of the conclusions published by researchers.

Thirdly, I organized field projects. Among these, I reported in this thesis on my endeavor to emulate King Richard's voyage from Acre to Jaffa,. The other field project whose findings are reported in this thesis was undertaken at Apollonia-Arsuf. The project involved:

- A scan by ground penetration sonar around the port(?) and the surrounding reefs, which yielded some interesting results.
- Water-jetting at 74 points in the port to determine its depth.
- Underwater excavation in the in the port.

To sum up, my goal in this research was to understand how the Crusaders successfully accomplished important feats of seamanship, travelling over vast, barely charted distances and transporting huge numbers of warriors, including their war equipment and sometimes horses.

Summary of Main Chapters

Part 1 is entitled: "Of ships, Seamanship and Fleets" and its main sections are as follows:[113]

Navigation and Ships

It seems that the Crusaders had to do without proper marine charts or portolans, except for an unpublished portolan, *Liber de existencia riveriarum* written in Latin, which could probably have been of help only to very knowledgeable and erudite captains (Jacoby, 2012, 65), is considered by Gautier Dalché, its editor, who dates it to ca. 1160–ca. 1200, the earliest among the extant medieval portolans, or nautical guides covering the entire Mediterranean (Jacoby, ibid.). Real portolan charts appeared only toward the end of the thirteenth century (Brown, 1949, 103).[114] However, various maps describing Jerusalem and important cities of the Roman Empire existed, so Crusader navigators must have been familiar with what lay beyond the sea.

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[113] The first part consisted of some 18 sub-sections, but for the sake of brevity I will group some of them together, and elaborate on those in which I think that a new proposition has been advanced.

[114] The *Pseudo-Skylax* described in detail (Shipley, 2012) the known version of which was printed in the sixteenth century by Pierre Pithou, was, apparently, discovered in the late thirteenth century.

Some Crusaders may have had access to a magnetic compass, especially in the later Crusades. Navigation by night was mainly done by the stars, and by day by the sun, or coastal features.

Most of the ships used by the Crusaders, in the various Crusades were dromons, galleys (always equipped with oars), and round ships used for transportation of equipment, warriors, horses and accompanying masses. Crusaders arriving from Northern Europe used vessels known as cogs. Special ships for transporting horses, known as *huissiers*, had openings either at the side or the stern. I allowed myself to correct a mistake that appeared in various researches, confusing the French word *porte* – the door of a ship – with port side, meaning the left side of a ship. If the ship was equipped with a side *huis* (meaning "opening" and giving us the word *huissiers*) – there was no mention whether it was on the port or starboard side of the ship.

The Third Crusade (1187–1192)

While the troops of First and the Second Crusades arrived by an overland route, and only logistical and other support was transported by sea, the participants of the later Crusades came by sea for the most part. The Third Crusade had mainly three fleets, French, English and the one from Northern Europe.

Emulating King Richard's Trip from Acre to Jaffa

In order to try and learn whether a ship going downwind, or with a quartering wind, could accomplish voyages similar to those made by the Crusaders, for example, by Richard the Lionheart sailing from Acre to Jaffa, we tried to emulate his trip on approximately the same date, in July, expecting the same conditions. The results were surprisingly similar to those reported in the sources.

Landings

I did not find specific mentions or descriptions of precise landing places in the Holy Land. Because of the lack of ports it is logical to assume that forces mainly landed on beaches near cities held by the Crusaders, particularly Acre, Jaffa, possibly near Caesarea and north or south of Atlit. I have also proposed an explanation as to how ships, once beached, were set afloat again using a system of anchors and capstans or winches to haul them back to sea.

I recounted the story of Baldwin the King of Jerusalem who sailed from Apollonia-Arsuf to Jaffa in the ship of Goderic, on May 1102, having found shelter in Arsuf after the disastrous battle of Ramla. In so doing I sought to demonstrate the presence of a land-sea connection between the castle of Apollonia-Arsuf and the sea, even before the port was built.

The Fourth Crusade (1202-1204)

The history of the Fourth Crusade, written by Geoffrey de Villehardouin imparts a great deal of information about the importance of combined sea-land operations, whether in the conquest of Constantinople or strongholds in the Peloponnese**.**

Fifth Crusade (1217–1221), Sixth Crusade (1128–1229) and Seventh Crusade (1248–1254)

One of the most courageous and technically difficult naval feats of the Crusades took place during the Fifth Crusade, when the army commanded by John de Brienne lashed two ships together, towed a siege machine on board up the Nile, and destroyed the defenses that prevented his army from sailing upstream in order to conquer Damietta, in Egypt.

The Sixth Crusade, also known as the "Crusade of Frederic II" did not reveal any phenomena particularly related to the sea or seamanship. However, the emperor, who did not depart with his fleet later managed to regain control of Jerusalem.

The Seventh Crusade, initiated by Louis IX (Saint Louis), was recounted by Joinville. The king and his army of many thousands sailed on 36 ships from the ports of Aigues-Mortes, which had been specifically built to prepare for the Crusade, and from Marseille. The goal was once again Damietta, since the conquest of Egypt was considered the key for conquering Jerusalem.

Louis' fleet distinguished itself, among other matters, by the use of small boats specially constructed, some even serving to be towed behind ships and to serve as temporary prison cells.

The Role of Small Boats

The use of small boats was not limited to being towed behind ships or carried on board. Small boats served as a vehicle of communication and assisted in fleet management, landings, as well as having the extremely important task of assisting in watering the ships by bring them water in barrels from springs on shore. This was vital work since ships with many dozens or hundreds of soldiers and crew members consumed a great deal of water, while storage was limited. The problem was exacerbated if a ship carried a few dozen horses, each requiring about 30 liters of water per day.

Ports in the Southern Levant and the Port of Acre

The northern part of the Southern Levant, today's Lebanon and Syria, had important ports, among them Tyre, Byblos, and Tartus. The Holy Land actually had only one serviceable port: Acre. For reasons discussed in the present study, the other so-called "ports" could not accommodate fleets, and in some cases, such as Apollonia-Arsuf, could hardly accommodate small boats, if at all. Atlit's Château Pèlerin – with its very small harbor located south of the castle with a jetty probably built by the Crusaders, and a Phoenician port to the north with a relatively short pier – could not accommodate fleets. Caesarea was not really serviceable after it was destroyed by earthquake. Dor was an unsafe lagoon. Jaffa – a small mooring basin – was hardly protected by a line of reefs with a dangerous entrance. Yavne-Yam was small inlet, Ashdod, Ashqelon and Gaza had no ports to speak of.

A special chapter in this study was devoted to the port of Acre, since not only was it the only real port in the Holy Land but, after the fall of Jerusalem, served as the capital of the Crusader kingdom. The mooring area in Acre in the Middle Ages was probably located in what is today an outer area, and may have had wooden jetties. Various assemblages were found underwater, including typical ceramics and even a horseshoe. Some researchers have interpreted William of Tyre's description of the port as proof that Acre had an inner harbor in addition to the port known to us. However, a comparison of the Latin version of William of Tyre's writings with its translation has led me to doubt this interpretation.

Part 2 of this thesis discusses the port(?) of Apollonia-Arsuf (Arsur), which remains quite a mystery. Following the underwater research described in Part 2, conducted by 30 volunteer divers and involving water-jet soundings at more than 70 points in the area in question, we now know that depth of the sea within its walls (breakwaters?) was more or less adequate for small craft, and perhaps, with great difficulty and under extremely good conditions, even for galleys, but most certainly not for round ships. We know that there were at least two fresh-water springs at the foot of the cliff, one of which is still partially active. The availability of fresh water would certainly have upgraded the importance of this location, since, as noted, water was a constant problem for sailors, soldiers and horses alike.

The underwater research project at Apollonia-Arsuf found that the northern and southern underwater walls were built partly of ashlars in the header technique, thus solving the problem of the debilitating vacuum effect of water retreating from the wall if the stones had been laid as stretchers. But we remain mystified by the fact that the western and most important wall, constructed on the reef, was built in the usual manner – ashlars laid as stretchers and not as headers. It is quite certain that the army of Richard the Lionheart was supplied from the sea and most probably that Apollonia-Arsuf, the site famous battle where Richard defeated Saladin in September 1191, played an important part in receiving these supplies – but how? We can only assume that the supplies were ferried by small craft, perhaps entering a precursor of the mid-thirteenth-century port that we investigated, and that larger, shallow-draft boats landed on the shallow sloping beach south of the site, where some protection could be afforded by a line of reefs.

However, findings such as sunken columns about 150 meters off the Apollonia-Arsuf beach, a tenth-century olive pit found near a reef off the same beach, along with pieces of cedar of a somewhat later period, and a piece of metal-impregnated wood, as well as many more targets identified by sonar, but not yet explored, show with some certainty the presence of a great deal of maritime traffic along this coast. It is reasonable to assume that ships may have foundered on the reefs close to the Apollonia-Arsuf beach.

Considering the lack of proper ports, the leaders of the Crusades would have had to find special solutions to land their soldiers, equipment, and especially horses, in the Holy Land.

My proposition is that this lack of ports called for landing on beaches. In order to land horses on beaches, the logical solution would have been to use ships with stern openings. Such ships, however, would be very inconvenient to land horses in Acre on a pier, as the stern gate, or a door, had to open at the water level – which would be too low for a pier. On the other hand, the use of ships with a side opening would have required the horses to be brought up on the deck, to the pier's level and that would have meant a long waiting line for vessels arriving at the pier to unload horses, since the port of Acre could not accommodate more than a few ships at a time. Additionally, it would not be easy either to maneuver horses from below deck to a side opening on a ship or to an upper deck.

It would also be much faster to land large number of soldiers and knights on beaches, rather than shuttling them by small boats as they would have had to do at the relatively short piers in Acre, or to have them disembark in the sea, as at Jaffa, and have them transported in small boats through the dangerous passage between the rocks which constituted the breakwater of Jaffa port.

Thus, this thesis concludes that even when landings were described as having taken place in the "Jaffa Port" (which served Jerusalem), or in Acre, which was a major Crusader city, they were not done in an actual port. Rather, at Acre, forces could have been conveniently landed on the northern beach, known today as the Horses Beach (Hof Hasousim), and in Jaffa, on the sloping beach north of the port itself, which was free of reefs and that thus would have been the backdrop, this study suggests of the famous description of Richard the Lionheart jumping into the water, followed by his troops.

This theory led to the conclusion that the preferred choice of transport ships used by the Crusaders would, when possible, be *huissiers* with stern openings, convenient for beach landings, rather than side openings.

The theories relating to the kinds of ships the Crusaders used led to a study of the rigs they employed. This resulted in the following conclusions.

Sailing Downwind

Mediterranean winds are not very stable, except for the relatively reliable shore breeze during the summer time in the Levant, and the northwestern winds in the Aegean Sea. Crusader ships could only sail downwind, or, in the best case, with the wind on their quarter. This was mainly due to the ship's lack of a deep keel. Nor could galleys row against the wind for substantial periods, be it because of the rowers' fatigue, or the ship's low freeboard which, if rowed against the wind and the waves, would ship green (solid) water over the gunwale. These conditions led to the conclusion that the Crusader sailors had to rig their ships in a manner optimal for sailing downwind.

Adaption of the Triangular Lateen Rig as a Square Sail

The classic Crusader ship's rig was the triangular lateen sail, rigged fore-and-aft (in a manner parallel to the longitudinal axis of the ship). This rig was considered to be efficient when going upwind but is rather difficult to tack (change direction when going upwind) or, even to tack downwind. As opposed to a square sail rigged athwart-ship (across the ship), which when tacking only has to have its yard turned at a different angle, the lateen sail, with its long and heavy yard cannot be simply tacked.

It must be taken down and re-hoisted on the other side of the mast, which is a difficult and sometimes dangerous operation. Also, the lateen rig does not allow the sail to be reefed.[115] In case of strong winds, the sail must be taken down altogether, and replaced with a smaller, more suitable sail. Nevertheless, lateen sails are shown in numerous depictions of Crusader ships. This, together with the fact that most of the sailing had to be done downwind, led me to conclude that Crusader sailors used a lateen triangular sail as if it was a square sail, rigged athwart ship. This was not very efficient but was a more practical of using the sail when going downwind.

In sum, this thesis endeavors to understand the magnitude of Crusader seamanship and the complexities of the major sea-land operations. It presents theories as to the type of rigs used to sail from Europe to the Levant, and their landing places in the Holy Land, as well has how they managed their vessels in terms of resolving the problems of In addition, research is presented to fathom the mystery of Apollonia-Arsuf and its connection to the sea. I believe that some proposals advanced in this thesis may provide partial answers to some of these intriguing questions.

[115] Reducing the area of the sail exposed to the wind.

Glossary

Anchoring	Preventing the vessel from drifting by dropping an anchor from the ship to the seabed. (Mooring Mediterranean style) Anchoring the ship stern to or stem to the quay, dropping an anchor from the other end of the vessel toward the sea.
Apparent wind	Wind as felt on the vessel – a combination of the true wind and the wind created by the speed of the vessel.
Athwart ship	At an approximately 90 degrees angle to the fore and aft axis of the vessel. Usual for the setting of square sails.
Beam	The breadth measured at the widest part of the vessel.
Beam wind	Wind blowing from the side.
Keel	The backbone of a ship. It runs along the lowest part of the hull from stem to stern.
Latin sail/Lateener	A triangular sail hung off a long inclined yard supported by a relatively short mast, and it is essentially a "fore-and-aft" sail, rigged in a manner parallel to the axis of the ship
Lee	Away from the wind.
Leeway	Sidewise movement of the ship due to the pressure of the wind on the sail, and, to some extent also due to the action of the waves, when trying to sail against the wind.
Port (side)	The left side of a vessel facing forward.
Quarter	Either side of the ship near the stern.
Quartering wind	A wind blowing from behind the vessel.
Reefing	Reducing the size of the sail exposed to the wind by various means.
Shrouds	Supporting lines running from the mast to the side of the hull.
Square Sail	Sail that is set athwart ship.
Starboard	The right-hand side of a vessel facing forward.
Stays	Supporting lines running from the mast to the stem of the stern.

Stem	The foremost timber of the ship, rising up from the forward tip of the keel.
Stern	The rear.
Strake	A line of planking extending the length of the vessel.
Tack	To sail at an angle to the wind closer than 90 degrees, alternating port and starboard.
True wind	The wind that actually blows (as opposed to the Apparent Wind).

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Appendixes

APPENDIX A

Sonar Investigation

The Harbour of

Apollonia-Arsuf

Oct-Nov 2010

The Harbour of Apollonia-Arsuf

Acknowledgements

Apollonia is a great and important place and we were happy to work there. During our two weeks stay we received help from all sides, for which we are thankful.

In first place we want to thank Oren Tal and Dan Mirkin for their precious help and warm hospitality.

A preliminary remark

The illustrations added to the printed version of this report allow a fast overview on the results of the sonar analyses. For better work we recommend opening the files on the joint CD where you can choose the size of the illustrations.

This report assumes that the reader is familiar with the possibilities and the limits of the methods of sonar analysing. Basically the sonar is measuring just the density of different materials. There is no information in the sonar data about the nature and the age of the objects.

A colour scale with seven numbered steps is added to the illustrations of the sonar cuts. Each step represents the signal strength that way: number of colour multiplied by 20db gives the intensity; for instance the green: 2*20db=40db or the red: 6*20db=120db and so on.

Tech Talk

The collection of the data took place from 9-30-2010 to 10-6- 2010. The survey was carried out by Dr. K. Storch (SOSO-Jena), the inventor and longtime user of this special sediment-sonar and by myself (abatonos). The equipment was mounted onto a small RIB steered by the tireless Arieh (Duba) Diamant.We want to thank him explicitly for that.

The sediment sonar in use is a perpendicular bifrequential sonar. The transducer produces two signals of constant strength. The reflections are measured. It allows under most circumstances to penetrate the sediment until the bedrock and to locate all hard findings or objects lying in there. The positioning was done by a combined DGPS. All positions are given in dd.dddd° in WGS 84.

Comment

To complete the long and successful excavations in Apollonia-Arsuf the director of this excavation Prof Dr Oren Tal is planning to study also the harbour or better to say the harbours, situated immediately at the foot of the cliff (ill.40).

There is already a study of the harbours from the 90s done and presented by Eva Grossmann (Maritime Tel Michal and Apollonia. Results of the underwater survey 1989-1996. In: BAR S915, 2001). She achieved remarkable results only by diving in these very often rough waters. The time has come for an amplified study. In the first step a sonar investigation was to execute to determine places where full excavation would be promising and where there is nothing to expect.

In the period when we did the sonar investigation the weather was fine, but we had often a relatively high swell that made it a little bit difficult to go by RIB to all places in the harbour. Nevertheless we achieved good coverage except of the most northern part of the harbour. In the so-called Crusaders harbour the bottom is completely covered by stones and pebbles that prevent the sonar signal to go underneath. Therefore no significant statement could be achieved from the data collected and this part was left out.

We should think about another method of prospection in the Crusaders harbour, but for the moment I have no solution. Most of the stones lying in the basin do not belong there, but they had fallen down from the hill. The scientific dilemma of the basin: is it a harbour and under the stones there is maritime material or is it a substructure of an architectural building and under stones there are walls, is not to decide by the sonar.

There was a vague possibility that the actual western edge of the harbour is not the original one, but there could be a kind of mole more to the West. To check this we measured also outside the harbour and thus the data are divided into two sections: the out area (ill. 1 - 21) and the inside area (ill. 22 - 39).

One initial remark regarding the system of the illustrations: in the post processing of the data we did a virtual excavation with layers in -20, -40, -80, -100, and 120 cm. The "digging tool" is on one hand the low frequency and on the other hand the high frequency. The result is a bit like in land excavation: you remove the earth and you see the surface of the layer. Pictures of this kind are named "cut", LF for low frequency and HF for high frequency. In addition to that you have the picture with the surface of the layer and all signals below that. It is like in land excavation when you remove the earth around the findings leaving them in situ and you go deeper into the soil. It gives you an idea of the continuation of the findings into the depth. Pictures of this kind are named "sum up", LF for low frequency and HF for high frequency. Generally you have 4 pictures for each layer (see the following list).

Layers and Illustration-Numbers

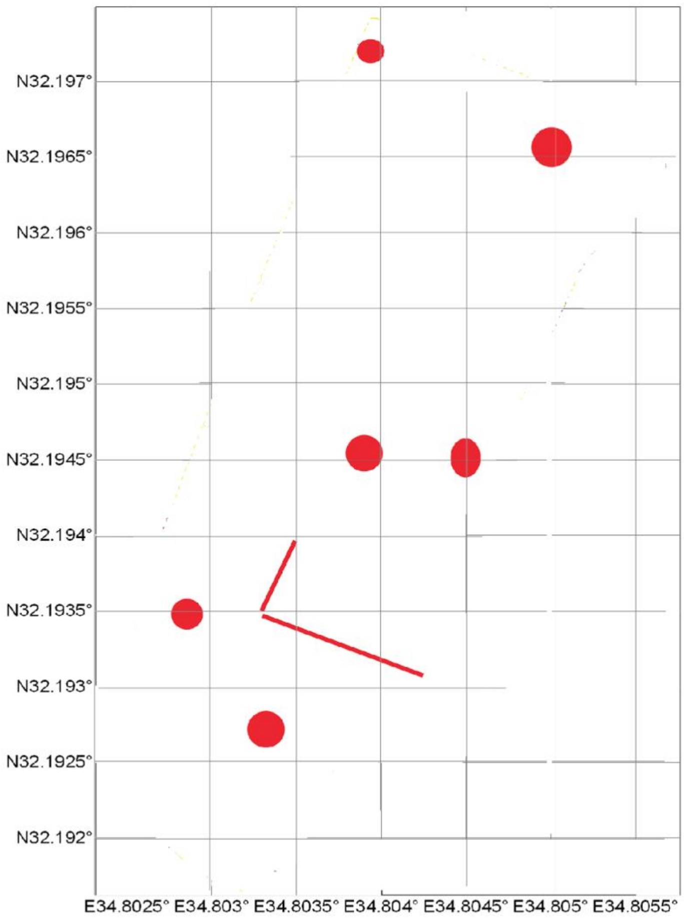
out area		**inside area**	
layer	ill.-no.	layer	ill.-no.
LF -20cm cut	2	LF -20cm cut	22
LF -20cm sum up	3	LF -20cm sum up	23
HF -20cm cut	4	HF -20cm cut	24
HF -20cm sum up	5	HF -20cm sum up	25
LF -40cm cut	6	LF -40cm cut	26
LF -40cm sum up	7	LF -40cm sum up	27
HF -40cm cut	8	HF -40cm cut	28
HF -40cm sum up	9	HF -40cm sum up	29
LF -80cm cut	10	LF -80cm cut	30
LF -80cm sum up	11	LF -80cm sum up	31
HF -80cm cut	12	HF -80cm cut	32
HF -80cm sum up	13	HF -80cm sum up	33
LF -100cm cut	14	LF -100cm cut	34
LF -100 sum up	15	LF -100cm sum up	35
HF -100cm cut	16	HF -100cm cut	36
HF -100cm sum up	17	LF -120cm cut	37
LF -120 cut	18	LF -120cm sum up	38
LF -120cm sum up	19	HF -120cm cut	39
HF -120cm cut	20		
HF -120cm sum up	21		

The area west to the harbour (out area)

In the depth profile (ill. 1) you can see the "foot" of the harbour wall consisting of beach rock shown mostly in red. Towards the open sea the bottom is sloping down gradually. When you put the high frequency cuts (ill. 4, 8,12,16,20) to a row, the development of the beach rock into the depth is clearly visible.

Looking at the sonar data there is a first result: the idea of another outer harbour wall in this to give up, there is no wall. We have to take the existing beach rock wall as the western limitation of the harbour.

Since we are immediately outside the harbour some shipwrecks are to be expected, because approaching a harbour or mooring outside is one of the most dangerous moments for a ship. We have a lot of evidence for that in other places. Indeed there are six places to individuate that might be suspicious to represent wreck sites. They are shown here in this text illustration as red dots.



Indication of possible sites

Going from north to South the first site in the northwest corner of the measured area is best to see in the HF sum up -20 cm (ill. 12), but also in the other HF sum ups (ill. 9,13,17,21) and also in the HF cuts from -80 cm on and deeper (ill. 12,16,20). The area has the extension of about 25 m with a solid nucleus of about 10 m.

The second site is situated near the North east corner of the measured area. It shows up in the HF sum ups -80 cm and deeper (ill. 13,17,21). It is present also in the HF cuts -80 cm and deeper (ill. 12,16,20).

In the middle of the area there are two more sites, one at the eastern edge and the other about 60 m west to it. You can see them in the HF cut -80 cm (ill. 12) and also in the LF cut -100 cm (ill. 14). In the LF sum up -40 cm they are represented in magenta.

Another site is situated in the prolongation of the actual western entrance of the harbour. It is shown in orange in the HF cut -100 cm (ill. 16) and also in the HF sum up - 20 cm and perhaps in the LF cut -120 cm (ill. 5, 18). It doesn't seem to be too extended.

And there is a last site in the South to be seen in orange in the HF cut -100 cm and deeper and also in the LF cut -100 cm (ill. 16, 20,14).

When we talk about "sites" or even "wreck sites" this is to understand cum grano salis. The sonar is just telling, that there is a difference in the intensity of the signal. Looking at the surrounding, you may argue whether this difference is caused by natural phenomena or by "human interference", which we call an anomaly in the data. So you cannot tell exactly that there is a shipwreck or part of it or a contaminated site in Parker's sense, but you can only tell that there are anomalies and try to interpret them. But if ever there should be a project to do excavations in the outer area of the harbour these "sites" would be the places to begin with. There may be also other finding places in that area and certainly there are, but the highest concentration and hence the most promising operation is given in the "sites" indicated here.

There is still another puzzling situation: in the HF cut of -120 (ill. 20) you have a row of green dots in the actual "entrance" of the harbour leading to west like pearls on a string and bending at the end to north. The same is still to see also in the HF cut of -100cm (ill. 10) and once sensitised one may find it also in the other pictures, most impressively in the LF sum ups (ill. 7, 11,15,19).

This structure is about 120 m long in the western direction and about 60 m in the northern direction. The statement of the sonar signal is, that there are softer spots in a harder surrounding. In general this indicates sites or places where some hard material came to ly, caused a depression and went off. Why and when it went off is not to tell without further investigation. But anyway the depression was filled with soft sediment and the sonar detects it.

It is highly hazardous to dare an interpretation, but on the level of hypotheses one may assume a wooden or whatever substructure for a mole, protected from the South and open to the North. Following this idea we have the main entrance of the harbour in the South and a secondary entrance in the middle of the harbour facing north. Perhaps it was a sort of rescue entrance in case of strong winds or high seas from the South.

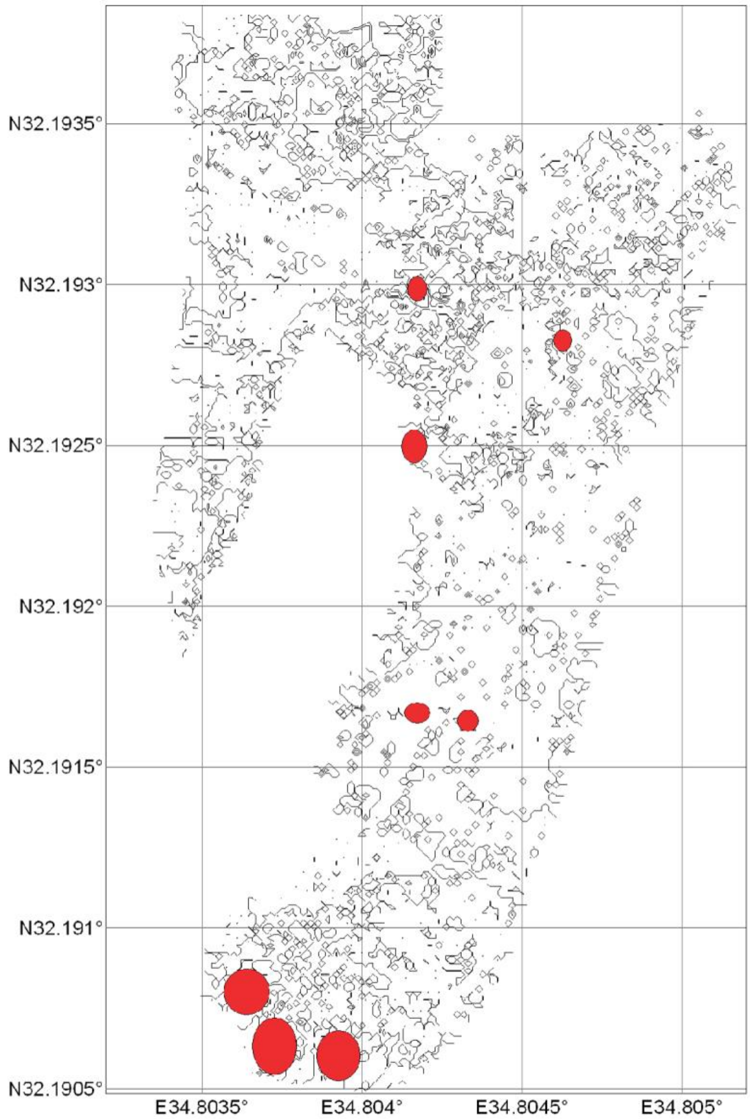
The harbour (inside area)

The harbour of Apollonia falls into three parts. This you can see by the sonar data and not in natura. In the south, where the entrance was, you have an area of about 50*50 m with a relatively dense concentration of material. This area is followed by a long part of the harbour, about 150 m, which is mostly empty. There are only some finding spots here and there. In the northern part, where the actual entrance is, you have again concentrations of finding spots mixed with rocks.

The concentration of material is obvious. Since the western entrance is actually in use, you should mainly expect recent material. At least near the surface of the bottom, the situation may change if we go deeper into the sediment.

Let us have a look to the anomalies mapped in the text illustration (note: the black lines bare no further information, they are just there for better orientation).

In the south we have this big area in



Indication of possible sites - inside area orange in the HF sum up -20 cm (ill. 25), structured by 3 oblong areas in magenta. While the orange area diminishes, when we go deeper in the HF sum ups (ill. 29,33), the areas in magenta remain. This evokes the idea of material scattered over the bottom, while its concentration in the magenta areas is more dense. The scattered material may reach the depth of 40 cm in the sediment according to the HF cut-40 cm (ill. 28). You can see this situation also in the other pictures, especially well in the LF sum ups, but I avoid enumerating them all here. This area is highly promising and if it is not too disturbed by recent material, good results are to expect.

In the middle of the" empty corridor" there are two sites that deserve attention. The eastern one is to see in the HF sum up -20 cm as an orange spot (ill. 25) and it is to encounter again only in the HF cut -20 cm (ill. 24) and the LF cut -40 cm (ill. 26). It may be small, but it is too isolated to be neglected. The other one, western to it, is even harder to find. It is very small, but has some strong signals. It can be seen in the HF sum up -20 cm (ill. 25) as a very small orange dot, but then again in the LF cuts -20, -40, -100 and -120 cm (ill. 22,26,34,37).

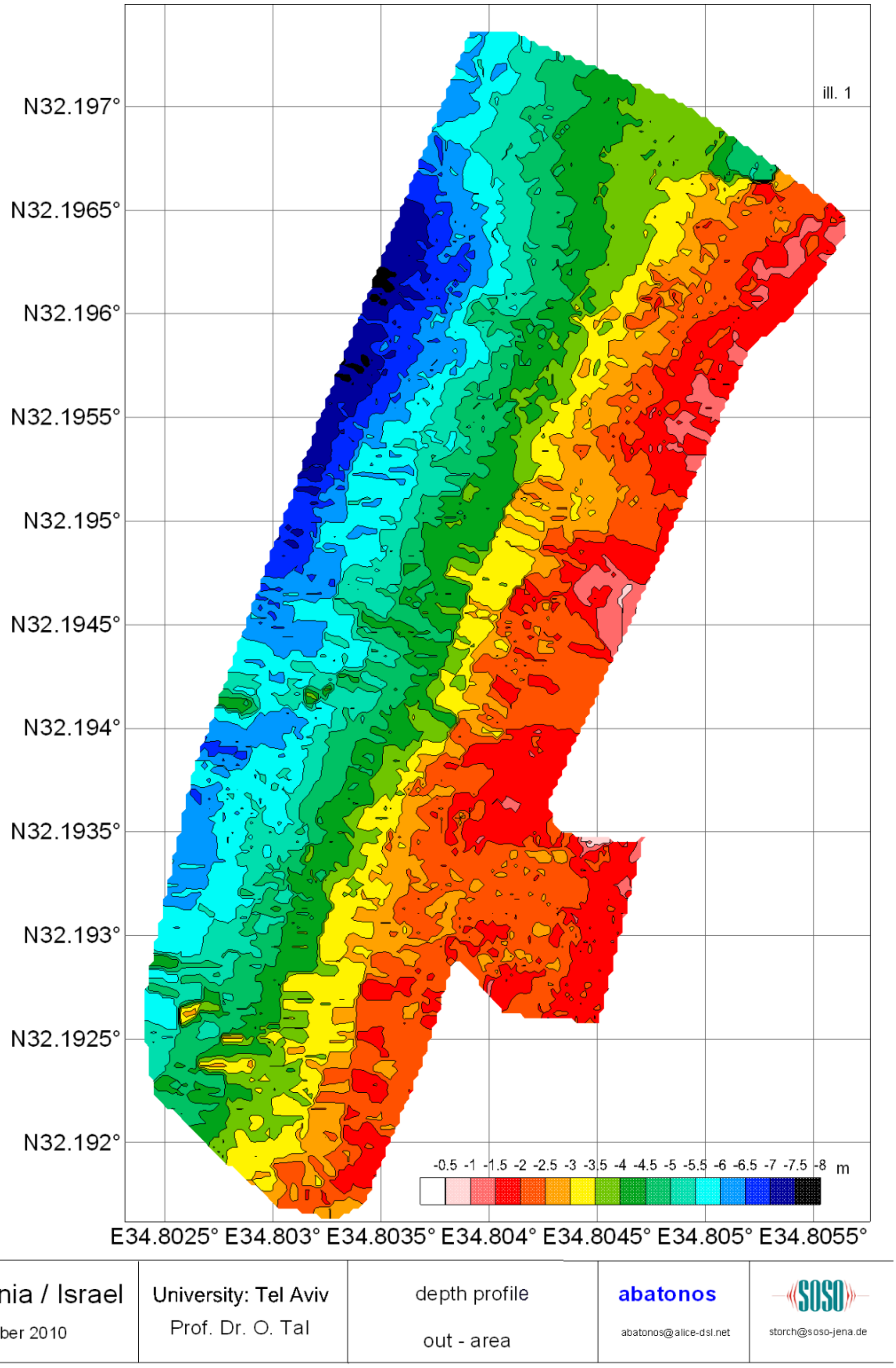
When we leave the "empty corridor" and proceed to the area of the western entrance, we meet another site right in the southern corner of the entrance. The site seems to be covered on the surface by beach rock in the LF cut -20 cm (ill.22), but it develops to something else in the depth as seen in the HF cuts -20 cm and -100 cm (ill.24,36). The intensity of its signal is shown by the HF sum ups -20 cm, -40 cm and - 80 cm (ill.25,29,33). It is visible in all LF sum ups.

Directly north to it and, so to say, in the middle of the entrance is situated another area of about 50 m of extension. It is best to find in the LF sum up -120 cm (ill.38), because there it shows as an isolated orange area in a yellow and blue surrounding. This area is present in all sum ups of LF and HF. In the HF cuts of -80 cm and -120 cm (ill.32,39) there are even black signals mixed within, that means very hard material.

One last spot deserves to be mentioned, lying eastern to the aforementioned site and in the middle of the harbour. It is only to see in the LF sum up -100 cm and -120 cm (ill.35,38). It is small and it has relatively weak signals, but could be an anomaly as well.

We have found no traces of wall in the harbour basin. In the area that we measured there was only water. We have found two areas of archaeological interest: the entrance area in the south and the entrance area in the West. It is by no way excluded that there is a lot more finding spots everywhere in the harbour. To study the southern area would be to my opinion a promising way to the understanding of the complexity of that harbour. Further considerations are not subject to this paper.

Dr. Hanz Günter Martin


ill. 1
N32.197°
N32.1965°
N32.196°
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N32.1945°
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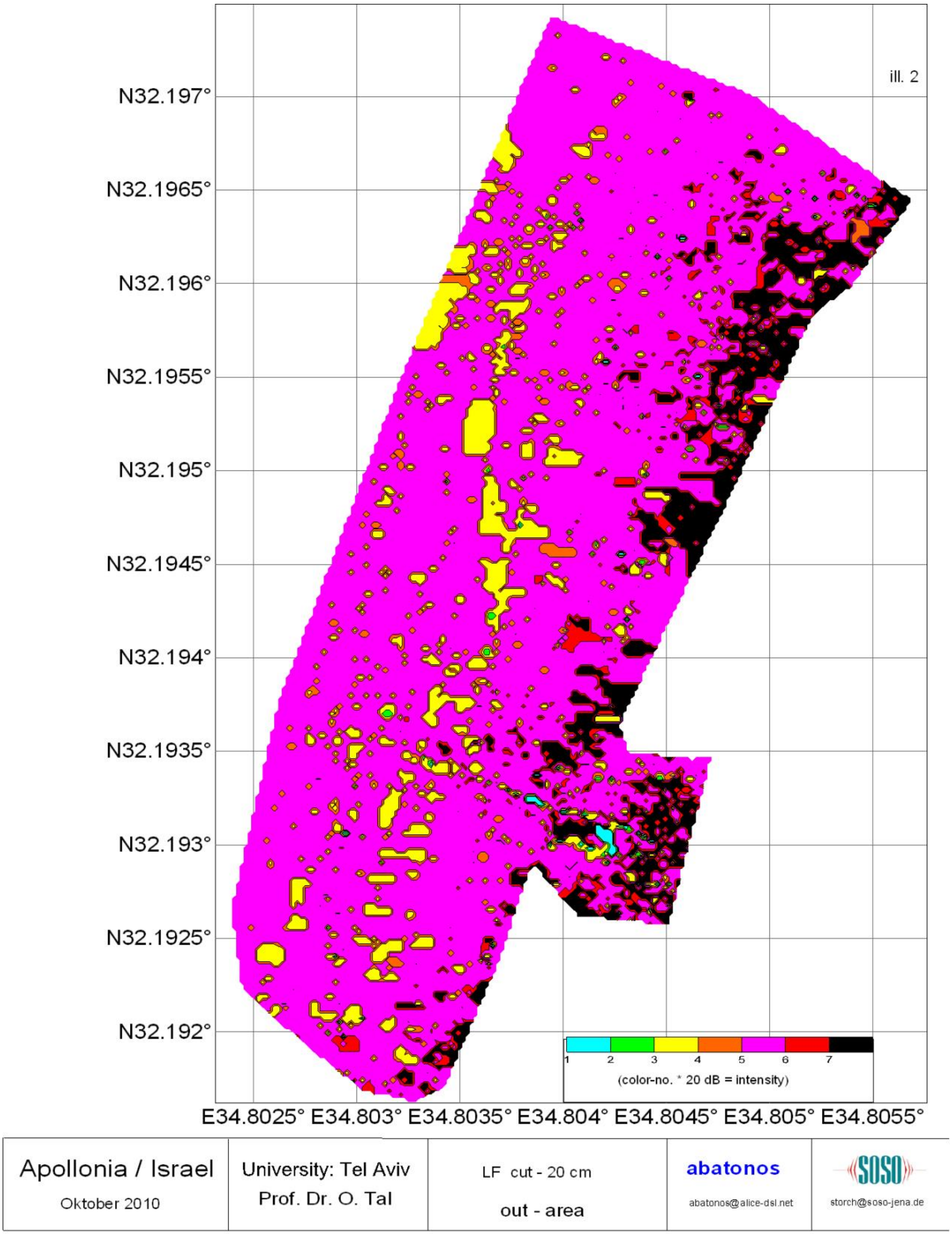
N32.193°
N32.1925°
N32.192°
-0.5 -1 -1.5 -2 -2.5 -3 -3.5 -4 -4.5 -5 -5.5 -6 -6.5 -7 -7.5 -8 m
E34.8025° E34.803° E34.8035° E34.804° E34.8045° E34.805° E34.8055°
Apollonia / Israel
Oktober 2010
University: Tel Aviv
Prof. Dr. O. Tal
depth profile
out - area
abatonos
abatonos@alice-dsl.net
storch@soso-jena.de


ill. 2
N32.197°
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N32.196°
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N32.1945°
N32.194°
N32.1935°
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N32.1925°
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(color-no. * 20 dB = intensity)
E34.8025° E34.803° E34.8035° E34.804° E34.8045° E34.805° E34.8055°
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University: Tel Aviv
Prof. Dr. O. Tal
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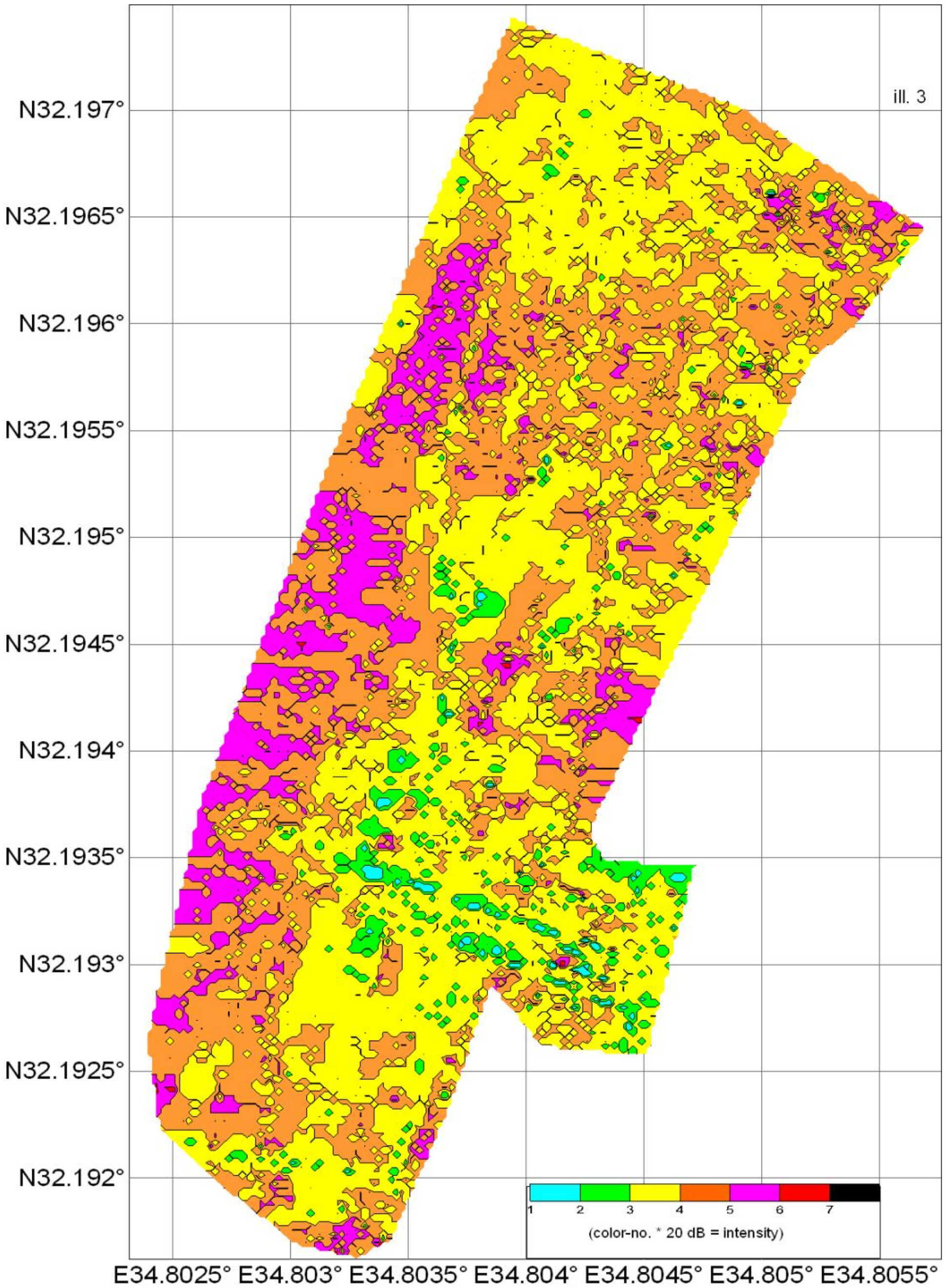
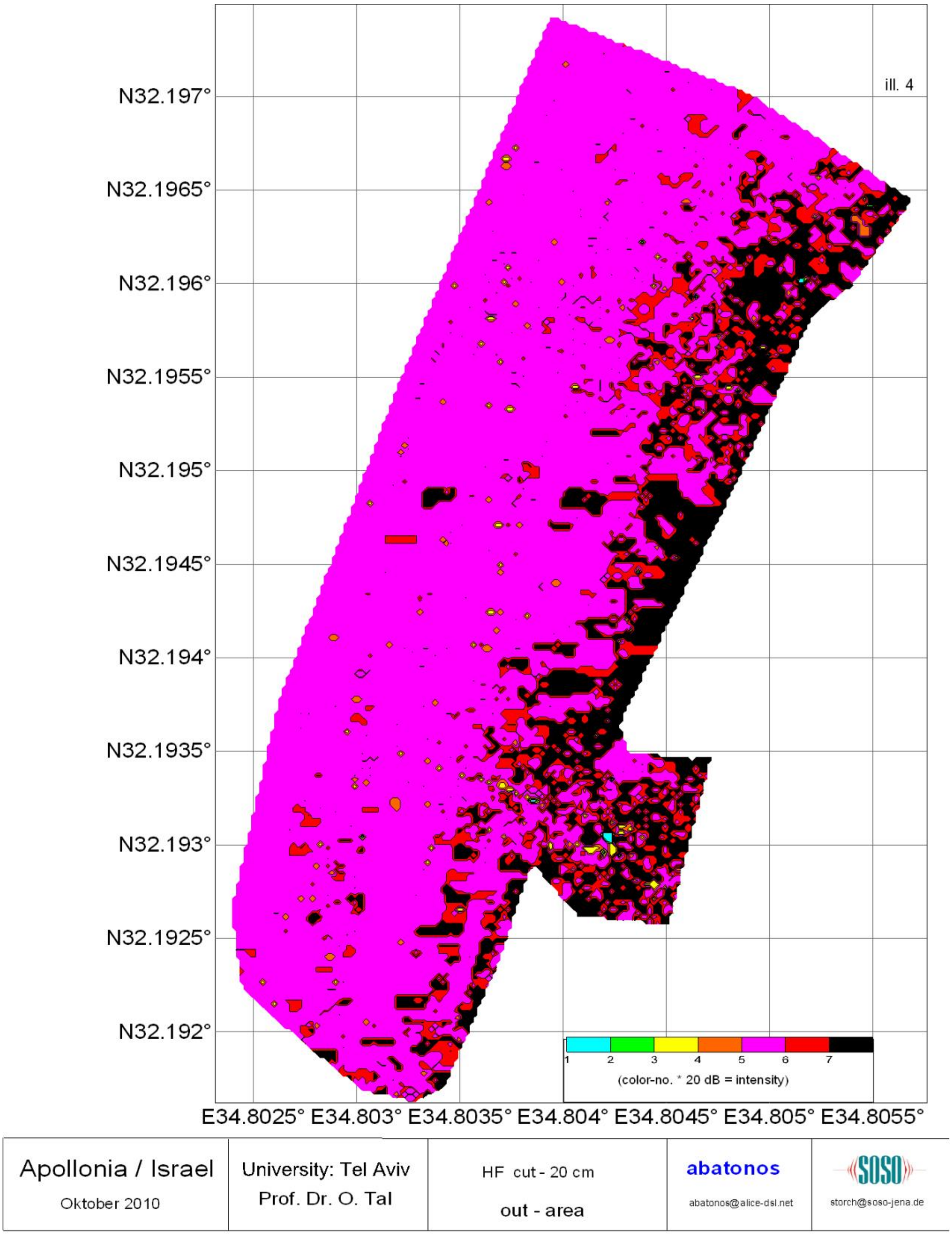
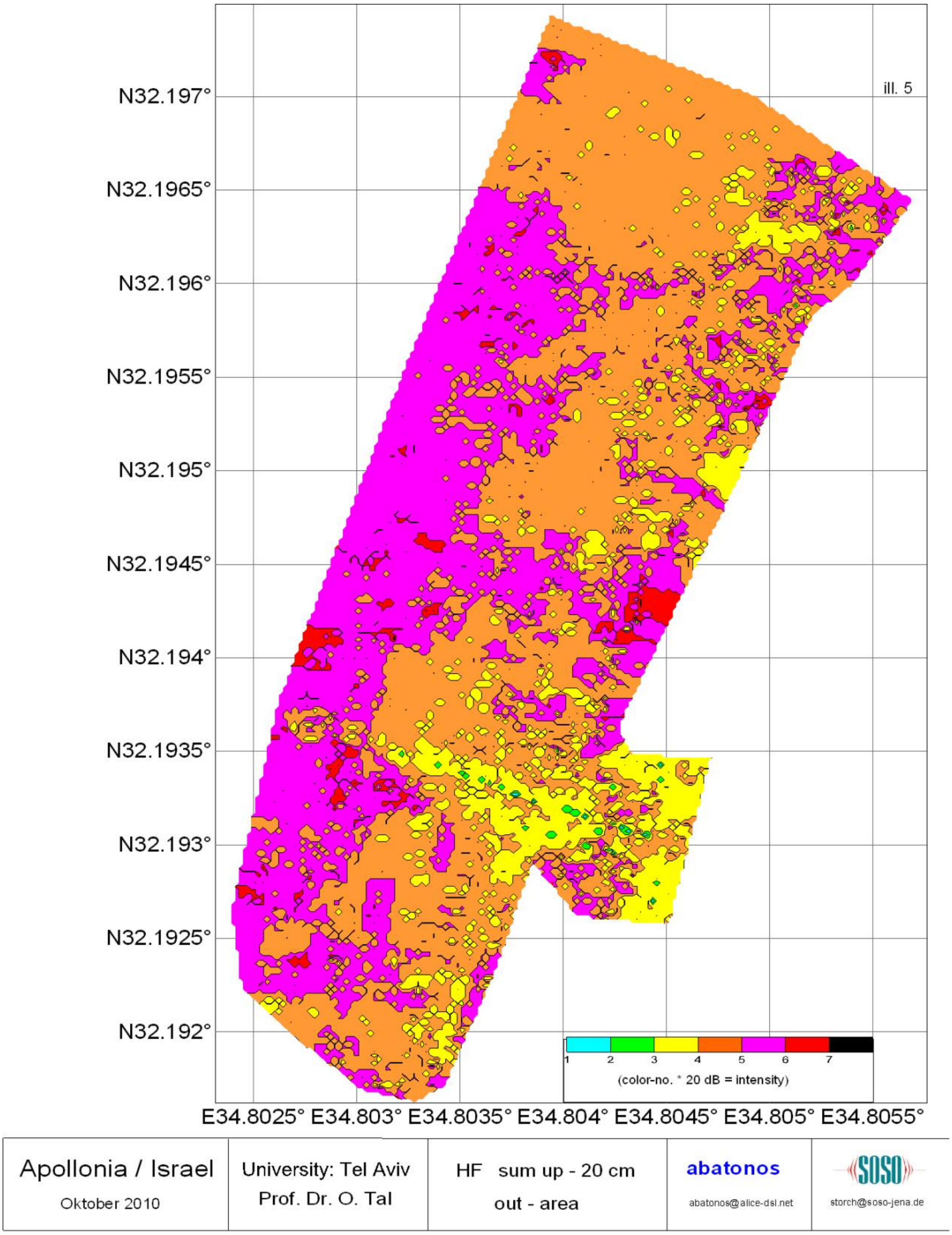
out - area
abatonos
abatonos@alice-dsl.net
SOSO
storch@soso-jena.de



Apollonia / Israel Oktober 2010	University: Tel Aviv Prof. Dr. O. Tal	LF sum up - 20 cm out - area	abatonos abatonos@alice-dsl.net	SOSO storch@soso-jena.de


ill. 4
N32.197°
N32.1965°
N32.196°
N32.1955°
N32.195°
N32.1945°
N32.194°
N32.1935°
N32.193°
N32.1925°
N32.192°
1 2 3 4 5 6 7
(color-no. * 20 dB = intensity)
E34.8025° E34.803° E34.8035° E34.804° E34.8045° E34.805° E34.8055°
Apollonia / Israel
Oktober 2010
University: Tel Aviv
Prof. Dr. O. Tal
HF cut - 20 cm
out - area
abatonos
abatonos@alice-dsl.net
SOSO
storch@soso-jena.de



ill. 5
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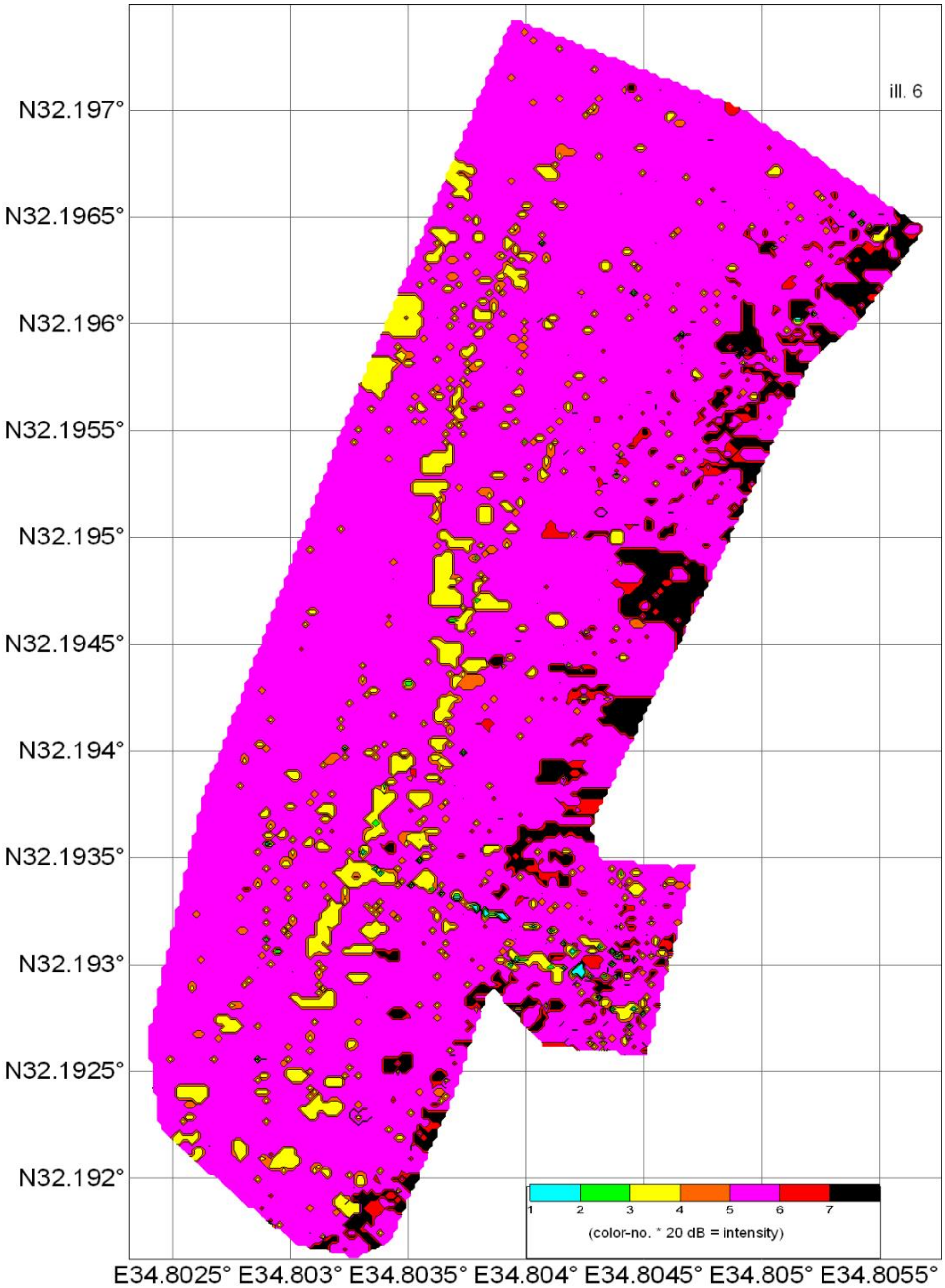
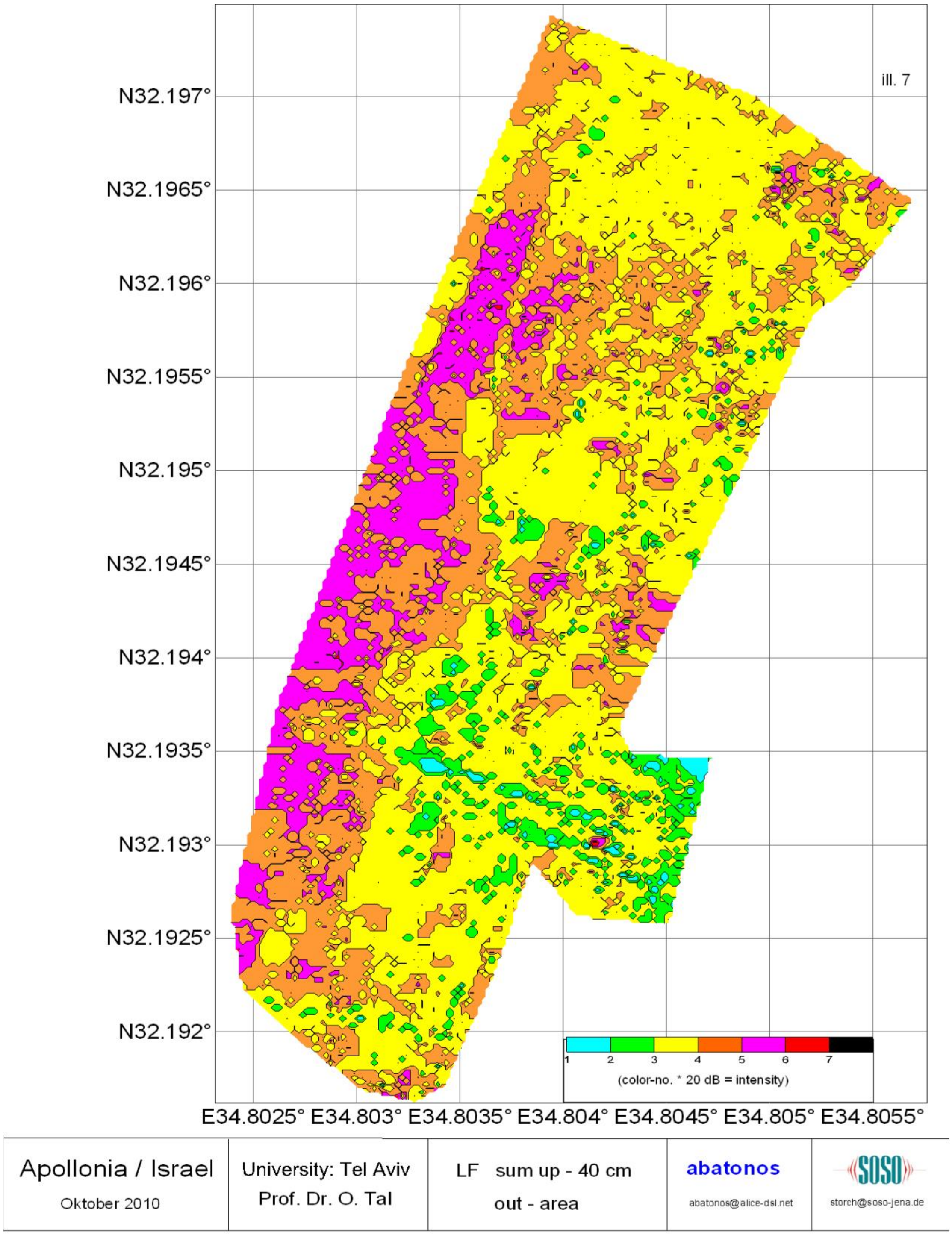
N32.195°
N32.1945°
N32.194°
N32.1935°
N32.193°
N32.1925°
N32.192°
E34.8025° E34.803° E34.8035° E34.804° E34.8045° E34.805° E34.8055°
1 2 3 4 5 6 7
(color-no. * 20 dB = intensity)
Apollonia / Israel
Oktober 2010
University: Tel Aviv
Prof. Dr. O. Tal
HF sum up - 20 cm
out - area
abatonos
abatonos@alice-dsl.net
SOSO
storch@soso-jena.de



Apollonia / Israel Oktober 2010	University: Tel Aviv Prof. Dr. O. Tal	LF cut - 40 cm out - area	abatonos abatonos@alice-dsl.net	SOSO storch@soso-jena.de


ill. 7
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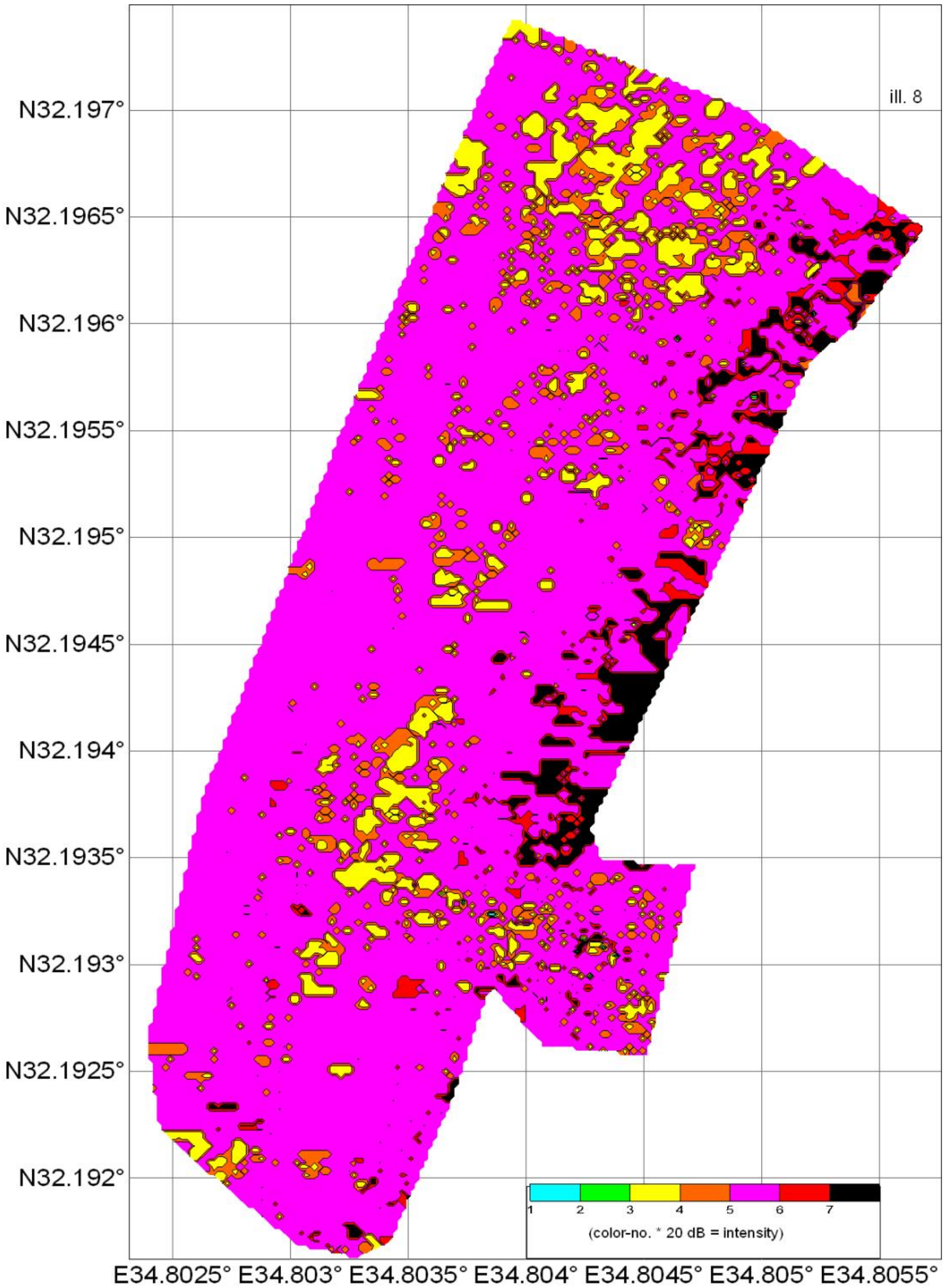
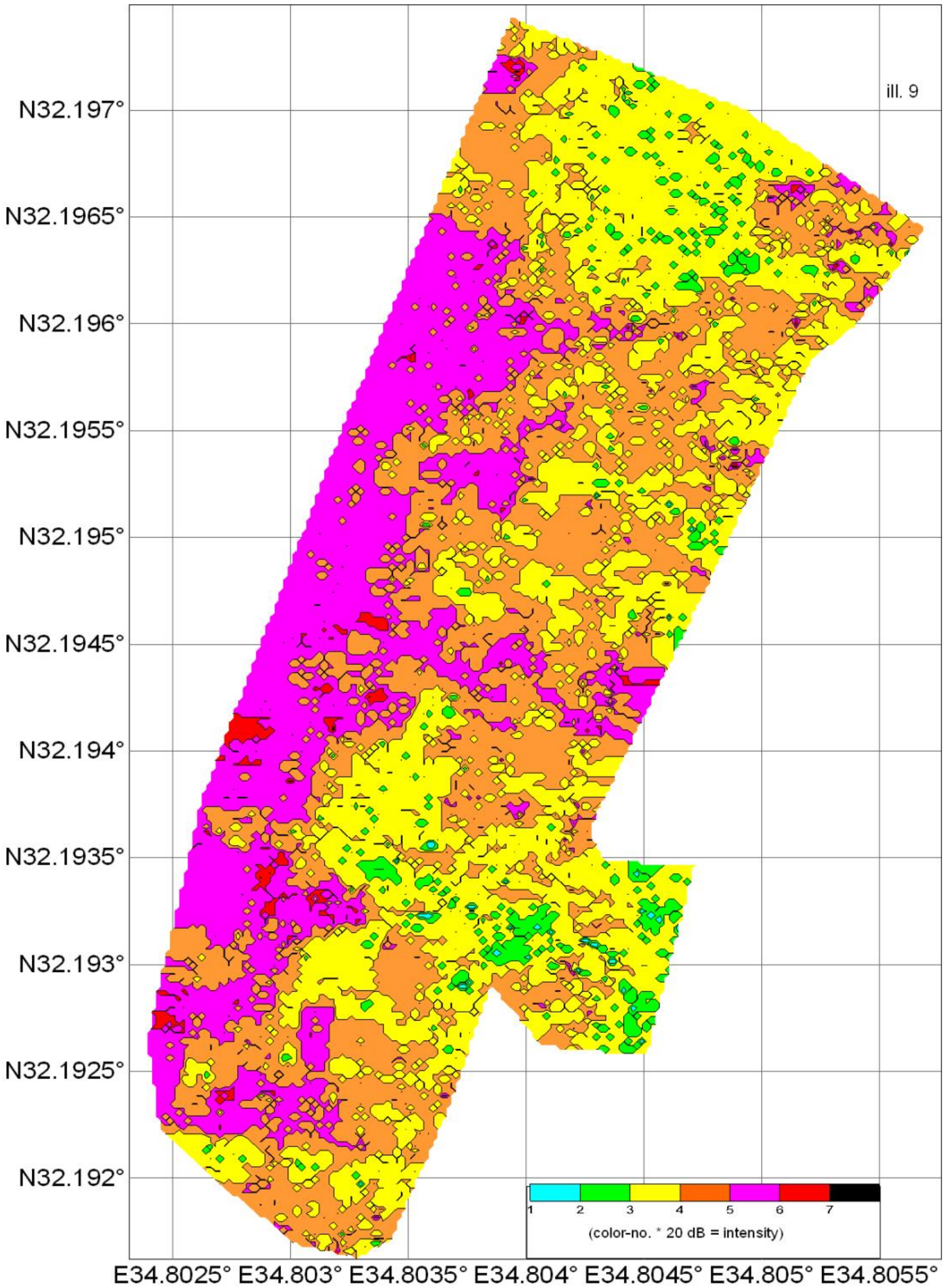
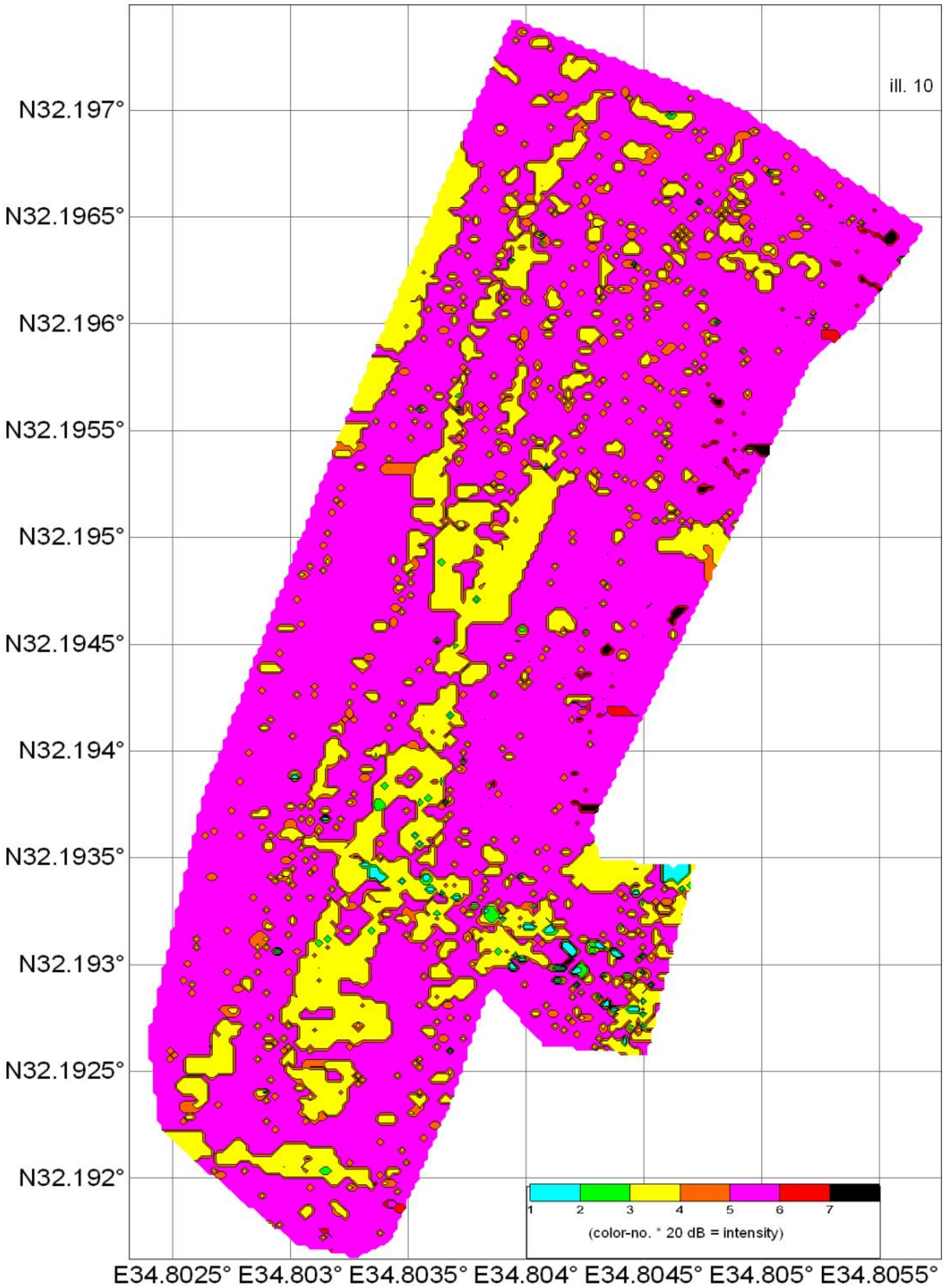
N32.1965°
N32.196°
N32.1955°
N32.195°
N32.1945°
N32.194°
N32.1935°
N32.193°
N32.1925°
N32.192°
E34.8025° E34.803° E34.8035° E34.804° E34.8045° E34.805° E34.8055°
1 2 3 4 5 6 7
(color-no. * 20 dB = intensity)
Apollonia / Israel
Oktober 2010
University: Tel Aviv
Prof. Dr. O. Tal
LF sum up - 40 cm
out - area
abatonos
abatonos@alice-dsl.net
SOSO
storch@soso-jena.de



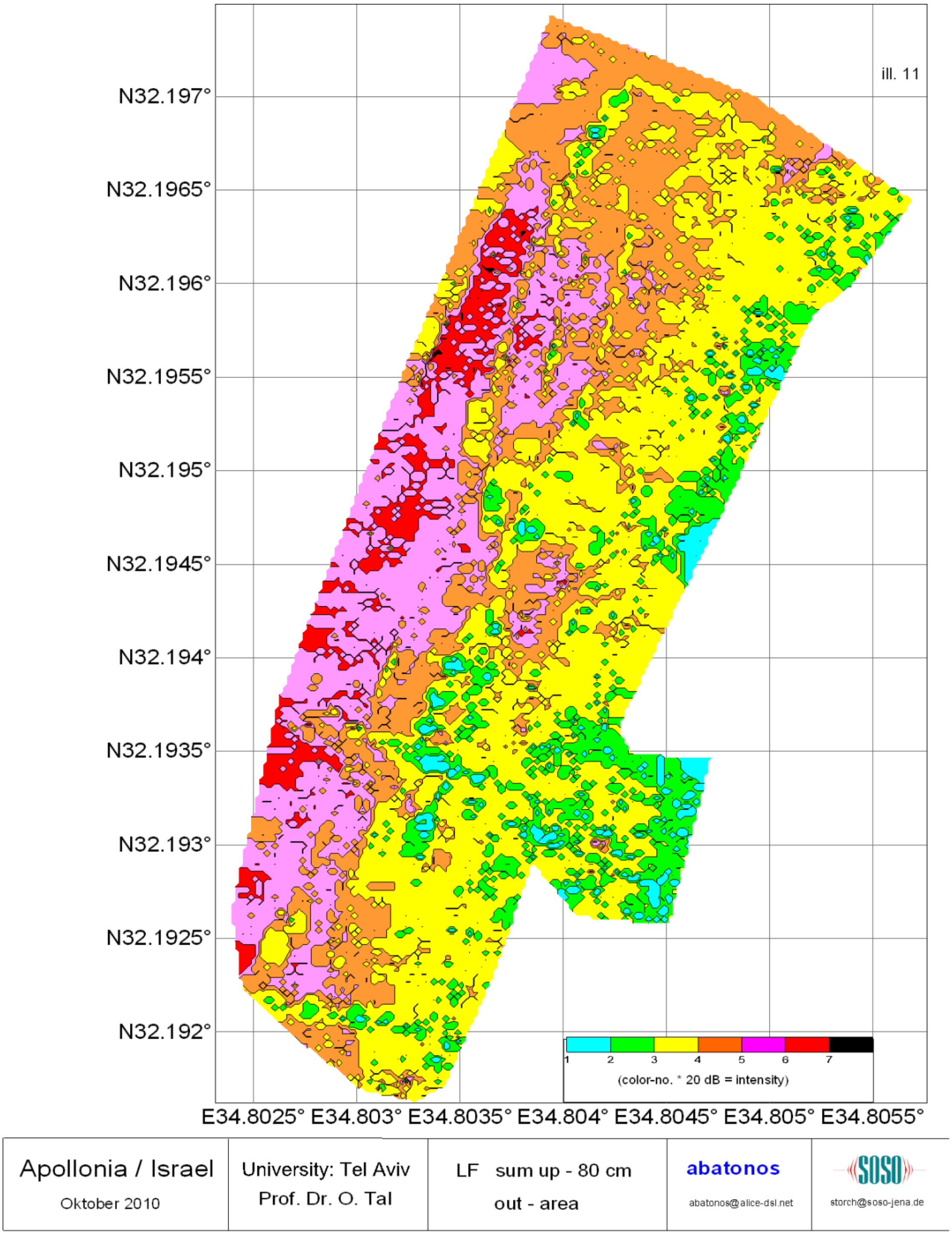
Apollonia / Israel Oktober 2010	University: Tel Aviv Prof. Dr. O. Tal	HF cut - 40 cm out - area	abatonos abatonos@alice-dsl.net	SOSO storch@soso-jena.de



Apollonia / Israel Oktober 2010	University: Tel Aviv Prof. Dr. O. Tal	HF sum up -40 cm out - area	abatonos abatonos@alice-dsl.net	SOSO storch@soso-jena.de



Apollonia / Israel Oktober 2010	University: Tel Aviv Prof. Dr. O. Tal	LF cut - 80 cm out - area	abatonos abatonos@alice-dsl.net	SOSO storch@soso-jena.de


ill. 11
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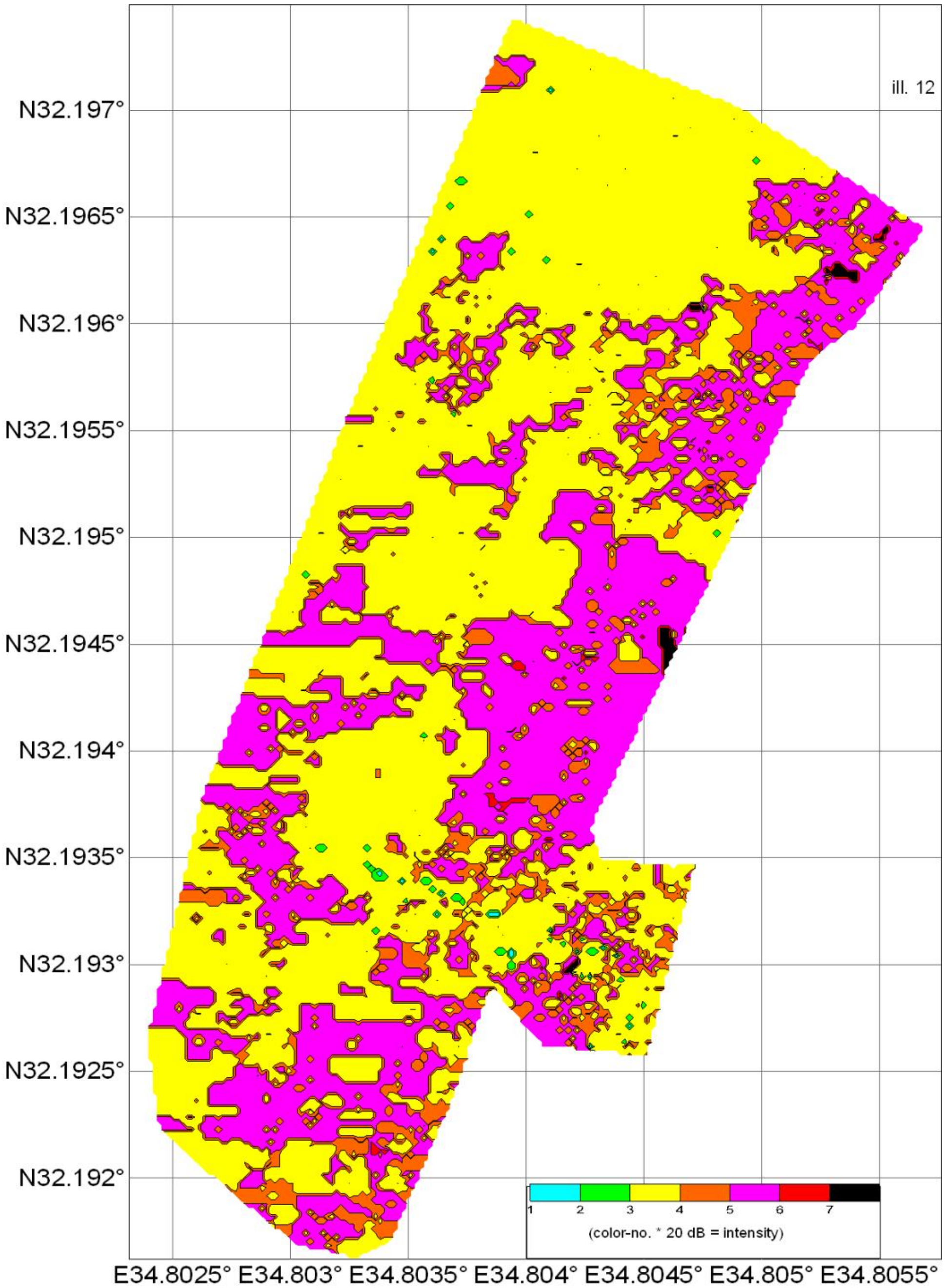
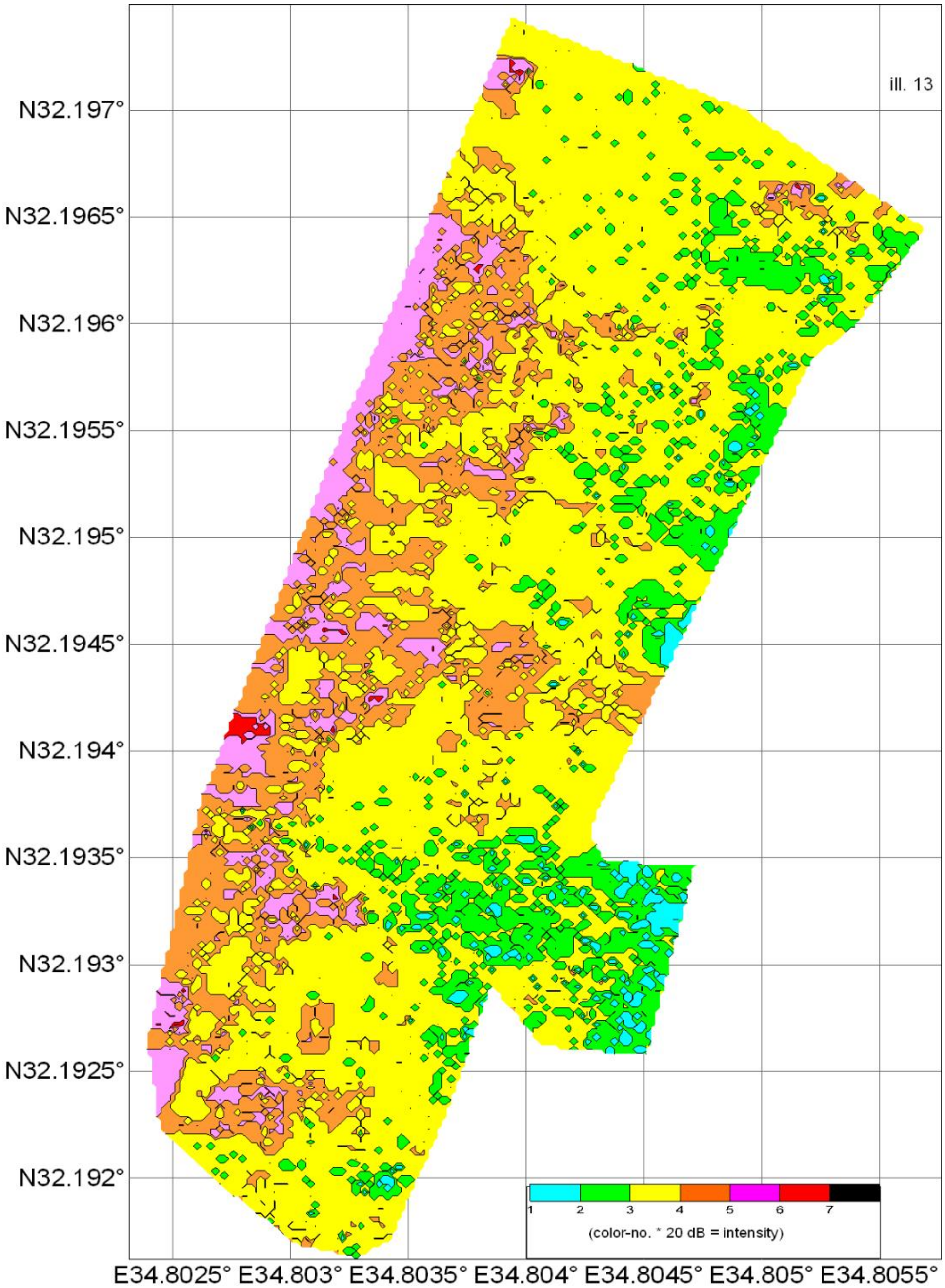
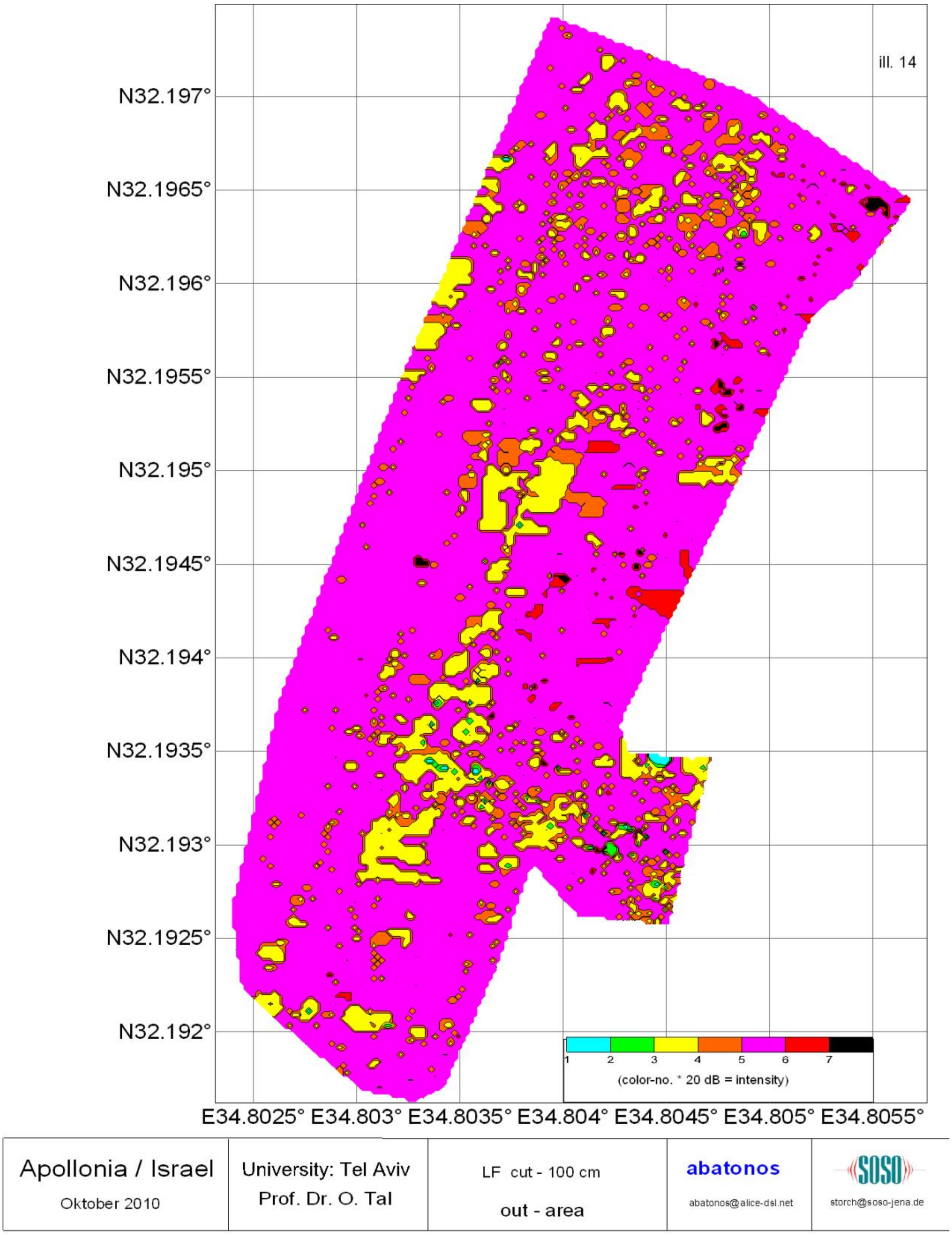
N32.196°
N32.1955°
N32.195°
N32.1945°
N32.194°
N32.1935°
N32.193°
N32.1925°
N32.192°
1 2 3 4 5 6 7
(color-no. * 20 dB = intensity)
E34.8025° E34.803° E34.8035° E34.804° E34.8045° E34.805° E34.8055°
Apollonia / Israel
Oktober 2010
University: Tel Aviv
Prof. Dr. O. Tal
LF sum up - 80 cm
out - area
abatonos
abatonos@alice-dsl.net
storch@soso-jena.de



Apollonia / Israel Oktober 2010	University: Tel Aviv Prof. Dr. O. Tal	HF cut - 80 cm out - area	abatonos abatonos@alice-dsl.net	SOSO storch@soso-jena.de



Apollonia / Israel Oktober 2010	University: Tel Aviv Prof. Dr. O. Tal	HF sum up - 80 cm out - area	abatonos abatonos@alice-dsl.net	SOSO storch@soso-jena.de


ill. 14
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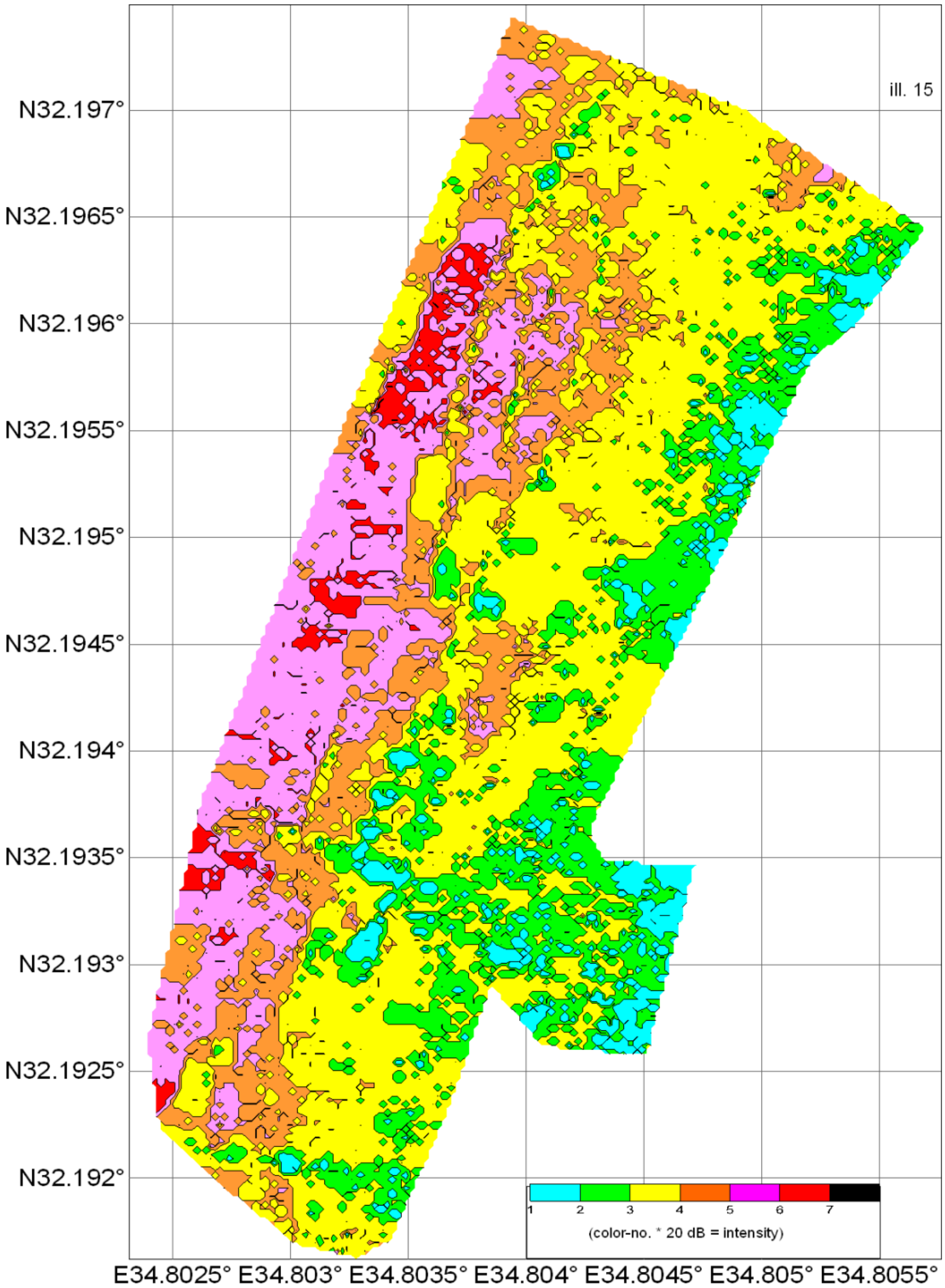
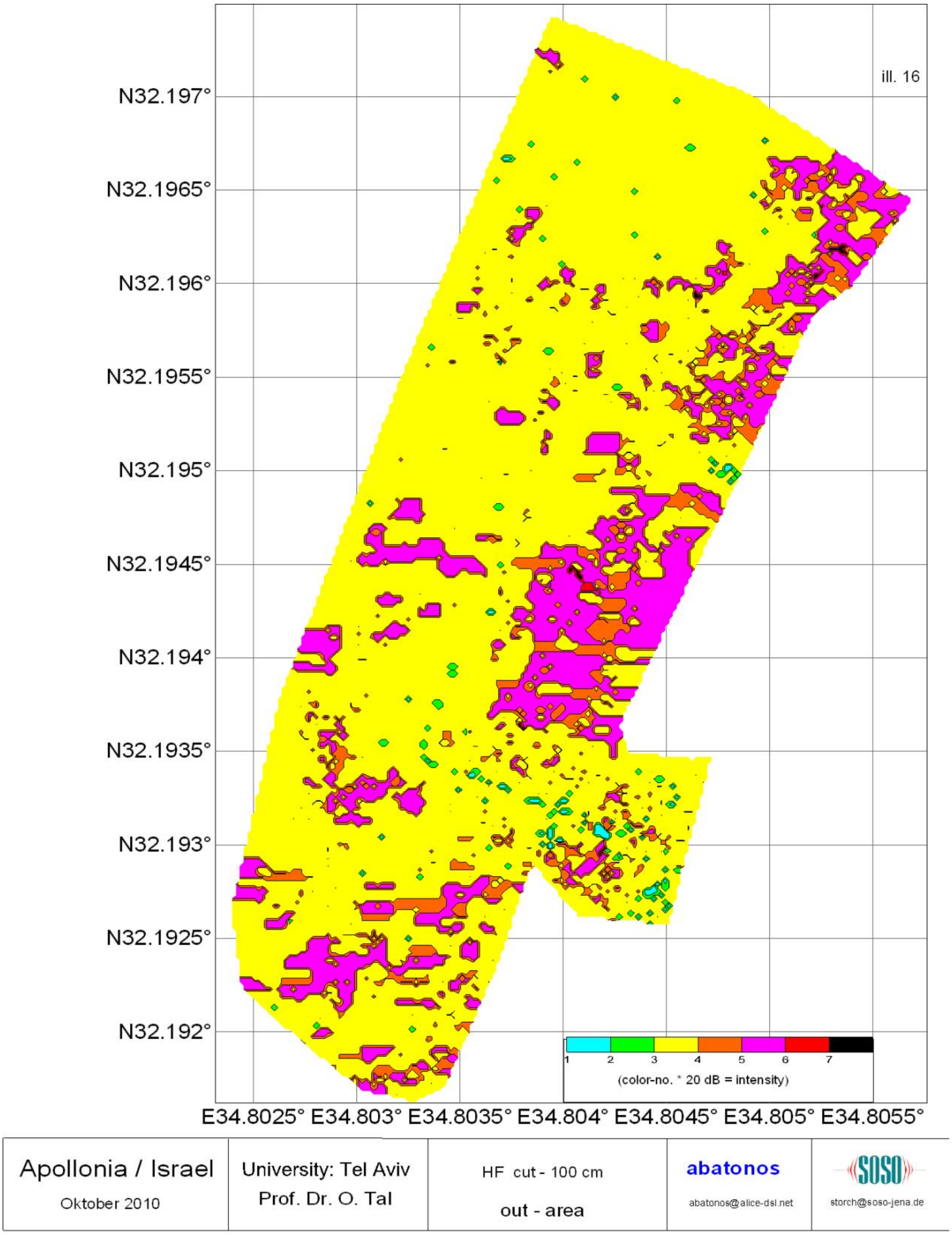
N32.196°
N32.1955°
N32.195°
N32.1945°
N32.194°
N32.1935°
N32.193°
N32.1925°
N32.192°
1 2 3 4 5 6 7
(color-no. * 20 dB = intensity)
E34.8025° E34.803° E34.8035° E34.804° E34.8045° E34.805° E34.8055°
Apollonia / Israel
Oktober 2010
University: Tel Aviv
Prof. Dr. O. Tal
LF cut - 100 cm
out - area
abatonos
abatonos@alice-dsl.net
storch@soso-jena.de



Apollonia / Israel Oktober 2010	University: Tel Aviv Prof. Dr. O. Tal	LF sum up -100 cm out - area	abatonos abatonos@alice-dsl.net	SOSO storch@soso-jena.de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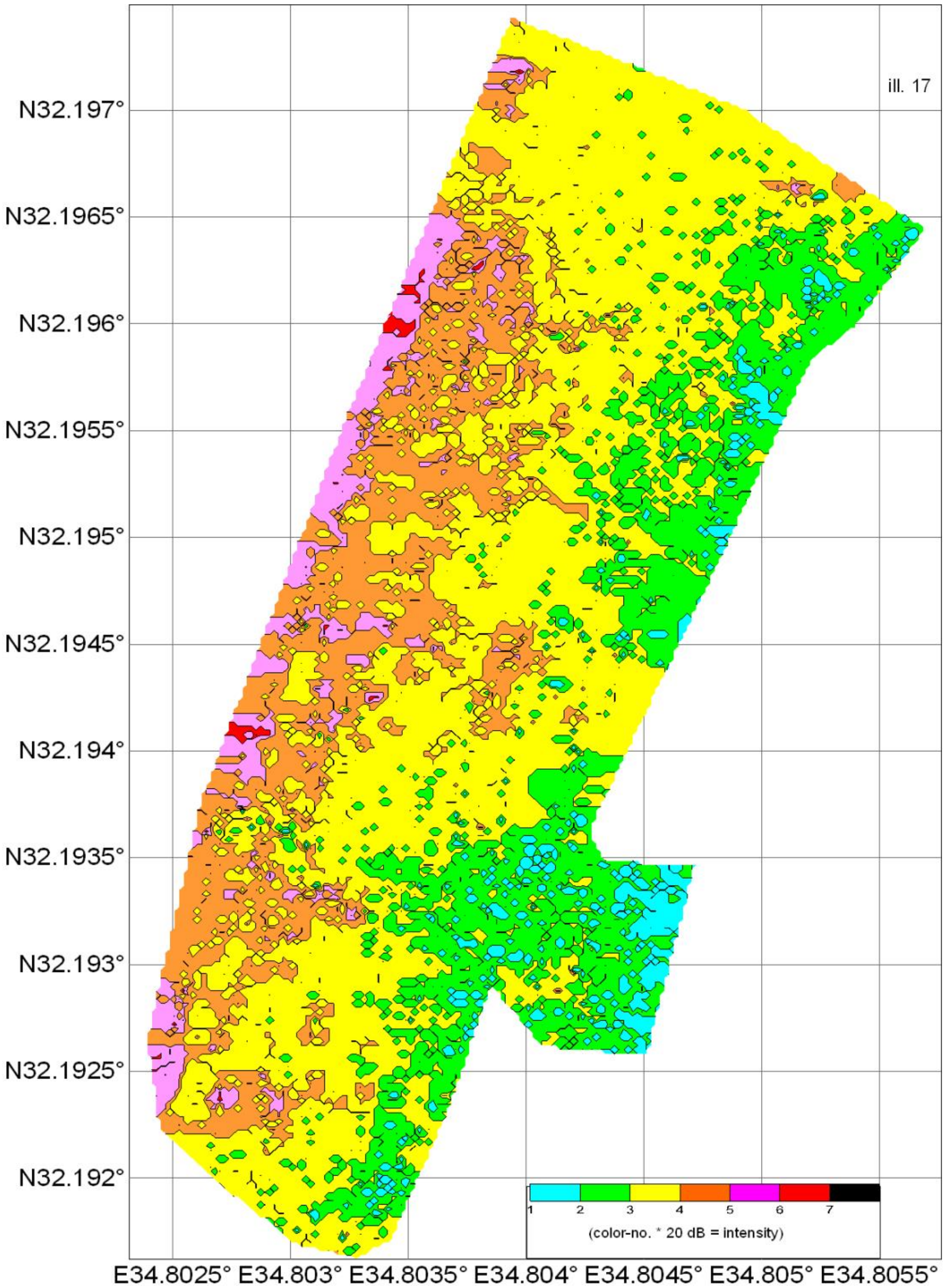
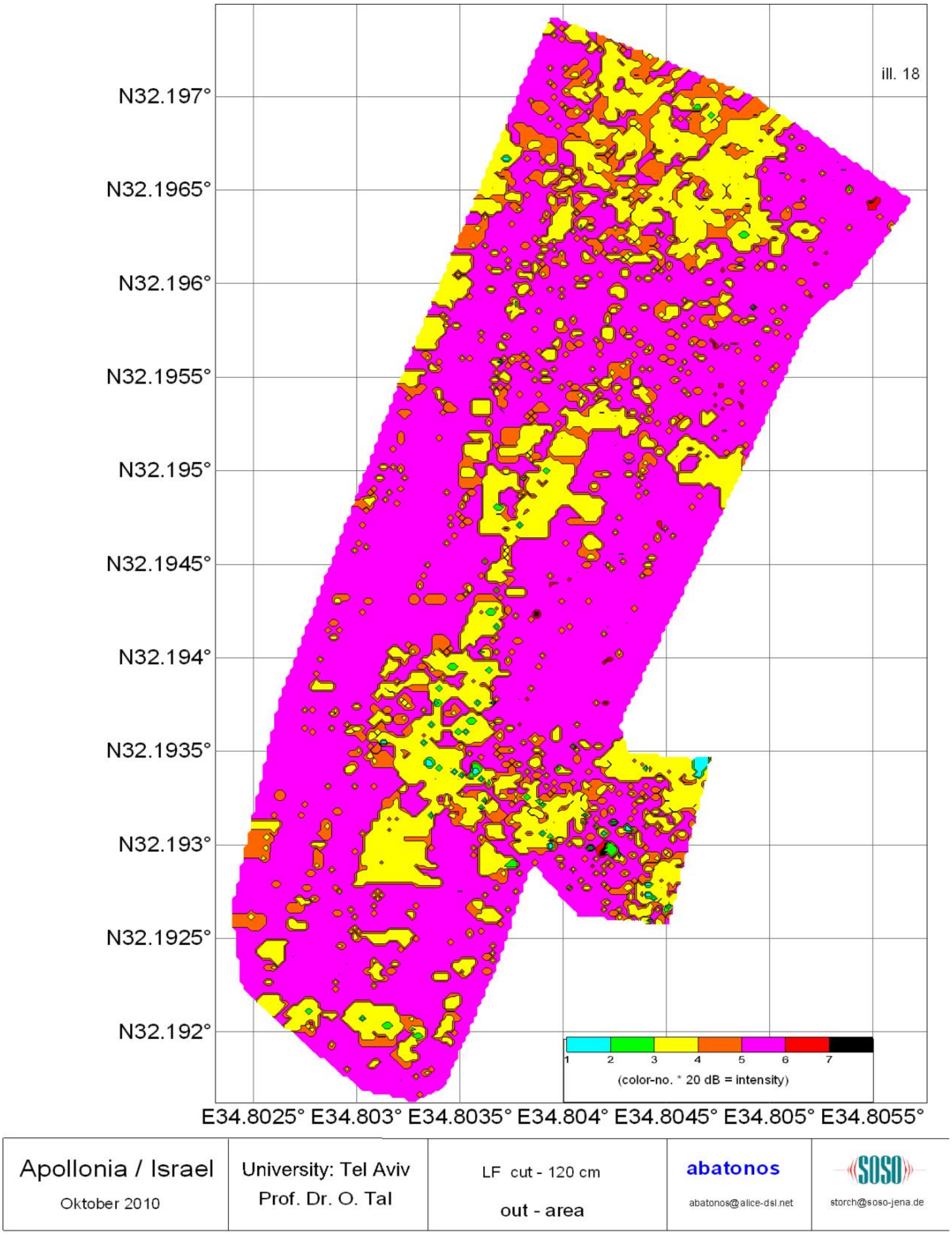
N32.196°
N32.1955°
N32.195°
N32.1945°
N32.194°
N32.1935°
N32.193°
N32.1925°
N32.192°
E34.8025° E34.803° E34.8035° E34.804° E34.8045° E34.805° E34.8055°
1 2 3 4 5 6 7
(color-no. * 20 dB = intensity)
Apollonia / Israel
Oktober 2010
University: Tel Aviv
Prof. Dr. O. Tal
HF cut - 100 cm
out - area
abatonos
abatonos@alice-dsl.net
SOSO
storch@soso-jena.de



Apollonia / Israel Oktober 2010	University: Tel Aviv Prof. Dr. O. Tal	HF sum up -100 cm out - area	abatonos abatonos@alice-dsl.net	SOSO storch@soso-jena.de


ill. 18
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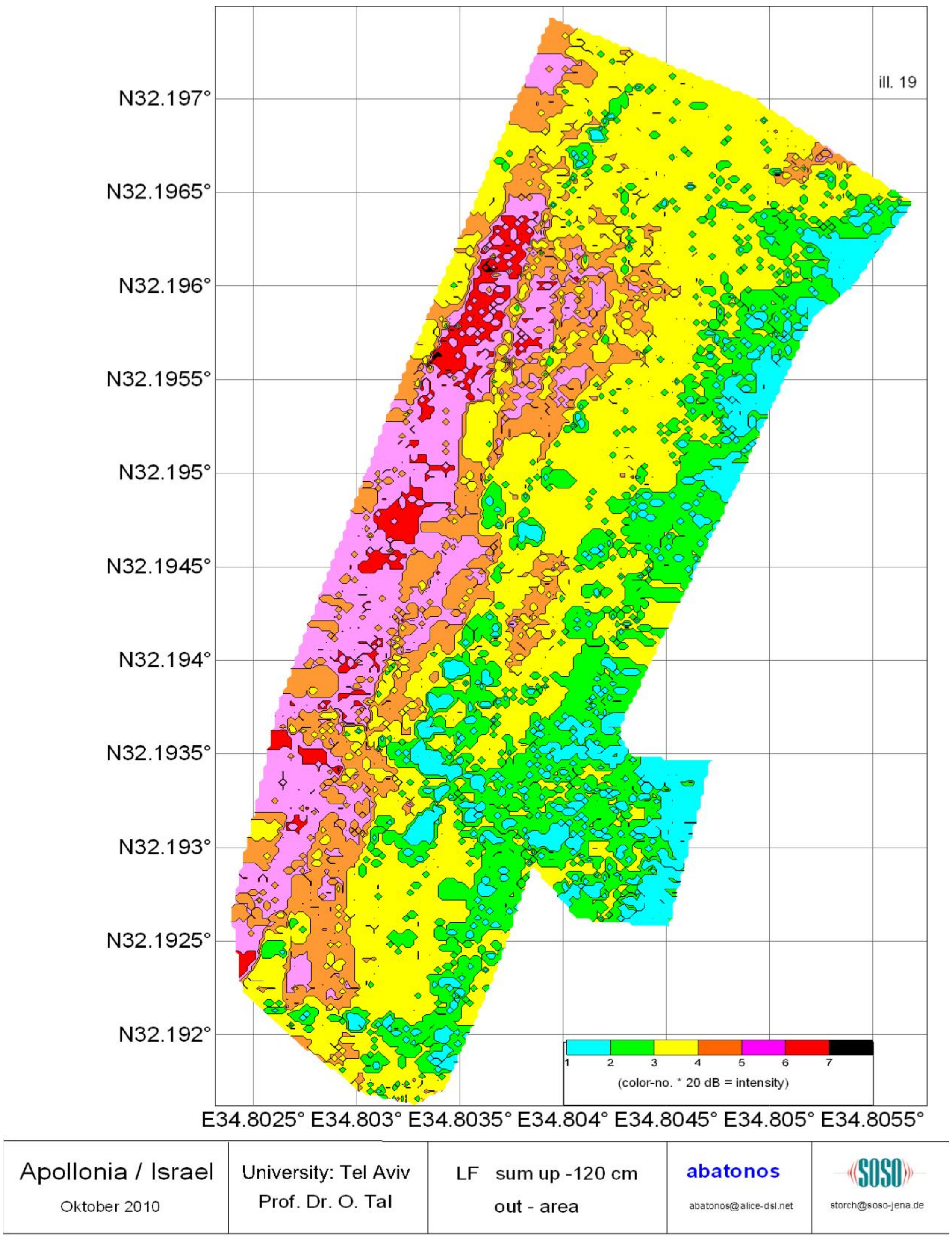
N32.1965°
N32.196°
N32.1955°
N32.195°
N32.1945°
N32.194°
N32.1935°
N32.193°
N32.1925°
N32.192°
E34.8025° E34.803° E34.8035° E34.804° E34.8045° E34.805° E34.8055°
1 2 3 4 5 6 7
(color-no. * 20 dB = intensity)
Apollonia / Israel
Oktober 2010
University: Tel Aviv
Prof. Dr. O. Tal
LF cut - 120 cm
out - area
abatonos
abatonos@alice-dsl.net
SOSO
storch@soso-jena.de


ill. 19
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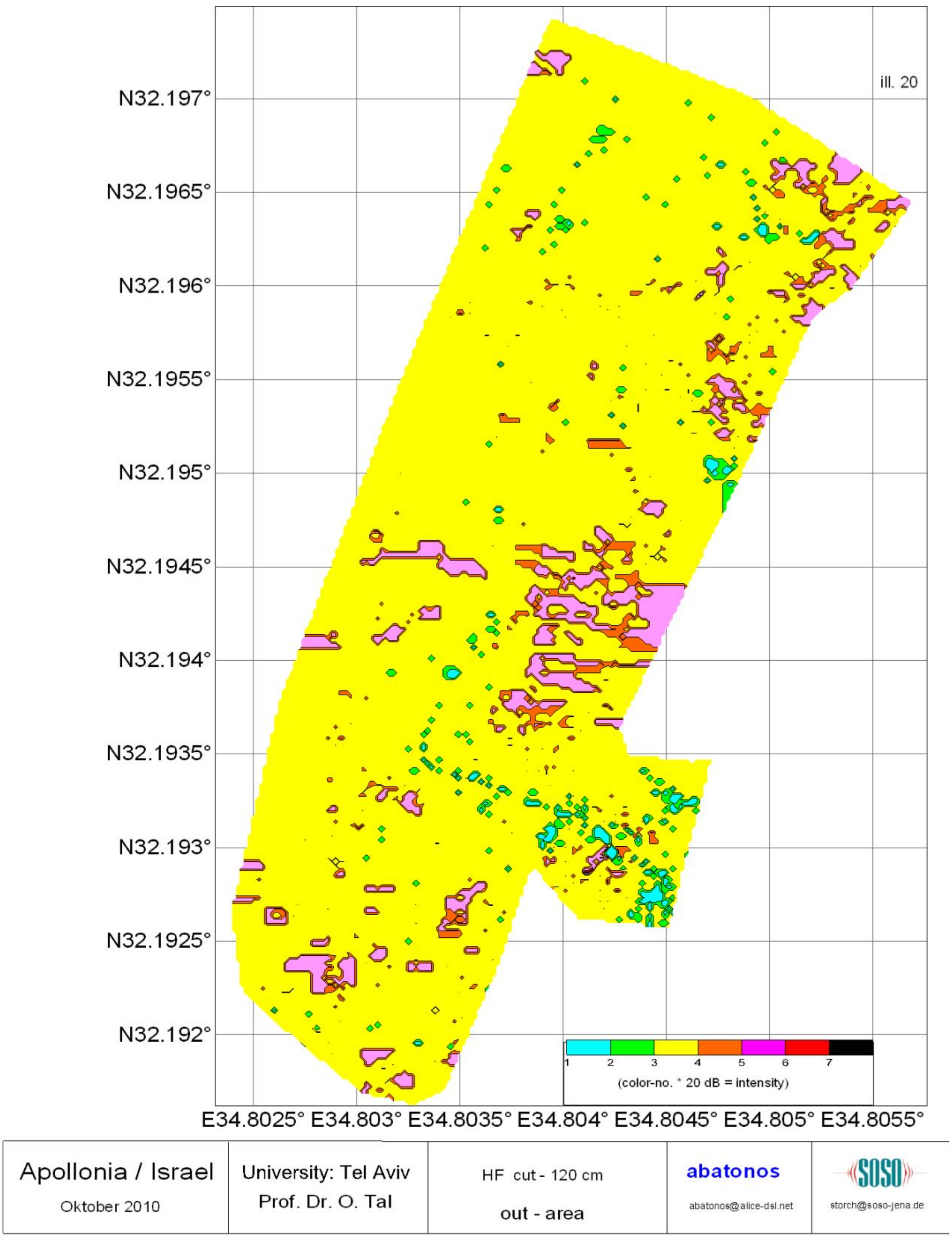
N32.195°
N32.1945°
N32.194°
N32.1935°
N32.193°
N32.1925°
N32.192°
E34.8025° E34.803° E34.8035° E34.804° E34.8045° E34.805° E34.8055°
1 2 3 4 5 6 7
(color-no. * 20 dB = intensity)
Apollonia / Israel
Oktober 2010
University: Tel Aviv
Prof. Dr. O. Tal
LF sum up -120 cm
out - area
abatonos
abatonos@alice-dsl.net
storch@soso-jena.de


ill. 20
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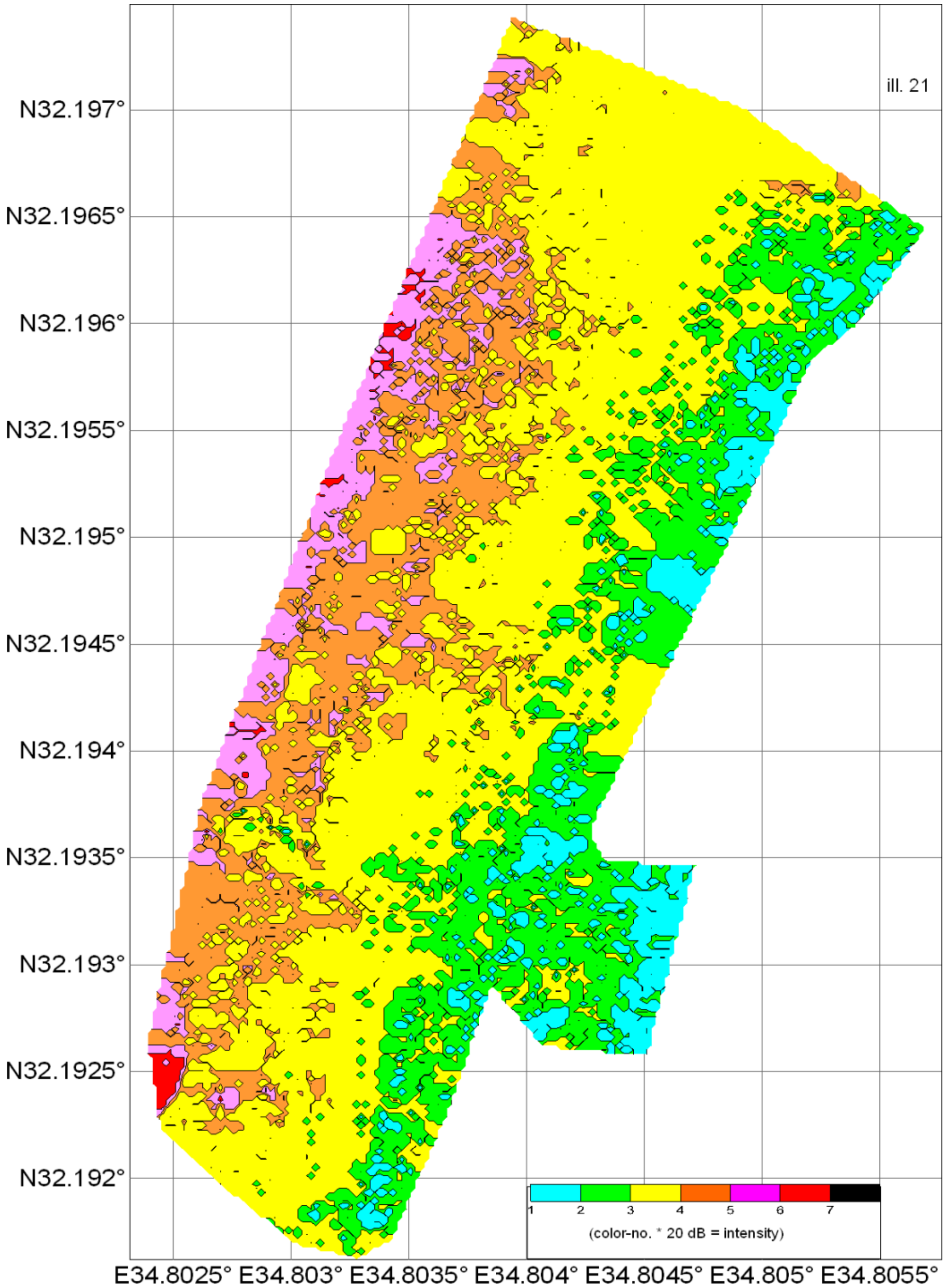
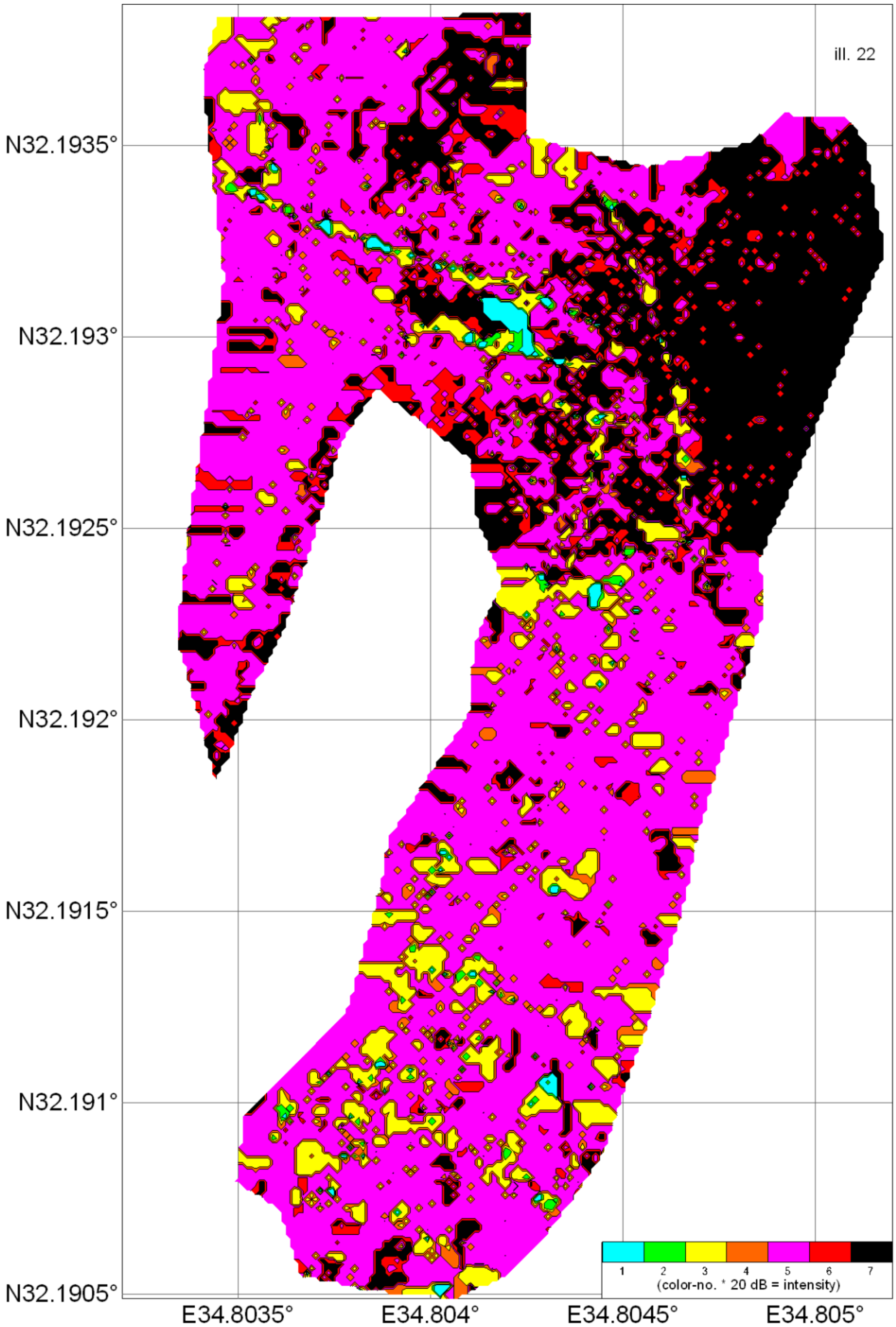
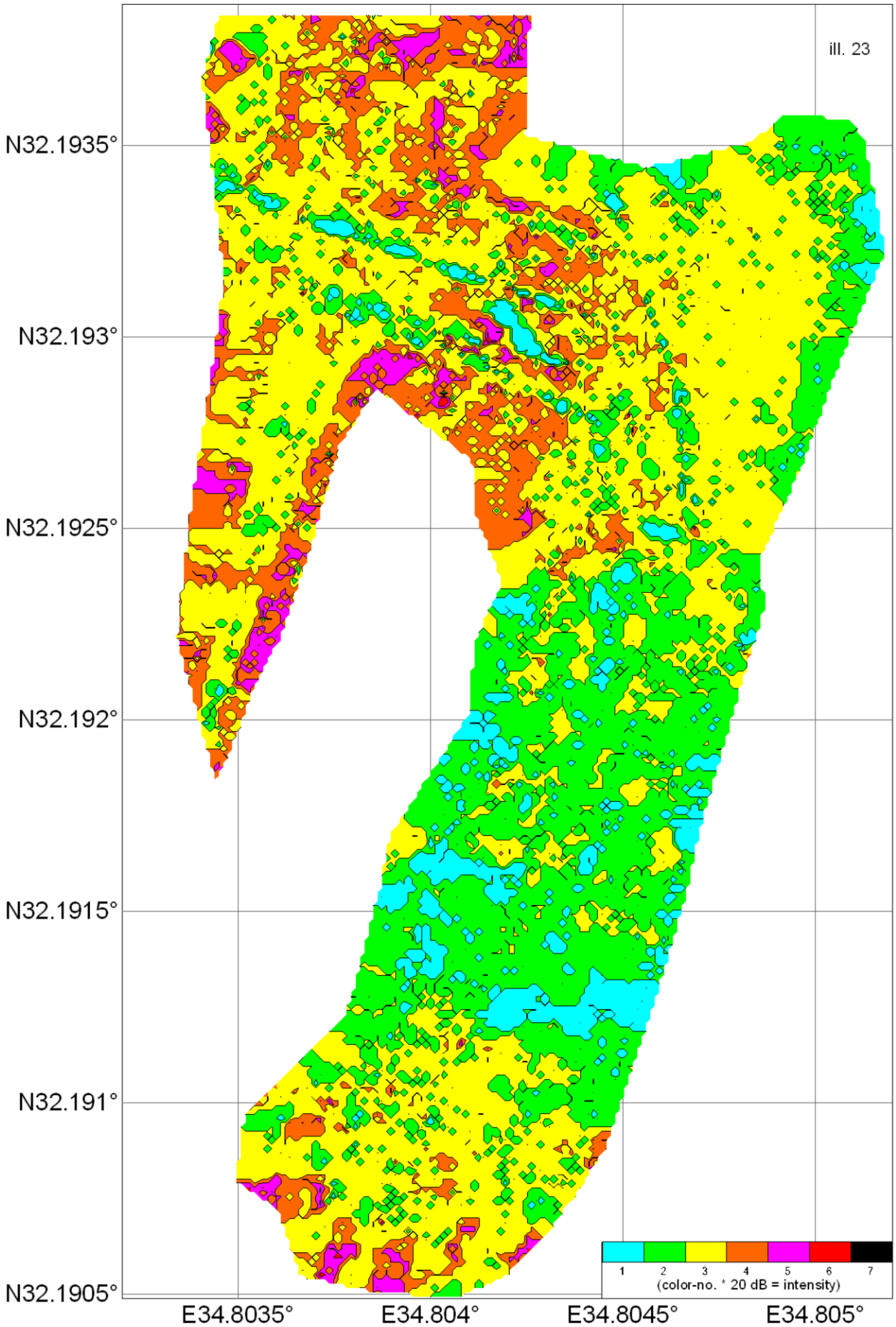
N32.196°
N32.1955°
N32.195°
N32.1945°
N32.194°
N32.1935°
N32.193°
N32.1925°
N32.192°
E34.8025° E34.803° E34.8035° E34.804° E34.8045° E34.805° E34.8055°
1 2 3 4 5 6 7
(color-no. * 20 dB = intensity)
Apollonia / Israel
Oktober 2010
University: Tel Aviv
Prof. Dr. O. Tal
HF cut - 120 cm
out - area
abatonos
abatonos@alice-dsl.net
SOSO
storch@soso-jena.de



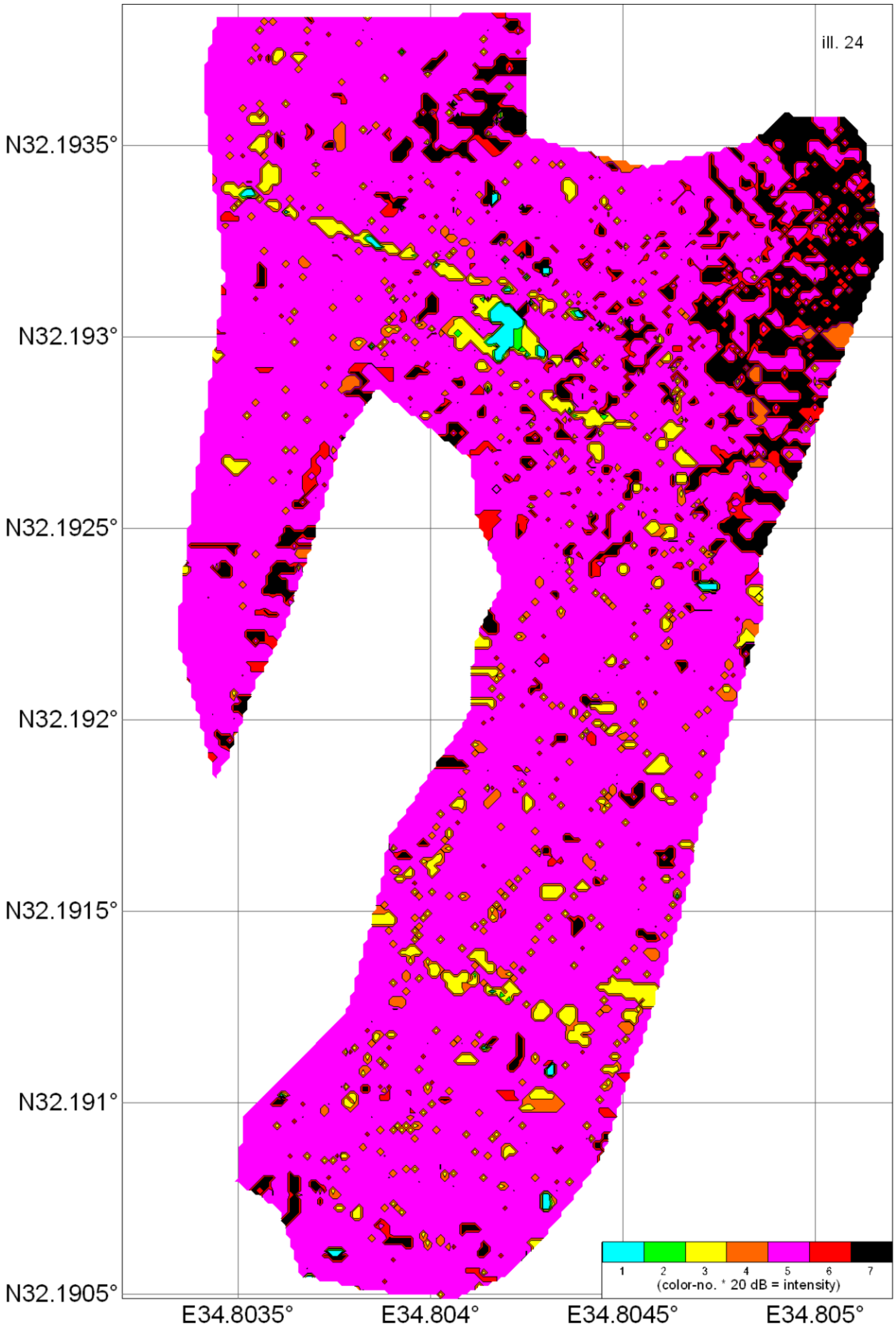
Apollonia / Israel Oktober 2010	University: Tel Aviv Prof. Dr. O. Tal	HF sum up -120 cm out - area	abatonos abatonos@alice-dsl.net	SOSO storch@soso-jena.de



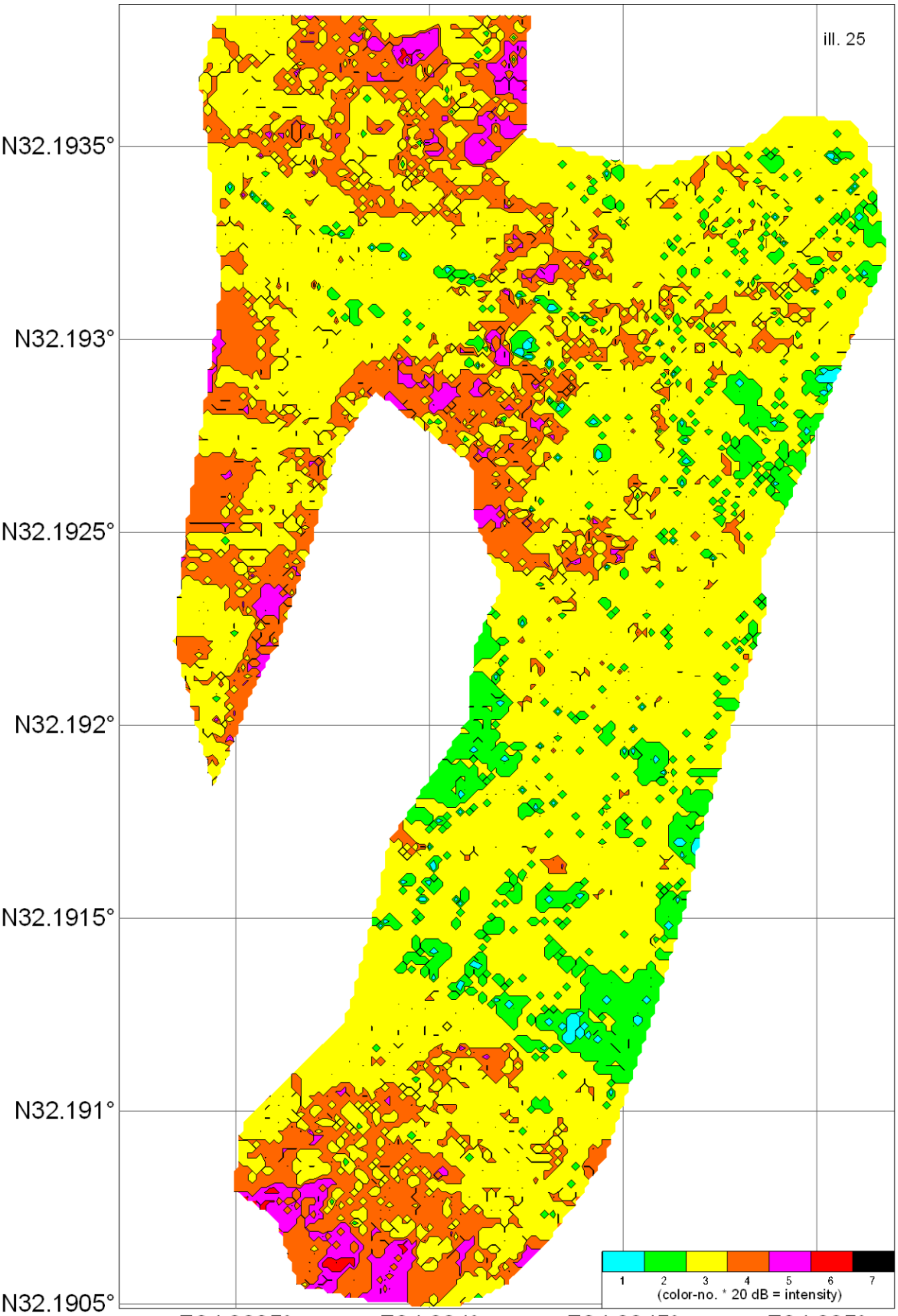
Apollonia / Israel Oktober 2010	University: Tel Aviv Prof. Dr. O. Tal	LF cut - 20 cm inside- area	**abatonos** abatonos@alice-dsl.net	SOSO storch@soso-jena.de



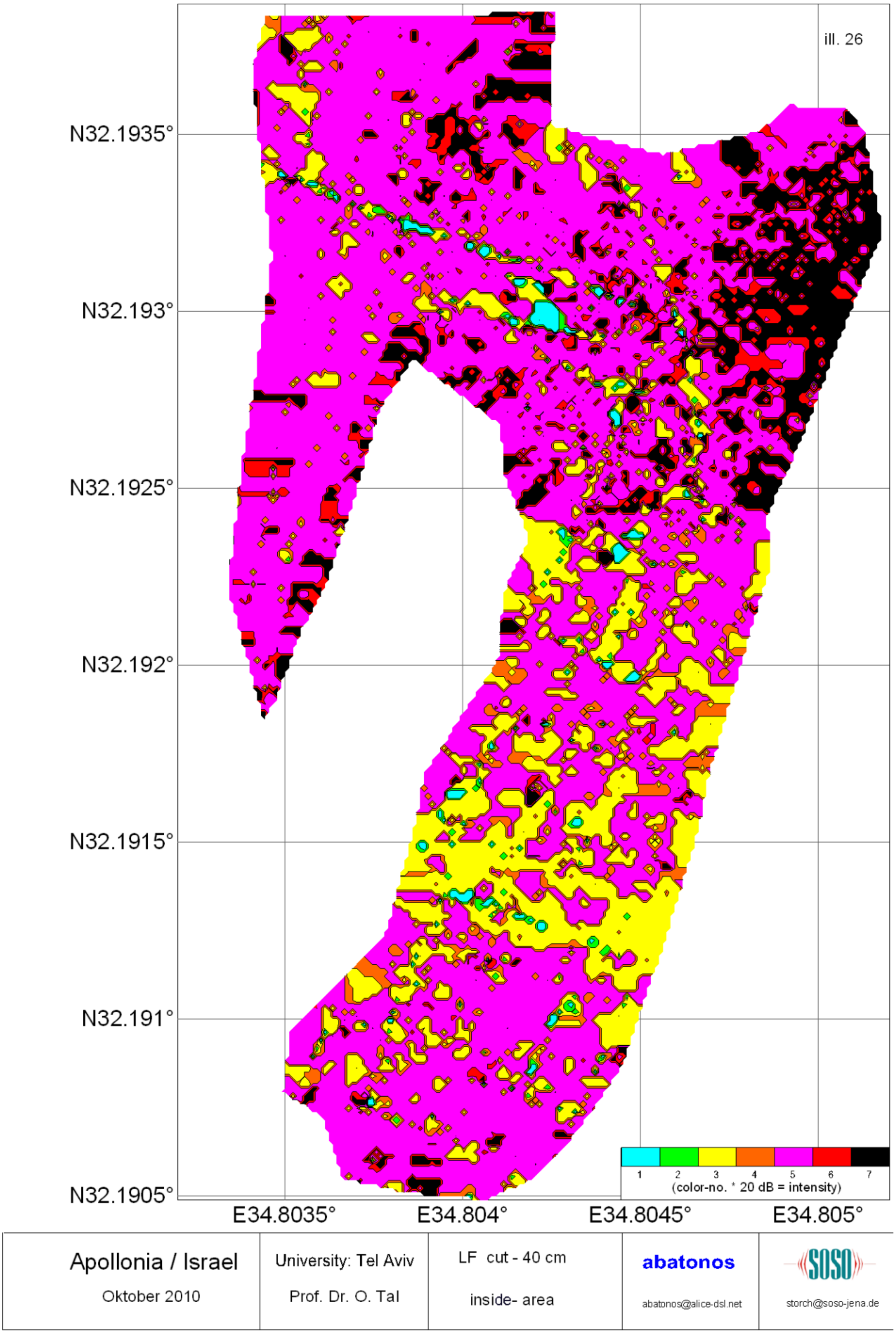
Apollonia / Israel Oktober 2010	University: Tel Aviv Prof. Dr. O. Tal	LF sum up - 20 cm inside- area	abatonos abatonos@alice-dsl.net	SOSO storch@soso-jena.de



Apollonia / Israel Oktober 2010	University: Tel Aviv Prof. Dr. O. Tal	HF cut - 20 cm inside- area	abatonos abatonos@alice-dsl.net	SOSO storch@soso-jena.de



Apollonia / Israel Oktober 2010	University: Tel Aviv Prof. Dr. O. Tal	HF sum up - 20 cm inside- area	abatonos abatonos@alice-dsl.net	SOSO storch@soso-jena.de


ill. 26
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N32.191°
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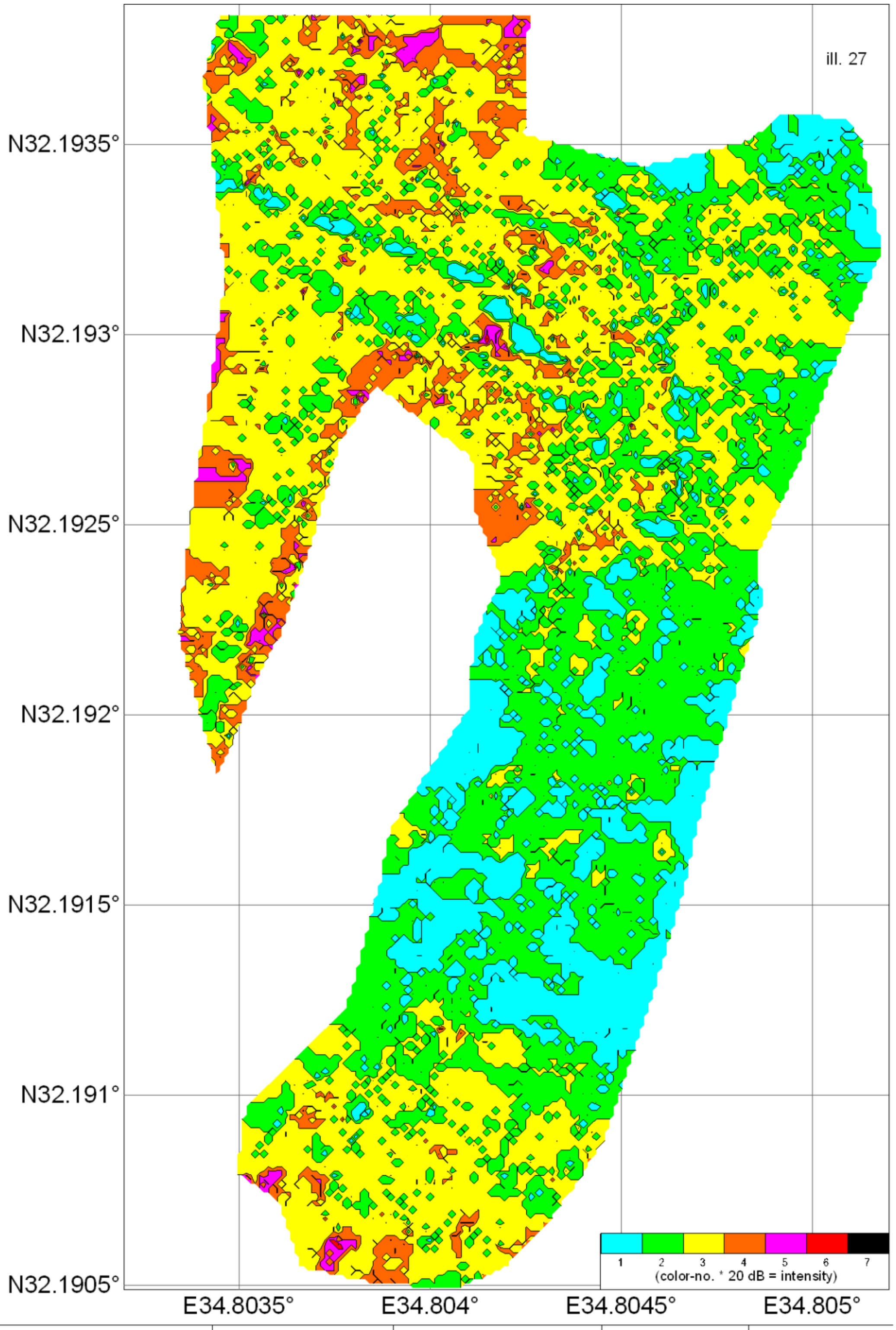
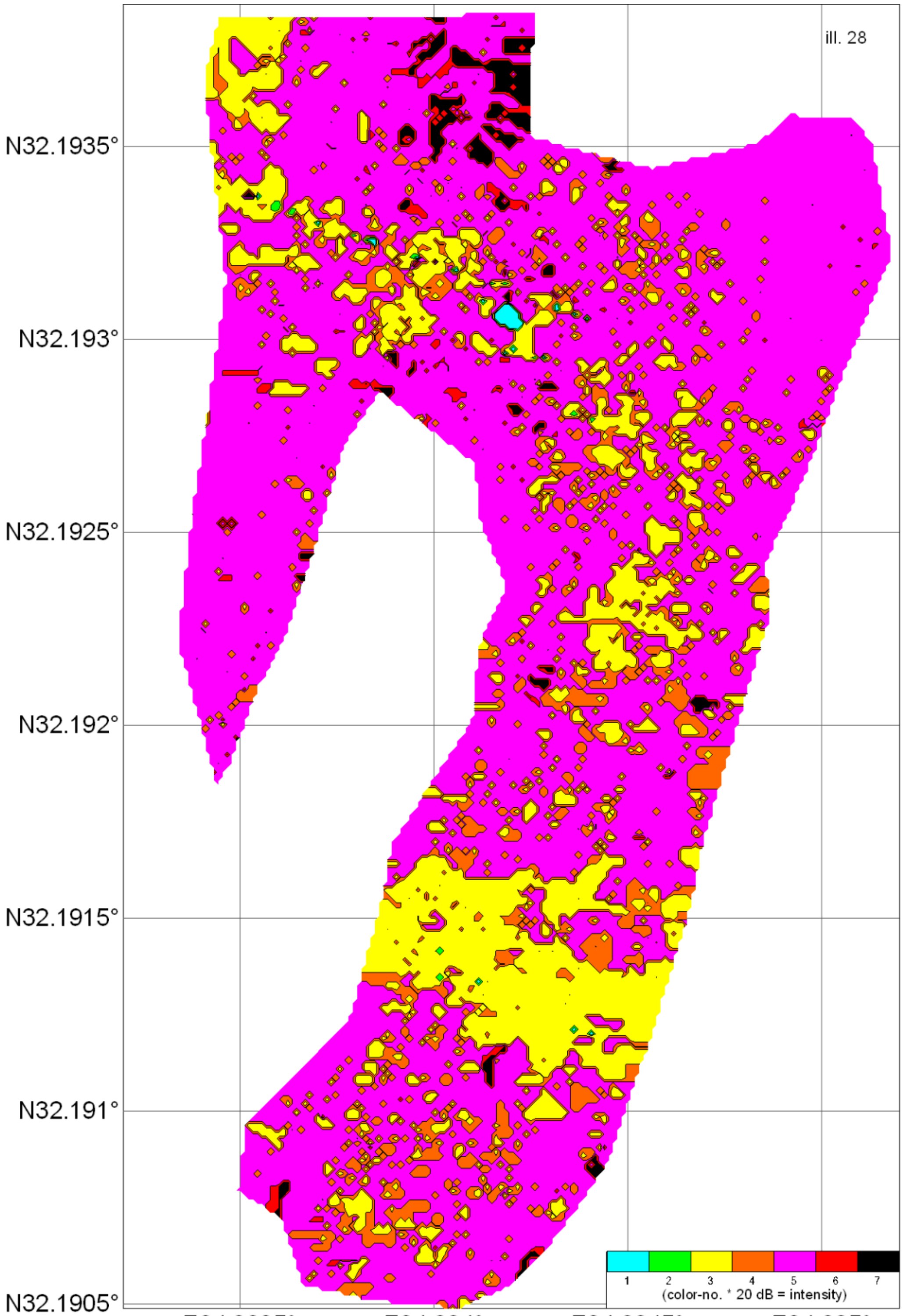
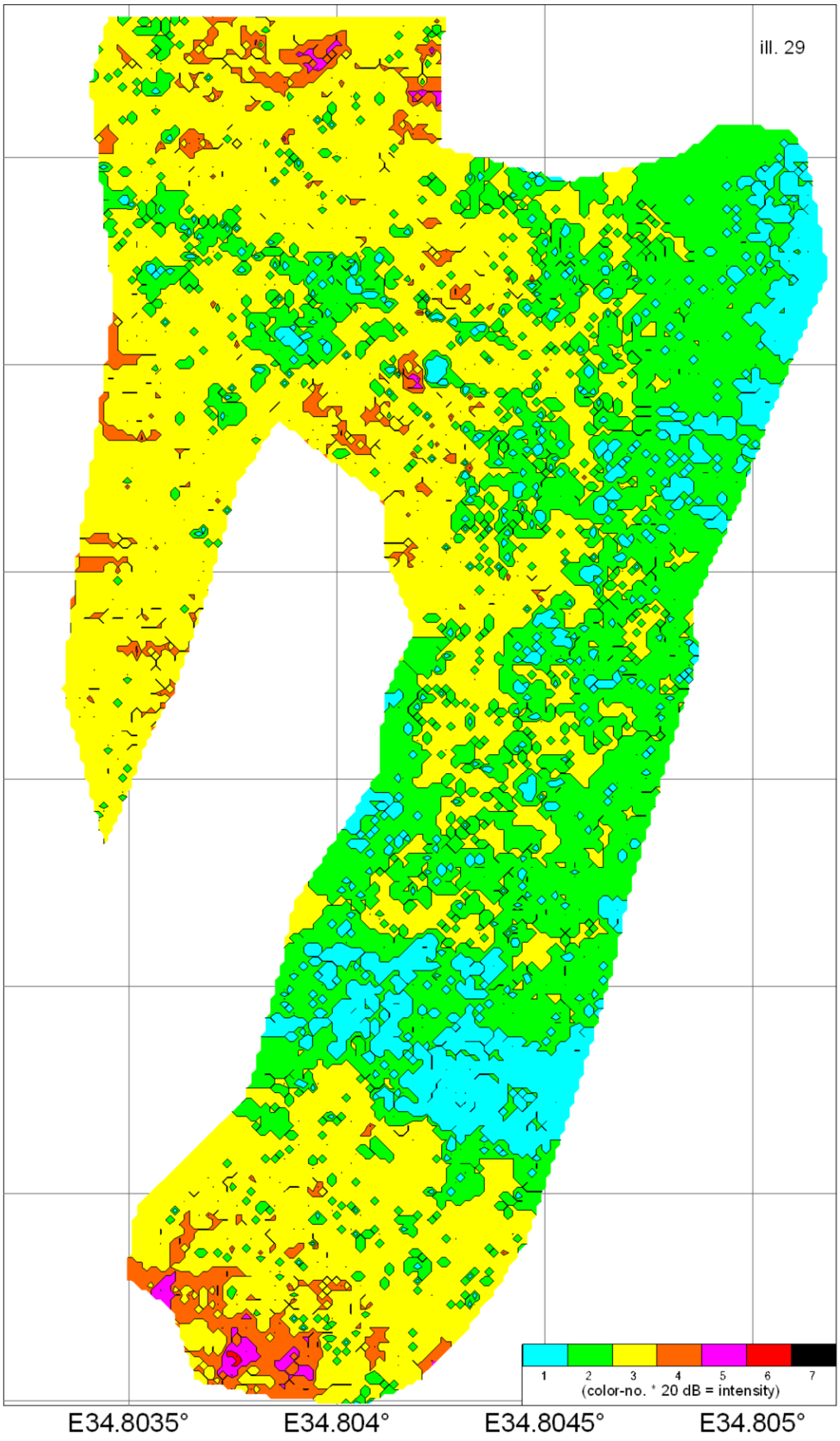
E34.8035°
E34.804°
E34.8045°
E34.805°
1 2 3 4 5 6 7
(color-no. * 20 dB = intensity)
Apollonia / Israel
Oktober 2010
University: Tel Aviv
Prof. Dr. O. Tal
LF cut - 40 cm
inside- area
abatonos
abatonos@alice-dsl.net
SOSO
storch@soso-jena.de



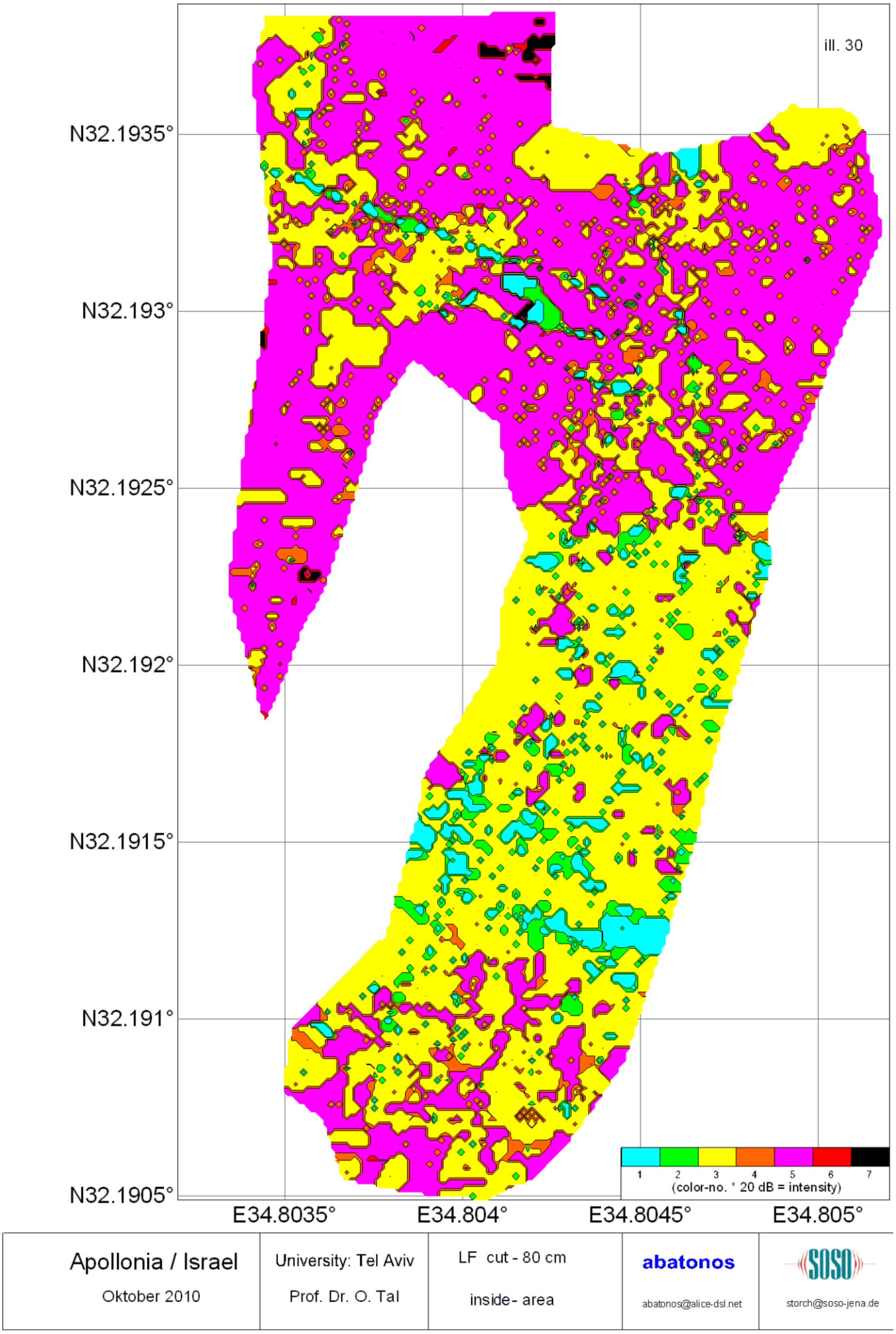
Apollonia / Israel Oktober 2010	University: Tel Aviv Prof. Dr. O. Tal	LF sum up - 40 cm inside- area	abatonos abatonos@alice-dsl.net	SOSO storch@soso-jena.de



Apollonia / Israel Oktober 2010	University: Tel Aviv Prof. Dr. O. Tal	HF cut - 40 cm inside- area	abatonos abatonos@alice-dsl.net	SOSO storch@soso-jena.de



Apollonia / Israel Oktober 2010	University: Tel Aviv Prof. Dr. O. Tal	HF sum up - 40 cm inside- area	abatonos abatonos@alice-dsl.net	SOSO storch@soso-jena.de


ill. 30
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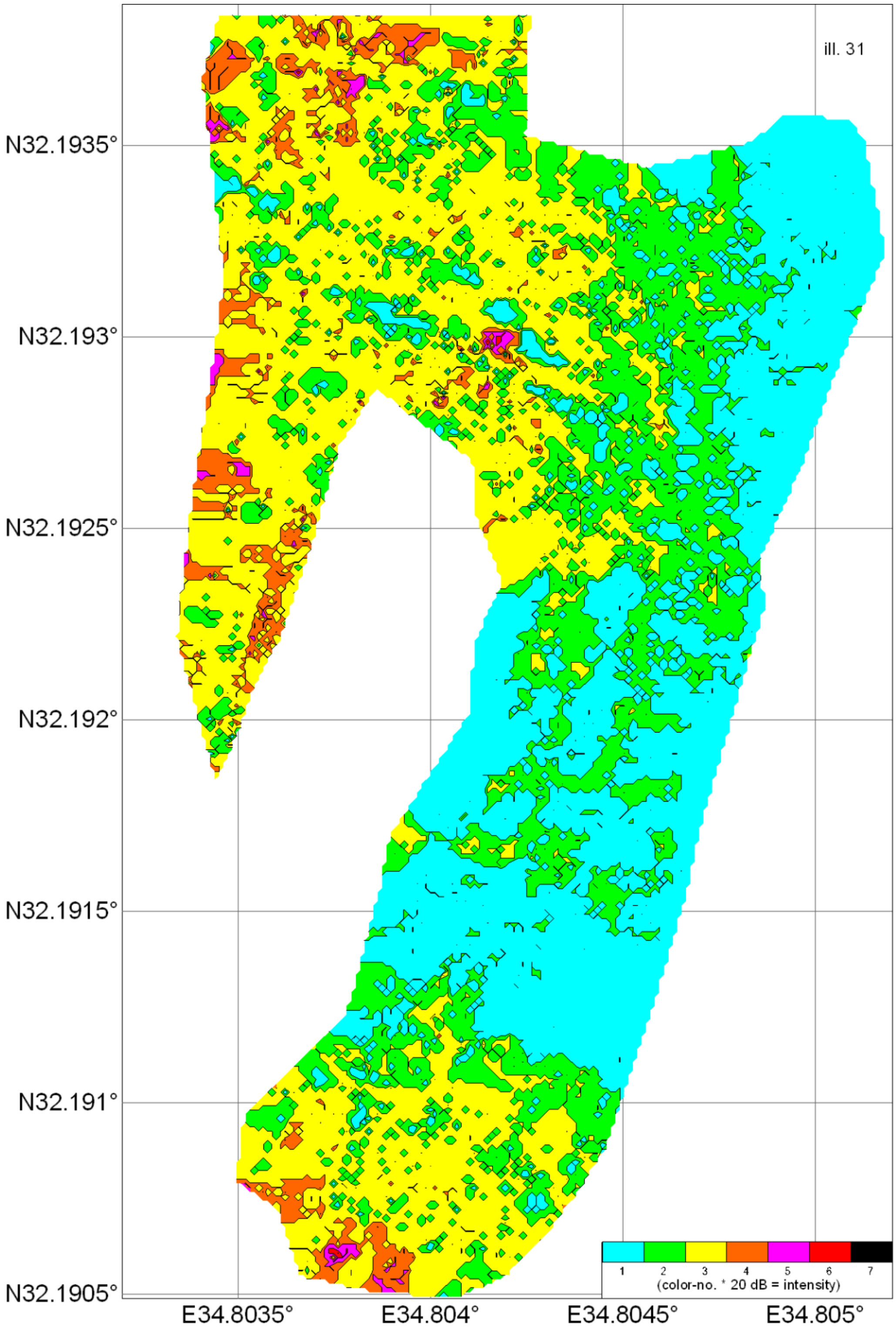
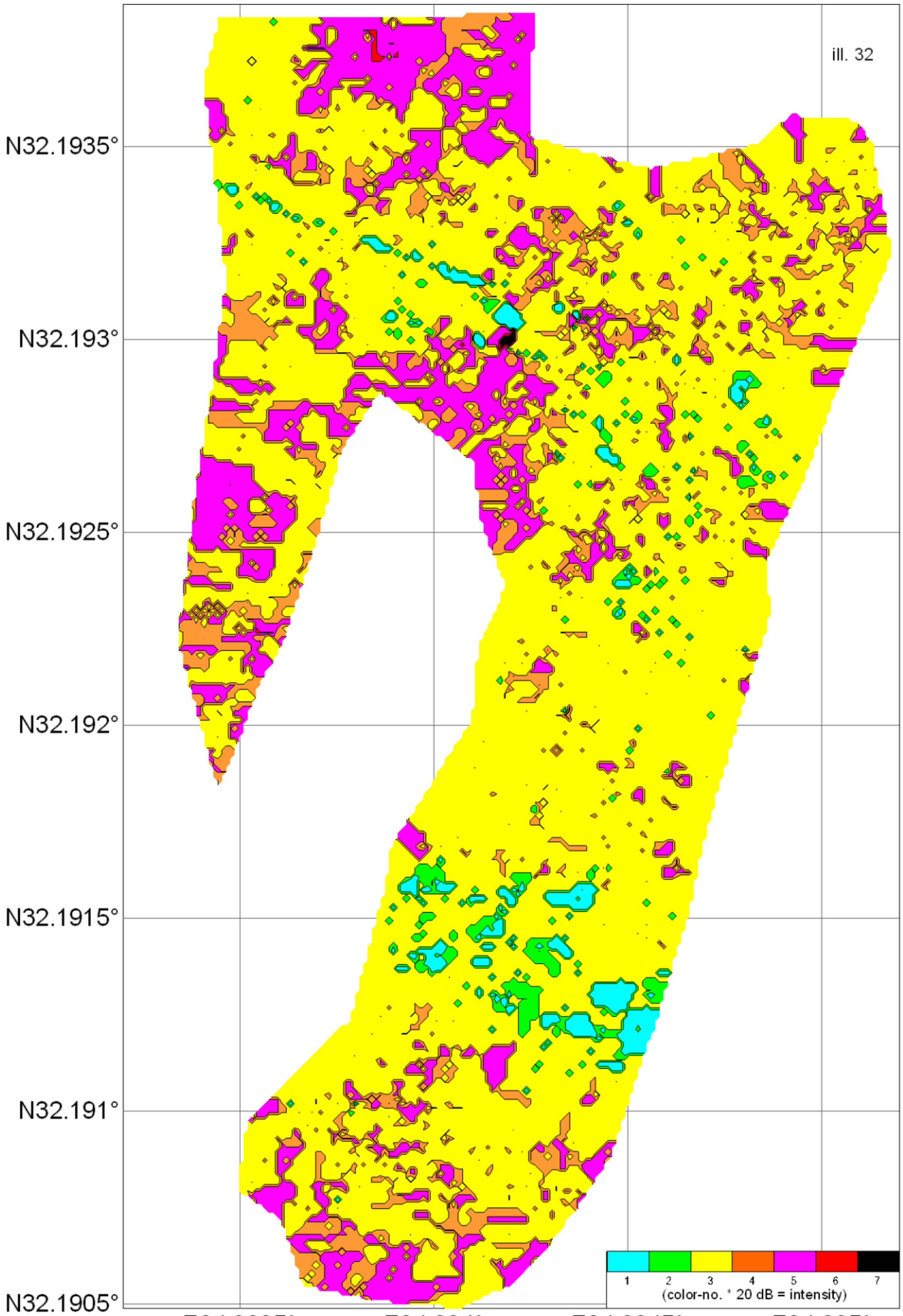
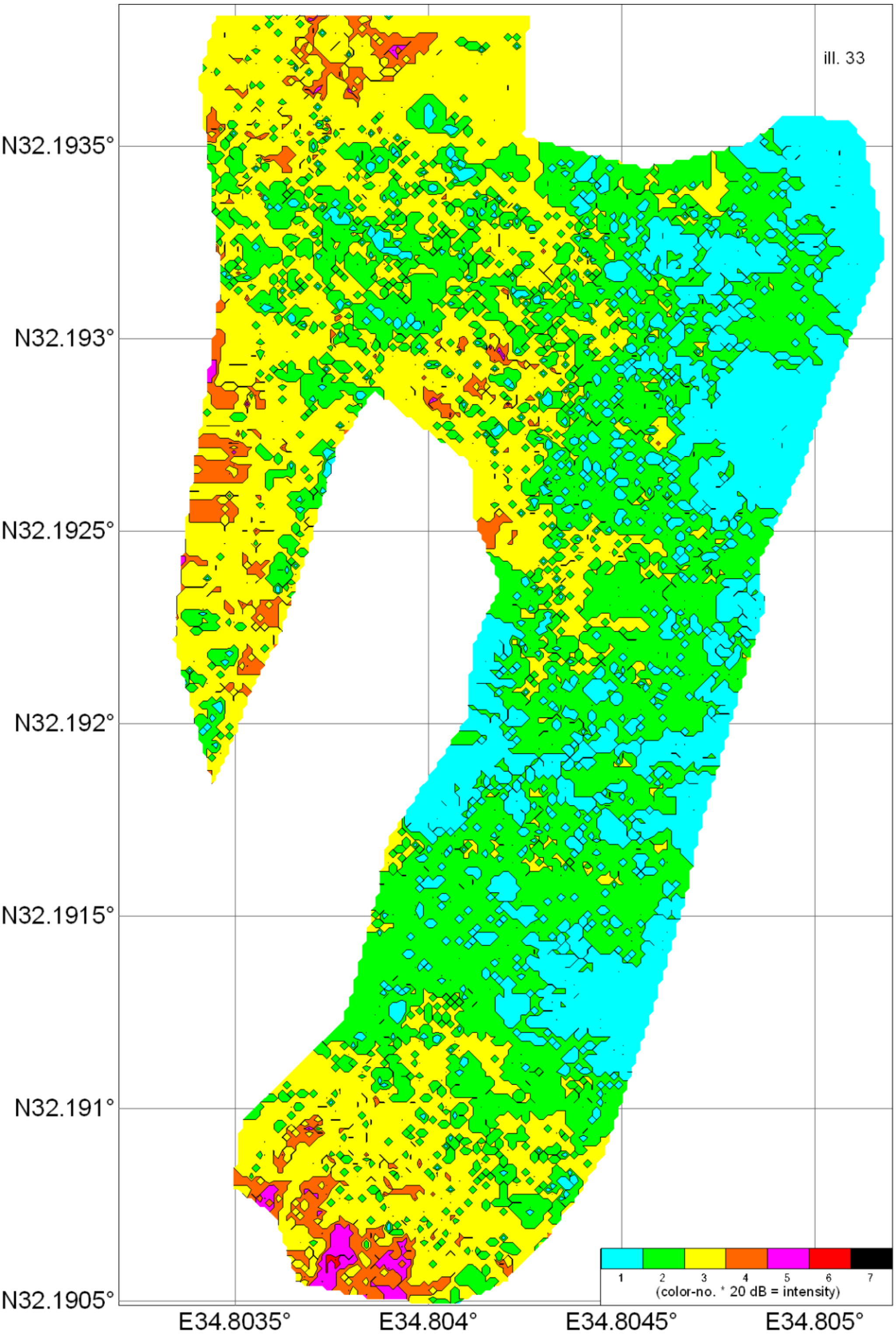
N32.1915°
N32.191°
N32.1905°
E34.8035°
E34.804°
E34.8045°
E34.805°
1 2 3 4 5 6 7
(color-no. * 20 dB = intensity)
Apollonia / Israel
Oktober 2010
University: Tel Aviv
Prof. Dr. O. Tal
LF cut - 80 cm
inside- area
abatonos
abatonos@alice-dsl.net
SOSO
storch@soso-jena.de



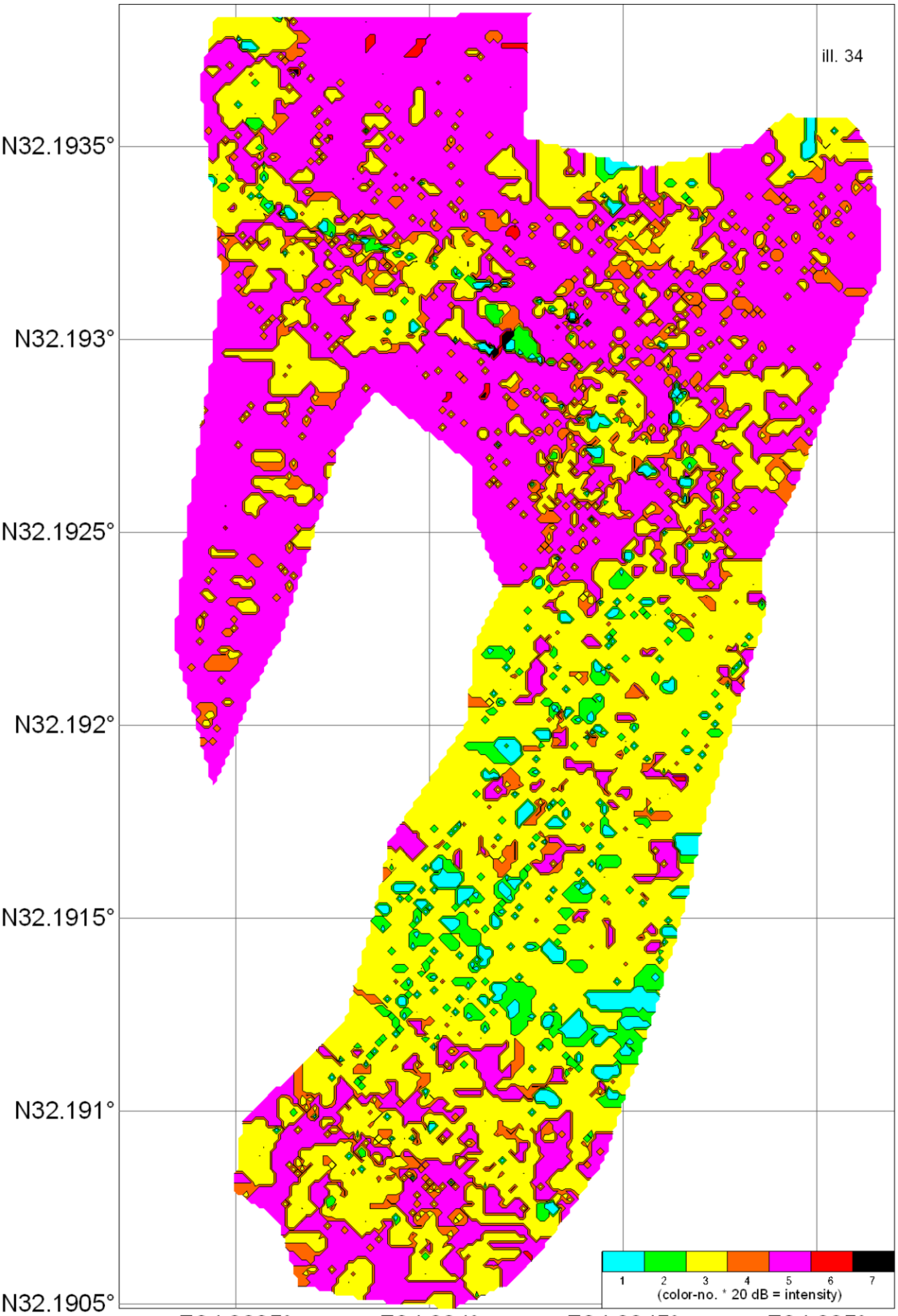
Apollonia / Israel Oktober 2010	University: Tel Aviv Prof. Dr. O. Tal	LF sum up - 80 cm inside- area	abatonos abatonos@alice-dsl.net	SOSO storch@soso-jena.de



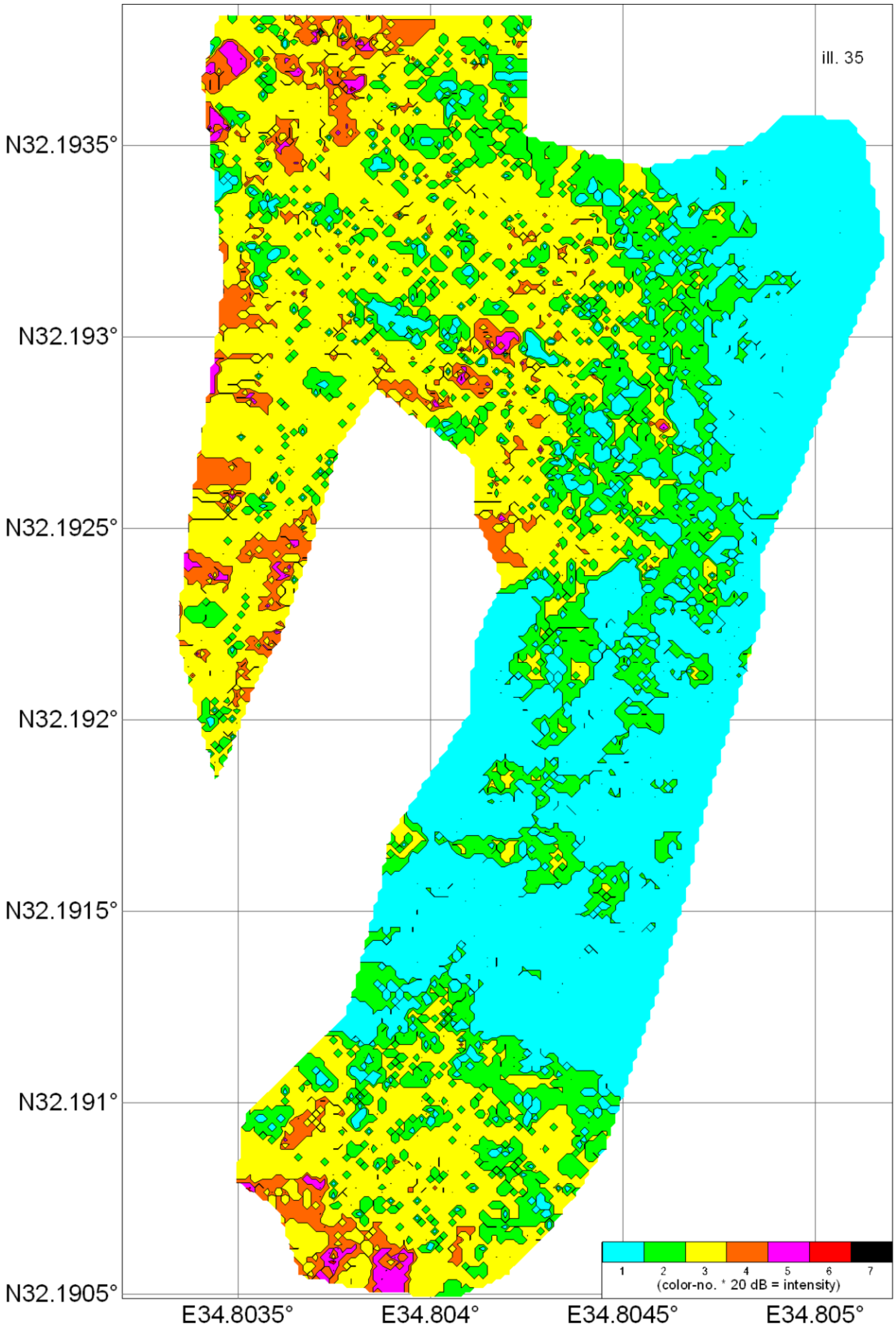
Apollonia / Israel Oktober 2010	University: Tel Aviv Prof. Dr. O. Tal	HF cut - 80 cm inside- area	abatonos abatonos@alice-dsl.net	SOSO storch@soso-jena.de



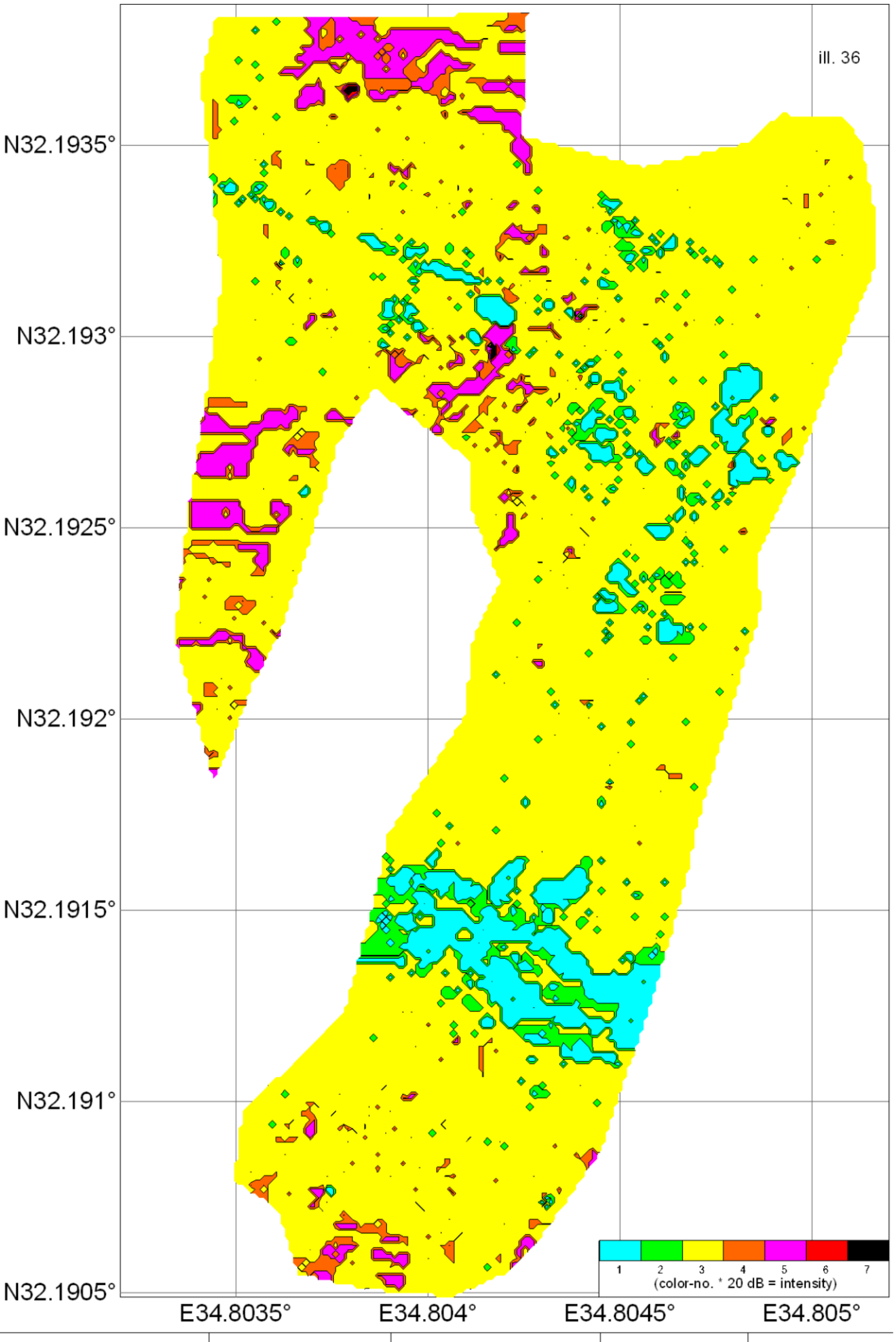
Apollonia / Israel Oktober 2010	University: Tel Aviv Prof. Dr. O. Tal	HF sum up - 80 cm inside- area	abatonos abatonos@alice-dsl.net	SOSO storch@soso-jena.de



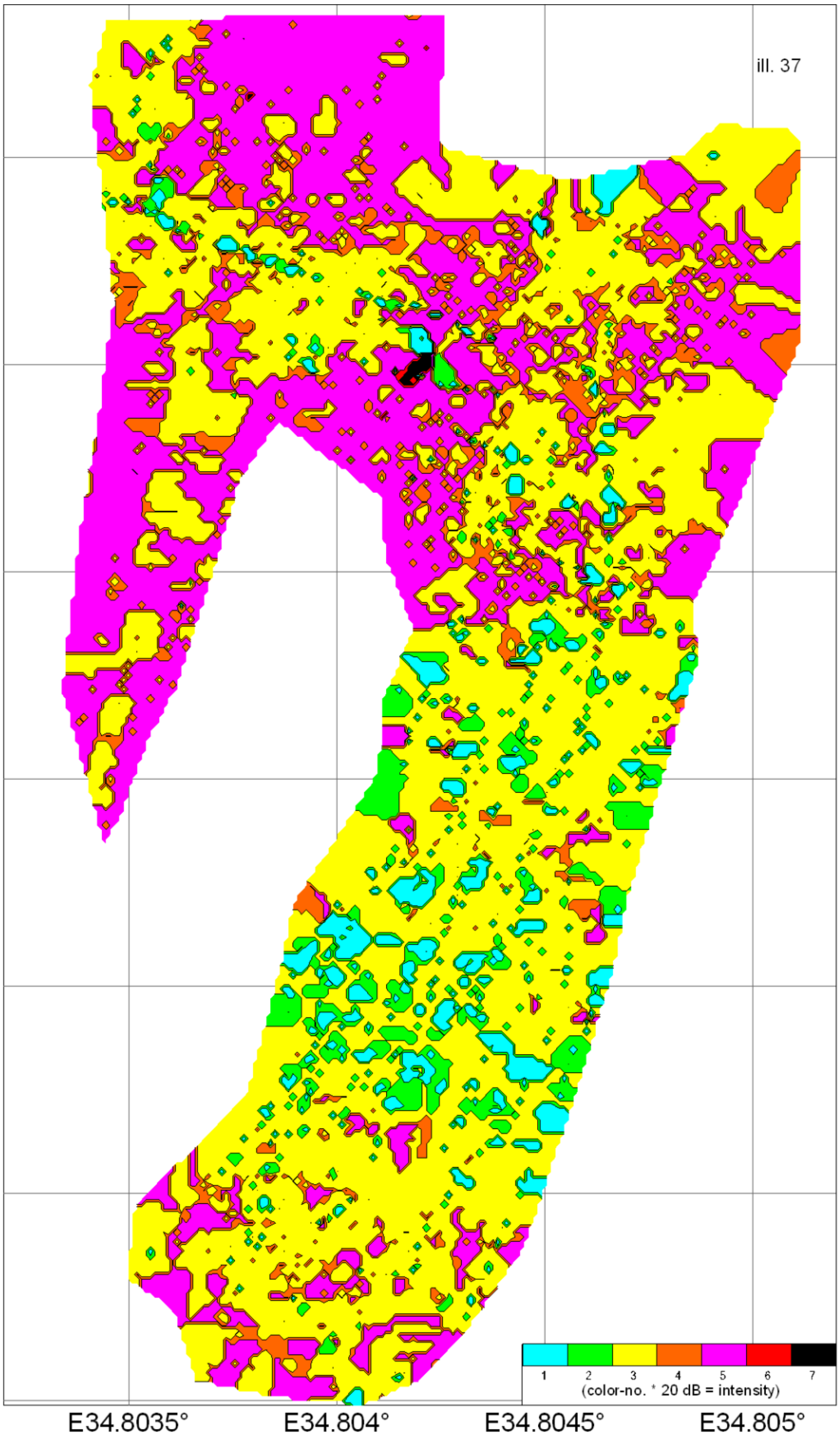
Apollonia / Israel Oktober 2010	University: Tel Aviv Prof. Dr. O. Tal	LF cut - 100 cm inside- area	abatonos abatonos@alice-dsl.net	SOSO storch@soso-jena.de



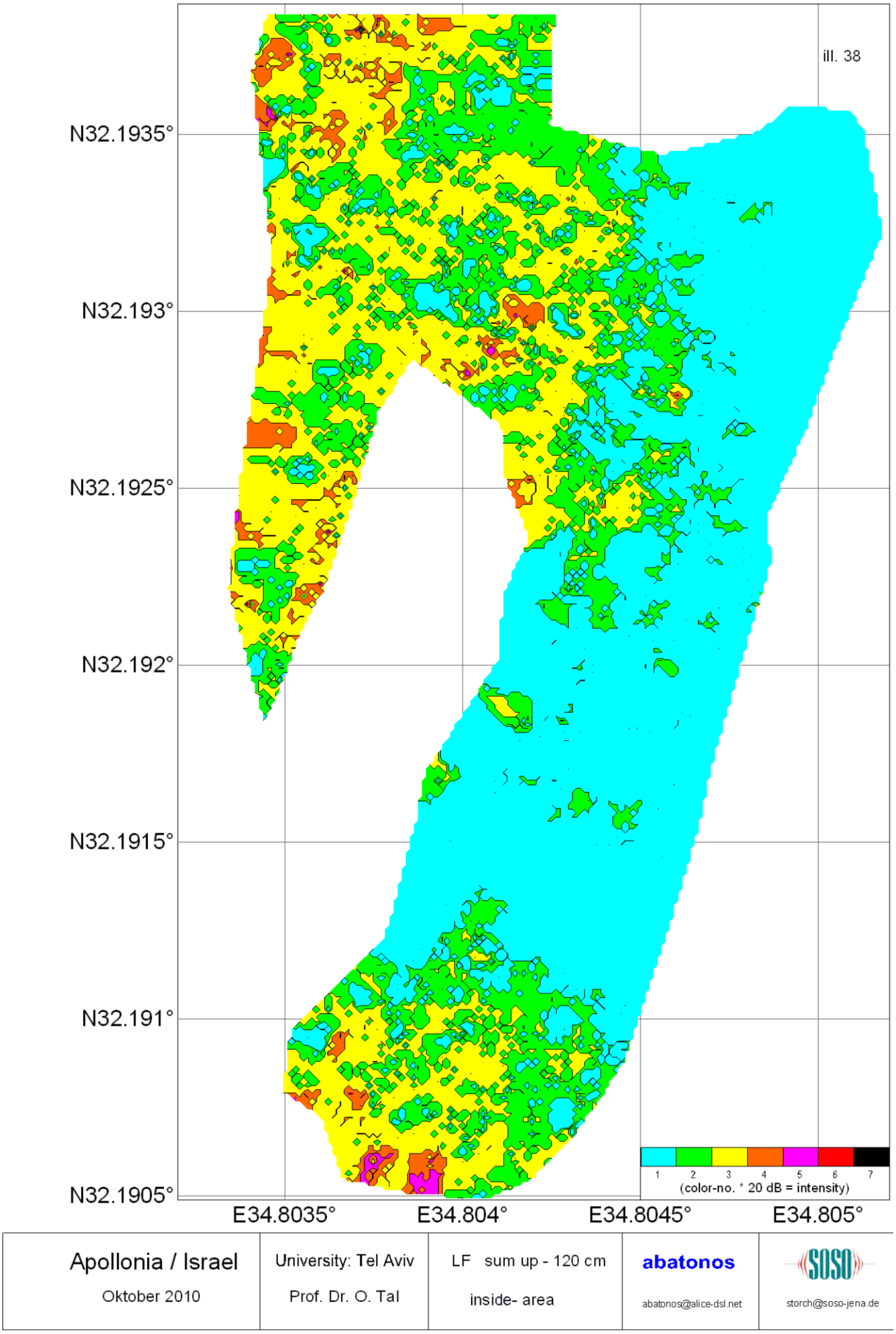
Apollonia / Israel Oktober 2010	University: Tel Aviv Prof. Dr. O. Tal	LF sum up - 100 cm inside- area	abatonos abatonos@alice-dsl.net	SOSO storch@soso-jena.de

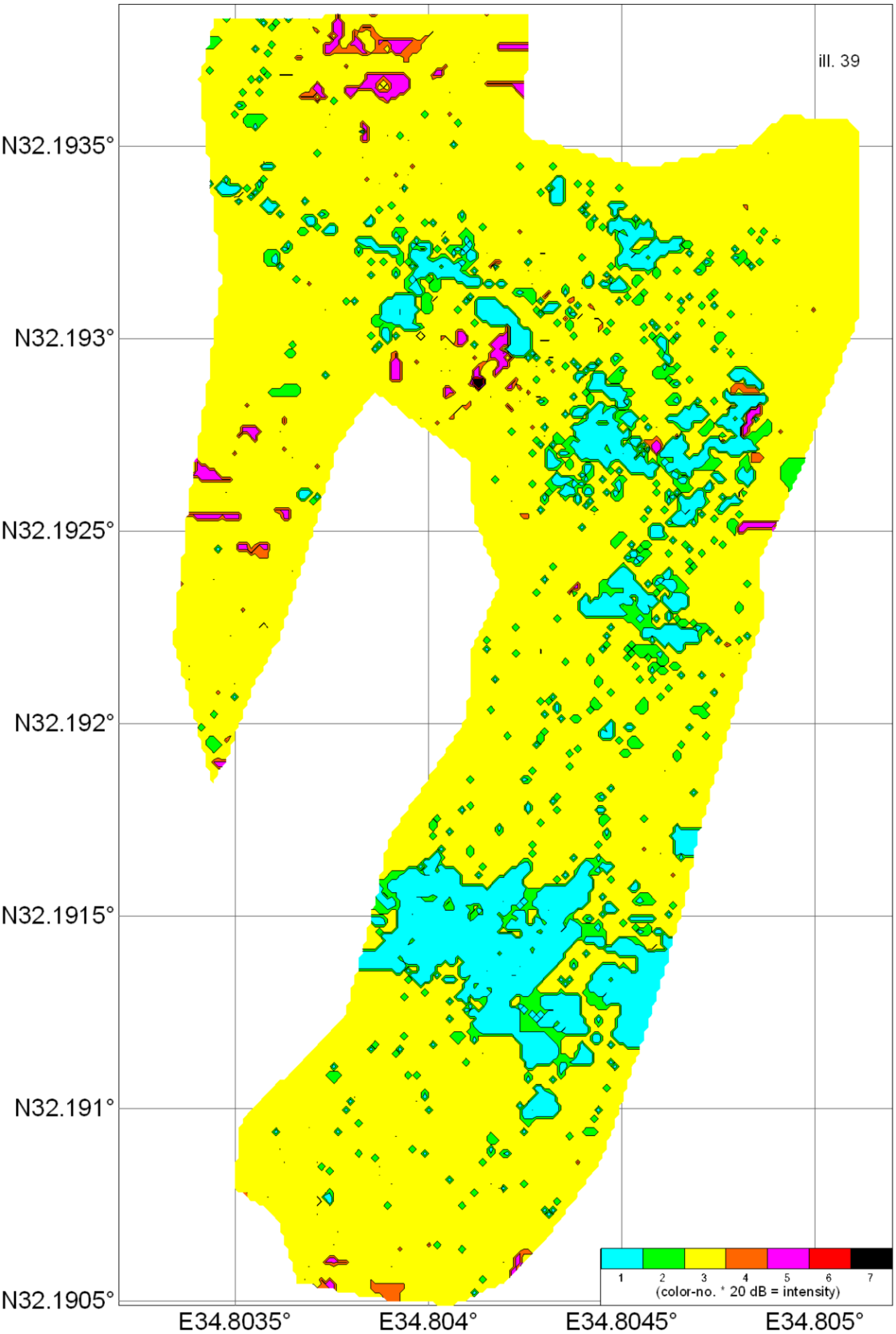


Apollonia / Israel Oktober 2010	University: Tel Aviv Prof. Dr. O. Tal	HF cut - 100 cm inside- area	abatonos abatonos@alice-dsl.net	SOSO storch@soso-jena.de



Apollonia / Israel Oktober 2010	University: Tel Aviv Prof. Dr. O. Tal	LF cut - 120 cm inside- area	abatonos abatonos@alice-dsl.net	SOSO storch@soso-jena.de


ill. 38
N32.1935°
N32.193°
N32.1925°
N32.192°
N32.1915°
N32.191°
N32.1905°
E34.8035°
E34.804°
E34.8045°
E34.805°
1 2 3 4 5 6 7
(color-no. * 20 dB = intensity)
Apollonia / Israel
Oktober 2010
University: Tel Aviv
Prof. Dr. O. Tal
LF sum up - 120 cm
inside- area
abatonos
abatonos@alice-dsl.net
SOSO
storch@soso-jena.de



Apollonia / Israel Oktober 2010	University: Tel Aviv Prof. Dr. O. Tal	HF cut - 120 cm inside- area	abatonos abatonos@alice-dsl.net	SOSO storch@soso-jena.de

APPENDIX B

Positions of Various Targets Discovered by Sonar

Outer Area

1. Lat 32º 11' 49.95" N; Long 34º 48'13.9" E.
2. Lat 32º 11' 49.5" N; Long 34º 48'18.32" E.
3. Lat 32º 11' 42.4" N; Long 34º 48'13.5" E.
4. Lat 32º 11' 40" N; Long 34º 48'16" E.
5. Lat 32º 11' 34" N; Long 34º 48'12.2" E.

Inner Area

6. Lat 32º 11' 26" N; Long 34º 48' 14" E.
7. Lat 32º 11' 26.7" N; Long 34º 48' 13.5" E.
8. Lat 32º 11' 26.13" N; Long 34º 48' 13.2" E.
9. Lat 32º 11' 30.2" N; Long 34º 48' 13.9" E.
10. Lat 32º 11' 29.8" N; Long 34º 48' 15" E.
11. Lat 32º 11' 33" N; Long 34º 48' 14.7" E.
12. Lat 32º 11' 34.8" N; Long 34º 48' 14.7" E.

APPENDIX C

List of Samples for Radiocarbon dating submitted to the AMS Lab.

(Institut für Teilchenphysik Eidgenössische Technische Hochschule Hönggerberg CH-8093 Zürich, Switzerland)

Submitted by	**Site**	**Core**	**Sample Name and Number**
Prof. Nili Liphschitz Dan Mirkin, Prof. Oren Tal	**Apollonia**	**1**	**New 3 – 3**
Prof. Nili Liphschitz Dan Mirkin, Prof. Oren Tal	**Apollonia**	**2**	**New 9 - 1**
Prof. Nili Liphschitz Dan Mirkin, Prof. Oren Tal	**Apollonia**	**2**	**New 9 – 3 A**
Prof. Nili Liphschitz, Dan Mirkin, Prof. Oren Tal	**Apollonia**	**2**	**New 9 – 4**
Prof. Nili Liphschitz, Dan Mirkin, Prof. Oren Tal	**Apollonia**	**2**	**New 9 – 5**
Prof. Nili Liphschitz Dan Mirkin, Prof. Oren Tal	**Apollonia**	**2**	**New 9 – 7 A**
Prof. Nili Liphschitz Dan Mirkin, Prof. Oren Tal	**Apollonia**	**2**	**New 9 – 7 C**
Prof. Nili Liphschitz, Dan Mirkin, Prof. Oren Tal	**Apollonia**	**3**	**New 10 – 1**
Prof. Nili Liphschitz, Dan Mirkin, Prof. Oren Tal	**Apollonia**	**3**	**New 10 – 3**
Prof. Nili Liphschitz, Dan Mirkin, Prof. Oren Tal	**Apollonia**	**3**	**New 10 – 4**
Prof. Nili Liphschitz, Dan Mirkin, Prof. Oren Tal	**Apollonia**	**3**	**New 10 – 5A**
Prof. Nili Liphschitz, Dan Mirkin, Prof. Oren Tal	**Apollonia**	**3**	**New 10 – 5C**

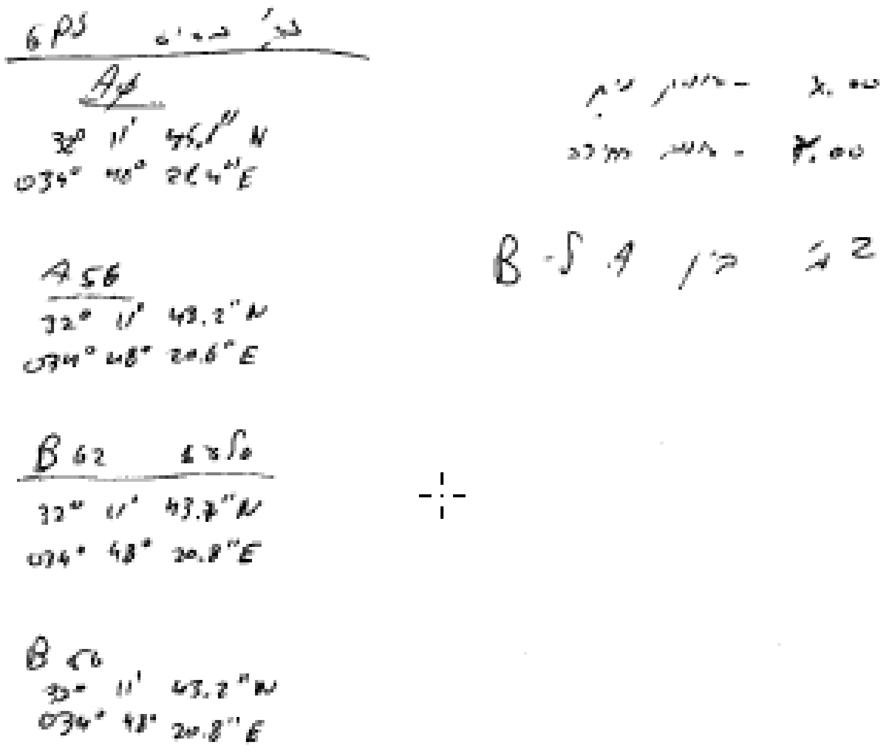
APPENDIX D

Equipment Transported to Expedition Camp by Boat

- Angus Fire LD 1800 water-pump used for operating dredges and water-jetting.
- Three sets of venturi dredgers, hoses, pipes, crates and one set of water-jetting equipment.
  - Crates for transporting rubble and stones.
  - Fifteen sets of dive gear and diving suits.
- Equipment for underwater documentation: drawing, recording and photography.
  - Measuring equipment.
  - Office supplies and dive log.
- Camp equipment: tent, table, kitchenware.
  - Miscellaneous tools and equipment.
  - Supply motor boat and rubber boat.

APPENDIX E

Original notes marking points of water-jetting in the "port."



GPS

A59

32° 11' 45.1" N
034° 48' 26.4" E

A 56

32° 11' 43.2" N
034° 48' 20.6" E

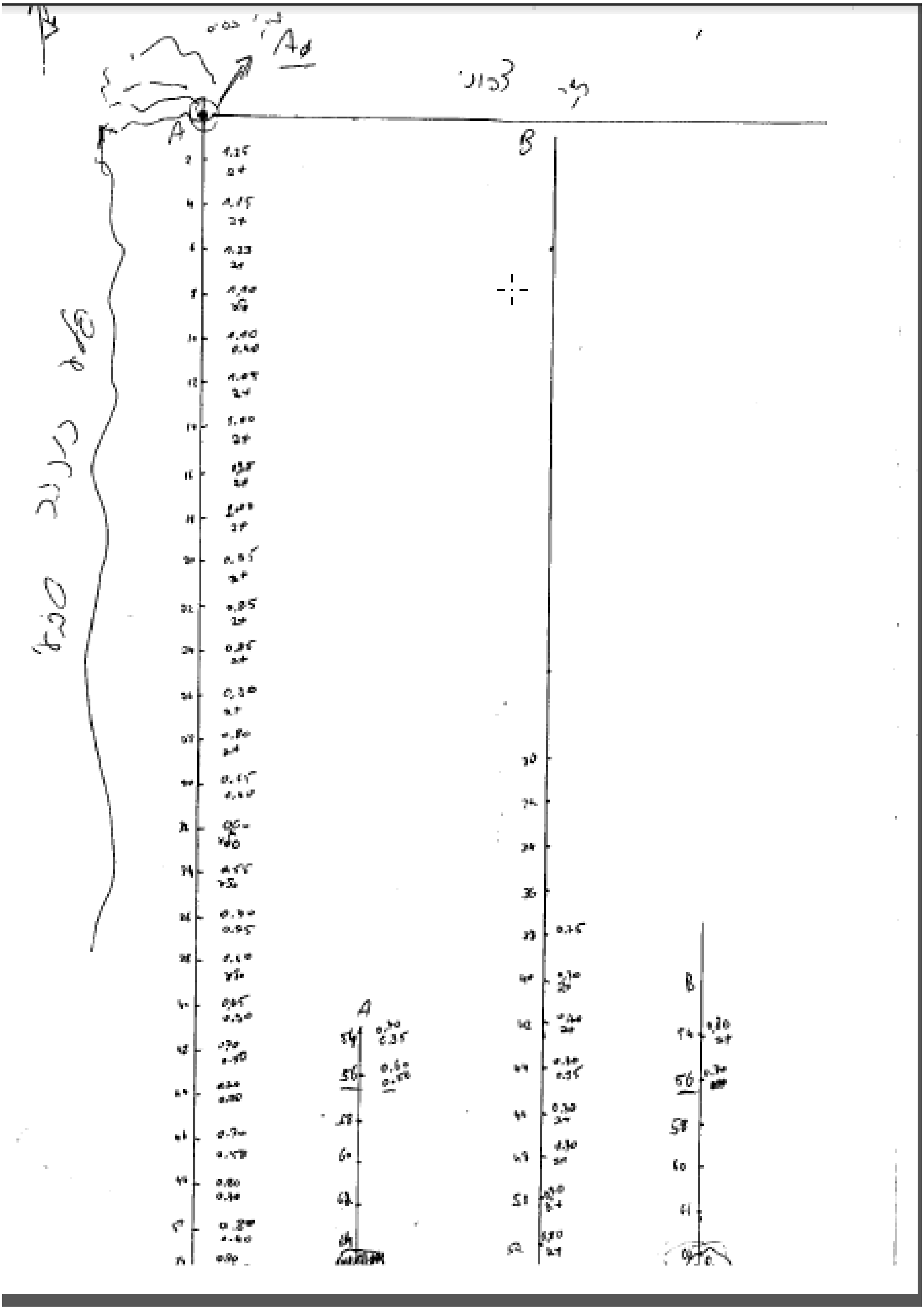
B 62

32° 11' 43.7" N
034° 48' 20.8" E

B 56

32° 11' 43.2" N
034° 48' 20.8" E

B.S.A



GPS [illegible]

[illegible]

32° 11' 43.1" N
034° 48' 20.8" E

X – 4

32° 11' 42.5" N
034° 48' 19.5" E

X 18

32° 11' 42.1" N
034° 48' 20.6" E

A 78

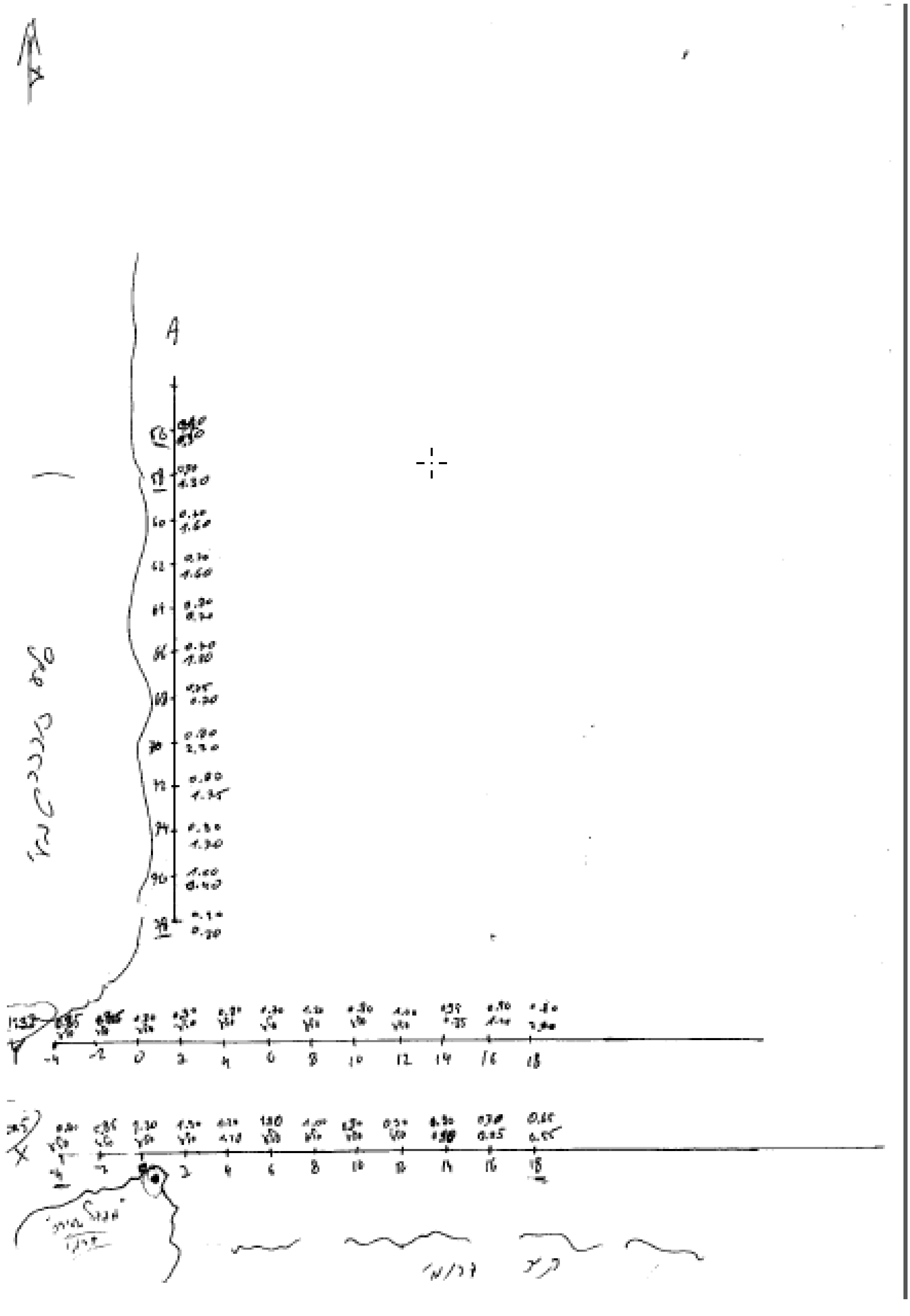
32° 11' 42.5" N
034° 48' 20.3" E

A 58

32° 11' 43.2" N
034° 48' 20.6" E

[illegible]

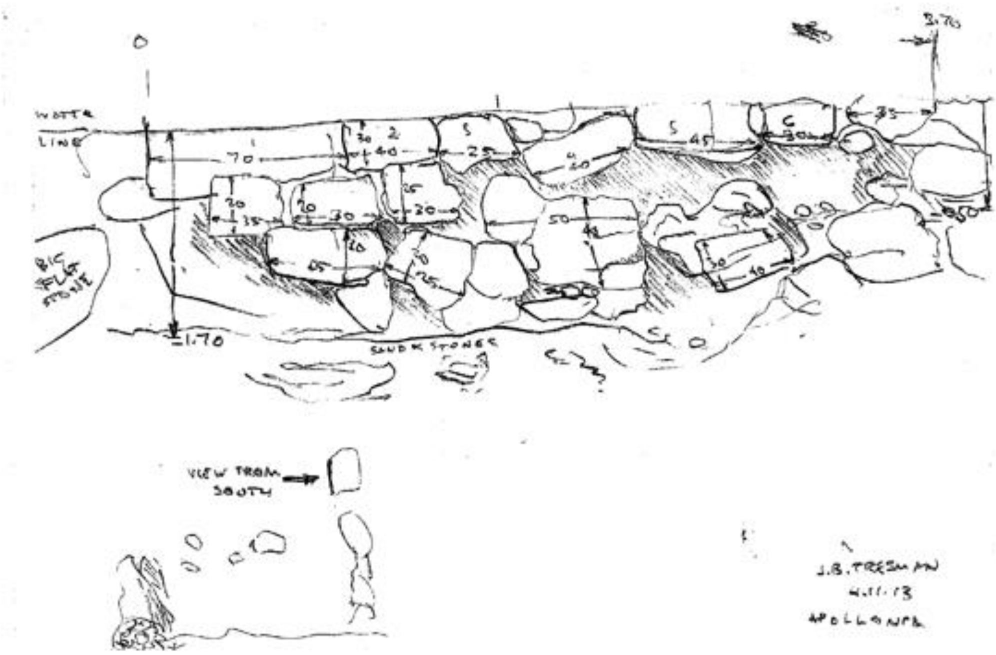
32° 11' 42.3" N
034° 48' 19.8" E



APPENDIX F

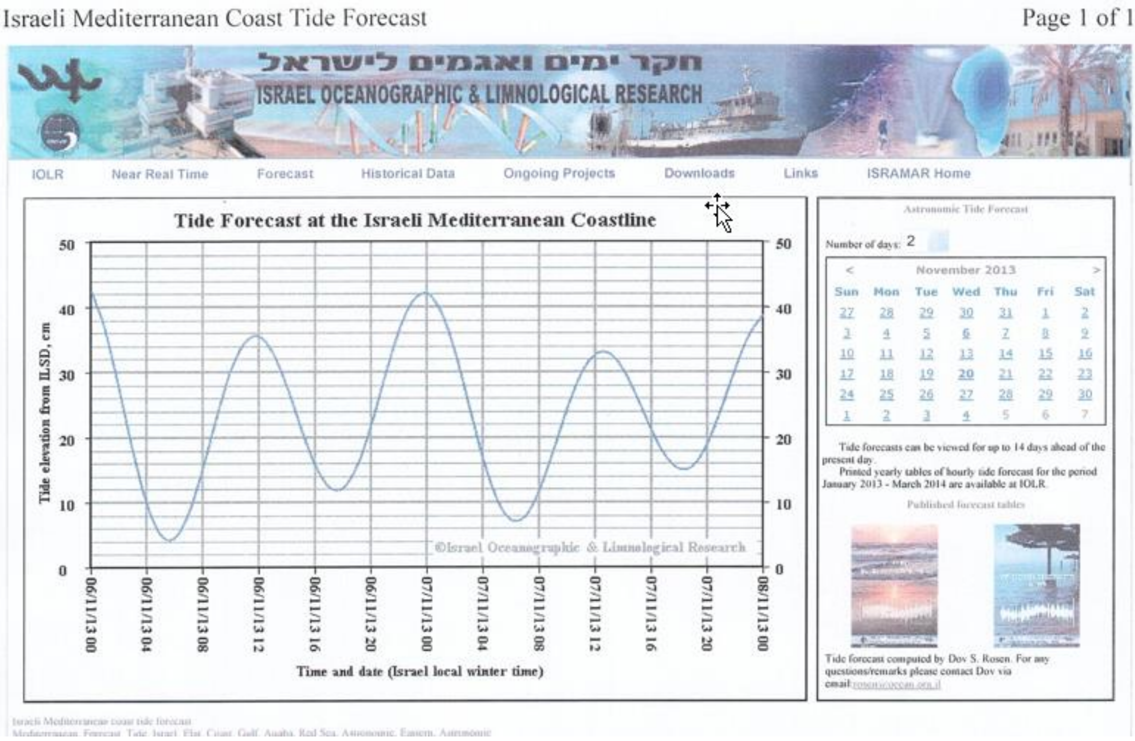
Original Drawing of the Western Part of the Northern Wall

(J. B. Tresman)



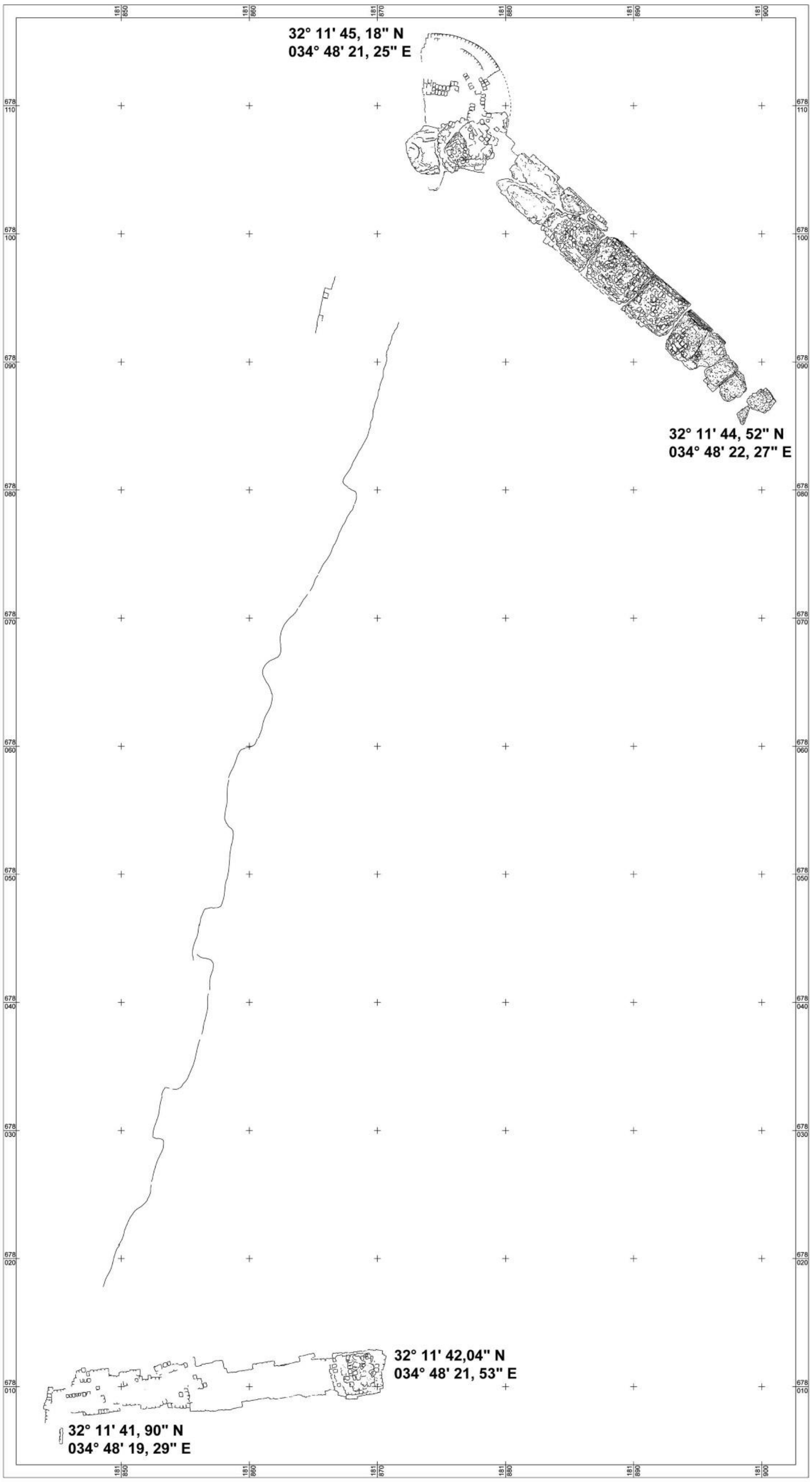
APPENDIX G

Tide Table for November 6, 2013



APPENDIX H

GIS Representation of the Apollonia Installation



אוניברסיטת תל אביב

הפקולטה למדעי- הרוח ע״ש לסטר וסאלי אנטין
בית הספר למדעי היהדות ע״ש חיים רוזנברג
החוג לארכיאולוגיה ולתרבויות המזרח הקדום

סוגיות ביחסי ים-יבשה בתקופה הצלבנית:
ימאות הצלבנים בדרום הלבנט

חיבור לשם קבלת תואר דוקטור לפילוסופיה

מאת:

דניאל מירקין

מנחים: פרופ׳ אורן טל, פרופ׳ יעקב כהנוב

הוגש לסנאט של אוניברסיטת תל אביב

ינואר, 2016

סוגיות ביחסי ים-יבשה בתקופה הצלבנית: ימאות הצלבנים בדרום הלבנט

תקציר

ספרים ומחקרים רבים הוקדשו למסעי הצלב ולצלבנים. מהם שעסקו בהיבטים הדתיים, אחרים בחנו את ההיבטים החברתיים של מסעי הצלב השונים ועוד עבודות ניסו לתאר חבורות האבירים, החיילים ואותם גלים עצומים של בני אנוש אשר זרמו לארץ הקודש כפי שהשתקפו בעיני מחברים בני דת האסלאם. מסעי הצלב הראשון והשני צעדו לארץ הקודש בדרכי היבשה, אך עמדו במהרה על הצורך להיעזר בתמיכה לוגיסטית המגיעה דרך הים. מסעי הצלב שבאו לאחר, ממסע הצלב השלישי ואילך, נעו בעיקר בדרכי הים, בין לארץ הקודש, בין דרך קונסטנטינופול ובין תחילה למצרים, ואף לצפון אפריקה.

מדענים רבים הקדישו את מחקריהם לתחומי התובלה הימית, להפלגות, לקשיים בהשגת מי שתיה ולשינוע חיילים, סוסים וציוד, ומחקריהם הניבו כמויות עצומות של מידע. עם זאת, וחרף העובדה כי המטרה המוצהרת של מסעי הצלב הייתה שחרור ארץ הקודש מידי הסראצנים, נותרו מספר שאלות הקשורות לחבל ארץ זה היכולות להוות נושא למחקר נוסף.

המחקר הנוכחי ינסה להתמקד בשאלה באיזה ספינות השתמשו הצלבנים כדי להוביל ארצה את כוחותיהם, ספינות אשר מרביתן היו שייכות לציים איטלקיים כגון אלו של ונציה או גנואה. איזה סוגי חיבל ומפרשים שמשו את ספינותיהם. היכן בחופי ארץ הקודש יכלו להנחית כוחות ופרשים אבירים על סוסיהם, כיצד השכילו לנהל את ציי האניות. כיצד נווטו? ומה היה טיב הקשר בין מבצרי הצלבנים בארץ הקודש ובין הים.

החלק הראשון של העבודה מוקדש לדיון בכמה מן הנושאים שצויינו לעיל, בעוד המבצר והמתקן הימי, (האם הנמל?) שלרגלי אפולוניה ארסוף הווה נושא למחקר מיוחד שתוצאותיו מובאות בחלק השני של העבודה הנוכחית.

בשני החלקים ניסה המחבר להתייחס לכמה שאלות אשר, לעניות דעתו, טרם לובנו עד תום. כמו כן הרשה לעצמו המחבר להציע מספר רעיונות, תוך ניצול הנסיון הימי אשר צבר במהלך שישים שנות הפלגה במפרשיות בים התיכון. ההיכרות הקרובה עם הים התיכון,

על שלוחותיו השונות, אפשרה למחבר לנסות ולהבין את הקשיים שעמהם נאלצו להתמודד הימאים שהשיטו את צבאות הצלבנים, והמחבר גם הרשה לעצמו לחלוק על כמה מן המסקנות שהועלו עד כה על ידי אחדים מן החוקרים.

אחת מן ההשערות המועלות בעבודה היא כי האזורים שבהם נחתו הצלבנים, מן הים, בארץ הקודש, קשורים ישירות למאפיינים של ספינותיהם. ציי הצלבנים כללו סוגים שונים של ספינות: בין אם היו אלו ספינות משא והובלת נוסעים מן הסוג הידוע כ"ספינות עגולות" (Round ships) המונעות במפרשים, בין אם היו אלו ספינות להובלת סוסים הידועות כ Huissiers, על שום פתח (Huis) שהיה קיים בהן להעמסת סוסים והורדתם, בין בירכתיים ובין בדופן צדדית, ובין אם היו אלו ספינות המונעות במשוטים, לעתים בעזרת מפרש ולעתים בלעדיו, הידועות כ Taride או Tarida, או בשם הגנרי הכללי Galley. הצלבנים אשר הגיעו מארצות צפון אירופה הפליגו בספינות הידועות בשם Cog, והיו אחרות שהיו ידועות בשם Buz או Buza או לעתים גם Buss. מרבית הספינות בנות אותה תקופה לא יכלו להפליג במפרשים נגד הרוח. הן יכלו לשוט בכוחות מפרשיהן רק במורד הרוח, כאשר הרוח מאחור, או במקרה הטוב, ברוח צד, אם תנאי הים אפשרו זאת, והגלים לא היו גבוהים יתר על המידה. החיבל הרגיל של ספינת המפרש בת אותה תקופה היה המפרש הידוע כמפרש לטיני, מפרש משולש המחובר לזרוע ארוכה הנחה על תורן קצר. המפרש הלטיני אמור היה לתפקד כמפרש אורכי, לאמור מפרש המקביל לציר האורך של הספינה, דבר שהקנה לו תכונות אווירודינמיות שהיו אמורות לאפשר הפלגה בזווית מסוימת בכיוון נגדי לרוח. אולם, הואיל והספינות לא יכלו להפליג בכיוון נגדי לרוח בגלל השוקע הרדוד שלהן והיעדר קוער ('Keel'), לא ניתן היה לנצל את תכונותיו של המפרש הלטיני, וההצעה המועלית בעבודה היא שהצלבנים השתמשו במפרש המשולש הלטיני כאילו היה מפרש מרובע, כאשר הוא מונף לרוחב הספינה, פחות או יותר בניצב לציר האורך שלה. לטענת המחבר השערה זו נתמכת באופן נרחב בראיות איקונוגרפיות, שחלקן מוצגות בעבודה עצמה.

מספר הנמלים בחופי ארץ הקודש מועט, ולמעשה, הנמל היחיד הראוי לשמו היה זה של עכו, אך גם שם לא התאפשר מקום עגינה אלא למספר מועט של ספינות. אם הגיע למקום צי של אניות, היו מרביתן נאלצות להטיל עוגן במפרץ, בגלל מקום מועט ליד הרציפים. העבודה סוקרת בקצרה את מרבית מקומות העגינה לאורך חופי הארץ ומסתבר שאף לא אחד מהם היה מסוגל להוות מקום עגינה לציים. מתבקשת איפוא המסקנה שהנחתת כוחות ו/או סוסים מן הים לא נעשתה, לרוב, בנמל היחיד שהיה קיים, לאמור עכו[1], אלא לאורך החופים. ידוע שכאשר ריצ׳רד לב הארי נחת ביפו, בחודש יולי 1192 הוא נאלץ לגרור את ספינותיו במעלה החוף, ואת זאת יכול היה לעשות רק בחוף החולי שמצפון למעגנה, שהרי בנמל עצמו לא היה חוף, והכניסה לאזור העגינה יכלה להתבצע רק דרך המעבר בין הסלע הידוע כ׳סלע אנדרומדה׳, ובין שורת השוניות. מכאן ההצעה שהספינות שהובילו חיילים, ובעיקר סוסים, היו בעיקר מן הסוג בעל הפתיחה בירכתיים, מבנה המאפשר נחיתה ישירות על החוף, אפילו לאבירים רכובים על סוסיהם, ולא מן הסוג בעל הפתיחה הצידית, הנוח יותר לפעולה בנמלים בעלי רציפים, ששם ניתן לפרוק סוסים בגישה אל הרציף, בין דרך הפתח הצידי, ובין ישירות מהסיפון העליון באמצעות גשרון (Gangway).

המחקר שנעשה לקראת העבודה לא הוגבל למקורות כתובים או מצוירים, בין משניים, ראשוניים או איקונוגרפיים, אלא התבסס גם על מחקר שדה. חלק התבסס על מסעות ים של המחבר בספינת המפרש שלו, במסלולי הצלבנים, ובעיקר על ניסיון לשחזר במדויק את מסעו של ריצ׳רד לב הארי מעכו ליפו במטרה לשחרר את המאמינים שהיו נצורים במבצר, ('citadelle') של יפו על ידי הסראצנים שאיימו להורגם. שחזור המסע בוצע בחודש יולי, במועד הדומה לזה שבו ביצע ריצ׳רד את המסע, ובאותו מסלול, ככל האפשר, (למעט השינויים במפרץ חיפה כתוצאה מהמבנים המודרניים והאניות העוגנות שם). התוצאות אמתו את האפשרות שספינת מפרש תעשה את המרחק הזה במהלך 12 שעות, כפי שמתאר אמברואז, (Ambroise) אשר כתב את ספר מסעות המלך ריצ׳רד לארץ הקודש.

[1] הנמל יפו, הגם שהיה ידוע כ"נמלה של ירושלים" לא היה אלא מעגנה קטנה המוגנת מעט על ידי שורה של שוניות, ולא היה בו מקום לציים ואף לא לספינות גדולות.

חלקו האחר של מחקר השדה נערך בים, באזור הסובב את המיתקן הימי הידוע כ׳נמל אפולוניה׳, והנמצא לרגלי המבצר של אפולוניה-ארסוף, וכן בתוך ה׳נמל׳ עצמו. המחקר סביב ה׳נמל׳ והשוניות המקיפות אותו נעשה באמצעות סונר חודר קרקע, המורכב על סירת גומי, אשר סקר את קרקעית הים, וכן את העצמים מתחת לקרקעית עד לעומק מסויים. סומנו מספר מטרות וחלקן נבדקו באמצעות 'Water-jetting'[2]. נאספו מספר ממצאים אשר נתגלו בעומקים של 1 עד 3 מטרים מתחת לפני קרקעית הים. המעניינים ביותר היו גרעין זית אשר תועד באמצעות בדיקת ^{14}C לשנים 880 - 1020 לסה״נ, וכן פיסת עץ ספוגת ברזל אשר תועדה לשנים 1400– 1280 לספירה. כמו כן נמצאו בתוך הים כמה עמודי גרנית במרחק של כ 150 מטרים מן החוף, ובדיקה על ידי מומחה העלתה כי מוצאם מברגמה באסיה הקטנה, עובדה השופכת אור חדש על מוצא העמודים גם באתר המבצר עצמו, אשר עד כה סברו כי מוצאם במצרים.

חלק אחר של עבודת השדה נערך בתוך המיתקן הימי עצמו, בעזרת 30 מתנדבים וציוד רב. העבודה כללה פינוי אבנים וסלעים מאזורים בנמל עצמו, אשר מידותיו כ 80 מטרים אורך ו 40 מטרים רוחב, על מנת לברר מה היה עומקו לפני שנתמלא בחול, שברי סלעים ואבנים אשר נפלו מן המבצר. כמו כן נמדדו, נבדקו וצוירו הקירות הצפוני והדרומי (שוברי הגלים?) של הנמל. עוד נבדק הקיר המערבי – חומת הים – שאינה אלא ריף טבעי שעליו נמצאו שרידי בניה מעשה ידי אדם. נמצא כי הקיר הצפוני נבנה על סוללה, מעשה ידי אדם וכי הבנייה הייתה ברובה ׳בנית ראשים׳, הטיפוסית לבנייה ימית[3]. באזורים מסויימים בתוך המתקן הימי בוצעה שאיבה של החול, לאחר סילוק שברי הסלעים, במטרה להגיע לסלע האם, וזה נתגלה בעומק של 2.40 מתחת לפני הים, כיום. כמו כן בוצעו לאורך ולרוחב הנמל 70 דיקורים באמצעות Water-jetting על מנת לברר את העומקים עד לסלע האם, ונמצא כי העומק הממוצע מתחת לפני הים הוא אכן כ 2.40 מטר.

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[2] Water-jetting: בדיקה באמצעות סילון מים מתבצעת על ידי הזרמת סילון מים חזק, באמצעות צינור פלדה המחובר אף הוא דרך צינור כיבוי אש למשאבה המורכבת על סירת עבודה. המשאבה יונקת מי ים ומזרימה אותם דרך הצינורות לצוללן המשתמש בזרם החזק כדי לדחוף את צינור הפלדה אל תוך קרקעית ים. הזרם מציף כלפי מעלה את העצמים הנמצאים מתחת לפני קרקעית הים ואלו נאספים ומועברים לבדיקה.

[3] 'בניית ראשים' היא בניה שבה האבנים מונחות במאונך לקיר, ולא לאורכו, כך פני האבן החשופים למים הם בעלי שטח קטן, דבר המחזק את המבנה ועוזר למנוע שליפה של האבן מתוך הקיר.

במבצר אפולוניה ארסוף נמצאים עמודים ועליהם כתובות הדרכה לתיירים המכנות את המיתקן אשר לרגלי הצוק 'הנמל הצלבני'. חרף זאת, ספק אם אכן אפשר להתייחס למתקן זה כ'נמל', ונכון לראותו, לכל היותר, כמעגנה קטנה, אשר בה יכלו להסתייע שוכני המבצר לצורך עגינת סירות על מנת ליצור קשר עם ספינות העוגנות בים.

לסיכום המחבר השתדל לתאר בעבודה את אופייה המיוחד של ימאות של הצלבנים וכן את ההיקף, המורכבות והקשיים בפעולות המשולבות שבצעו הצלבנים ביבשה ובים. העבודה מעלה השערות לגבי טיב וסוג החיבל (Rig) של ספינות הצלבנים במסעותיהם מאירופה ללבנט, כיצד פתרו בעיות של אספקת מזון ובעיקר מים לציים ולאניות נושאות סוסים, ובנוסף התייחסה העבודה באופן מיוחד לאפולוניה-ארסוף ולקשר שבין המבצר לים.