

THE TALISMANIC SEAL STONE OF CRETE:
A
RE-EVALUATION

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THE TALISMANIC SEAL STONE OF CRETE: A RE-EVALUATION.

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This thesis presents a re-evaluation of the talismanic seal stones of Crete. Its purpose is to present previous scholarship on these seal stones, introduce the reader to a new way of recording and viewing seal stones through Reflectance Transformation Imaging (RTI), and to offer the data from a study on 384 talismanic seal stones.

Seals were small stones or pieces of wood or ivory with intaglio, meaning designs were cut into their surface in order to create a relief when stamped in wet clay or a similar substance. They served several purposes: as identification, as a way of showing ownership, as a magical charm, and as portable art or jewelry. By around 2500 BCE, seal stones were in use on the island of Crete. Most of these seal stones were used for their sphragistic properties – that is, authenticating documents or otherwise securing property. The talismanic stones, categorized by Sir Arthur Evans, were rarely used in this way. Evans believed these stones were worn as magical charms or talismans. His idea has been criticized, but today we are no closer to ascertaining how this type of seal stone was used.

For this study, the data on 384 talismanic seal stones was collected and organized. RTI was performed on 12 seal stones, as a new way of making digital surrogates and learning more information about the stone surface. The results of this study are presented here to clear up some of the confusion surrounding the talismanic seal stone of Crete.

Table of Contents

Abstract.....	ii
List of Images.....	v
Introduction.....	1
Chapter I.....	8
Chapter II.....	25
Chapter III.....	43
Bibliography.....	70
Appendix A.....	74
Appendix B.....	84

List of Images (Figure # --- Page #)

Figure 1.1 --- 15 - A three-sided hieroglyphic seal stone with a chart showing signs from seal stones tablets (Image from Palace of Minos Vol I).

Figure 1.2 --- 16 - Seal stone with 'Minoan Genius' and ceiling of inner chamber of Senmut Tomb (Images from Palace of Minos Vol IV, Part II)

Figure 1.3 --- 18 - Vessel types identified by Evans (Images from Palace of Minos Vol IV, Part II)

Figure 1.4 --- 19 - Lions' Mask seal stones (Image from Palace of Minos Vol I).

Figure 1.5 --- 20 - Rustic shrine of the Snake Goddess (Image from Palace of Minos Vol I)

Figure 2.1 --- 27 - The basic set up when doing the highlight-based method and the direction the light should fall to create raking light (both images from Duffy et al 2013).

Figure 2.2 --- 28 - RTIBuilder

Figure 2.3 --- 28 - RTIViewer

Figure 2.4 --- 29 - An object rendered through surface normals and same object rendered through spectral enhancement.

Figure 2.5 --- 32 - Dome created for the RTISAD project (image from Earl et al, 2011).

Figure 2.6 --- 34 - Statue head of Amazon during recording and virtual reconstruction (image a from Earl et al, 2011 and image b from Happa et al, 2009).

Figure 2.7 --- 37 - The placement of the handheld light during RTI (image modified from Cultural Heritage Imaging).

Figure 2.8 --- 40 - Setup for capturing photograph

Figure 2.9 --- 42 - RTI images: CMS II, 2, 16; CMS II, 3, 80; CMS II, 4, 193; CMS II, 3, 361; CMS II, 3, 72.

Figure 3.1 --- 44 - Division of Crete

Figure 3.2 --- 46 - Talismanic seal stones found on Crete from *CMS* Vol I – IV

Table 3.3 --- 47 - Name of site and number of talismanic seal stones found

Figure 3.4 --- 48 - Talismanic seal stones with and without recorded excavated context

Figure 3.5 --- 49 - Percentages of stone shape.

Figure 3.6 --- 50 - Examples of amygdaloid shaped seal stones: *CMS* II, 3, 361 and *CMS* II, 3, 80

Figure 3.7 --- 51 - Examples of lentoid shaped stones: *CMS* II, 3, 73; *CMS* II, 4, 223 and *CMS* II, 3, 313

Figure 3.8 --- 52 - Seal stones made of carnelian: *CMS* II, 4, 153 and *CMS* II, 3, 367.

Figure 3.9 --- 53 - Percentages of stones.

Figure 3.10 --- 54 - Map of materials used to make talismanic seal stones, excluding carnelian and jasper.

Figure 3.11 --- 55 – Map with locations where amethyst talismanic stones have been found and the three stones from Gournia: *CMS* II, 3, 244; *CMS* II, 3, 245 and *CMS* II, 3, 247.

Figure 3.12 --- 57 - Talismanic stones with fish: *CMS* IV, 187; *CMS* II, 4, 95 and *CMS* II, 2, 16. (Drawings from *CMS*).

Figure 3.13 --- 59 - Distribution of the three most popular motifs.

Figure 3.14 --- 60 - Distribution of vessel motif.

Figure 3.15 --- 61 - Three very similar looking stones: *CMS* III, 337; *CMS* IV, 169 and *CMS* IV, 172 (Images from the *CMS*).

Figure 3.16 --- 64 - Part of the Cupbearer fresco and its location at Knossos (Image on left taken at the Archaeological Museum at Heraklion and image on right taken at Knossos).

Figure 3.17 --- 65 - String hole orientation in amygdaloid and lentoid shaped stones: *CMS* II, 3, 42 and *CMS* II, 3, 91 (Images taken at the Archaeological Museum in Heraklion).

Figure 3.18 --- 66 - The back of CMS II, 3, 92.

Figure 3.19 --- 67 - CMS II, 3, 313; CMS II, 3, 251 and CMS II, 3, 295
(Images taken at Archaeological Museum at Heraklion).

Table 4.1 --- 75 - Spreadsheet with location name, coordinates, and
number of talismanic seal stones found.

Figure 4.2 --- 76 - Map with Minoan sites where talismanic seal stones
have been found.

Figure 4.3 --- 77 - Locations for talismanic seal stones found in
excavated context

Figure 4.4 --- 78 - Locations of talismanic seal stones without excavated
context

Figure 4.5 --- 79 - Materials of talismanic seal stones.

Figure 4.6 --- 80 - Materials talismanic seal stones.

Figure 4.7 --- 81 - Shapes of talismanic seal stones.

Figure 4.8 --- 82 - Motifs on talismanic seal stones.

Table 4.9 --- 83 - Graph of talismanic seal stones

Introduction

Seals were small stones or pieces of wood or ivory with intaglio, meaning designs were cut into the surface in a way that when stamped in wet clay or a similar substance the impression left was in relief. They have been in use since at least the 6th millennium BCE when they appear at various Near Eastern centers.¹ Seal stones served several purposes: as identification, as a way of showing ownership, as a magical charm, and as portable art. Mesopotamia, Syria, and Egypt began using seal stones primarily for their sphragistic properties, meaning they were being used as seals to authenticate documents or secure property.² They would be a necessity for any civilization that acknowledged property ownership. By around 2500 BCE Crete was also making use of seal stones.³ It was this date when the civilization there began to flourish and relationships with the Near East and Egypt opened. Their use of seal stones expanded beyond using them as identification and security to include personal adornment and magic. The talismanic stones, identified by Sir Arthur Evans, are a class of seal stones that were rarely used as seals.⁴ It was his belief that they were worn as magical charms or talismans.

¹ Collon 1997, 9.

² Ibid., 11-46.

³ Boardman 1970, 22.

⁴ Younger 1988, xii-xiii. There have been seven examples of talismanic stones used as seals found on Crete. These seven sealings were found at five locations: three from Chania, and one each from Gournia, Agia Triadha, Kato Zakros, and Knossos.

This thesis presents a re-evaluation of the talismanic seal stone found on Crete. Few studies have been done on this material and the ones that exist disagree on many points. A total of 384 talismanic stones were collected, organized, and studied in preparation of the thesis. The stones included in this study are from the *Corpus der minoischen und mykenischen Siegel (CMS)*, Volumes I; IS; II,I; II,2; II,3; II,4; II,5; II,6; II,7; II,8; III; and IV. These volumes include 4,701 seal stones in the National Archaeological Museum in Athens and the Archaeological Museum in Heraklion.⁵ The 384 stones, included in this study were thought to be sufficient to identify the characteristics of this type of seal stone. The gathered material was compared to previous scholarship to identify any inconsistencies. Any differences were investigated further. This thesis also presents a new way of viewing the talismanic stones through Reflectance Transformation Imaging (RTI). The information in this thesis and RTI images of the talismanic seal stones will help further any future larger projects on seal stones.

⁵ This study only includes talismanic seal stones found on Crete and published in Volumes I – IV of the *CMS*. Volumes V-XIII also include talismanic stones but these were not included in this study because it was thought that a sample size of 384 would be sufficient for the study. Any future research on talismanic stones, will include Volumes V – XIII as well.

Introduction to Seal Stones

The first seal stones used on Crete were of the stamp variety. They were made of ivory or of soft stones that closely resembled ivory. The three most common shapes at this time were the three-sided prism bead, the broad ivory cylinder and figures of animals carved in the round.⁶ Other shapes were in use but these three were the most popular. Each seal was pierced with one or two string-holes for attachment to the body. The design on most of these would have been a geometric pattern, sometimes including animals.⁷ Because of their rough carving, many of these early seal stones appear crude when compared to later examples.⁸

In the early 1900s, when Sir Arthur Evans discovered Knossos, he divided up the Bronze Age, on Crete, into three phases. These phases are based on changes in pottery. Seal stones also went through changes often corresponding to the trends in pottery decoration and other art forms. The first seal stones, mentioned above, are thought to be no earlier than Early Minoan II (EM II). They continue in this way until the MM phase when several changes occurred. It is during this time that the great palace complexes on Crete were built. These became economic

⁶ In most cases these were made from pieces of tusk cut horizontally and left in their natural shape.

⁷ Boardman 1970, 24-26. When animals appeared in the intaglio of the ivory seals they were often dangerous or threatening animals such as lions, scorpions, or spiders. These types of animals would function apotropaically.

⁸ Boardman 1970, 26.

centers, not only for local products but also for foreign trade. There was a great need for seals; to identify goods and property, to authorize, and to keep records. A technological advancement also occurred, the cutting wheel and the tubular drill were introduced to Crete around this time.⁹ This allowed harder stones, such as jasper, to be used for seals.¹⁰ With the increase need of seals and the greater ease in making them, evidence of seal stones use increases and does not decline until LM III. During each phase a different motif or style of making that motif, a different stone, or different shape becomes more popular than others.

The evidence of seals usually comes from two places: tombs/burials and sites destroyed by fire. When a seal stone is found in a tomb, even if the tomb is undisturbed, the age of the stone cannot be ascertained by the context. Seal stones were sometimes collected and buried with their owner and it was not uncommon for some of these stones to be antiques or heirlooms handed down through the family, making dating difficult.¹¹ However, tombs and burials provide valuable evidence of how seal stones were worn.¹² Fire destruction also records

⁹ Higgins 1981, 51.

¹⁰ The stones made before this time were cut by hand with a copper or bronze knife. Copper has a hardness 3 to 3.5 on the Mohs scale so any stone being cut in this way would need to be below this. This would include any stones in the calcite, gypsum, or talc families. Steatite or soapstone was probably the most common stone used; it has a hardness of 1 on the Mohs scale. After the introduction of the cutting wheel and the tubular drill harder stones like the above mentioned jasper, as well as amethyst, carnelian, agate, and rock crystal could be used.

¹¹ Younger 1977, 144-145 and Galanakis 2005, 3.

¹² Ibid., 146-158.

how seal stones were used to secure property. When an object with a seal stamped into it burns in a fire, the object is destroyed but the clay sealing is baked hard. In this way, a record is left of the impression.¹³ This can help in dating if the date of the destruction is known. These sealings can also give us clues of seal use.¹⁴

Known seal stones have been categorized by their use, motif, shape, and material. The two primary categories are sphragistic and non-sphragistic. As mentioned earlier, the former means that the stones were used to seal something and the latter were used as jewelry or as an amulet or talisman. The talismanic seal stones are a class of seal stones that are almost all non-sphragistic, only seven examples have been found where a talismanic stone was used as a seal.¹⁵ Evans believed these stones could protect a sailor at sea or make a hunter lucky or bring rain.¹⁶ The magic of each stone was derived from the design cut in its surface.

There are thousands of motifs by which seal stones and sealings can be divided. John K. Younger separated over 2600 motif categories in the Late Bronze Age alone. These can be placed into broader categories of plants, monsters, animals, people, geometric shapes, and

¹³ Boardman 1970, 20.

¹⁴ Some of the baked hard sealings give us clues on their backs of how and to what they were attached.

¹⁵ See *supra* n. 4.

¹⁶ Evans 1935, 541.

architectural structures.¹⁷ Younger discovered that over half of the seal stones, sealings, and signet rings have at least one animal.¹⁸ The study of the iconography of some stones and signet rings may help scholars understand aspects of Minoan society such as religion. The scenes on signet rings are thought to be religious in nature and might have been reserved for the use of the clergy. Iconography may also tell us about the personality of the owner.¹⁹

The main shape categories are lentoid, amygdaloid, cushion/pillow, prism, and cylinder. Along with these are discoids and signet rings. Younger found that the most common shape during the Late Bronze Age was lentoid.²⁰ The shape of a seal stone helps identify how it was used and how it might have been worn.²¹ Lastly, seal stones can be divided up by material. When Kenna catalogued the Minoan seal stones and rings in the Ashmolean Museum, he found 22 different materials being used.²² Many of the materials were imported to Crete. If we could identify exactly where the material came from, we might be able to get a better understanding of Crete's economy and trade agreements.

¹⁷ Younger 1988, xii.

¹⁸ Ibid., xi.

¹⁹ Whatever an owner chose to have engraved on their stone became a symbol of them. This identified them and could represent them in transactions. It has not been proven, however, that owners were given the choice.

²⁰ Younger 1973, 135.

²¹ Younger 1977, 153-158.

²² Kenna 1960, 159. Many of these he also subdivided by color. He also had a category of unknown.

As mentioned above, Evans believed that the Minoans wore these stones as talismans. But could there be another explanation? These stones were only rarely used to secure property or authorize a transaction or tablet. The designs and images on many of them are almost identical so it is unlikely that they were used as personal identification. They could instead have been used to identify a group of people.

The goal of this study is to better understand the talismanic class of Minoan seal stones. All talismanic seal stones from the first four volumes on the *CMS* are included. This is a large enough sample to pick out patterns but not so large that the data becomes overwhelming. This thesis is divided into three chapters. First, the scholarship that has been done on Minoan seal stones is presented, starting with Sir Arthur Evans. The next chapter is on Reflectance Transformation Imaging, which was chosen as a way of making digital representatives of some of the seal stones in the Archaeological Museum in Heraklion. In the third chapter, all of the information gathered on the talismanic seal stones is presented in comparison with some of the scholarship from the first chapter.

Chapter I

History of Talismanic Seal Stones

The story of the talismanic seal stone begins with one man, Sir Arthur Evans. It was he who first noticed a difference between these seal stones and the others he found on Crete and who categorized these stones as ‘talismanic’. This chapter includes, a review of Evans and his contributions to Cretan history, his interpretations of the talismanic stone and the scholarship written on the subject since his time.

Many people throughout time have been fascinated by Greek seal stones. Evidence has been found of Romans collecting and displaying seal stones from the Classical period. During the Renaissance, they were also collected and copied.¹ This collecting has not stopped even today, though most collections now are owned by museums not individuals. The first known publication with a Minoan seal stone was a catalogue of the engraved stones owned by James Tassie published in 1791. At this time, Minoan stones were being included in private and museum collections of Greek, Roman, and Phoenician artifacts. They next appeared in 1843 in a book by Ludwig Ross. Recognizing that they were different than the

¹ Boardman 1970, 19.

other stones, he called them 'island gems'.² In 1876, numerous seal stones and signet rings were found during Heinrich Schliemann's excavations at Mycenae and Tiryns. In his book, *Mycenae; A narrative of researches and discoveries at Mycenae and Tiryns*, he calls the stones 'lentoid gems', despite some of them being amygdaloid in shape.³ The motifs on some of these stones looked Minoan but at the time this was unrecognized because the discoveries on Crete had not yet occurred.⁴ They were attributed to the Mainland where they had been found.

Evans was not the first to discover Knossos, but he was the first to make it and the Minoan civilization known to the world.⁵ His excavations began in 1900, although he had begun formulating ideas about the importance of Crete before. Around 12 years earlier he first noticed markings resembling Egyptian hieroglyphs on some of the seal stones in a collection of "Phoenician" seals donated to the Ashmolean, where he was Keeper.⁶ Later in 1892, while in Athens, he purchased some seal

² Ibid., 19, 118. He gave them this name because many of them were found on Melos. In a later study, some of these stones proved to be Archaic and the Bronze Age stones were attributed to Crete and Mainland Greece.

³ Schliemann 1880, 202.

⁴ Ibid, 363-364. One of the stones described is made of agate and has a bull's head and a double ax cut into its surface. This stone may have been made by a Cretan or made by a mainlander trying to mimic the Minoan style. The motif is Minoan. Knossos had not been discovered yet, and Schliemann interpreted this stone as representing a 'Hera-idol.'

⁵ MacGillivray 2000, 93. Years earlier Minos Kalokairinos, dragoman to the British vice-consul of Candia, excavated a small section of Knossos or as the hill was called then, the Kephala.

⁶ Ibid, 73-74. This collection was donated by the Reverend Greville Chester. The stones in this collection were purchased in Greece and the Middle East. The ones with

stones from Crete with similar markings.⁷ In the next year he noticed these same markings on some vases excavated at Mycenae.⁸ Greek was thought to be the first written European language but here was evidence of writing on artifacts dating thousands of years before the first Greek inscriptions. It was beginning to look like this Mycenaean script originated on Crete but Evans wanted to find proof.

In 1894, Evans made his first trip to Crete in search of his proof. On this trip, he purchased more seal stones and 1/3 of the property under which Knossos was hidden. The location of the ancient city of Knossos had been known for centuries, but, because it was buried, no one knew how big it was or its age. Several individuals, including Schliemann, had tried and failed to get permission to dig or buy the required land. Evans had read the report from the short excavation that had taken place in 1879, spoken to those who had already explored the area, and looked at artifacts said to have come from the site.⁹ He was convinced that here at Knossos he would find the evidence he wanted to prove the existence of a written language older than Greek.

the hieroglyph like marks were from Crete. At this time seal stones from Greece were called, as mentioned above, 'island stones' or 'Phoenician'.

⁷ Ibid, 102.

⁸ Evans 1943, 309.

⁹ Macgillivray 2000, 91-116. W.J. Stillman wrote a report for the Archaeological Institute of America on the findings of M. Kalokairinos. This report made it to other archaeological societies and was read by Evans. On this first trip to Crete, Evans spoke with Kalokairinos and with others who had been to the site.

Purchasing the land and getting permission to excavate took longer than anticipated because of the political climate in Crete. Greece had won its independence from the Ottoman empire in 1832, but this did not include Crete. From this time until almost the close of the century Crete was under the control of the Ottoman Empire. Most Cretans wished to join Greece, with which they shared a language and religion. The years between 1821 and 1898 were years of unrest for the people of Crete, and frequently occurring revolts eventually culminated in a civil war. Finally, in 1913, after 15 years of relative independence, the Cretans officially joined the mainland. While under Ottoman rule, artifacts found during archaeological excavations were required to go to the Imperial Museum in Istanbul. At the same time the local representatives of the Cretan Assembly's majority wished to keep all artifacts on Crete in their newly formed museums.¹⁰ This caused problems for archaeologists wishing to dig on Crete, because if they did get permission from the Ottoman government, the local Cretan officials would not give permission for fear of losing artifacts to Istanbul. Further hindered by the unwillingness of the landowners to sell the remaining parts of Knossos, Evans waited for six years from the time of his first visit until he could start digging.

¹⁰ Macgillivray 2000, 89. Part of the Pact of Halepa allowed the Greek Cretans to legally form their own literary and scientific group. It was originally called the Association of Friends of Education but was better known as the Syllogos. Their first museum was in Candia.

Evans originally came to Crete to find evidence of early writing. He accomplished this and in the process unearthed the largest of the Minoan palaces. He discovered countless artifacts and divided the Bronze Age on Crete into phases, based on pottery style.¹¹ In his mind, he also gave Europe a new chapter in their long history.¹² For those who came after him, he was laying the groundwork in Minoan archaeology.

Evans and the Talismanic Stones

Evans was particularly influential in the study of Minoan seal stones, including the stones he called ‘talismanic’. His collection of seal stones was the largest in the world at the time, and even today it remains one of the largest collections outside of Greece.¹³ He was the first to study the seal stones of Crete as Minoan and his interpretations of these stones were the only to exist for many years. He recorded his interpretations in his books on his excavation at Knossos and the Minoan civilization. The first volume was published in 1921.¹⁴ In these books, he described his findings in architecture, pottery, scripts, seals, frescoes, and almost all aspects of life in Bronze Age Crete.

To Evans the talismanic stones were unique. He noticed that many had the same or similar motifs and that they could not have been used

¹¹ Boardman 1970, 20.

¹² MacEnroe 1995, 3.

¹³ The Evans collection is at the Ashmolean Museum of the University of Oxford.

¹⁴ *The Palace of Minos – A comparative account of the successive stages of the early Cretan civilization as illustrated by the discoveries at Knossos.*

as stamps, as were other types of seals. He believed that the Minoan people instead wore these stones “to secure magic protection or divine aid.”¹⁵ The motif on the stone would have given power through sympathetic magic. Each motif could convey a different charm or protection on a person.

Evans cited ethnographic evidence when interpreting the use of these stones. On his first trip to Crete he noticed many Cretan women wearing ancient talismanic stones on cords around their necks as lactation charms. He observed, “It is an interesting coincidence that many of these stones, once made to secure magic protection or divine aid to the old Minoan folk in their various vocations, were re-used --- especially those of lighter hue --- by the Cretan mothers of our own times for their own physical needs, and are hence known as ‘galopetras’ or ‘milk stones’.” He traded other stones for or purchased many of these for his collection. Some women, however, would not sell or trade and would point to their baby as proof of the stones’ power.¹⁶ Evans believed that if the women on Crete during his time used these specific stones as charms, then it was highly likely that their ancestors did the same.¹⁷

The talismanic stones began being used during MM III. Evans believed that the talismanic stones replaced the three and four-sided

¹⁵ Evans 1935, 446.

¹⁶ MacGillivray 2000, 129.

¹⁷ Evans 1935, 446.

prism stones with hieroglyphic symbols, which were abandoned at the end of MM II (Figure 1.1). He believed these prism stones were also used as amulets.¹⁸ He saw many connections between the Minoan seals and art from other civilizations, he seemed to especially find parallels in Egyptian art. Not only were the hieroglyphs on some of the seals similar or possibly the same, but also some of the figures. One example of this was in the figure he called the 'Minoan genius'. She can be seen on a seal stone in figure 1.2 and in figure 1.3. The Hippopotamus Goddess Ta-urt was her parallel. She had the head and legs of a hippopotamus, the body and arms of a woman and dorsal appendages like the crocodile.¹⁹ This figure related to the talismanic seal stones with the vessel motif that will be discussed below.

¹⁸ Evans 1921, 671.

¹⁹ Evans 1935, 433.

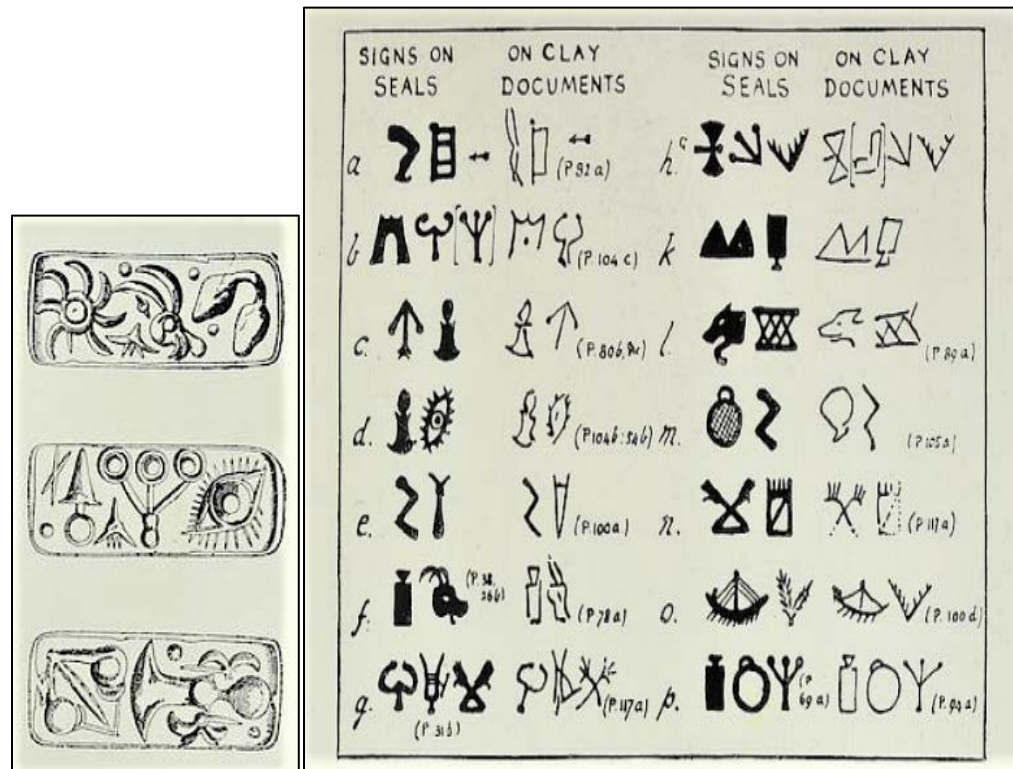


Figure 1.1 - A three-sided hieroglyphic seal stone with a chart showing signs from seal stones and signs from tablets (Image from Palace of Minos Vol I).

At the beginning of MM III a new shape began to be used for seal stones called amygdaloid, 'almond shaped.' The talismanic seals, which first appear during this same time period, were predominately made in this shape. Evans traced the shape to Proto-Dynastic Egyptian bead forms.²⁰ The lentoid shape was also a popular shape for talismanic stones. Hard stones such as jasper and carnelian were often used for the talismanic seals but also softer materials such as steatite. Evans identified the province of Sitia, or the eastern most end of the island, as

²⁰ Evans 1921, 671-672.

being the area where the greatest number of the talismanic stones had come from.²¹

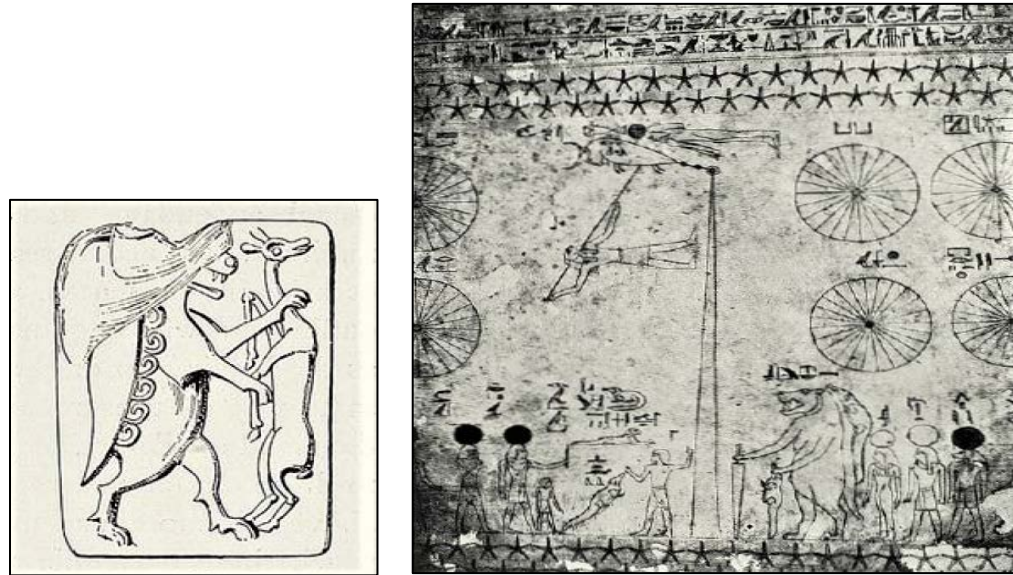


Figure 1.2 – left – seal stone with ‘Minoan Genius’ and right – Hippopotamus Goddess on ceiling of inner chamber of Senmut Tomb (Images from Palace of Minos Vol IV, Part II)

Some of the motifs appearing on the talismanic seals as identified by Evans were ritual vessels, lions’ masks, fishes or squids, double axes, pillared structures, birds, stricken animals, and heart shapes. Each of these motifs secured a benefit on its owner. Evans went into the greatest detail when explaining how the ritual vessel motif was used as a vegetation charm. He identified three varieties of vessels used on these stones (Figure 1.3). The first is a pedestalled chalice shape with S-shaped handles and sometimes a conical cover or cap. He calls this vessel the ‘kantharos’ type because of its resemblance to the later Greek vessel by

²¹ Evans 1935, 446.

that name. Many of the stones with this shape also have plant fronds or branches and a sun shape. According to Evans, “A better pictographic rendering of drought caused by the scorching summer sun of Crete could hardly be imagined, and the chalice itself would be naturally associated with rain-bringing rites.”²² The next vessel he called the coffee-pot shape, anachronistically. Evans believed that these one-handed ewers with a curving spout arising from the body were adaptations of Egyptian vessels.²³ The third vessel shape is the single handled ewer with a lip. This is the vessel he connects with the ‘Minoan genius’. He found several seal stones with the ‘Minoan genius’ holding such a vessel. In some she is pouring a liquid onto a tree or into another vessel, therefore should be connected with vegetation rites, among other things.²⁴ Evans also noted that these shapes of vessels were used as vegetation charms because these were the shapes used in rituals. The liquid that would be poured out of the vessels represented the rain coming down from the sky to save the vegetation from a drought.²⁵

²² Ibid., 446.

²³ Ibid., 447-448.

²⁴ Ibid., 449.

²⁵ Ibid., 450-453.

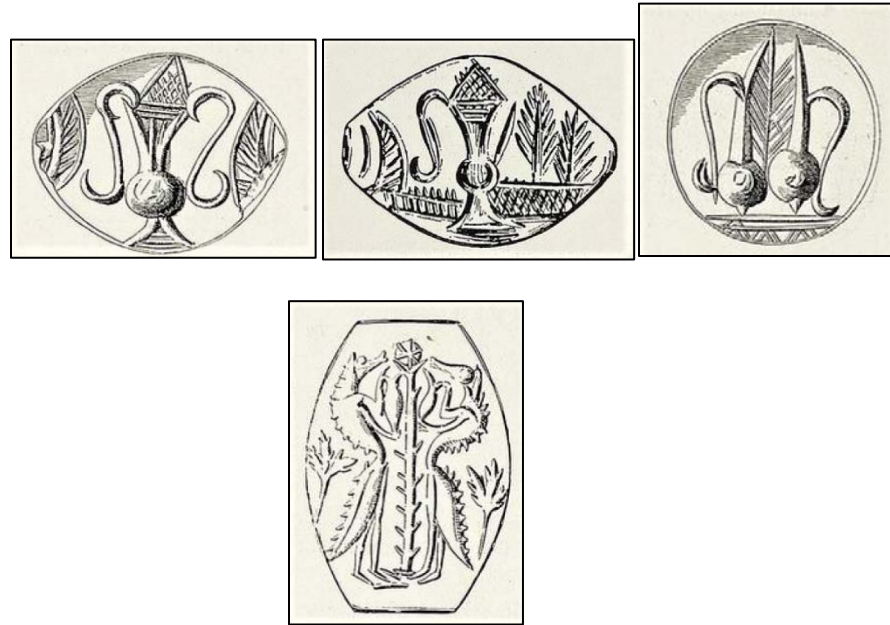


Figure 1.3 – Vessel types identified by Evans, top left – ‘kantharos’ type; top middle – coffee-pot type; top right – single handled ewer; bottom – ‘Minoan Genii’ with ewers (Images from Palace of Minos Vol IV, Part II)

The lions’ mask motif was very common. According to Evans many of them were roughly or hastily cut because of high demand. He believed this motif went through stages. It first appeared on lentoid shaped stones with squared edges, then rounded amygdaloids, and lastly elongated amygdaloids, some with a ridge on the back. He connects this motif with a sign resembling a cat face that appeared on some of the hieroglyphic seal stones (Figure 1.4). The lions’ mask seal stone would have given physical strength to its owner.²⁶

²⁶ Evans 1921, 673-674.

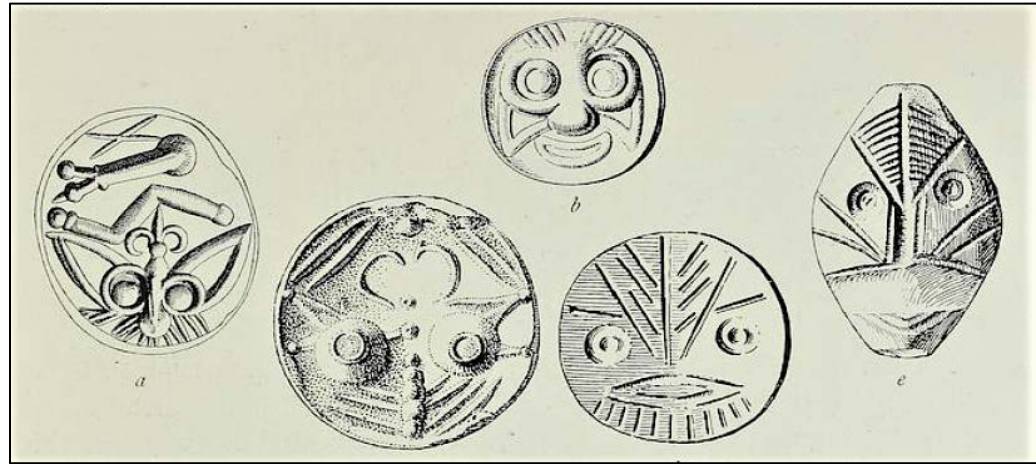


Figure 1.4 - Lions' Mask seal stones (Image from *Palace of Minos Vol I*).

Evans does not mention what power he thought the stones with the heart shape might possess, but he does connect them with the silphium seed. The silphium plant was highly prized and used for several purposes, one being medical. It was thought to have only grown in North Africa, but Evans believed that it was also grown on Crete, possibly making this plant a very important part of the Cretan economy.²⁷ The bird motif Evans believed was a swiftness charm.²⁸ Fish, squids, and other sea creatures would be lucky charms suitable for fishermen. The double axe was taken as a sign of divine guardianship and so protected the wearer. The stricken animal motifs were believed by Evans to be good luck for hunters. On these, the animal did not matter. Some had goats, others lions, but what was important was the spear stuck into the

²⁷ Ibid., 284-285.

²⁸ Evans 1935 541-548.

animal. Lastly, Evans does not explain what power or charm the pillared structure motif possessed, but he does think these were examples of round, peak-roofed structures similar to the round huts thought to be the prototype of the Temple of Vesta. On one of the stones he adds that the curvy lines on each side of the shrine were snakes and that this stone is showing the rustic shrine of the Snake Goddess.²⁹

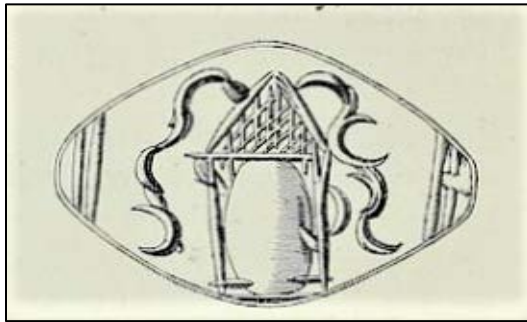


Figure 1.5 - Rustic shrine of the Snake Goddess (Image from Palace of Minos Vol I)

V.E.G. Kenna

Many of Evans interpretations and ideas about seal stones were later expanded by V.E.G. Kenna. In 1960, Kenna published a description of Minoan seal stones along with a catalogue of those found in the Ashmolean Museum. The book begins with a brief history of seal stones, then beginning with EM I gives a description and examples of each motif, material, and shape found during each phase. At the back of the book, a

²⁹ Evans 1921, 674-675.

description and photograph is given for each of the seal stones and sealings at the Ashmolean.

Kenna also wrote a book on talismanic seal stones.³⁰ In this book he defines the talismanic stone as a class of stones with recurring motifs used for their magical power.³¹ These six recurring motif categories are ritual vessels; religious symbols which includes double ax and sacral horns; plant symbols which includes rose motifs, seeds, vegetable fronds, and bundles; fish symbols which includes tunny, dolphin, flying fish, octopus, and squid; animal symbols which includes bucranium, lion's mask, and wounded quarry; insect symbols which includes the beetle, fly, bee, and ant; and birds.³² Examples of stones from each category are described and drawn. He also lists the stones by location. Kenna agrees with Evans interpretations of the stones being used for magic. He also, as can be seen by his motif categories, interprets the designs cut on the stones, the same as Evans. They only disagree on one point, the date the talismanic stones were in use. Evans dates them MM III to LM I but Kenna dates them MM III to LM III.³³

Kenna also prepared, either partially or solely, five volumes of the *Corpus der minoischen und mykenischen Siegel (CMS)*. These are CMS

³⁰ "The Cretan Talismanic Stone in the Late Minoan Age." 1969.

³¹ Kenna 1969, 26.

³² Ibid., 27.

³³ Ibid., 10, 12, 31.

Volumes IV, VII, VIII, XII, XIII. Substantial amounts of work were put into each book. Each of these volumes contains over 150 stones and volumes IV and XII have over 300 each. Drawings, photographs, and impressions were made of every stone. In addition, each stone has an entry containing information on where the stone was found, the shape, material, cutting technique, date, measurement, and description of the design.

Artemis Onassoglou

In 1985, Artemis Onassoglou, re-examined talismanic seal stones in a supplemental volume of the *CMS*.³⁴ She divides the seal stones into nine motif categories: vessel, ships, vegetation, crustacean/sea creature, insect, bundle, other animal, miscellaneous, and isolated. After giving a description of each motif category and breaking them down into subcategories, Onassoglou writes about the manufacture of the talismanic stones. She then has a section on the Cut Style of seal stone which has some similar motifs as the talismanic stones. At the end of the book is a catalogue of all the talismanic stones previously published in the *CMS*.

Her motif categories are almost the same as the ones used by Kenna and Evans but she interprets many of the designs, cut into the

³⁴ Onassoglou 1985.

stones, differently. She does not include a lions mask category, instead she has interpreted this design as papyrus and put them in the vegetation category. She does not interpret the design on stones, like in figure 1.5, as rustic shrines, but instead as types of vessel.

Conclusion

Between the writings of Kenna and Onassoglou very little was written on the talismanic type, and not much has been written since. Books such as *Greek Gems and Finger Rings* by John Boardman, *Aegean Seals: An Introduction* by Olga Krzyszkowska, and *Minoan Glyptic: Typology, Deposits, and Iconography* by Konstantinos Galanakis briefly summarize the type but do not go into much detail.³⁵ Articles on seal stones occasionally mention them as well.³⁶

There is much confusion over the dates of these stones as well as which stones should be included in which motif category. The current study is an attempt to clear some of this uncertainty. A further review of some of the things Evans believed, a comparison with other studies, and the results of the current study, will be in Chapter 3. In the next chapter, a method of enhancing the details on the seal stones is presented. The current visualizations of seal stones make it very difficult to study the motifs, the cutting technique, and the material. A more

³⁵ See Boardman 1970, Krzyszkowska 2005, and Galanakis 2005.

³⁶ See Younger 1977.

accurate digital recording would benefit the study of not only the talismanic stones but all seal stones.

Chapter II

Using Reflectance Transformation Imaging to Make Digital Surrogates of Seal Stones.

Reflectance Transformation Imaging or RTI is an imaging technique that allows its users to create an accurate digital representation or surrogate of an object and also make a simulation of that object being illuminated from different angles. This technique is useful for looking at surface details, sometimes even highlighting scratches on the surface of an object not visible to the human eye. RTI has successfully been used in the analysis of coins, fossils, clay tablets, lithics, and pottery.¹ Seal stones are of a similar size as coins thus the technique can be used on them as well. As part of this thesis, RTI was performed on twelve seal stones in the Archaeological Museum in Heraklion. This was done firstly, to create a digital surrogate that was as close as possible to what I saw in person, to test this method on a small object, and lastly to learn new information about the design or image cut on these seal stones.

Minoan seals were small stones or pieces of wood or ivory with a design cut intaglio in their surface. They have been found in a variety of colors, shapes, sizes, and materials. The design cut into each is unique, while many look very similar, no two are exactly the same. Many of the

¹ See Artal-Isbrand 2013 for use on pottery, Kotoula 2013 for use on coins, and Hammer 2002 for use on fossils.

subtle differences that distinguish seals from one another are difficult to see in publications. Currently, the best method to get a clear understanding of what seal stones look like is to see them in person. This led me to investigate different methods of digital representations. I wanted to know which type of imaging would work best on seal stones. This method also had to be easy to use, inexpensive, fast, and transportable. RTI meets these requirements.

“RTI is a computational photographic method that captures a subject’s surface shape and color and enables the interactive relighting of the subject from any direction.”² The most common method is Polynomial Texture Mapping or PTM, invented by Tom Malzbender of Hewlett-Packard Labs in 2000.³ Hewlett-Packard defines PTMs as “a simple representation for images of functions instead of just color. In a conventional image, each pixel contains static red, green, blue values. In a PTM each pixel contains a simple function that specifies the red, green, blue values of that pixel as a function of two independent parameters.”⁴ The color values of pixels are different in each photograph taken due to the movement of the light source. When preparing RTI imagery, multiple photographs are taken of an object from a stationary camera. Each shot

² Definition from the Cultural Heritage Imaging website at <http://culturalheritageimaging.org/Technologies/RTI/> .

³ Malzbender 2001.

⁴ Definition of PTM from the Hewlett-Packard website at www.hpl.hp.com/research/ptm .

is taken with a light shining on the object from a different direction. The so-called “raking” light tends to emphasize surface relief. Figure 2.1 *a* shows the basic set up for the highlight-based method and *b* illustrates the angles from which the light should shine in order to create the raking light.

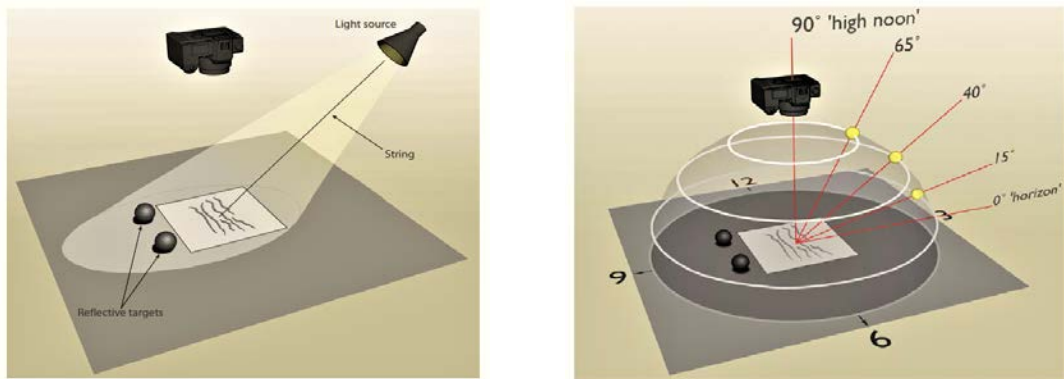


Figure 2.1 - *a* - the basic set up when doing the highlight-based method and *b* - the direction the light should fall to create raking light (both images from Duffy et al 2013).

Computer software subsequently lines up the photographs and finds the angle in which the light was shining.⁵ Figure 2.2 shows a screenshot taken from RTIBuilder. This is the stage in the process after the photographs are lined up and the light identified in each. It then takes this information and the color or function information and mathematically generates a model of the surface of the object. This model can then be viewed in another software that allows a simulation of the

⁵ When using the highlight-method 54 photographs are usually taken of the object.

relighting of the object, from all the angles of the handheld light from the original photographs. By doing this, the surface of the object can be examined in great detail (Figure 2.3).

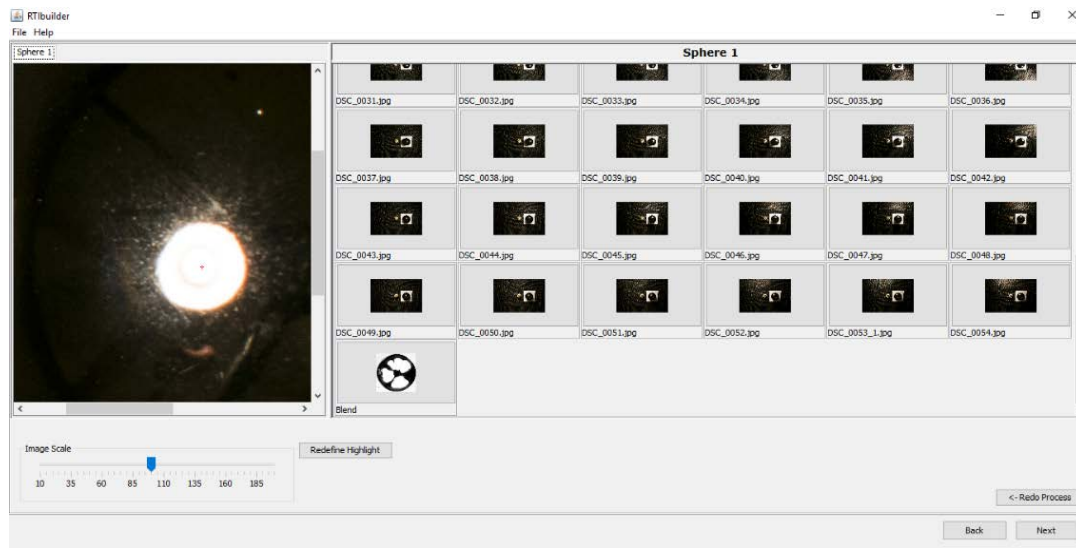


Figure 2.2 - RTIbuilder - photographs have been lined up and the light from each has been found.

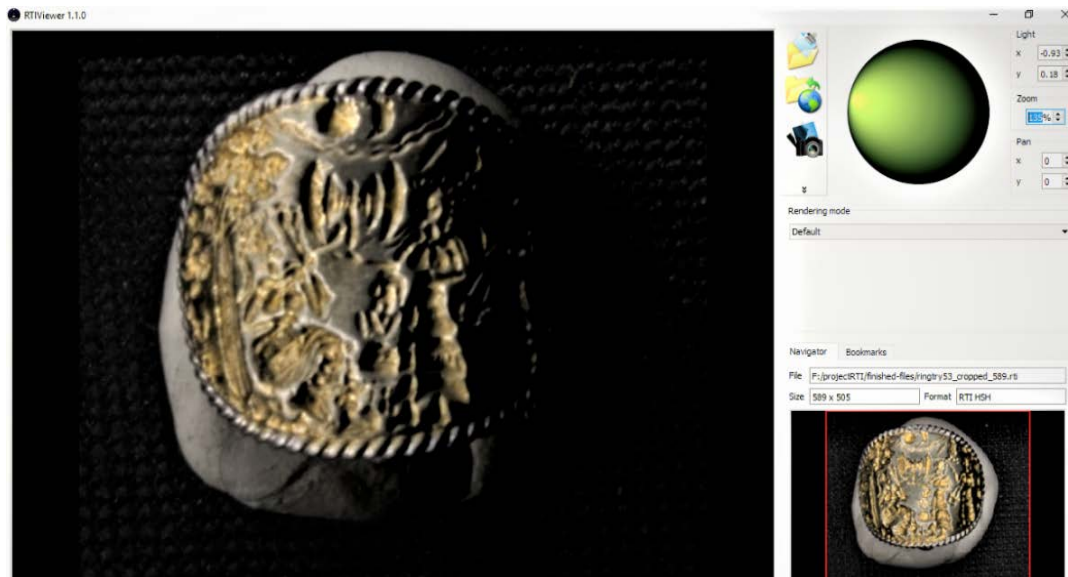


Figure 2.3 RTIViewer - this software allows the relighting of the image.

The photographs can also be processed through other algorithms to produce images highlighting other information. For instance, the object can be visualized through spectral enhancement or by surface normal. The surface normal describes the 3D orientation of the face of the underlying surface, calculated for every pixel in the digital photograph. When viewing an object with spectral enhancement it becomes artificially shiny, this makes any scratch on the surface more noticeable (Figure 2.4 a,b).⁶



Figure 2.4 a - the object rendered through surface normals and b - the object rendered through spectral enhancement.

“Humanity’s legacy can be unlocked and shared between people through digital representations.”⁷ This quote emphasizes the most important reason for making digital representations. Surrogates or representations are stand-ins for real physical objects. When a surrogate is created, and placed online, anyone anywhere in the world with a

⁶ Earl et al 2010, 2042-2043.

⁷ Mudge et al 2008, 2.

computer and internet has access to that object. This access is beneficial to everyone, whether a researcher or a student or a regular person.⁸ Another benefit to making surrogates is that they are nondestructive. They can be made without causing any damage to the object being replicated. Also, after a model is made, it can be viewed repeatedly, leaving the original safe from repeat handling. This is very important when studying very fragile objects like ancient manuscripts. Another benefit to making simulations is that they do not take up any physical space, the files can be compressed and stored on a hard drive, flash drive, or on the cloud. Other types of digital surrogates include 3D models, digital texts, digital audio and video files, and digitized photographs. There are, however a few things to remember about digital surrogates. They are not clones of the original material; a digital image can never be a true substitute for a painting hanging in a gallery. Also, surrogates in a digital format can be altered, copied, and manipulated.⁹

When choosing a method for making representations it is important to consider the object and pick a method best suited for its size, shape, and surface. RTI is ideal for making images of an object with a relief or carving on its surface. It is a versatile method in that it can be used on objects of different sizes and shapes. It also allows the viewer to

⁸ Hughes 2003, 6.

⁹ Ibid., 8.

look at the object in the most advantageous light, which is important when looking at something with very faint scratches or incisions.

Fixed-light method RTI.

RTI models can be made in two different ways, the highlight-based method and the fixed-light method. The fixed-light method uses a dome with LEDs and a camera or video recorder attached. Because this system is controlled through a computer, the entire process is automated. This cuts down on capturing and processing times and makes the results consistent.¹⁰ The Electronics and Computer Science department at the University of Southampton has built seven RTI domes to be used on their own projects, other universities, and by museums around the world including the domes used by the Louvre and the British Museum.¹¹

The first dome created was for an Arts and Humanities Research Council (AHRC) and Reflectance Transformation Imaging System for Ancient Documentary Artifacts (RTISAD) project. The intent of this collaborative project was to first of all build two RTI capture systems, create research centers at the University of Southampton and Oxford, then perform RTI on ancient texts and documents and archaeological artifacts. They also wanted to integrate RTI into existing projects and

¹⁰ Earl et al 2010, 2043.

¹¹ Information about their domes can be found at <https://reflectanceimaging.org>

spread their research, results, and information about RTI. All of this is recorded by the British Computer Society in an article entitled, “Reflectance Transformation Imaging Systems for Ancient Documentary Artefacts.”¹² This article recounts the afore mentioned objectives and advantages of using RTI. The capture systems were originally created to make models of ancient texts, tablets, papyri, and other forms of early writing. The raking light created in RTI makes the text easier to read, but this is not the only reason the technique is useful. Many of the texts are very fragile and by creating a surrogate the original can be left undisturbed while the surrogate serves the needs of most researchers. The dome was also successfully used on other objects such as coins, pottery, and brick stamps (Figure 2.5).¹³



Figure 2.5 Dome created for the RTISAD project (image from Earl et al, 2011).

¹² Earl 2011.

¹³ Ibid., 147.

A similar method for making PTMs was used by the University of Southampton on their collaborative Herculaneum Conservation Project. In this project a dome-type rig was used instead of a dome (Figure 2.6a). RTI was performed on a painted statue head of a young woman that had been excavated at Herculaneum in 2006. The goal was to make a digital reconstruction of the statue under lighting conditions as close as possible to what they were in the past.¹⁴ While at the museum they used a laser scanner, a RTI dome-type rig, and a digital camera to record the statue head. This information was then used to make a virtual reconstruction. RTI not only gave them access to the object after leaving the museum but it also helped them to see exactly how the statue would look under different lighting conditions. This model can help researchers investigate how this statue and others like it, may have been perceived under different lighting conditions. Also, because of its well preserved paint researchers can investigate the use of paint on statuary.¹⁵ Figure 2.6a shows the statue head being captured and b shows one of the reconstructions.

¹⁴ Happa et al 2009, 5.

¹⁵ Earl et al 2009, 6-7.



Figure 2.6 a - statue head of Amazon during recording and b - virtual reconstruction (image a from Earl et al, 2011 and image b from Happa et al, 2009).

An RTI dome was used by Hewlett-Packard Labs on the Antikythera Mechanism. This device, thought to be an ancient astrological computer, was found in 1900, in the remains of a shipwreck off the coast of the Greek island Antikythera.¹⁶ In 2005, RTI models were made of the 82 fragments of the mechanism. RTI was used because of its ability to record subtle surface details on corroded metals as well as other materials and researchers could use the images and models made with the software to further investigate the mechanism after leaving the museum.¹⁷ By using RTI researchers are now able to read over 1000 more characters than originally could be made out.¹⁸

¹⁶ Freeth et al 2006, 587-591.

¹⁷ Edmunds et al 2006, 917 and www.antikythera-mechanism.gr . The PTMs can be viewed on the Hewlett-Packard website at www.hpl.hp.com/research/ptm/antikythera_mechanism/index.html .

¹⁸ Earl et al 2010, 2045.

There are, however, a few disadvantages to using this system. Objects must be able to fit under the dome, and the domes are not easily portable. It cannot be used on objects outside or on architecture. Domes are also very expensive. While PTMBuilder, RTIBuilder, and RTIViewer are free downloads, the software needed to control the dome is not free.¹⁹

RTI using the Highlight-based method

The highlight-based method is much more versatile. The primary equipment needed is a camera with a remote, a tripod or copy stand, a shiny black or red ball of appropriate size, a black piece of cloth, a string, and a flashlight or handheld lamp. The shiny black or red ball is used as a reflective target. The size of the shiny ball is determined by the size of the object. For a large object, a reflective target about the size of a billiard ball would be appropriate, but on a small object target the size of a marble would be more suitable. The target size is better expressed in the resolution of the digital photographs. It is recommended that the diameter of the ball should take up 200 pixels in the image.²⁰

In the highlight-based method the artifact or object is placed on a black piece of cloth with the black or red shiny ball beside it, either on the same surface or mounted and attached to the tripod or copy stand.

¹⁹ Earl et al 2010, 2043.

²⁰ Duffy 2013, 5.

The camera is stabilized directly above the object. Then a light source is moved at equal distance around the object. The light should be moved around the object at oblique angles. This can be seen in figure 2.1 *b* and in figure 2.7 where the red circles represent the placement of the handheld light. The light should be pointed at the object at the same distance away at each position. A string tied to the light source ensures that equal distance is kept each time (Figure 2.1a). Photographs are taken at each position of the light source. These are then processed through software that recognizes the reflection of the light source on the shiny ball, it then uses an algorithm to reconstruct the direction from which light was cast on the object (Figure 2.2). After processing, the finished product can be viewed in a software program that allows the user to be move the light over the object from any direction (Figure 2.3). This method can be used on large and small objects, vertical and horizontal surfaces, both indoors and outdoors.²¹ The software is free and the equipment is relatively inexpensive.²²

²¹ It should be noted that when the highlight-based method is used outdoors, it should be used at night or at dawn or dusk. This is to ensure that the software detects your light source rather than the daylight on the shiny ball. Shooting during certain times of the day would also cause shadows of the camera and tripod legs to be in your shot.

²² Earl et al 2010, 2044.

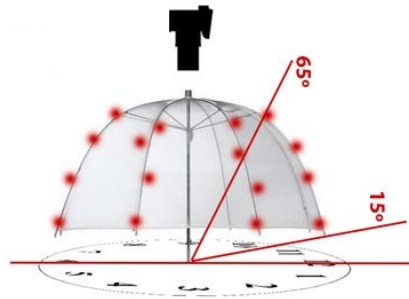


Figure 2.7 The red circles represent the placement of the handheld light (image modified from Cultural Heritage Imaging).

As mentioned above, the University of Southampton has used RTI on multiple projects. They have not only used the dome method but they have also successfully used the highlight-based method. Their Portus Project began in 2007 and ended in 2011 but their work continued in the Portus in the Roman Mediterranean Project until 2014. Portus was a large Imperial Roman harbor built by Claudius in AD 42. RTI was used along with photogrammetry, laser scanning, and dense surface modeling to record the site. RTI was used because it has the capability to record surfaces at great detail. They chose the highlight-based method for use on site because it is portable and can record a variety of materials. It was used to record in situ artifacts and building materials such as bricks. Representations of the artifacts allowed the researchers not on site to study the material and were also used to supplement the soil texture and

Munsell color records of the site. The images of the building materials assisted in the creation of a virtual reconstruction of the site.²³

Highlight-based RTI has been used successfully on rock art as well. Sarah M. Duffy used this method on rock art at Ughtasar, a site located around 3200 MASL in the Syunik Mountains in Southern Armenia. The rock art is thought to date to 5th to 2nd millennium BCE and includes geometric shapes, animals, and anthropomorphic figures. Highlight-based RTI was chosen because the equipment could easily be transported up the mountains and because it is inexpensive. RTI had also been used in recording other rock art because it can record in detail the subtle surface relief. Despite the challenges of a rocky terrain, strong winds, low temperatures, and dangerous animals, over 20 usable PTMs were created. These images will be used to further study rock art in Europe and elsewhere.²⁴

Highlight-based Method on Seal Stones

As mentioned above, when this study of seal stones began, the representations available were considered inadequate for research on material, stone color, and in some cases the cut image. I wanted to find a solution to this problem. Digital models of seal stones would be an ideal approach. I originally considered using photogrammetry to make 3D

²³ Earl et al 2010, 2047 and <http://www.portusproject.org>.

²⁴ Duffy 2013, 18-19.

models, but because of complexity of carrying this out with small seal stones abandoned the idea. Photogrammetric software also has limitations when processing photographs of objects with shiny surfaces and/or objects made of translucent materials.²⁵ The obvious alternative was RTI.

RTI can be used on small objects and it can be used on shiny, glassy, or translucent materials. But all previous RTI models on objects the size of seal stones were done using domes. I did not have a dome nor would a dome be ideal for a project where all equipment must fit in a backpack. Could the highlight-based method be used to make RTI models of seal stones? The first tests of the method were on half-dollar and quarter sized coins and jewelry. These were successfully made into RTI models but seal stones are smaller. Would the same technique work?

I was given permission to examine and photograph twelve seal stones in the Archaeological Museum in Heraklion. A Nikon D5000 with a remote was used, with a tripod, a shiny black gear shifter knob as a reflective target, and an LED lighting panel. I also had a black piece of cloth and a string. The setup at the museum was similar to that shown in figure 2.8. The images were processed using the free and open-source software RTIBuilder and RTIViewer.²⁶

²⁵ Cignoni and Scopigno 2008, 14.

²⁶ These can be downloaded from the Cultural Heritage Imaging website at <http://culturalheritageimaging.org/Technologies/RTI/>.



Figure 2.8 Setup for capturing photographs.

Twelve RTI models of 12 seal stones ranging in size from 10 mm in diameter to 21.5 mm wide were created.²⁷ The biggest challenge encountered in this endeavor was the small size of the seal stones. One stone had a radius of 10 mm.²⁸ The software did not have any problems with the size of the stones but my camera was not fitted with an appropriate lens for an object this small.²⁹

²⁷ I encountered several challenges when doing this project. One of these challenges was working in the conditions afforded in Heraklion. When I had tested the method, and practiced it before my trip I had used the floor or a small table that I could easily move around. At the museum, I was provided with a large table, which inadvertently made maneuvering with the light difficult. My tripod was a small, lightweight one that was not very sturdy. This and the large table create some motion blur in the photographs. I was concerned that the overhead lights in the room and the light coming from the window I was below would cause a problem but this was not the case.

²⁸ CMS II,3,313 has a radius of 10 mm, which is smaller than a dime. The online CMS does not give the measurements of the seal stones and the drawings are all made about the same size. I did not know the size of the stones when I requested to examine them.

²⁹ I used a 18-55 mm lens locked on 18. A “macro” lens would have been a better choice for this project. Many of the photographs were blurry, grainy, and dark. These are all things that can be fixed on any future projects. A sturdier tripod and being more careful will take care of any blurriness from movement. The camera I was using only had 12.3 megapixels, a camera with a higher number, at least 20 megapixels, should help with the graininess along with a different lens as mentioned above. The darkness of the photographs can be taken care of by changing my shutter speed and

Currently, I am experimenting with RTI on small objects such as coins and jewelry. The ring seen in figures 2.2, 2.3, 2.4, and 2.8 is from this experimentation. This will enable me to come up with a good setup and guidelines for working with very small objects. I would like to continue studying seal stones and hope to get a chance at making more RTI models. However, RTI can be used on other objects besides seal stones. It is a very accurate, easy to use, and an inexpensive method of making digital representations. Making digital surrogates is very important in archaeology but also for other humanities fields because it offers access to information and objects that may be difficult to obtain in any way other than first-hand experience. In the next chapter, more information will be given about the seal stones photographed in the Archaeological Museum in Heraklion.

aperture and also by running the raw photographs through a photo editing software before loading them into RTIBuilder. Figure 2.9 shows images of five of the RTI models.

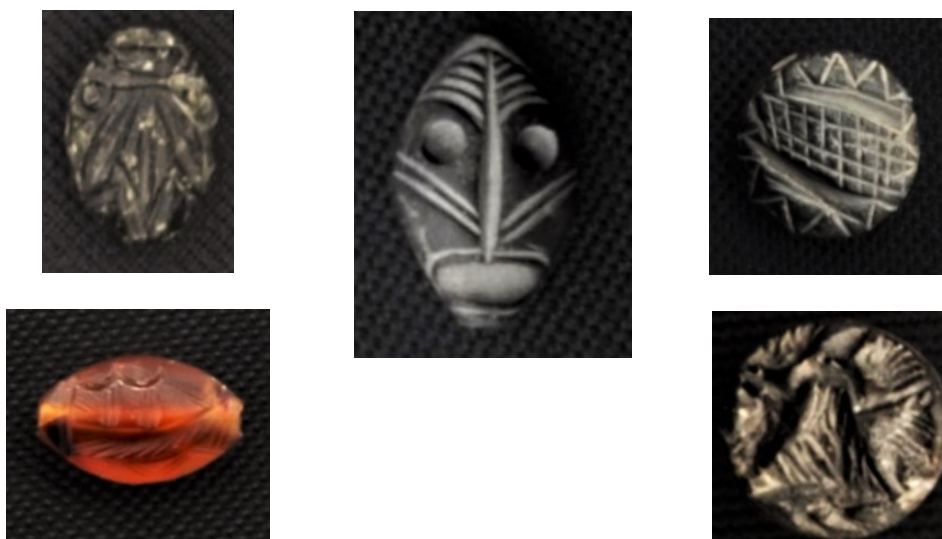


Figure 2.9 – RTI images of top left – CMS II, 2, 16; top middle CMS II, 3, 80; top right CMS II, 4, 193; bottom left CMS II, 3, 361; bottom right CMS II, 3, 72.

Chapter III

Examination of the Talismanic Seal Stone

Some of the confusion surrounding talismanic seal stones is because very little scholarship has been written about them. Another problem is that scholars often disagree on how these stones were used and how they should be classified. For instance, the dates that the seal stones were used and manufactured has been disputed. Sir Arthur Evans, when categorizing them, dated them MM III – LM I.¹ V.E.G. Kenna also believed that these stones were first introduced during MM III but thought they continued to be manufactured, though of poor quality, until LM III.² Reynold Higgins, expert in Greek jewelry more than seal stones, wrote that the talismanic seals were still being used during LM II.³ Most scholars today agree with Evans and date them MM III – LM I but no one is certain.⁴ Besides chronology, many of the characteristics of the talismanic stone are also not consistent in all literature. Using previous scholarship, data I have created, and my own observations, I propose to re-examine these stones. I will first look at their find spots and then move to their shape, material, motifs, cutting technique, and use. I hope

¹ Evans 1921, 672.

² Kenna 1969, 25.

³ Higgins 1967, 184.

⁴ Krzyszkowska 2005, 133.

by doing this to clear some of the confusion surrounding the talismanic seal stones.

Most of my data came from the *Corpus der minoischen und mykenischen Siegel* (CMS). The CMS was begun in 1958, by Friedrich Matz. His goal was to publish a description, drawing, and photograph of all the known Aegean seal stones, signet rings, and clay sealings dating from the Bronze Age located in museums all over the world. The first volume included all the seal stones, rings, and sealings in the National Archaeological Museum in Athens. Today there are over 20 catalogue volumes and nine supplementary volumes. They have also been digitized and placed online through ARACHNE, the Central Object-Database of the German Archaeological Institute and the Archaeological Institute of the University of Cologne.⁵

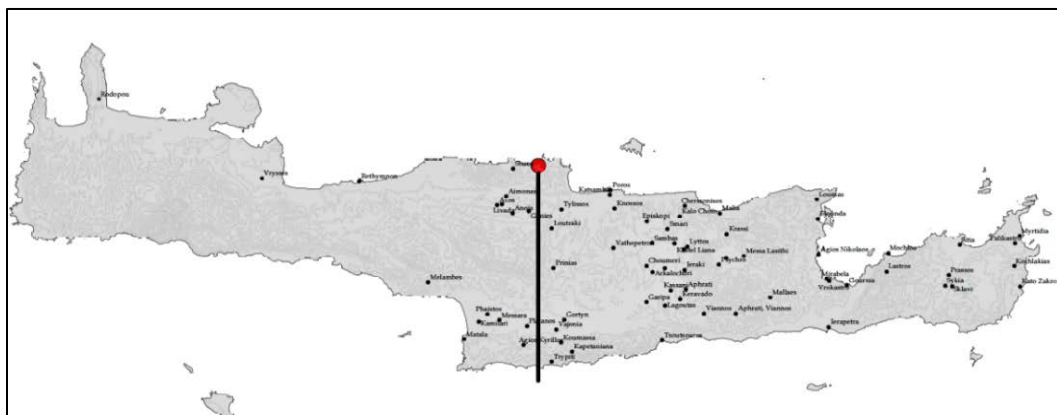


Figure 3.1 - Division of Crete into East and West

⁵ www.uni-heidelberg.de/faku

Find Spots

All scholarship agrees that the talismanic seal stones were more common in east Crete but this depends upon your definition of east. If a dividing line were drawn down the center of the island somewhere near Paralia Fodele, then most talismanic stones indeed come from east Crete (Figure 3.1).⁶ It is also true that most Minoan sites are east of this line. If, however, the definition of east Crete began with the prefecture of Lassithi, the statement would be incorrect. Sir Arthur Evans thought that the greatest number of talismanic seal stones came from the province of Sitia, although my compilation of sites indicates otherwise.⁷ I looked at all the talismanic stones in Volumes I - IV of the *CMS* and found that most come from the prefecture of Heraklion (Figure 3.2).⁸

⁶ Paralia Fodele is on the northern coast of Crete about 26 km northwest of Heraklion.

⁷ Evans 1935, 446. Evans formed this idea from his ethnographic evidence. He purchased or traded more of the talismanic stones in this province.

⁸ This study includes a total of 384 stones. 323 stones were marked as talismanic in the *CMS* volumes I – IV. Also, included are 61 stones not marked as talismanic but that resemble talismanic stones. These have possibly been miss-identified.

When looking at a map of only the stones with a known provenience, meaning that they and the find spot where they were found was recorded during an archaeological excavation, there were slightly more stones recorded in the prefecture of Lassithi. However, this might be explained by the excavation records being more complete at some of these sites than in other areas.

Table 3.3 - Name of site and number of talismanic seal stones found at each.

Site Name	Number of Seal Stones
Kamilari	1
Knossos	39
Myrtidia	4
Sitia	19
Agios Kyrillos	1
Platanos	2
Koumassa	1
Ierapetra	3
Kato Zakros	3
Palikastro	13
Rethymnon	1
Livada	1
Katsambas	1
Episkopi	4
Vathepetron	1
Malia	29
Matala	1
Trypiti	2
Gortyn	1
Prinias	1
Sambas	1
Jeraki	1
Kassani	1
Aphrati	3
Keravado	1
Lagoutas	1
Viannos	1
Lyttos	1
Cherssonisos	1
Gonies	1
Vrokastro	3
Gournia	14
Mochlos	13
Sykia	3
Prassos	5
Psychro	1
Messa Lassithi	1
Loumas	1
Elounda	4
Mirabela	4

Site Name	Number of Seal Stones
Kochlakias	1
Tylissos	1
Anoja	1
Poros	1
Vajonia	1
Arkalochori	1
Roussochoria	3
Agios Nikolaos	1
Lasithiou	5
Aimonas	3
Mallaeas	1
Messara	14
Lastros	6
Axos	2
Garipa	1
Sisses	1
Sklavi	5
Kapetaniana	1
Choumeri	3
VrysSES	1
Smari	1
Kalo Choio	1
Tsoutsouros	2
Rodopou	1
Kanli Kasteli	1
Kastel Liana	1
Krassi	1
Melambes	1
Loutraki	1
Phaistos	12
Aphrati, Viannos	1

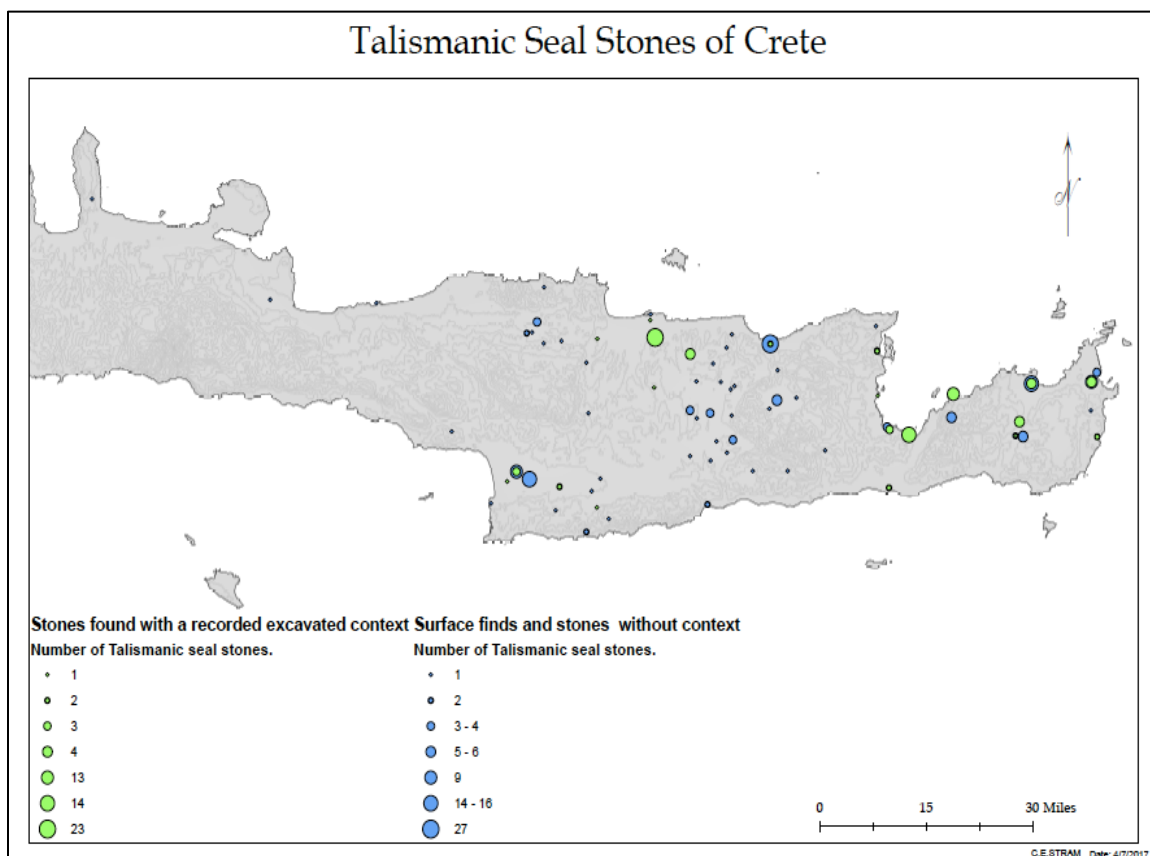


Figure 3.4 - Seal stones with and without recorded excavated context.

Only 74 stones out of a total of 384 talismanic stones were found in an excavated context. Of these most were found in burials. The 310 others were either found at a site on the surface, or without a certain findspot or else have no provenience, with 119 in the latter category. Most of the stones without context information were found in the prefecture of Heraklion. It should be remembered that most of the known Minoan sites are also in this area, so it should not be a surprise that more stones have been found here.

It has been cited in some sources that the talismanic stones were not used by the highest class of Minoan Society living at Knossos because so few have been found in the palace archives.⁹ It is true that very few of the talismanic stones were used as stamps, but, in my research, I have found that the greatest number of talismanic stones were found at Knossos. Out of the 265 stones with known provenience, 39 come from Knossos, followed by Malia with 29 talismanic stones (Table 3.5).

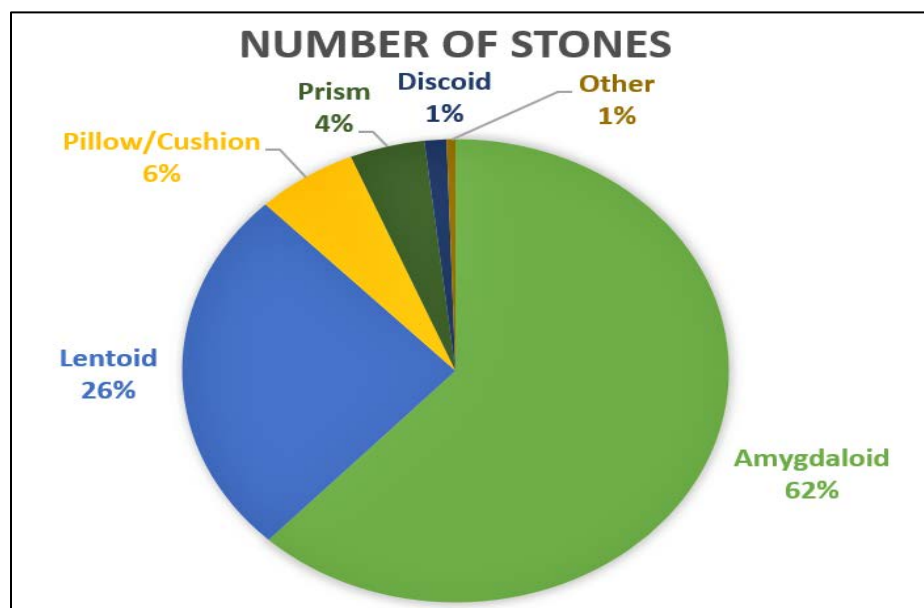


Figure 3.5 - Percentages of stone shape.

⁹ Galanakis 2005, 14.

Shape

The amygdaloid shape, as recorded in previous scholarship, is the most common shape of talismanic seal stones.¹⁰ This shape has been called almond-like because of its resemblance to an almond (Figure 3.6). I observed, when performing RTI on some seal stones in the Heraklion museum, that some of the amygdaloid lions' mask stones have a ridge down the back, which has also been noted by Evans (Figure 3.6).

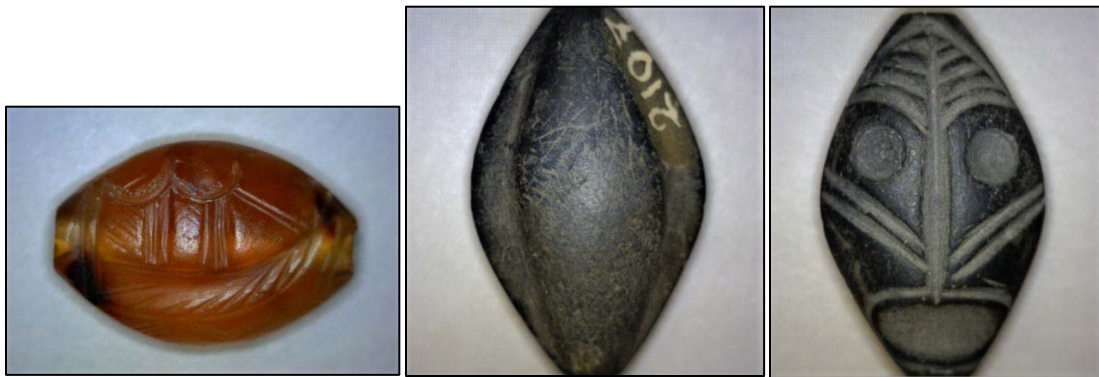


Figure 3.6 – Examples of amygdaloid shaped seal stones, left – front CMS II, 3, 361; middle – back CMS II, 3, 80; right – front of same.

I found that over 50% of the talismanic stones were amygdaloid in shape (Figure 3.5). They can be found in an even distribution over all of the sites on Crete. The second most popular shape is the round lentoid form, totaling 99 out of the 384 stones in my study (Figure 3.7). The rest

¹⁰ Kenna 1960, 68.

of the stones were in various other shapes including pillow or cushion and prism.



Figure 3.7 – Examples of lentoid shaped stones, left – CMS II, 3, 73; middle – CMS II, 4, 223; right – CMS II, 3, 313.

Material

As has been recorded in previous studies on the talismanic stones, carnelian is the most common material, comprising close to 50% of the stones in my study (Figure 3.9).¹¹ Carnelian is a variety of chalcedony. It is a translucent stone that can be brown, red, or orange (Figure 3.8). It is a 6-7 on the Mohs scale. Stones of this hardness could not be made into seal stones before MM II, when the cutting wheel was introduced to

¹¹ Ibid.

Crete.¹² Carnelian is not a local mineral. It had to be imported and probably came from the area of present day southeast Iran.¹³

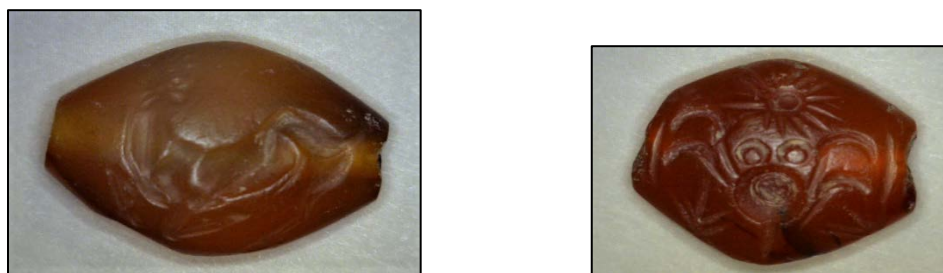


Figure 3.8 – Seal stones made of carnelian, left - CMS II, 4, 153, right – CMS II, 3, 367.

It has sometimes been argued that the talismanic stones were made of cheap or common materials.¹⁴ While today carnelian is not an expensive gem stone, during the Bronze Age it was an import and so would have been costlier to use than a local mineral, such as serpentine. Carnelian was significant in Egyptian religion. Stones made of carnelian were placed on the necks of the deceased as protection.¹⁵ The red/orange color of the stone might also have been significant to the Minoans.¹⁶ The second most popular stone was jasper, at 87 of the 384 stones. Most of these, according to the *CMS*, are of green jasper. With so many seals

¹² Boardman 1970, 375.

¹³ Younger 1979, 40.

¹⁴ Boardman 1970, 43.

¹⁵ Morgan 2008, 40-41.

¹⁶ Krzyszkowska 2005, 136-137.

made from red and green stones, it does seem that color was important, but there is no other evidence to support the specific meaning.

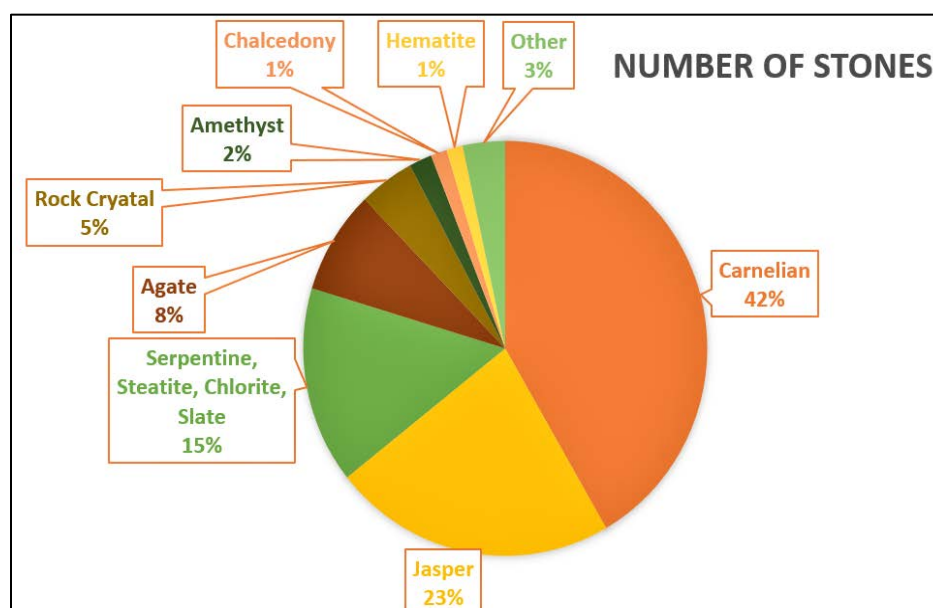


Figure 3.9 - Percentages of stones.

Carnelian and jasper were evenly distributed among all sites. Figure 3.10 is a map of materials, excluding these two stones. Steatite, serpentine, chlorite, and slate have been grouped together. These are all soft stones that look similar to one another when carved into seal stones.¹⁷ Fifty-nine talismanic seal stones belong to this group. As can be seen on the map, these stones were used more in the prefecture of

¹⁷ In many of the CMS entries, two materials were given. An example of this is steatite or serpentine, which was listed as the material for 12 entries.

Heraklion than elsewhere. Agate, rock crystal, chalcedony, and amethyst were also used for talismanic seals. Minerals only occurring in low amounts were grouped together under the heading 'other' on the map.

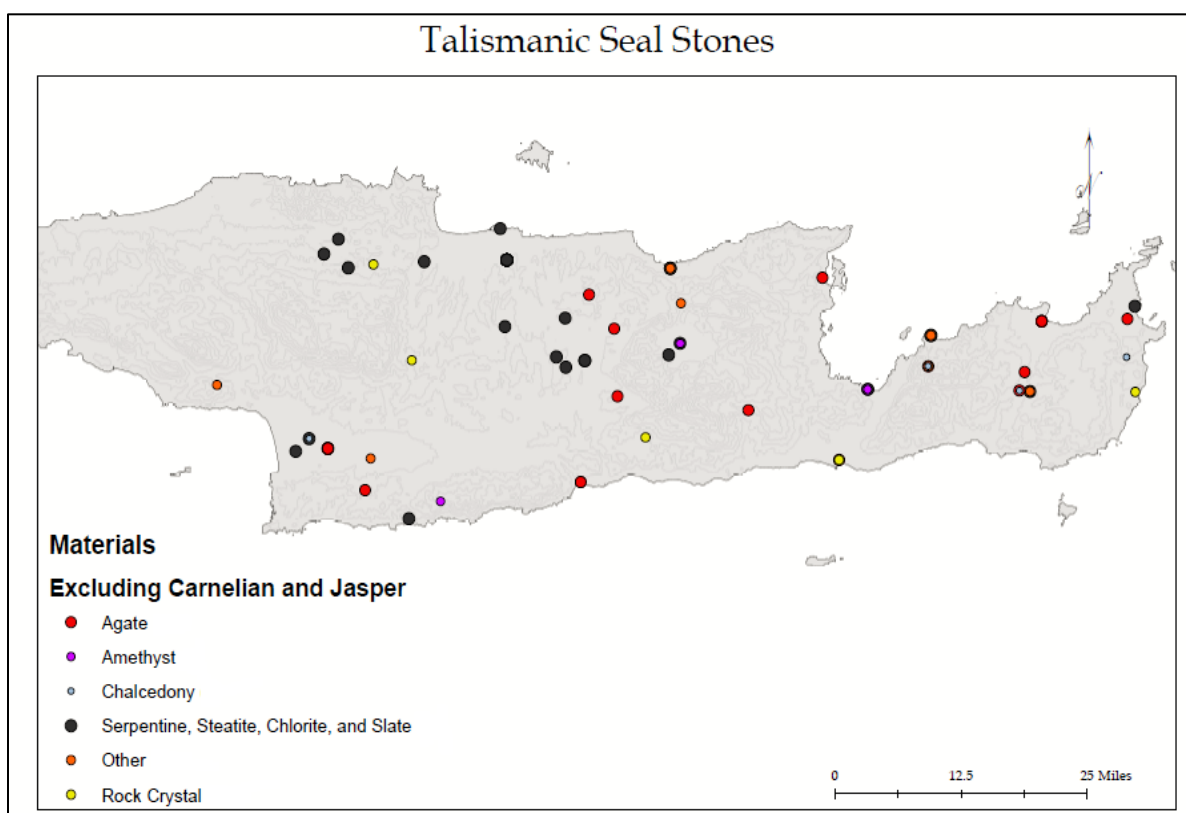


Figure 3.10 - Map of materials used to make talismanic seal stones, excluding carnelian and jasper.

Figure 3.10 reveals a potentially significant pattern in the distribution of amethyst, a purple stone in the quartz family regarded as important throughout history. This stone was once believed to guard against drunkenness.¹⁸ Later it was worn as a sign of piety and celibacy.

¹⁸ Morgan 2008, 24-26.

The color purple was also considered the color of royalty. There is no surviving evidence from which to restore the meaning of this stone to the Minoans, but we do know it was uncommon imported. Only seven of the talismanic stones were made of amethyst, and none in Knossos. Of the four sites, three of the seven stones come from Gournia (Figure 3.11). With such a small sample, it is unclear whether the elevated quantity of seals from this precious stone recovered at Gournia is significant to our understanding of the economic and palatial systems across Crete.

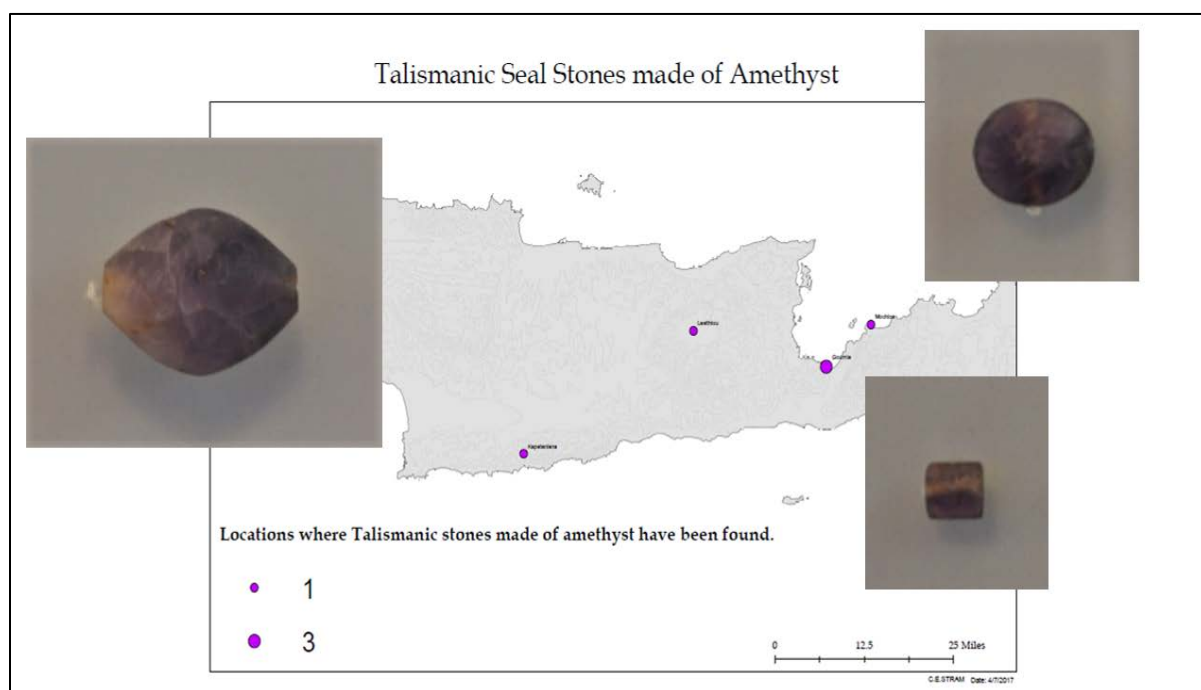


Figure 3.11 - Locations where amethyst talismanic stones have been found and the three stones from Gournia: II, 3, 244; II, 3, 245 and II, 3, 247.

Motifs

Dividing seal stones up into groups by what is cut on their surface is a challenge. For one thing two people may not see the same thing. Where Evans saw a rustic shrine with snakes, others have seen a tankard shaped vessel.¹⁹ Also, no matter what we see it as, it is probably not the same as what the Minoans saw. Sir Arthur Evans thought that the image or design cut on the talismanic stones gave them their power as a talisman. He divided these stones up into groups based on what was carved on them. Others have done the same. As mentioned in the first chapter, the problem is that not everyone uses the same motif categories and classifies the stones consistently, like the seal stone shown in figure 3.12 (*CMS* II, 2,16). In the *CMS* this seal stone is listed as having a plant shoot on it. Onassoglou includes it in the vegetation motif.²⁰ When I look at this stone I see a fish, the two circles are eyes and what others have seen as shoots, I see as fins. Fish were usually made in profile on talismanic stones but occasionally top views were made.

¹⁹ Krzyszkowska 2005, 134.

²⁰ Onassoglou 1985.



Figure 3.12 - Left – Talismanic stones with fish, top left – CMS IV, 187; top right – CMS II, 4, 95; and bottom drawing and photograph of CMS II, 2, 16. (Drawings from CMS)

A future study on these motifs would include compiling all of a type, in each motif category. An example of this would be to put all the talismanic stones with fish, which is usually in a sea creature motif category, and see if they are similar. Any that are not may belong to a different category. Using figure 3.12 as an example, most fish on talismanic seal stones look like the figure on the top left. All the motifs should also be compared to other Minoan art, such as frescoes and pottery.

In the current study the stones have been divided into eleven categories of motifs. The categories are vessel, lion mask, double ax, plant, ship, sea creature, heart, insect, animal (other than sea creatures),

decorative, and architectural. Many of the motifs are the same as those used by Onassoglou and the *CMS*.²¹ The categories vessel, plant, ship, sea creature, insect, and animal are the same. Onassoglou has additional categories: bundle, miscellaneous, and isolated. The remaining categories in this study, apart from decorative were influenced by Evans.²² The word ‘decorative’ was chosen because it best described the stones in this group. As mentioned before some stones have been placed in a different motif category than Onassoglou and the *CMS* placed them. For a complete list of stones and my categorization, see Appendix B.

Some stones were excluded from this part of the study. The stones that were not identified by the *CMS* as talismanic were left out (Footnote 8). The prism shaped stones were also left out because some stones could go into three different categories. Many of the stones were difficult to place into any motif category.

Over 25% of the talismanic stones, in this study, have sea creatures on them. The next biggest group was the category called decorative which includes rings, circles, cross hatching and anything else that was considered decorative. Figure 3.13 is a map showing the

²¹ Onassoglou has nine categories. I include architectural and decorative and make separate categories for stones with the heart motif and those with a double ax.

²² The first study on talismanic seal stones that I read was by Kenna. He was influenced by the interpretations of Evans. I learned these interpretations first, when I see a lions’ mask stone I identify it as such, not because I see a lion but because that is how these stones were first introduced to me.

distribution of the three most popular motifs. Most motifs were evenly distributed among the sites except for the heart and vessel motifs. There are only eight stones with the heart motif and all except two were found in the prefecture of Lassithi. The stones with the vessel motif were found in the highest concentrations on the north coast. (Figure 3.14)

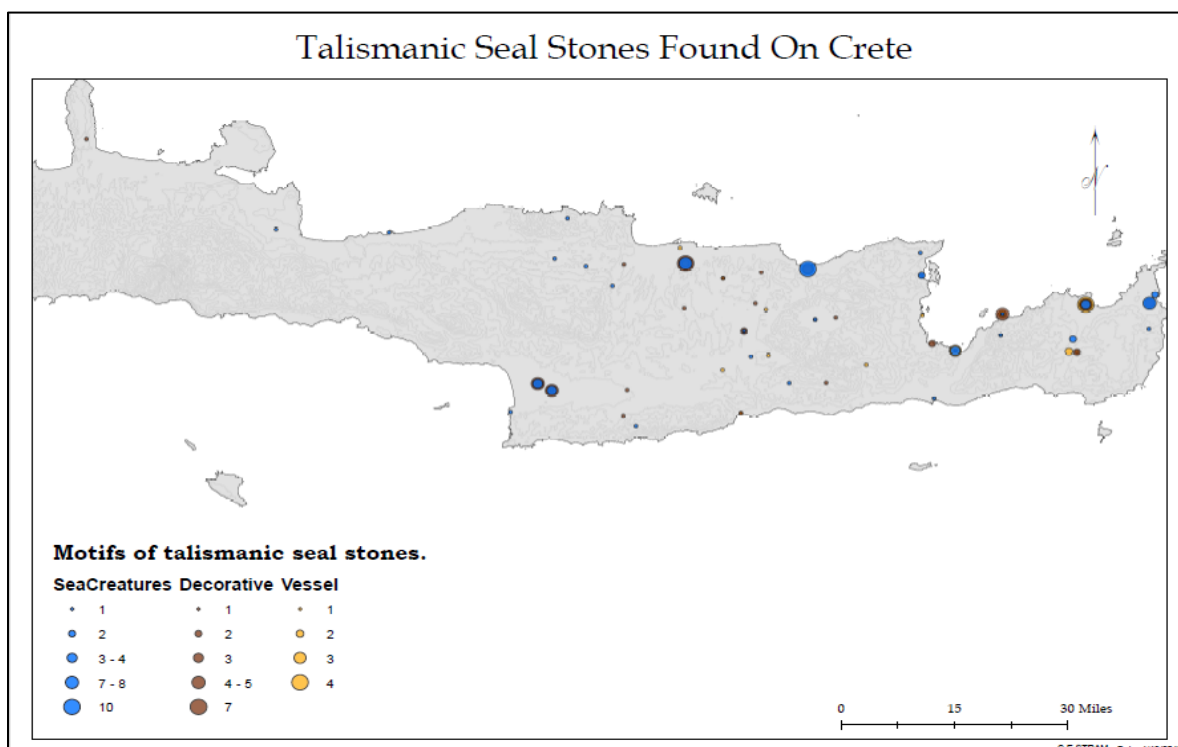


Figure 3.13 - Distribution of the three most popular motifs.

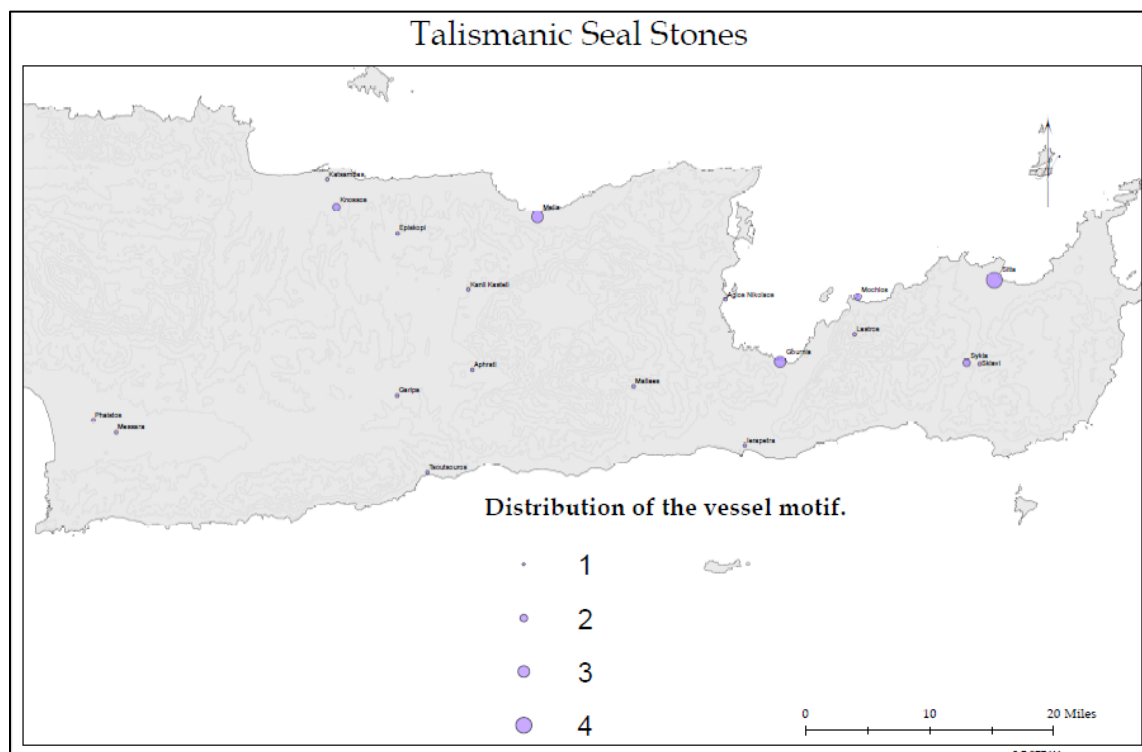


Figure 3.14 - Distribution of vessel motif.

Placing these stones into categories based on motif is only a way to sort them, they do not help us figure out how these stones were used. Because there is so much subjectivity in placing the stones in these different categories, this may not even be the best way to organize them. The motif of the stone is not always a way to separate it from other seal stones either. As mentioned above, this study includes any stone that appears to be talismanic. Some were marked in the *CMS* as possibly talismanic, but others were categorized as figurative, ornamental or some other group of seal stones (Figure 3.15). If the material, the cutting

technique, and shape were similar to the talismanic stones, the stone was included in this study.

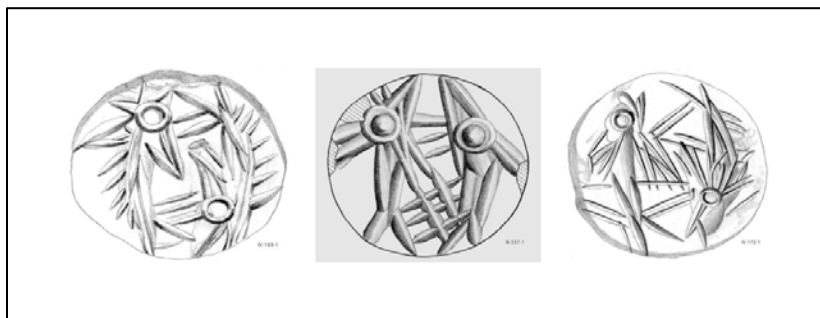


Figure 3.15 - Three very similar looking stones, the middle seal stone, CMS III 337, is not marked as talismanic in the CMS, the other two, left - CMS IV 169 and right CMS IV 172, are. (Images from the CMS)

Cutting Technique

What distinguishes the talismanic stones from other seal stones is not necessarily the motif, but rather the way they were cut.²³ The designs or figures are made from broad straight cuts with rounded outlines, alternated or edged by sharp narrow cuts and occasional arcs, circles, and dots.²⁴ There was no attempt to disguise the tool marks or to make the images appear naturalistic. It has been said that a stone cut in this way could be made quickly and from a single tubular-drill.²⁵ Often lines do not connect when they should be expected to do so, such as when the tentacles on an octopus are not connected to the body. The

²³ Krzyszkowska 2005, 136-137.

²⁴ Boardman 1970, 42-44.

²⁵ Krzyszkowska 2005, 133-134.

motifs of the talismanic class were those that could easily be made by this technique.²⁶ I cannot verify what technique was used in making them because I have only examined a few stones in person and am not yet expert in the manufacturing of seal stones. I can, however, report that according to the *CMS*, almost every stone which I classified as talismanic for my study was reported to be wheel cut. In addition, many of these were also tubular-drilled. Cutting wheels and the tubular-drill were attached to a lathe operated with a bow.²⁷ The cutting wheels produced lines, thin lines if the wheel was thin and thick lines if the wheel was thick. The tubular-drill produced circles and arches. Stones contemporary to the talismanic used similar tools but in a different way. Their designs were naturalistic and detailed.

How Were the Talismanic Stones Used?

Sir Arthur Evans thought that the talismanic stones were used to give protection or power to their wearer. Excluding Kenna, none of the scholars cited in this study have thought the same as Evans on this point. Even Boardman, one year after Kenna, wrote that if these stones were so important to the Minoans, they should have made them more carefully.²⁸ Currently, there is no way to prove Evans right or wrong

²⁶ Boardman 1970, 44.

²⁷ Krzyszkowska 2005, 83-85.

²⁸ Boardman 1970, 43.

definitively, although we may at least raise questions of how they were used. It is at least certain that they were not used as stamps except in a few cases.²⁹

They also had string holes drilled in them and so were likely worn around the neck or wrist like other seal stones. Evidence from frescoes and burials confirm how seal stones were worn. The Cupbearer fresco (Figure 3.16) from Knossos shows a man with a lentoid shaped seal stone on a bracelet around his left wrist. There have also been seal stones found in graves. Some have been found around the neck on a necklace with beads, while others have been found near the wrist of the deceased.³⁰

²⁹ See supra n. 4, Chapter I.

³⁰ Younger 1977, 146-149. At one of the tombs of Armenoi near Rethymnon a necklace of beads with a lentoid shaped stone was found around the neck of one of the dead. There are also some examples from the Mainland. At the tombs, at Agios Ioannis and Zafer Papoura seal stones have been found near the wrists of some of the skeletons. These stones were possibly attached to the wrists of the deceased but the chords have rotted away leaving only the stone.

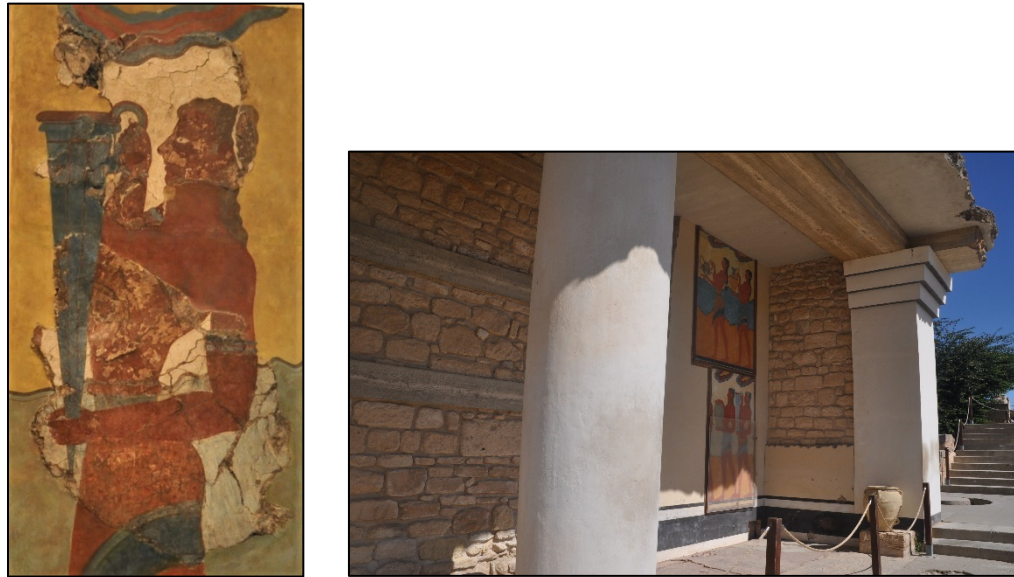


Figure 3.16 – Part of the Cupbearer fresco and its location at Knossos (Image on left taken at the Archaeological Museum at Heraklion and image on right taken at Knossos).

The amygdaloid shaped stones have the string holes drilled through them long ways or horizontal to the image (Figure 3.17). Lentoid stones have been found with string holes in the vertical position, as it is in figure 3.17, and in the horizontal position. Lentoid shaped stones are not actually completely round and the string hole is always drilled through the shorter of the two diameters.³¹ These string holes appear to have been drilled by the maker of the stone so that the amygdaloid could be made worn around the neck and the lentoid worn on the wrist. The drill holes are at an orientation best suited to displaying an image cut on these shapes of stones. However, this was not how all owners wore their

³¹ Ibid., 155.

stones. Some wore them in a way that made the image difficult to read. Some of the stones found in tombs, near the wrists of deceased individuals have been amygdaloid shaped stones, which would indicate they were not being worn in the way intended by the maker.³² This leads me to believe that the stones were not commissioned by an owner but premade. Otherwise, the manufacturer should be expected to have drilled the string hole in the appropriate orientation for how the stone was intended to be worn.³³



Figure 3.17 - String hole orientation in amygdaloid and lentoid shaped stones (left – CMS II, 3, 42; right CMS II, 3, 91 Images taken at the Archaeological Museum in Heraklion)

³² Ibid., 154.

³³ We know the string hole was drilled last. Many broken stones have been found in workshops at Malia and other sites, with images already cut on the surface, but with cracks and breaks from the of the string hole.

Also, relating to how the stones were worn, evidence exists that many seal stones were worn face down. In the fresco, above, the seal stone on the man's wrist does not show any image or design. There could be two reasons for this, either that the artist did not feel the need to add the detail, knowing her or his audience could recognize a seal stone, or it was common practice to wear them with the carving against the skin. This may have been done to protect the cutting, or, if Evans was correct and these were magical, it could be a form of contagious magic. Evans called it sympathetic magic in his book but if the magic comes from the image and if the image needs to touch the wearers skin to transfer the power, then it would be a form of contagious magic. There is other evidence besides the fresco that seal stones were worn with the carving towards the skin. Some lentoids have a conical shaped back. An example of one like this can be seen in figure 3.18, a stone which would be impossible to wear except face down.³⁴

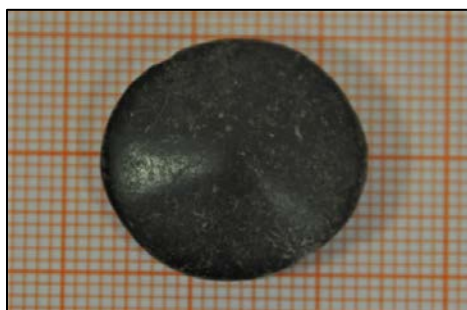


Figure 3.18 - The back of CMS II, 3, 92.

³⁴ This was also noted in by John Younger (Younger 1977, 156, n.76.)

Also, the image or design on many of the talismanic stones is almost impossible to see either from size of the stone or from the material. This makes me think that the image was not the important part of the stone. Examples of these can be seen in 3.19. *CMS II*, 3, 313, left photograph, has a radius of 10mm, the carving would have been difficult for anyone, including the owner to see unless very close up. The other examples are made of materials that obscure the image.

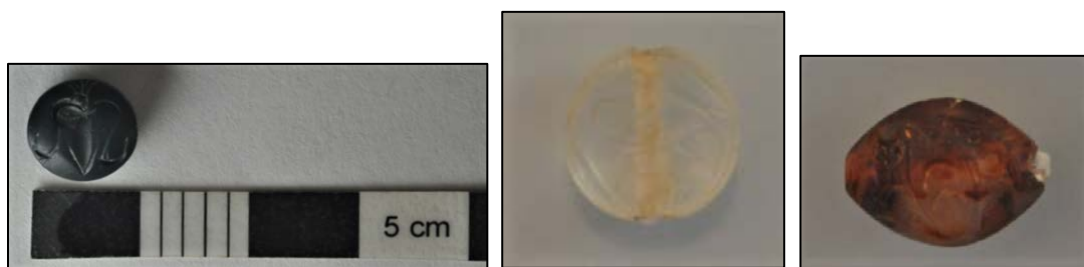


Figure 3.19 – (from left to right) *CMS II*, 3, 313; *CMS II*, 3, 251; and *CMS II*, 3, 295 (Images taken at Archaeological Museum at Heraklion)

The talismanic seal stones were rarely used as stamps. They could not have been used as individual identification because of their uniformity. They could have been used as magical charms as Evans thought, with the power originating from the incised image. However, it seems that if they were used in this way, as Boardman argued, we would expect the images to have been more carefully carved and worn with the design facing the correct direction. Furthermore, if seeing the image clearly were important, materials that obscure the image would be excluded. Possibly the talismanic stones were used as amulets, meaning

the charm or magic was associated with the material, the shape, or more likely the color of the stone. They were certainly worn around the neck and on the wrist, like jewelry. This may not have been their primary function, but it is the only function for which we have definite evidence.

Conclusion

The talismanic seal stone of Crete was categorized by Sir Arthur Evans in the late 1890s. Evans believed these seal stones were worn by the ancient Cretans to impart magic on the wearer arising from the image, not the mineral, color, or shape of the stone. He cited ethnographic evidence as the reason for this interpretation.³⁵ Few studies have examined this type of stone since Evans'.

The talismanic seal stones cannot be defined by their use because we do not know how they were used. They cannot be defined by their shape or material either, though predominately amygdaloid shaped and made of carnelian, these two characteristics are not unique to talismanic seals alone. The carvings on their surfaces can be divided into between 9-11 motif categories but the categories themselves are common to all seal stones. As mentioned above what sets the talismanic seal stone apart is the style in which they were cut.

³⁵ See *supra* n. 17, Chapter I.

All seal stones were made with similar tools but it was the way the lapidary used these tools that made a stone ‘talismanic’ or figurative or any other style. The figures and designs on the talismanic stones were made up of lines, arches, circles, and rings. Animals and plants were made in an abstract way on purpose, not because the lapidary was in a hurry or bad at his/her job. This style, which works well when cutting cross-hatching or fish, is what makes the talismanic seal stone unique.

This thesis was written on the talismanic seal stones found on Crete. It presents a re-evaluation of a type of seal stone that has been overlooked in other studies on Minoan seal stones. Three hundred and eighty-four stones were collected, organized, and studied in preparation of this thesis. They were organized in spreadsheets and spatially on maps. Appendix A gives a brief description of how the maps were created. It also presents three maps not included in this chapter. Appendix B is the spreadsheet created with information on all 384 stones from the *CMS*. These maps and spreadsheets were made in an attempt to characterize the talismanic stone. In this process it was discovered that the shape or material or provenience do not set this type of seal stone apart. The defining characteristic of the talismanic seal stone is its style.

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Appendix A

Mapping

All of the maps in this thesis were created through ArcMap and QGIS software. Close to 75% of the coordinates needed to create the site shapefiles could be found online.¹ The remaining sites were found in either *The Archaeology of Crete – An Introduction* by J.D.S. Pendlebury or *Η Προϊστορική Κατοικησις της Ελλάδος και η Γενεσις του Ελληνικού Εθνους* by Konstantinos Syriopoulos.² The book by Pendlebury is a general guide to the archaeology of Crete, included are maps with prominent sites from each time period. The book by Syriopoulos is a catalog of prehistoric locations in Greece. The book is divided by time period and then by region. Each section includes a map.

Table 4.1 is a section of the spreadsheet created with all the sites, their coordinates, and number of seal stones found. This was imported to QGIS to create a shapefile.³ Figures 4.2 – 4.8 are maps created in ArcMap.⁴ Figure 4.9 is a graph created in the same software.

¹ Almost all locations with a Wikipedia entry include coordinates. These coordinates are linked to GeoHack. These are pages that list the coordinates of the site or location and mapping options, such as Google Maps. Another source for coordinates is the Ancient-Greece.org web site.

² The site of Sinda, where one seal stone was found, could not be found on any map. This site was consequently removed from the spatial analysis part of this project.

³ ArcMap encountered problems with some of the spreadsheets, QGIS was used as an alternative.

⁴ The shapefile of Crete was created by Dr. Sarah Murray and the topographic shapefile was downloaded from <http://GEODATA.gov.gr>.

Table 4.1 – A section of the spreadsheet with location name, coordinates, and number of talismanic seal stones found.

	A	B	C	D	E
1	Site Name	Northing	Easting	Number of Seal Stones	
2	Kamilari	35.03359	24.79006		1
3	Knossos	35.29806	25.16306		39
4	Myrtidia	35.2179	26.2637		4
5	Sitia	35.2	26.1		19
6	Agios Kyrillos	34.97857	24.91069		1
7	Platanos	35.022777	24.020878		2
8	Koumassa	34.9833	25.0131		1
9	Ierapetra	35.01158	25.74057		3
10	Kato Zakros	35.09806	26.26139		3
11	Palikastro	35.20033	26.25003		13
12	Rethymnon	35.36667	24.46667		1
13	Livada	35.310461	24.855681		1
14	Katsambas	35.33083	25.15071		1
15	Episkopi	35.26667	25.25		4
16	Vathepetron	35.20495	25.15868		1
17	Malia	35.28333	25.45		29
18	Matala	34.99296	24.74971		1
19	Trypiti	34.938083	24.987		2
20	Gortyn	35.03663	25.02242		1
21	Prinias	35.15919	24.994544		1
22	Sambas	35.21565	25.26439		1
23	Jeraki	35.15128	25.35151		1
24	Kassani	35.10351	25.31314		1
25	Aphrati	35.10555	25.35405		3
26	Keravado	35.08214	25.33847		1
27	Lagoutas	35.0676	25.29714		1
28	Viannos	35.0475	25.4023		1
29	Lyttos	35.2059	25.3597		1
30	Cherssonisos	35.30219	25.35464		1
31	Gonies	35.29409	24.92864		1
32	Vrokastro	35.1199	25.7447		3
33	Gournia	35.10941	25.79261		14
34	Mochlos	35.18347	25.90496		13
35	Sykia	35.10356	26.058		3
36	Prassos	35.12948	26.06822		5
37	Psychro	35.16247	25.44522		1
38	Messa Lasithi	35.1821	25.51343		1
39	Loumas	35.31316	25.71479		1
40	Elounda	35.26667	25.71667		4
41	Mirabela	35.12504	25.738		4
42	Kochlakias	35.147	26.24685		1
43	Tylissos	35.29704	25.018285		1
44	Anoja	35.28937	24.88447		1
45	Poros	35.34191	25.15214		1

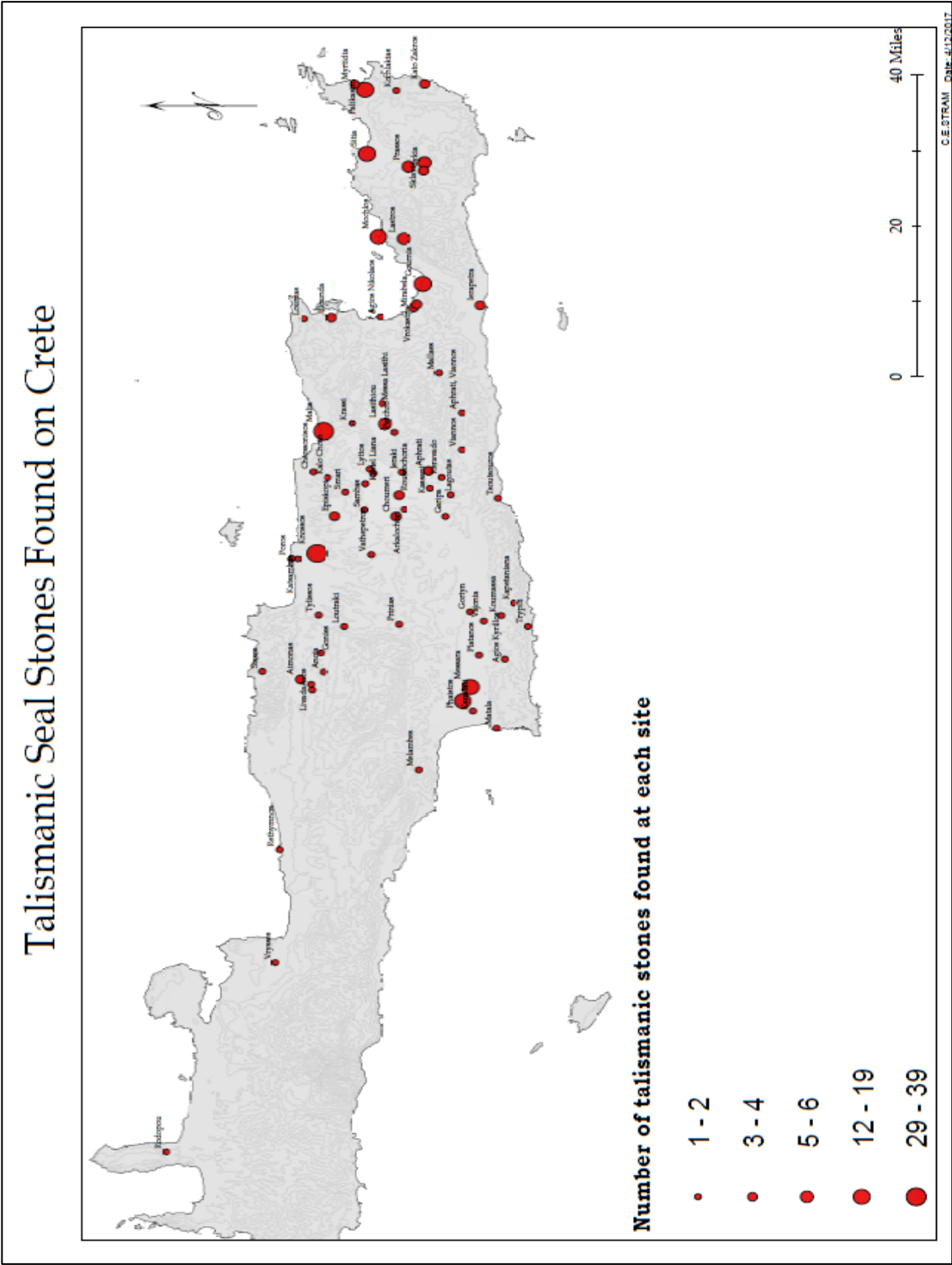


Figure 4.2 - Map with Minoan sites where talismanic seal stones have been found.

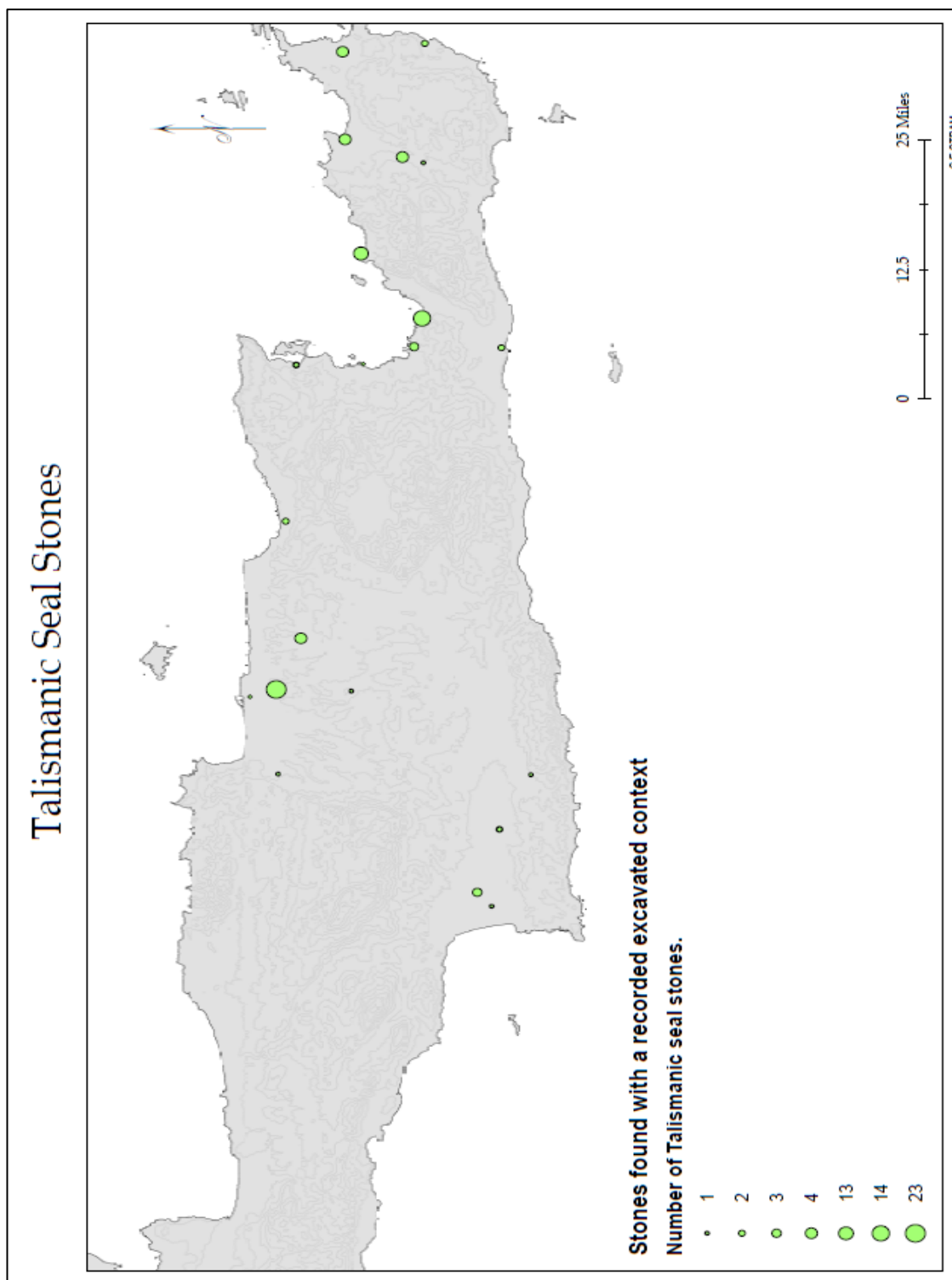


Figure 4.3 - Locations for talismanic seal stones found in excavated context.

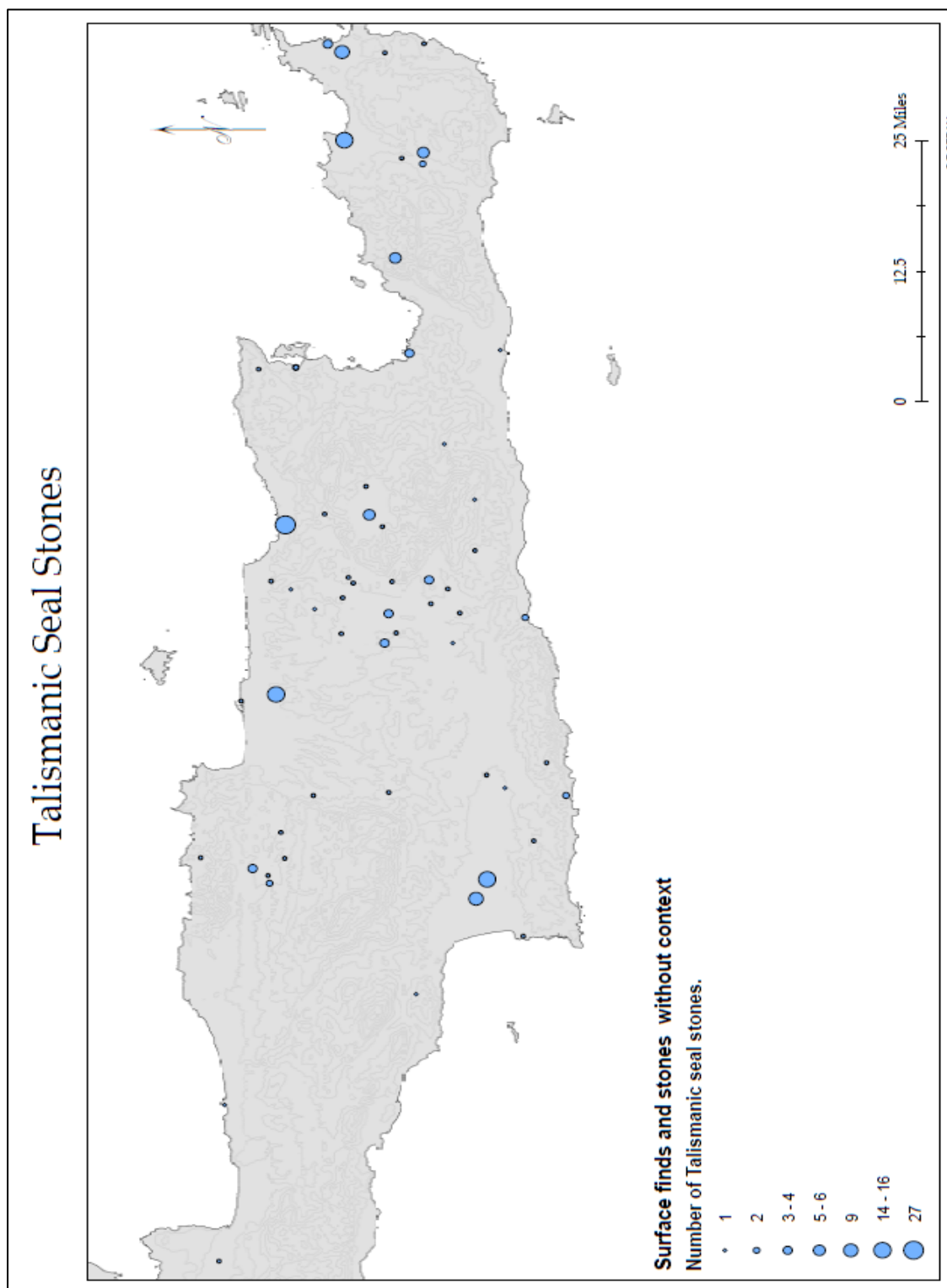


Figure 4.4 - Locations of talismanic seal stones without excavated context.

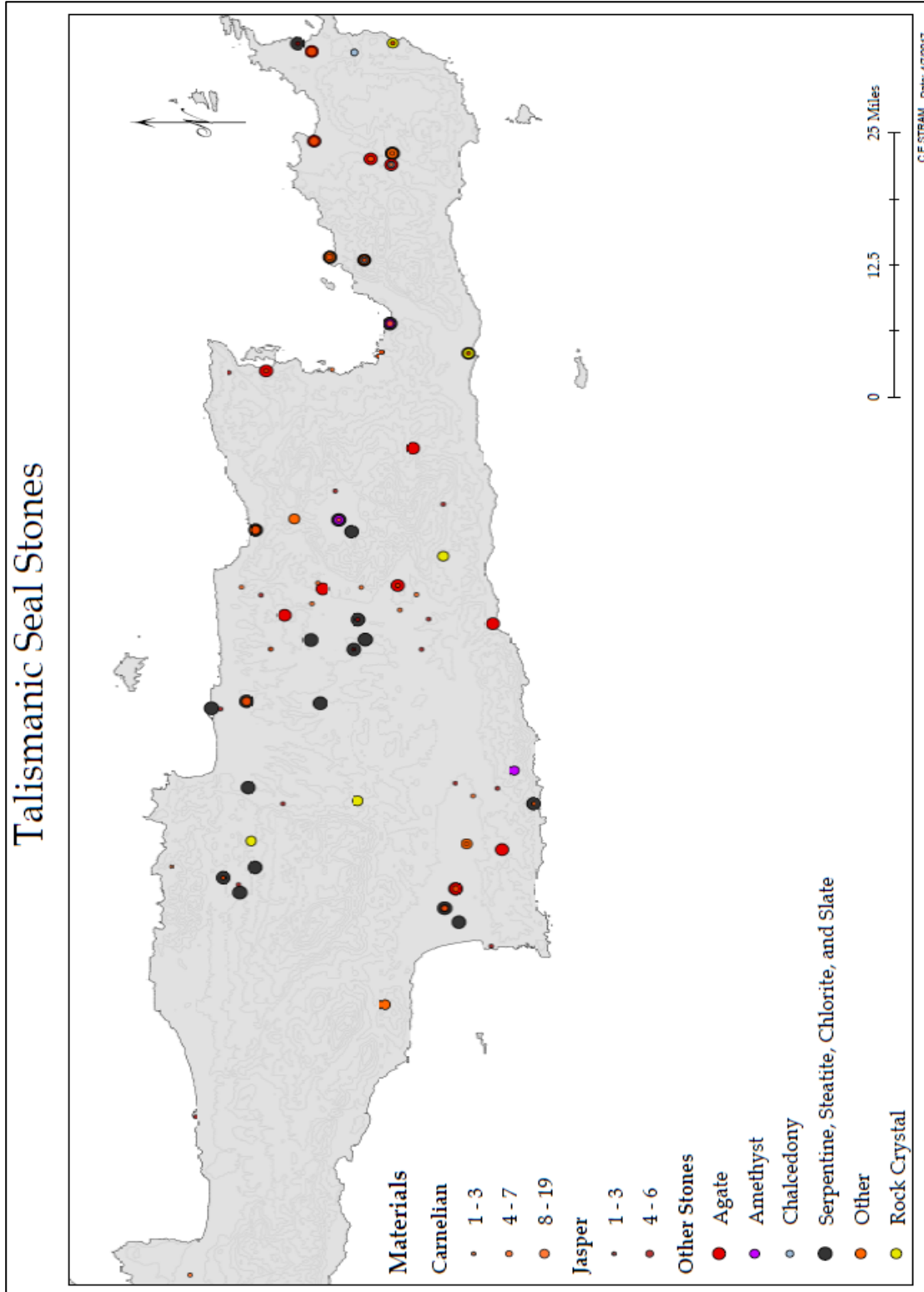


Figure 4.5 - Materials of talismanic seal stones

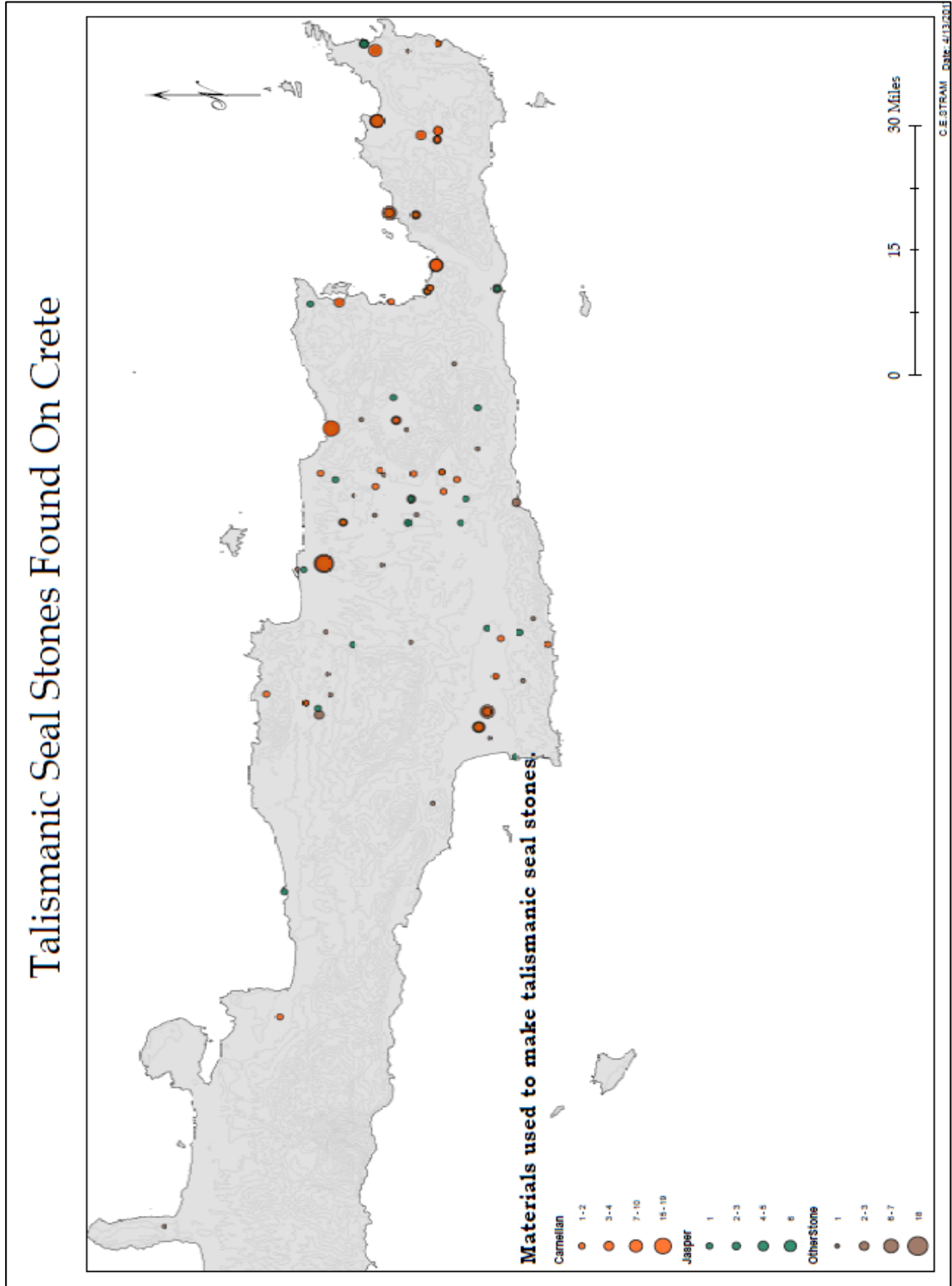


Figure 4.6 - Map of materials used to make talismanic seal stones.

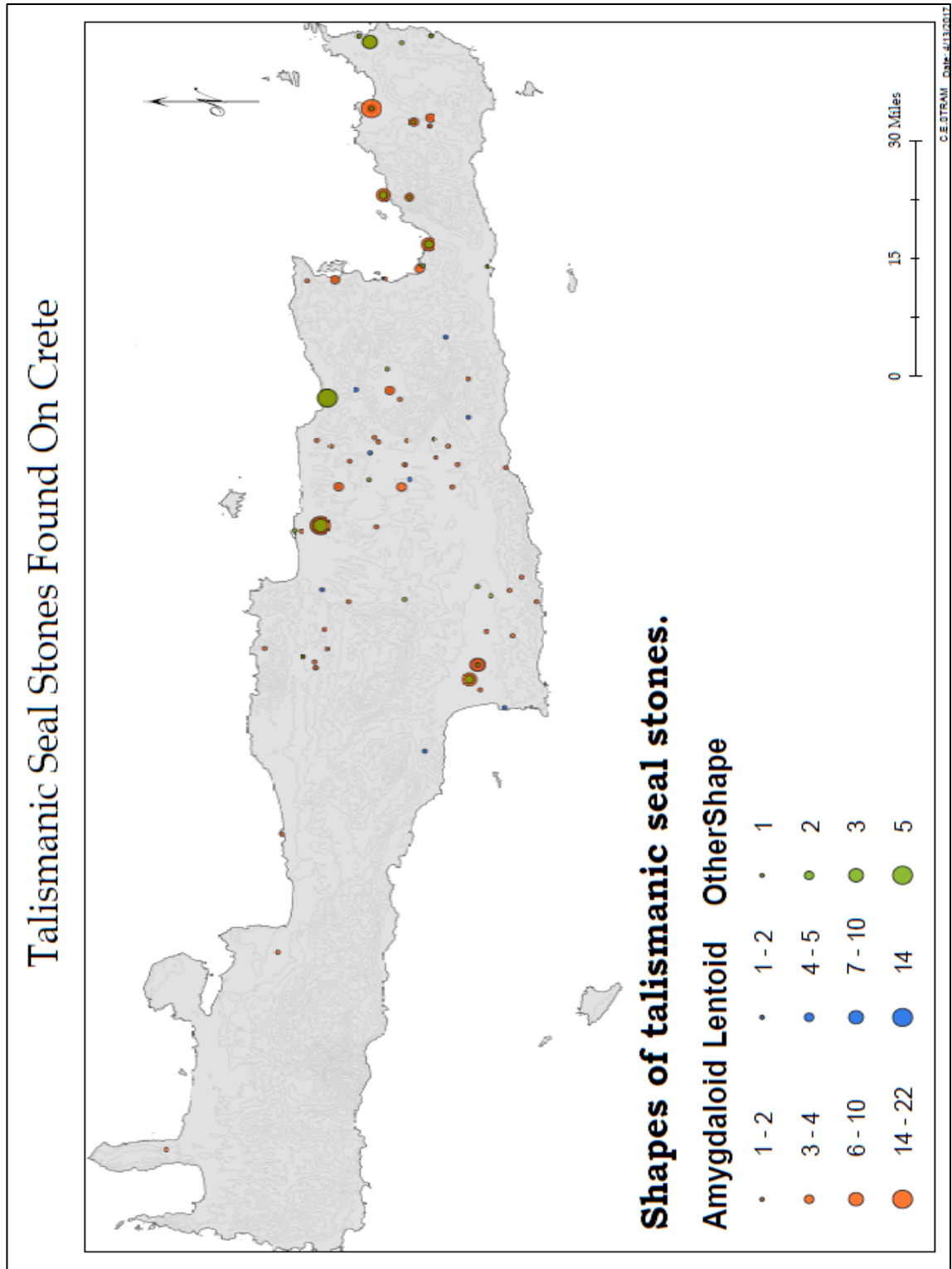


Figure 4.7 - Shapes of talismanic seal stones.

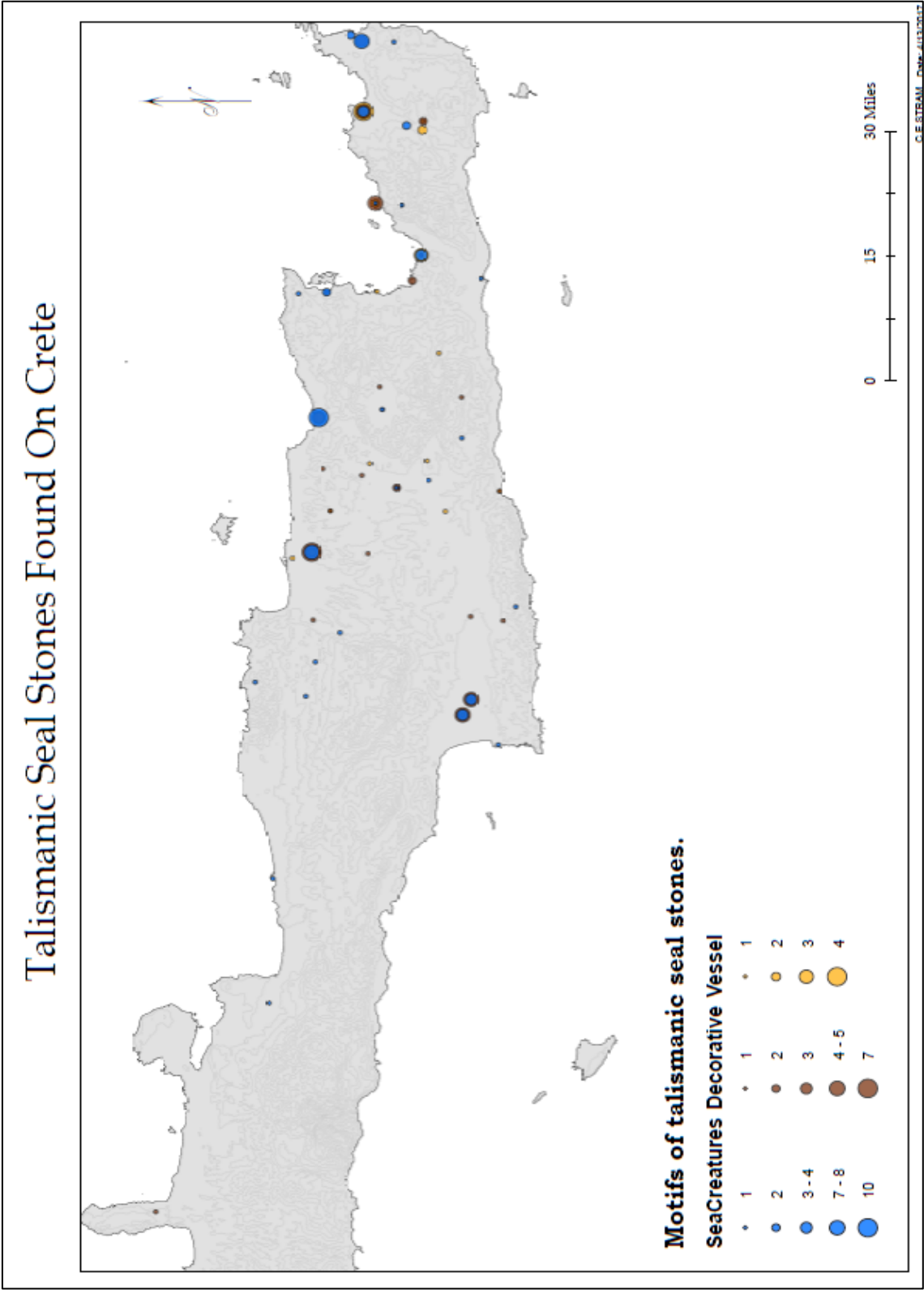
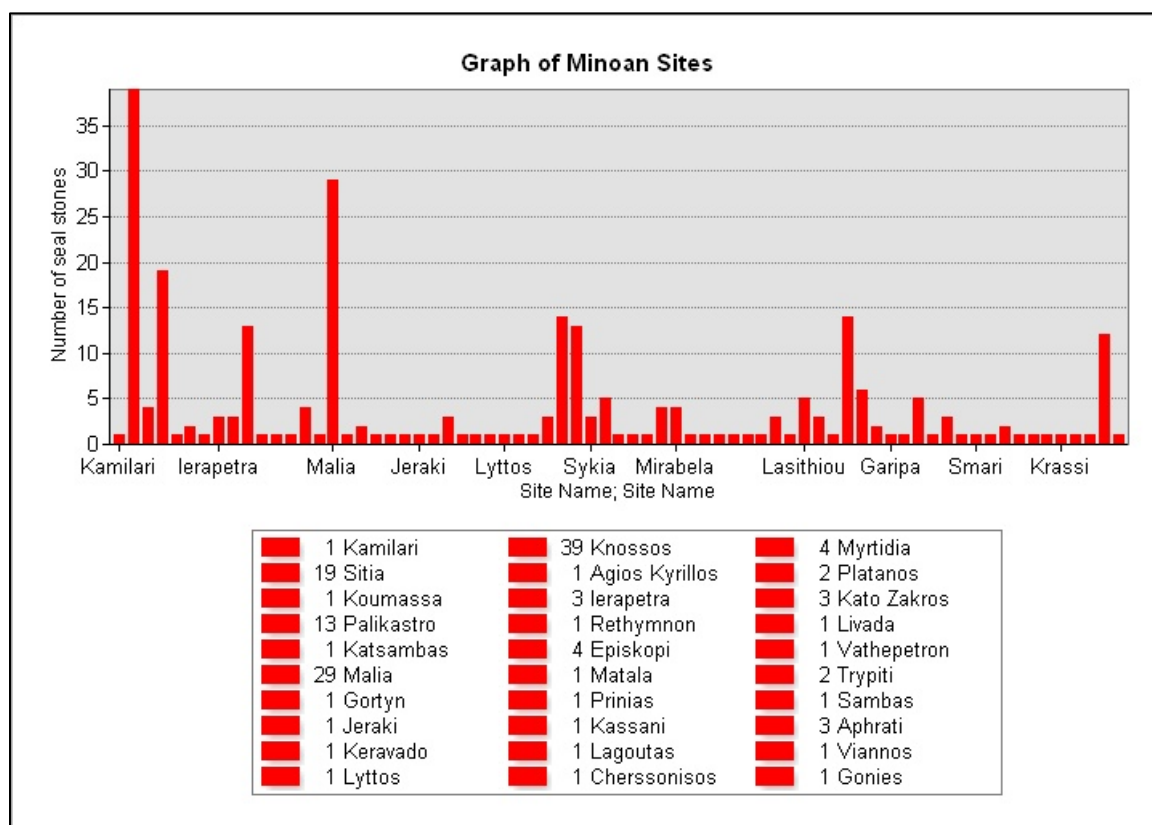


Figure 4.8 - Motifs on talismanic seal stones.

Table 4.9 - Graph of talismanic seal stones.



Appendix B

Appendix B is a spreadsheet with all the data collected on 384 talismanic seal stones. The first column lists the *CMS* number, then the provenience (if known), the context (if known), the shape of the stone, the material, how it was cut, the date, whether the *CMS* classifies the stone as talismanic or not, and motif. All of the information in this spreadsheet, comes from the *CMS* volumes I; IS; II,1; II,2; II,3; II,4; II,5; II,6; II,7; II,8; III, and IV. These volumes include seal stones in the National Archaeological Museum in Athens and the Archaeological Museum in Heraklion. For easier viewing, the spreadsheet has been oriented in landscape.

CMS #	SITE NAME	CONTEXT	SHAPE	MATERIAL	CUT	DATE	TALIS	MOTIF
IS 086-1	Agios Kyrillos	Hallway at Kephali	Amygdaloid	Agate?	Wheel Cut	SM I	Y	Insect
III 245-1	Agios Nikolaos		Amygdaloid	Carnelian	Wheel, Tube Cut	SM I	Y	Vessel
IV 153-1	Aimonas		Discoid	Carnelian	Wheel Cut	MM II - MM III	N	NT - Figurative
IV 236-1	Aimonas		Amygdaloid	Flecked Jasper	Wheel Cut	SM I	Y	Animal
IV 205-1	Aimonas		Lentoid	Steatite or Serpentine	Wheel?	SM I	Y	Animal
II 4-170-1	Anoja		Amygdaloid	Serpentine	Scraped, Wheel Cut	SM I ?	N	NT - Ornamental
II 3-205-1	Aphrati		Pillow	Agate	Wheel Cut	MM II - MM III	N	NT - Architectural
II 3-206-1	Aphrati		Amygdaloid	Carnelian	Wheel, Tube Cut	SM I	Y	Vessel
IV 251-1	Aphrati		Amygdaloid	Green Jasper	Wheel, Tube? Cut	SM I	Y	Animal
IV 247-1	Aphrati, Viannos		Amygdaloid	Jasper	Wheel Cut	SM I	Y	Decorative
II 4-192-1	Arkalochori		Lentoid	Serpentine	Wheel Cut	SM I	N	NT - Ornamental
IV 177-1	Axos		Amygdaloid	Agate	Wheel Cut	SM I	Y	Insect
IV D050-1	Axos		Lentoid	Serpentine or Slate	Scraped	SM I	N	NT - Figurative and Ornamental
II 3-215-1 A,B	Cherssonisos		Amygdaloid	Carnelian	Wheel, Tube Cut	SM I	Y	3-Sided Prism
IV 202-1	Choumeri		Amygdaloid	Green Jasper	Wheel Cut	SM I	Y	Double Ax
IV 234-1	Choumeri		Amygdaloid	Jasper	Wheel Cut	SM I	Y	Heart
IV 206-1	Choumeri		Amygdaloid	Steatite or Serpentine	Wheel?	SM I	N	NT - Figurative and Ornamental
IV 183-1	Elounda		Lentoid	Agate	Tube, Wheel Cut	SM I	Y	Plant

II 3-297-1	Elounda		Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Decorative
II 3-296-1	Elounda		Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Sea Creature
II 3-295-1	Elounda		Amygdaloid	Carnelian	Wheel, Tube Cut	SM I	Y	Sea Creature
II 3,140-1	Episkopi	Christou Corridor, grave ?	Lentoid	Carnelion	Wheel Cut	SM I	N	NT - Ornamental
II 3,138-1	Episkopi	Kephala Corridor Grave ?	Amygdaloid	Green Jasper	Wheel Cut	SM I	Y	Decorative
II 3,137-1	Episkopi	Kephala Corridor Grave ?	Amygdaloid	Green Jasper	Wheel Cut	SM I	Y	Vessel
II 3,139-1	Episkopi	Kephala Corridor Grave ?	Amygdaloid	Green Jasper	Wheel, Tube Cut	SM I	Y	Animal
IV 181-1	Garipa		Amygdaloid	Green Jasper	Tube, Wheel Cut	SM I	Y	Vessel
II 3-220-1	Gonies		Amygdaloid	Rock Crystal	Wheel Cut	SM I	Y	Sea Creature
II 3-163-1	Gortyn		Pillow	Green Jasper	Wheel, Tube Cut	SM I	Y	Decorative
II 3-234-1	Gournia	Settlement, House Hb	Lentoid	Agate	Wheel Cut	SM I	Y	Heart
II 3-247-1	Gournia	Necropolis of Sphoungaras, Pithosbestattun g, MM III - LM I	Pillow	Amethyst	Wheel Cut	SM I	Y	Heart
II 3-244-1	Gournia	Necropolis of Sphoungaras, Pithosbestattun g, MM III - LM I	Amygdaloid	Amethyst	Wheel Cut	SM I	Y	Sea Creature
II 3-245-1	Gournia	Necropolis of Sphoungaras, Pithosbestattun g, MM III - LM I	Lentoid	Amethyst	Wheel, Tube Cut	SM I	Y	Sea Creature
II 3-241-1	Gournia	Necropolis of Sphoungaras, Pithosbestattun g, MM III - LM I	Lentoid	Carnelian	Tube, Wheel Cut	SM I	Y	Vessel
II 3-242-1	Gournia	Necropolis of Sphoungaras,	Amygdaloid	Carnelian	Tube, Wheel Cut	SM I	Y	Vessel

		Pithosbestattung, MM III - LM I						
II 3-231-1 A,B,C	Gournia	Palace? Room G3 House?	3-Sided Prism	Carnelian	Wheel Cut	SM I	Y	3-Sided Prism
II 3-243-1	Gournia	Necropolis of Sphoungaras, Pithosbestattung, MM III - LM I	Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Architectural
II 3-233-1	Gournia	Settlement	Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Vessel
II 3-232-1	Gournia	Augos Settlement	Amygdaloid	Carnelian	Wheel, Tube Cut	SM I	Y	Sea Creature
II 3-248-1	Gournia	Necropolis of Sphoungaras, Pithosbestattung, MM III - LM I	Amygdaloid	Carnelian	Wheel, Tube Cut	SM I	Y	Sea Creature
II 3-249-1	Gournia	Necropolis of Sphoungaras, Pithosbestattung, MM III - LM I	Lentoid	Rock Crystal	Wheel Cut	SM I	Y	Decorative
II 3-235-1	Gournia	Settlement, house MM III - LM I	Amygdaloid	Rock Crystal	Wheel Cut	SM I	Y	Double Ax
II 3-246-1	Gournia	Necropolis of Sphoungaras, Pithosbestattung, MM III - LM I	Lentoid	Steatite or Serpentine	Wheel Cut	SM I	Y	Plant
IV 162-1	Ierapetra		Amygdaloid	Agate	Wheel, Tube Cut	SM I	Y	Vessel
II 2,273-1 A,B,C	Ierapetra		4-Sided Prism	Green Jasper	Tube	MM II	N	NT - 4-Sided Prism, Ornamental
IV 187-1	Ierapetra		Lentoid	Rock Crystal	Tube, Wheel Cut	SM I	Y	Sea Creature
II 3-203-1A,B,C	Jeraki		3-Sided Amygdaloid	Carnelian	Wheel, Tube Cut	SM I	Y	3-Sided Prism
IV 231-1	Kalo Choio		Amygdaloid	Green Jasper	Wheel, Tube Cut	SM I	Y	Decorative
II 2,016-1	Kamilari	Room ? Tholostomb from MM II B -	Amygdaloid	Serpentine or Slate	Wheel, Compass Cut	MM II - MM III	N	NT - Figurative or Ornamental possibly Talismanic

	MM III A, SM III A context							
IV 242-1	Kanli Kasteli		Amygdaloid	Agate	Wheel Cut	SM I	Y	Vessel
IV 204-1	Kapetaniana		Amygdaloid	Amethyst	Wheel, Tube Cut	SM I	Y	Sea Creature
II 3-204-1	Kassani		Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Sea Creature
IV 249-1	Kastel Liana		Lentoid	Carnelian	Wheel Cut	SM I	Y	Decorative
IV 200-1	Kato Zakros		Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Animal
II 3-286-1	Kato Zakros		Amygdaloid	Green Jasper	Wheel Cut	SM I	Y	Ship
II 2,283-1	Kato Zakros		Discoid	Rock Crystal	Wheel Cut	MM II	N	NT - Figurative
II 3,130-1	Katsambas	House ar Quarry	Amygdaloid	Green Jasper	Wheel Cut	SM I	Y	Vessel
II 3-207-1	Keravado		Amygdaloid	Carnelian	Wheel, Tube Cut	SM I	Y	Ship
II 3,012-1 A,B	Knossos		3-Sided Prism	Carnelian	Wheel Cut	SM I	Y	3-Sided Prism
III 309-1	Knossos		Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Decorative
III 345-1	Knossos		Lentoid	Carnelian	Wheel Cut	SM I	Y	Decorative
II 3,047-1	Knossos	Necropolis Epano Jypsades Grave II	Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Insect
II 3,030-1	Knossos	Necropolis Mavro Spilās Grave IV	Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Plant
III 278-1	Knossos		Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Sea Creature
III 299-1	Knossos		Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Sea Creature
II 3-182-1	Knossos		Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Ship
II 3,049-1	Knossos	Necropolis Epano Jypsades	Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Sea Creature

		Grave VII *Under Skull						
II 3,082-1 A,B	Knossos	Sanctuary of Demeter Deposit H House ?	3-Sided Prism	Carnelian	Wheel, Tube Cut	SM I	Y	3-Sided Prism
III 289-1	Knossos		Lentoid	Carnelian	Wheel, Tube Cut	SM I	Y	Insect
II 3,042-1	Knossos	Necropolis Sapher Papoura Grave 36?	Amygdaloid	Carnelian	Wheel, Tube Cut	SM I	Y	Sea Creature
II 3,081-1	Knossos	Sanctuary of Demeter Deposit H House ?	Amygdaloid	Carnelian	Wheel, Tube Cut	SM I	Y	Sea Creature
III 294-1	Knossos		Lentoid	Carnelian	Wheel, Tube Cut	SM I	Y	Sea Creature
II 3,026-1	Knossos	House of the High Priest ?	Amygdaloid	Carnelian?	Wheel, Tube Cut	SM I	Y	Sea Creature
II 3-180-1	Knossos		Amygdaloid	Chalcedony	Wheel, Tube Cut	SM I	N	NT - Figurative
II 3-178-1	Knossos		Lentoid	Green Jasper	Wheel Cut	SM I	Y	Plant
II 4-124-1	Knossos	Necropolis Mavro Spilão, Grave VI, rock chamber grave,MM III - LMIA	Lentoid	Green Jasper	Wheel Cut	SM I	Y	Sea Creature
III 304-1	Knossos		Amygdaloid	Green Jasper	Wheel, Tube Cut	SM I	Y	Decorative
II 3,097-1	Knossos		Amygdaloid	Green Jasper	Wheel, Tube Cut	SM I	Y	Vessel
II 3,080-1	Knossos	Sanctuary of Demeter Deposit H House SM I - SM II ? Context	Amygdaloid	Hematite	Wheel, Round Bead Cut	SM I	Y	Lion Mask
II 3-177-1	Knossos		Amygdaloid	Pseudojasper	Wheel, Tube Cut	SM I	Y	Vessel
II 4-110-1	Knossos	Palace	Amygdaloid	Red Jasper	Scraped	SM I ?	N	NT - Ornamental

IV 208-1	Knossos		Amygdaloid	Rock Crystal	Wheel Cut	SM I	Y	Ship
III 305-1	Knossos		Amygdaloid	Rock Crystal	Wheel, Tube Cut	SM I	Y	Decorative
II 4-186-1	Knossos	Ellinika Corridor	Lentoid	Serpentine	Circle, Scraped ?	SM I	N	NT - Ornamental
II 4-147-1	Knossos		Pillow	Serpentine	Circle, Wheel Cut	MM III - LM I	N	NT - Ornamental
II 4-128-1	Knossos	Necropolis Mavro Spilão, Grave XVII, Chamber B, rock chamber grave SM II	Amygdaloid	Serpentine	Scraped, Wheel ? Cut	MM III - LM I	N	NT - Architectural
II 3-186-1	Knossos		Lentoid	Serpentine	Wheel Cut	MM III - LM I	N	NT - Ornamental
III 270-1	Knossos		Amygdaloid	Serpentine	Wheel Cut	SM I	N	NT - Ornamental
II 4-014-1	Knossos		Amygdaloid	Serpentine	Wheel, Circle Cut	SM I ?	N	NT - Ornamental
II 3-185-1	Knossos		Lentoid	Serpentine	Wheel?	MM III - SM I	N	NT - Architectural
II 3,071-1	Knossos	Temple Tomb	Lentoid	Serpentine	Wheel Cut	SM I	Y	Decorative
III 287-1	Knossos		Lentoid	Slate	Wheel?, Circle? Cut	SM I	Y	Decorative
II 3,093-1	Knossos		Lentoid	Steatite or Serpentine	Cut, Scraped	SM I - SM II	N	NT - Cretan Popular Group
II 3,072-1	Knossos	Hogarth's Tomb, rock chamber grave, Geometric context	Lentoid	Steatite or Serpentine	Cut, Scraped	SM I	N	NT - Popular Cretan Group
II 3,092-1	Knossos		Lentoid	Steatite or Serpentine	Cut, Scraped	SM I - SM II	N	NT - Popular Cretan Group
II 3,037-1	Knossos	Necropolis Mavro Spilās Grave IX Chamber D	Lentoid	Steatite or Serpentine	Wheel Cut	SM I	Y	Decorative

II 3,045-1	Knossos	Necropolis Sapher Papoura ? Grave ?	Amygdaloid	Steatite or Serpentine	Wheel, Tube Cut	MM III - LM I	N	NT - Architectural
II 3-325-1	Kochlakias		Pillow	Chalcedony	Wheel Cut	SM I	Y	Sea Creature
II 2,026-1	Koumassa	Tholos B	Amygdaloid	Green Jasper	Wheel Cut	MM II - MM III	Y	Decorative
IV 260-1	Krassi		Lentoid	Hematite	Wheel Cut	SB I - SB II	N	NT - Cut Style
II 3 208-1	Lagoutas		Amygdaloid	Green Jasper	Wheel Cut	SM I	Y	Ship
III 334-1	Lasithiou		Amygdaloid	Amethyst	Wheel Cut	SM I	Y	Sea Creature
III 263-1	Lasithiou		Amygdaloid	Carnelian	Wheel Cut	SM I	N	NT - Figurative
III 271-1	Lasithiou		Lentoid	Carnelian	Wheel, Tube Cut	SM I	Y	Heart
III 275-1	Lasithiou		Amygdaloid	Chlorite?	Wheel Cut	SM I	Y	Lion Mask
III 311-1	Lasithiou		Amygdaloid	Limestone	Wheel Cut	SM I	Y	Decorative
IV 189-1	Lastros		Amygdaloid	Agate	Wheel Cut	SM I	Y	Plant
IV 191-1	Lastros		Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Double Ax
LASTROS	Lastros		Lentoid	Carnelian	Wheel Cut	SM I	Y	Heart
IV 192-1	Lastros		Pillow	Chalcedony	Wheel Cut	SM I	Y	Vessel
IV 193-1	Lastros		Amygdaloid	Green Jasper	Wheel Cut	SM I	Y	Sea Creature
IV 195-1	Lastros		Lentoid	Obsidian	Wheel, Tube Cut	SM I	N	NT - Figurative and Ornamental
II 3,006-1	Livada		Amygdaloid	Green Jasper	Wheel, Tube Cut	SM I	Y	Sea Creature
II 3-294-1	Loumas		Amygdaloid	Green Jasper	Wheel Cut	SM I	Y	Sea Creature
IV D047-1	Loutraki		Amygdaloid	Flecked Jasper	Wheel Cut	SM I	Y	Sea Creature

II 3-211-1	Lyttos	SM I context	Amygdaloid	Carnelian?	Wheel Cut	SM I	Y	Plant
III 308-1	Malia		Lentoid	Agate	Wheel Cut	SM I	Y	Double Ax
III 276-1	Malia		Gable Prism	Agate	Wheel Cut	SM I	Y	Sea Creature
III 338-1	Malia		Button	Carnelian	Wheel Cut	MM II - MM III	Y	Animal
III 290-1	Malia		Lentoid	Carnelian	Wheel Cut	SM I	Y	Insect
III 268-1	Malia		Lentoid	Carnelian	Wheel Cut	SM I	Y	Plant
III 283-1	Malia		Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Sea Creature
III 284-1	Malia		Lentoid	Carnelian	Wheel Cut	SM I	Y	Sea Creature
III 288-1	Malia		Lentoid	Carnelian	Wheel Cut	SM I	Y	Sea Creature
III 321-1	Malia		Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Sea Creature
III 328-1	Malia		Lentoid	Carnelian	Wheel Cut	SM I	Y	Sea Creature
III 336-1	Malia		Lentoid	Carnelian	Wheel Cut	SM I	Y	Sea Creature
IV 209-1	Malia		Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Sea Creature
III 264-1	Malia		Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Ship
III 272-1	Malia		Amygdaloid (Prism with ladder rub	Carnelian	Wheel, Barrel Cut ?	SM I	Y	Heart
IV 210-1	Malia		Amygdaloid	Carnelian	Wheel, Tube Cut	SM I	Y	Decorative
III 253-1	Malia		Pillow	Carnelian	Wheel, Tube Cut	SM I	Y	Insect
III 274-1	Malia		Amygdaloid	Carnelian	Wheel, Tube Cut	SM I	Y	Lion Mask
III 244-1	Malia		Amygdaloid	Carnelian	Wheel, Tube Cut	SM I	Y	Sea Creature

III 324-1	Malia		Lentoid	Carnelian	Wheel, Tube Cut	SM I	Y	Sea Creature
III 249-1	Malia		Amygdaloid	Carnelian	Wheel, Tube Cut	SM I	Y	Vessel
III 258-1	Malia		Amygdaloid	Carnelian	Wheel, Tube Cut	SM I	Y	Vessel
IV 178-1	Malia		Amygdaloid	Green Jasper	Wheel Cut	SM I	Y	Decorative
IV 220-1	Malia		Amygdaloid	Green Jasper	Wheel Cut	SM I	Y	Ship
IV 235-1	Malia		Amygdaloid	Green Jasper	Wheel, Tube Cut	SM I	Y	Decorative
III 257-1	Malia		Lentoid	Green Jasper	Wheel, Tube Cut	SM I	Y	Vessel
III 280-1	Malia		Pillow	Limestone	Wheel Cut	SM I	Y	Plant
III 241-1 A,B,C	Malia		4-Sided Prism	Rock Crystal	Wheel Cut	MM II - MM III	N	4-Sided Prism
II 3,151-1A,B	Malia	Atelier de Sceaux, stray find	Amygdaloid	Serpentine	Wheel Cut	SM I ?	N	NT - Script
II 3,144-1	Malia	Central Court of Palace	Lentoid	Steatite or Serpentine	Wheel Cut	SM I	Y	Plant
IV 165-1	Mallaes		Lentoid	Agate	Wheel, Tube Cut	SM I	Y	Vessel
II 3-159-1	Matala		Lentoid	Pseudojasper	Wheel, Tube Cut	SM I	Y	Sea Creature
IV D041-1	Melambes		Lentoid	Hard Stone	Wheel Cut	SM I	Y	Animal
II 3-291-1	Messa Lasithi		Pillow	Green Jasper	Wheel, Tube Cut	SM I	Y	Decorative
IV D049-1	Messara		Lentoid	Agate	Wheel Cut	SM I	N	NT - Ornamental
IV 224-1	Messara		Amygdaloid	Agate	Wheel, Tube Cut	SM I	N	NT - Figurative
IV 169-1	Messara		Lentoid	Agate	Wheel, Tube Cut	SM I	Y	Sea Creature
IV 172-1	Messara		Lentoid	Agate	Wheel, Tube Cut	SM I	Y	Sea Creature

IV 179-1	Messara		Lentoid	Agate	Wheel, Tube Cut	SM I	Y	Vessel
IV D046-1	Messara		Lentoid	Carnelian	Wheel Cut	SM I	Y	Sea Creature
IV 225-1	Messara		Amygdaloid	Carnelian	Wheel, Tube Cut	SM I	Y	Animal
IV D042-1	Messara		Lentoid	Carnelian	Wheel, Tube Cut	SM I	Y	Animal
IV 237-1	Messara		Amygdaloid	Carnelian	Wheel, Tube Cut	SM I	Y	Decorative
IV 190-1	Messara		Amygdaloid	Green Jasper	Wheel Cut	SM I	Y	Decorative
IV 194-1	Messara		Amygdaloid	Green Jasper	Wheel Cut	SM I	Y	Decorative
IV 238-1	Messara		Amygdaloid	Jasper	Wheel, Tube Cut	SM I	Y	Decorative
IV 186-1	Messara		Lentoid	Rock Crystal	Wheel Cut	SM I	Y	Sea Creature
IV 254-1	Messara		3-Sided Prism	Slate	Scraped, Drilled	SM I	N	3-Sided Prism
II 3-301-1	Mirabela		Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Plant
II 3-298-1	Mirabela		Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Ship
II 3-299-1	Mirabela		Amygdaloid	Green Jasper	Wheel Cut	SM I	Y	Decorative
II 3-300-1	Mirabela		Amygdaloid	Green Jasper	Wheel Cut	SM I	Y	Decorative
II 3-265-1	Mochlos	Seager Excavation	Lentoid	Amethyst	Wheel Cut	SM I	Y	Heart
II 3-261-1	Mochlos	Seager Excavation	Amygdaloid	Carnelian	Wheel, Tube ? Cut	SM I	Y	Vessel
II 3-264-1	Mochlos	Seager Excavation	Lentoid	Carnelian	Wheel Cut	SM I	Y	Plant
II 3-258-1	Mochlos	Seager Excavation	Amygdaloid	Carnelian	Wheel, Tube Cut	SM I	Y	Animal
II 3-260-1	Mochlos	Seager Excavation	Amygdaloid	Carnelian	Wheel, Tube Cut	SM I	Y	Vessel

II 3-267-1	Mochlos	Seager Excavation	Amygdaloid	Green Jasper	Wheel Cut	SM I	Y	Decorative
II 3-263-1	Mochlos	Necropolis, Grave XXII, built chamber grave	Amygdaloid	Green Jasper	Wheel, Tube Cut	SM I	Y	Decorative
II 3-253-1	Mochlos	Necropolis, grave, SM I	Amygdaloid	Hematite	Wheel Cut	SM I	Y	Lion Mask
II 3-266-1	Mochlos	Seager Excavation	Amygdaloid	Rock Crystal	Wheel, Tube Cut	SM I	Y	Decorative
II 3-251-1	Mochlos	Necropolis, Grave I, MM III?	Discoïd	Rock Crystal	Wheel, Tube Cut	MM III - LM I	Y	Sea Creature
II 3-262-1	Mochlos	Seager Excavation	Lentoid	Serpentine	Wheel, Tube Cut	SM I	Y	Insect
II 3-255-1	Mochlos	Necropolis, Grave XVIII, built chamber grave	Pillow	Soft Stone	Scraped	SM I	Y	Decorative
II 3-268-1	Mochlos	Seager Excavation	Lentoid	Steatite or Serpentine	Wheel Cut	SM I	Y	Decorative
II 3,313-1	Myrtidia		Lentoid	Green Jasper	Wheel Cut	SM I	Y	Sea Creature
II 3-313-1	Myrtidia		Lentoid	Green Jasper	Wheel Cut	SM I	Y	Sea Creature
II 3-312-1	Myrtidia		Pillow	Serpentine	Wheel Cut	MM II - MM III	N	NT - Architectural
II 4-069-1	Myrtidia		Amygdaloid	unknown	Wheel Cut	MM III - LM I	N	NT - Figurative
II 3-318-1	Palikastro	in the city?	Amygdaloid	Agate	Wheel, Tube Cut	SM I	Y	Sea Creature
II 2,285-1 A,B,C	Palikastro		3-Sided Prism	Carnelian	Tube, Wheel Cut	MM II	Y	3-Sided Prism
II 3-320-1	Palikastro		Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Decorative
II 3-315-1	Palikastro		Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Sea Creature
II 3-317-1	Palikastro		Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Sea Creature
II 3-278-1	Palikastro	Block d, Room 11, house	Pillow	Carnelian	Wheel, Tube Cut	SM I	Y	Animal

II 3-319-1	Palikastro		Pillow	Carnelian	Wheel, Tube Cut	SM I	Y	Decorative
II 3-280-1	Palikastro	House s, house	Amygdaloid	Carnelian	Wheel, Tube Cut	SM I	Y	Sea Creature
II 3-281-1	Palikastro	House s ?, house?	Amygdaloid	Carnelian	Wheel, Tube Cut	SM I	Y	Sea Creature
II 3-284-1	Palikastro	British School Excavation	Amygdaloid	Carnelian	Wheel, Tube Cut	SM I	Y	Sea Creature
II 3-316-1	Palikastro		Amygdaloid	Carnelian	Wheel, Tube Cut	SM I	Y	Sea Creature
II 3-314-1	Palikastro	Sta Ellinika Corridor	Amygdaloid	Green Jasper	Wheel Cut	SM I	Y	Architectural
II 3-321-1	Palikastro		Amygdaloid	Green Jasper	Wheel, Tube Cut	SM I	Y	Decorative
III 301-1	Phaistos		Pillow	Carnelian	Wheel Cut	SM I	Y	Decorative
II 3,155-1	Phaistos		Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Plant
III 247-1	Phaistos		Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Sea Creature
II 3,156-1	Phaistos		Amygdaloid	Carnelian	Wheel,Tube Cut	SM I	Y	Decoration
III 326-1	Phaistos		Amygdaloid	Chalcedony?	Wheel Cut	SM I	Y	Sea Creature
III 281-1	Phaistos		Amygdaloid	Green Jasper	Wheel Cut	SM I	Y	Decorative
IV 214-1	Phaistos		Amygdaloid	Green Jasper	Wheel Cut	SM I	Y	Sea Creature
III 260-1	Phaistos		Amygdaloid	Green Jasper	Wheel Cut	SM I	Y	Vessel
II 3-157-1	Phaistos		Pillow	Green Jasper	Wheel, Tube Cut	SM I	Y	Decoration
II 3,154-1	Phaistos		Amygdaloid	Green Jasper	Wheel, Tube Cut	SM I	Y	Sea Creature
III 344-1	Phaistos		Lentoid	Red Jasper	Wheel, Tube Cut	SM I	Y	Decorative
III 273-1	Phaistos		Amygdaloid	Serpentine?	Wheel Cut ?	SM I	Y	Lion Mask

II 3,121-1	Platanos	Mycenaean Grave	Amygdaloid	Carnelian	Wheel, Tube Cut	SM I	Y	Architectural
II 2,025-1	Platanos	Tholos B corridor Stavros	Amygdaloid ?	Leg	Scraped, Circle Cut	MM II - MM III	N	NT - Ornamental
II 4-177-1	Poros	Amemomylos Corridor?	Pillow	Serpentine	Wheel Cut	MM II - MM III	N	NT - Architectural
II 3-308-1 A,B,C	Prassos		3-Sided Prism	Agate	Wheel, Tube Cut	SM I	Y	3-Sided Prism
II 3-275-1	Prassos	Bosanquet Excavation	Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Plant
II 3-272-1	Prassos	Bosanquet Excavation	Amygdaloid	Carnelian	Wheel, Tube Cut	SM I	Y	Double Ax
II 3-273-1	Prassos	Bosanquet Excavation	Amygdaloid	Carnelian	Wheel, Tube Cut	SM I	Y	Sea Creature
II 3-274-1	Prassos	Bosanquet Excavation	Amygdaloid	Carnelian	Wheel, Tube Cut	SM I	Y	Sea Creature
II 3-164-1	Prinias		Ring Stone	Rock Crystal	Wheel Cut	SM I	Y	Plant
II 3-289-1	Psychro		Amygdaloid	Slate	Wheel, Tube Cut	SM I	Y	Animal
II 3,002-1	Rethymnon		Amygdaloid	Green Jasper	Wheel, Tube Cut	SM I	Y	Sea Creature
IV 241-1	Rodopou		Amygdaloid	Medium-Hard Stone?	Wheel, Tube Cut	SM I	Y	Decorative
IV 218-1	Roussochori a		Amygdaloid	Green Jasper	Wheel Cut	SM I	Y	Sea Creature
II 4,193-1	Roussochori a		Lentoid	Serpentine	Wheel Cut	SM I	Y	Decorative
II 4-193-1	Roussochori a		Lentoid	Serpentine	Wheel Cut	SM I	Y	Decorative
II 3-201-1	Sambas		Pillow	Serpentine	Wheel Cut	MM II-MM III	N	NT - Architectural
IV 182-1	Sisses		Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Sea Creature
IV 219-1	Sitia		Amygdaloid	Agate	Wheel Cut	SM I	Y	Decorative
IV 226-1	Sitia		Amygdaloid	Agate	Wheel, Tube Cut	SM I	Y	Animal

III 293-1	Sitia	Amygdaloid	Agate	Wheel, Tube Cut	SM I	Y	Sea Creature
IV 223-1	Sitia	Amygdaloid	Agate	Wheel, Tube? Cut	SM I	Y	Heart
IV 180-1	Sitia	Amygdaloid	Agate ?	Wheel Cut	SM I	Y	Lion Mask
IV D045-1	Sitia	Amygdaloid	Agate?	Wheel, Tube Cut	SM I	Y	Vessel
IV 196-1	Sitia	Amygdaloid	Black Jasper	Wheel Cut	SM I	Y	Sea Creature
IV 188-1	Sitia	Amygdaloid	Carnelian	Tube, Wheel Cut	SM I	Y	Sea Creature
IV 197-1	Sitia	Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Decorative
IV 164-1	Sitia	Lentoid	Carnelian	Wheel Cut	MM II - MM III	N	NT - Architectural
IV 175-1	Sitia	Lentoid	Carnelian	Wheel Cut	SM I	Y	Plant
IV 252-1	Sitia	Lentoid	Carnelian	Wheel Cut	SM I	Y	Plant
IV 163-1	Sitia	Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Vessel
IV 244-1	Sitia	Amygdaloid	Carnelian	Wheel, Tube Cut	SM I	Y	Animal
IV 243-1	Sitia	Amygdaloid	Carnelian	Wheel, Tube Cut	SM I	Y	Vessel
IS 073-1 A,B,C,D	Sitia	4-Sided Prism	Green Jasper	Wheel Cut	MM II	N	4-Sided Prism
III 329-1	Sitia	Lentoid	Green Jasper	Wheel Cut	SM I	Y	Decorative
III 342-1	Sitia	Amygdaloid	Green Jasper	Wheel Cut	SM I	Y	Decorative
II 3-311-1	Sitia	Amygdaloid	Jasper?	Wheel, Tube? Cut	SM I	Y	Vessel
IV 203-1	Sklavi	Lentoid	Carnelian	Wheel Cut	SM I	Y	Plant
IV 201-1	Sklavi	Amygdaloid	Carnelian	Wheel, Tube Cut	SM I	Y	Decorative

IV D043-1	Sklavi		Amygdaloid	Carnelian	Wheel, Tube Cut	SM I	Y	Vessel
IV 207-1	Sklavi		Lentoid	Obsidian	Wheel, Tube Cut	SM I	Y	Decorative
IV 255-1	Sklavi		Amygdaloid	Slate	Scraped	SM I	Y	Double Ax
IV 227-1	Smari		Amygdaloid	Agate?	Wheel Cut	SM I	Y	Ship
IV D044-1	Sykia		Amygdaloid	Agate	Wheel Cut	SM I	Y	Vessel
II 3-270-1	Sykia	Kandemi Kephali Corridor, Sink Larnax Grave, SM III	Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Vessel
IV D031-1	Sykia		Lentoid	Chalcedony	Wheel, Tube Cut	MM II	N	NT - Ornamental
II 3-161-1	Trypiti		Amygdaloid	Carnelian?	Wheel, Tube Cut	SM I	N	NT - Ornamental
II 3-162-1	Trypiti		Amygdaloid ?	Slate?	Wheel Cut	SM I	N	NT - Ornamental
IV 239-1	Tsoutsouros		Amygdaloid	Agate	Wheel Cut	SM I	Y	Decorative
IV D048-1	Tsoutsouros		Amygdaloid	Agate	Wheel?, Tube Cut	SM I	Y	Vessel
II 4-108-1	Tylissos	Housing, Settlement SM IB - SM IIIAI	Lentoid	Serpentine	Wheel Cut	SM I	Y	Decorative
II 4-189-1	Vajonia	Perivola Corridor?	8 - Shield	Carnelian	Wheel, Tube Cut	SM I	Y	Insect
II 3,143-1	Vathepetron	mansion, stray find	Amygdaloid	Steatite or Serpentine	Wheel Cut	SM I	Y	Decoration
II 3-209-1	Viannos		Lentoid	Rock Crystal	Wheel Cut	SM I	Y	Sea Creature
II 3-230-1	Vrokastro	Karakovillia, Bone Enclosure II Ossuary	Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Plant
II 3-228-1	Vrokastro	Amygdali Corridor, Grave IV, chamber	Amygdaloid	Carnelian	Wheel, Tube Cut	SM I	Y	Plant

		grave subminoan- protogeometric House?						
II 3-229-1	Vrokastro		Pillow	Green Jasper?	Wheel Cut	SM I	Y	Plant
IV 215-1	Vrysses		Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Sea Creature
IS 074-1			Amygdaloid	Agate	Wheel Cut	SM I	Y	Ship
III 346-1 A,B			Lentoid	Agate	Wheel Cut	SM I	Y	2-Sided
I 455-1			Pillow	Agate?	Wheel Cut	SM I	Y	Decorative
IS 088-1			Lentoid	Amethyst	Wheel, Tube	SM I	Y	Animal
II 3-365-1			Amygdaloid	Black Jasper	Wheel, Tube Cut	SM I	Y	Sea Creature
I 451-1			Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Plant
I 462-1			Lentoid	Carnelian	Wheel Cut	SM I	Y	Sea Creature
I 464-1			Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Sea Creature
I 465-1			Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Vessel
II 3,361-1			Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Ship
III 296-1A,B			Amygdaloid	Carnelian	Wheel Cut	SM I	Y	3-Sided Prism
III 339-1			Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Animal
III 262-1			Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Architectural
II 3-372-1			Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Decorative
II 3-373-1			Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Decorative
III 306-1			Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Double Ax

III 307-1	Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Double Ax
III 291-1	Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Insect
II 4-231-1	Amygdaloid	Carnelian	Wheel Cut	SM I	N	NT - Figurative
II 3-223-1	Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Plant
III 312-1	Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Plant
III 314-1	Lentoid	Carnelian	Wheel cut	SM I	Y	Plant
II 3-371-1	Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Sea Creature
II 3-376-1	Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Sea Creature
III 248-1	Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Sea Creature
III 279-1	Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Sea Creature
III 282-1	Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Sea Creature
III 292-1	Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Sea Creature
III 297-1	Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Sea Creature
III 300-1	Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Sea Creature
III 327-1	Lentoid	Carnelian	Wheel Cut	SM I	Y	Sea Creature
III 332-1	Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Sea Creature
III 335-1	Lentoid	Carnelian	Wheel Cut	SM I	Y	Sea Creature
II 3-361-1	Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Ship
III 265-1	Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Ship

II 3-359-1	Lentoid	Carnelian	Wheel Cut	SM I	Y	Vessel
III 246-1	Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Vessel
III 251-1	Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Vessel
III 255-1	Amygdaloid	Carnelian	Wheel Cut	SM I	Y	Vessel
I 436-1 A,B,C	3-Sided Amygdaloid	Carnelian	Wheel, Round Bead	SM I	Y	3-Sided Prism
I 452-1	Amygdaloid	Carnelian	Wheel, Tube	SM I	Y	Sea Creature
I 460-1	Amygdaloid	Carnelian	Wheel, Tube	SM I	Y	Sea Creature
I 466-1	Amygdaloid	Carnelian	Wheel, Tube	SM I	Y	Sea Creature
IS 090-1	Lentoid	Carnelian	Wheel, Tube	SM I	Y	Sea Creature
IS 089-1	Amygdaloid	Carnelian	Wheel, Tube	SM I	Y	Vessel
III 347-1 A,B,C	3 - Sided	Carnelian	Wheel, Tube Cut	SM I	Y	3-Sided Prism
III 316-1	Amygdaloid	Carnelian	Wheel, Tube Cut	SM I	Y	Animal
III 252-1	Lentoid	Carnelian	Wheel, Tube Cut	SM I	N	NT - Figurative
III 343-1	Amygdaloid	Carnelian	Wheel, Tube Cut	SM I or Modern ?	N	NT - Ornamental
II 3-367-1	Amygdaloid	Carnelian	Wheel, Tube Cut	SM I	Y	Sea Creature
II 3-375-1	Lentoid	Carnelian	Wheel, Tube Cut	SM I	Y	Sea Creature
III 295-1	Amygdaloid	Carnelian	Wheel, Tube Cut	SM I	Y	Sea Creature
III 325-1	Amygdaloid	Carnelian	Wheel, Tube Cut	SM I	Y	Sea Creature
II 3-358-1	Amygdaloid	Carnelian	Wheel, Tube Cut	SM I	Y	Vessel

II 3-360-1	Amygdaloid	Carnelian	Wheel, Tube Cut	SM I	Y	Vessel
III 259-1	Amygdaloid	Carnelian	Wheel, Tube Cut	SM I	Y	Vessel
I 441-1	Amygdaloid	Carnelian	Wheel, Tube, Lunette Tube	SM I	Y	Sea Creature
II 3,367-1	Amygdaloid	Carnelian	Wheel, Tube, Round Bead Cut	SM I	Y	Sea Creature
IS 085-1	Amygdaloid	Carnelian?	Wheel Cut	SM I	Y	Insect
III 322-1	Lentoid	Chlorite	Wheel Cut	SM I	N	NT - Figurative
I 442-1	Lentoid	Chlorite?	Wheel, Circle Cut	SM I	N	NT - Ornamental
I 434-1	Discoid	Fluorite	Wheel Cut	MM II - MM III	N	NT - Ornamental
I 450-1	Amygdaloid	Green Jasper	Wheel Cut	SM I	Y	Sea Creature
I 454-1	Amygdaloid	Green Jasper	Wheel Cut	SM I	Y	Sea Creature
III 250-1	Amygdaloid	Green Jasper	Wheel Cut	SM I	Y	Animal
II 3-368-1	Amygdaloid	Green Jasper	Wheel Cut	SM I	Y	Decorative
III 302-1	Amygdaloid	Green Jasper	Wheel Cut	SM I	Y	Decorative
III 310-1	Amygdaloid	Green Jasper	Wheel Cut	SM I	Y	Decorative
III 277-1	Amygdaloid	Green Jasper	Wheel Cut	SM I	N	NT - Figurative
II 3-362-1	Amygdaloid	Green Jasper	Wheel Cut	SM I	Y	Sea Creature
II 3-366-1	Amygdaloid	Green Jasper	Wheel Cut	SM I	Y	Sea Creature
III 298-1	Amygdaloid	Green Jasper	Wheel Cut	SM I	Y	Sea Creature
III 331-1	Lentoid	Green Jasper	Wheel Cut	SM I	Y	Sea Creature

III 333-1	Amygdaloid	Green Jasper	Wheel Cut	SM I	Y	Sea Creature
I 439-1	Amygdaloid	Green Jasper	Wheel, Round Bead, Bezel Tube	SM I	Y	Decorative
II 3-374-1	Amygdaloid	Green Jasper	Wheel, Tube Cut	SM I	Y	Decorative
III 313-1	Amygdaloid	Green Jasper	Wheel, Tube Cut	SM I	Y	Decorative
III 340-1	Amygdaloid	Green Jasper	Wheel, Tube Cut	SM I	Y	Decorative
III 261-1	Amygdaloid	Green Jasper	Wheel, Tube Cut	SM I	N	NT - Figurative
III 315-1	Lentoid	Green Jasper	Wheel, Tube Cut	SM I	Y	Plant
II 3-364-1	Amygdaloid	Green Jasper	Wheel, Tube Cut	SM I	Y	Sea Creature
II 3-369-1	Amygdaloid	Green Jasper	Wheel, Tube Cut	SM I	Y	Sea Creature
IV 250-1	Amygdaloid	Green Jasper	Wheel, Tube Cut	SM I	Y	Sea Creature
I 438-1	Pillow	Green Jasper	Wheel, Tube, Lunette Tube	SM I	Y	Double Ax
I 437-1 A,B,C	3-Sided Amygdaloid	Green Jasper ?	Wheel, Round Bead, Lunette Tube	SM I	Y	3-Sided Prism
I 440-1	Amygdaloid	Green Jasper ?	Wheel, Round Bead, Lunette Tube	SM I	Y	Vessel
II 3-370-1	Amygdaloid	Green Jasper?	Wheel Cut	SM I	Y	Plant
I 461-1	Lentoid	hard stone	Wheel Cut	SM I	Y	Sea Creature
III 267-1	Lentoid	hard stone	Wheel Cut	SM I	Y	Decorative
III 341-1	Amygdaloid	hard stone	Wheel Cut	SM I	Y	Decorative
II 3-357-1	Amygdaloid	Hematite	Wheel Cut	SB I - SB II	N	NT - Cut Style

III 303-1	Amygdaloid	Hematite	Wheel, Tube Cut	SM I	Y	Decorative
I 457-1	Lentoid	Pseudojasper	Wheel Cut	SM I	Y	Sea Creature
I 453-1	Lentoid	Pseudojasper	Wheel Cut	SM I	Y	Decorative
IV 137-1 A,B,C	3 - Sided	Pseudojasper	Wheel Cut	MM II	N	NT - 3-Sided Prism
IS 087-1	Lentoid	Red Jasper	Wheel Cut	SM I	Y	Sea Creature
I 432-1	Discoid	Rock Crystal	Wheel Cut	MM II - MM III	N	NT - Architectural
I 456-1	Amygdaloid	Rock Crystal	Wheel Cut	SM I	Y	Sea Creature
II 3-363-1	Amygdaloid	Rock Crystal	Wheel Cut	SM I	Y	Sea Creature
IV 176-1	Amygdaloid	Rock Crystal	Wheel Cut	SM I	Y	Sea Creature
II 4-099-1	Amygdaloid	Serpentine	Circle, Scraped	SM I	N	NT - Ornamental
II 4-095-1	Lentoid	Serpentine	Wheel Cut	SM I	Y	Animal
II 4-098-1	Lentoid	Serpentine	Wheel Cut	SM I	Y	Decorative
II 4-234-1	Amygdaloid	Serpentine	Wheel Cut	SM I ?	Y	Decorative
III 266-1	Lentoid	Serpentine	Wheel Cut	SM I	Y	Decorative
II 3-377-1	Pillow	Serpentine	Wheel Cut	MM II - MM III	N	NT - Architectural
II 4-232-1	Lentoid	Serpentine	Wheel Cut	SM I	N	NT - Ornamental
II 4-094-1	Lentoid	Serpentine	Wheel Cut	SM I	Y	Sea Creature
III 254-1	Lentoid	Serpentine	Wheel Cut	SM I	Y	Vessel
II 4,236-1	Pillow	Serpentine	Circular	SM III A1 - SM III A2 ?	N	NT - Decorative

I 443-1	Amygdaloid	Serpentine or Slate	Scraped, Circle Cut	SM I ?	N	NT - Ornamental
III 286-1	Pillow	Slate	Scraped, Compass	SM I	Y	Insect
III 491-1	Lentoid	Slate	Scraped, Compass	SM I - SM II	N	NT - Figurative
III 330-1	Lentoid	Slate	Wheel, Circle Cut	SM I	N	NT - Figurative and Ornamental
III 323-1	Lentoid	Slate	Wheel, Circle Cut	SM I	Y	Sea Creature
III 337-1	Lentoid	Slate	Wheel, Tube Cut	SM I	N	NT - Figurative
I 458-1	Lentoid	Slate or Chlorite	Scraped, Drilled	SM I	Y	Decorative
I 459-1	Lentoid	Slate or Chlorite	Scraped, Drilled	SM I	Y	Decorative
II 3-383-1	Lentoid	Steatite or Serpentine	Wheel Cut	SM I	N	NT - Cretan Popular Group