



Eva Crane Trust

ECTD_211

TITLE: Bee hives of the Ancient World (Part II)

SOURCE: Bee World 66: 23-41, 148-170
[with A.J. Graham]

DATE: 1985

BEE HIVES OF THE ANCIENT WORLD. 2

Sections 1 to 4 of this paper⁶¹ presented pictorial evidence about ancient hives, and evidence provided by records and literary sources. Here we describe the direct archaeological evidence from hives and hive parts that have so far been found and identified. Relationships between these finds and traditional hives still (or recently) in use are discussed and, as a result, suggestions are made as to what artefacts should be sought in certain regions, to provide further archaeological evidence on hives used in the Ancient World.

5. Direct archaeological evidence

Hives are made of perishable or breakable materials, and it is not to be expected that many will have survived from Antiquity in recognizable form. Nevertheless some examples exist, which are discussed here region by region, together with some vessels that might also be hives. Those which have been mistakenly identified as hives are dealt with in Section 7.

Egypt

As we have seen, hives of Ancient Egypt are widely known from their representations in art. They must have been a common item of agricultural and domestic equipment. It may seem anomalous, therefore, that no actual hive has been identified with certainty in the rich harvest of Egyptian archaeology. The reasons for this situation are not hard to find. In general, Egyptian archaeology has concentrated on great public buildings and tombs. Few settlements have been excavated and published. In addition, since hives seem to have been made of unbaked clay, their preservation is improbable, and their recognition must certainly be difficult. Even so, we draw attention here to some suggestive objects which have just appeared in the published record, in the hope that we may at least alert Egyptologists to the possibility of identifying hives among their finds.

Pottery yielded by the recently explored rock-cut tomb of Memi, at El-Hawawish, included 36 coarse handmade jars, reminiscent in shape of the hives depicted on the tomb of Pabesa (Fig. 4). For some of the information presented here we are grateful to Mr Naguib Kanawati, who excavated the tomb. He puts its date early in the reign of Djedkara of the Fifth Dynasty, i.e. c. 2400 BC, and he is confident that the jars are of a 'late Old Kingdom to First Intermediate Period' date, i.e. c. 2400–2133 BC. The excavators could not understand the purpose of these jars, but in 1985 one of us (AJG) was able to see one of them (H82.M23.89) which is preserved in the Ancient History Teaching Collection at Macquarie University, Sydney, Australia. Like some others, it has a hole about 2 cm in diameter near the end opposite the mouth (Fig. 8)⁷⁷. This makes it similar to a small version of some horizontal baked clay hives used in parts of the Mediterranean region today: it is 36 cm long and 14 cm across the widest diameter. Other

jars vary in length between 29 and 41 cm and in maximum diameter between 11 and 17 cm. They are too small to be actual hives; we think it possible, however, that they could have been small models of hives specially made for the furniture of the tomb, and that the smooth Nile mud—with which they were filled at the time they were deposited—might have symbolized honey⁷⁸. We have no way of knowing whether the jars were placed in the tomb upright, horizontal or slanting; the pottery was not found in its original place, and the tomb had been plundered, and suffered other later disturbances.

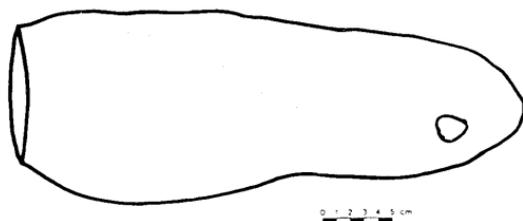


Fig. 8. Shape of hand-made cylindrical jar, one of 36 (c. 2400-2133 BC) found in the tomb of Memi, El-Hawawish, Saqqara, Egypt⁷⁷.

Greece

Large wide-mouthed jars made of coarse pottery, found (in pieces) at Vari, south of Athens on the slopes of Mount Hymettus, were identified as hives by Jones, Graham and Sackett⁷²; Fig. 9 shows their shape. They were similar to hives used today in Crete and the Cyclades¹⁰², and the area where they were found was famous for honey. What clinched the identification was the detection of beeswax by gas chromatography on fragments of the vessels. A special feature of these jars was their interior 'combing', a roughening of the surface caused by drawing a comb-like instrument over the clay before firing. It covers only part of the jar, and when this is used horizontally as a hive, the roughened (combed) surface could be positioned at the top, to help the bees to attach their combs.

The identification of these jars as hives established the correct interpretation of numerous similar vessels found at other sites in Greece. Complete, or nearly complete, examples had been unearthed at Trachones, also in the Hymettus region south of Athens, in the Agora excavations at Athens, and at Isthmia near Corinth, from the so-called Fortress of Justinian. Since 1973, when Jones, Graham and Sackett⁷² tried to give a comprehensive list of these finds (their note 21), new examples have been discovered or identified. Two hives virtually complete were found in a grave at Marathon, where they were set mouth to mouth to make a coffin for a boy about seven years old⁷³. At Eretria, on the island of Euboea, several examples were found in the splendid House with Mosaics, where they seem to have been stored new at the time the house was destroyed by fire. One complete example has been fully published⁶⁵. Many finds of similar material have been made in other parts of Eretria, including two complete hives which reportedly came from the West Necropolis, where it is suggested they also served to make a coffin¹⁰⁷. Table 2 gives details of all fully published complete examples known to us.

TABLE 2. Greek pottery hives in the Agora Museum, Athens, and elsewhere (see text), whose dimensions have been established (cm).

Hives are listed roughly in date order; others are described by Jones, Graham and Sackett⁷² or in the text. Agora Museum hives are indicated by A/inventory no.

<i>Place</i>	<i>Date</i>	<i>Length</i>	<i>Mouth diameter</i>	<i>Interior combing*</i>
A/P11017	-425 to -400	44	39	< half
Eretria	-400 to -370	38.5	36.5	yes
(ring)	-400 to -370	(9.3)		yes
Trachones	-400 to -300	54	37	one-third
(rings)	-400 to -300	(7-10)	(36-41)	yes
Vari	-350 to -275	40-45	33-39	about half
(rings)	-350 to -275	(6.5-9)	(32-40)	yes
A/P16286	-300 to -200	36	34	two-thirds
Marathon	-200 to -100	59	35	yes
Marathon	-200 to -100	55	30	yes
A/P28483	-200 to -100	41	37	three-quarters
A/P14453	?-300 to 0	47	36	half
A/P5824	-100 to 0	46	38?	half
A/P7976	early Roman	64	32	
A/P21772	c. 0 to + 50	57	33	half
Isthmia	+550 to +600	63	30	half
Isthmia	+550 to +600	63	29	half
Isthmia	+550 to +600	60	30	half
Isthmia	+550 to +600	57	32	half
<i>Hives in current use:</i>				
Antiparos	present	80	39	none
Kashmir	present	50	35	< half
(rings)	present	(c. 16)		
		(mud ring for 5 combs)		

* The combing always covers the whole length of the hive interior; the proportion of the circumference covered is given if known. Sometimes the lines run along the hive, sometimes at right angles to the length, and sometimes in both directions.

In addition, fragments of such hives have been found at many Greek sites. The list given in 1973⁷² can now be very considerably extended, and the map in Fig. 10 shows all sites known to us where such remains have so far been found. It is not accidental that these are all sites which have been intensively explored by archaeologists prepared to pay serious attention to coarse pottery. We do not doubt that evidence for the use of pottery hives from the Classical to the Late Antique period (c. 500 BC to c. AD 600) is to be found virtually all over Central and Southern Greece and the Aegean Islands.

At several sites (Vari, Trachones, Eretria, Philaidae = Brauron, Agrileza, Thorikos) extension rings have been found made of pottery similar to the hives, and with similar combing all over the interior. Most of the known rings are short, 6.5-10 cm in length, and could therefore accommodate two or three combs built parallel to the mouth of the hive. Using similar equipment nowadays in Egypt⁸ and Crete¹⁰², beekeepers can ensure that

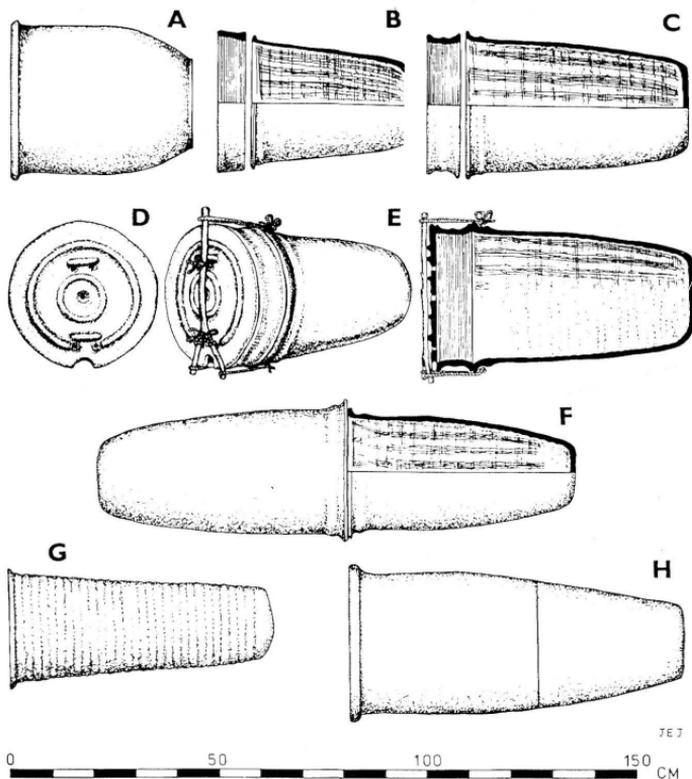


Fig. 9. Scale drawings of ancient pottery hives found in Greece, at sites shown on the map in Fig. 10. Original drawing, reproduced by kind permission of J. E. Jones.

See Table 2 for details of hives:

- A. in Agora Museum, Athens, P11017 (A on map)
- B. Vari, with extension, VH135 (B on map)
- Trachones (C on map)
- C. hive with extension
- D. closure
- E. hive assembled with extension, closure and fastenings proposed⁷²
- F. Marathon, two hives used to make a coffin (D on map)
- G. Isthmia (V on map)
- H. hive as currently made and used on Antiparos, Cyclades

that combs are oriented in this way. An important discovery⁷⁵ in the excavations of Thorikos is a much longer extension ring, similar in size to examples currently used in various parts of the world⁸. We are grateful to Mr J. E. Jones for this information prior to publication. This discovery shows that in Ancient Greece significant variations existed even between hives of the same type.

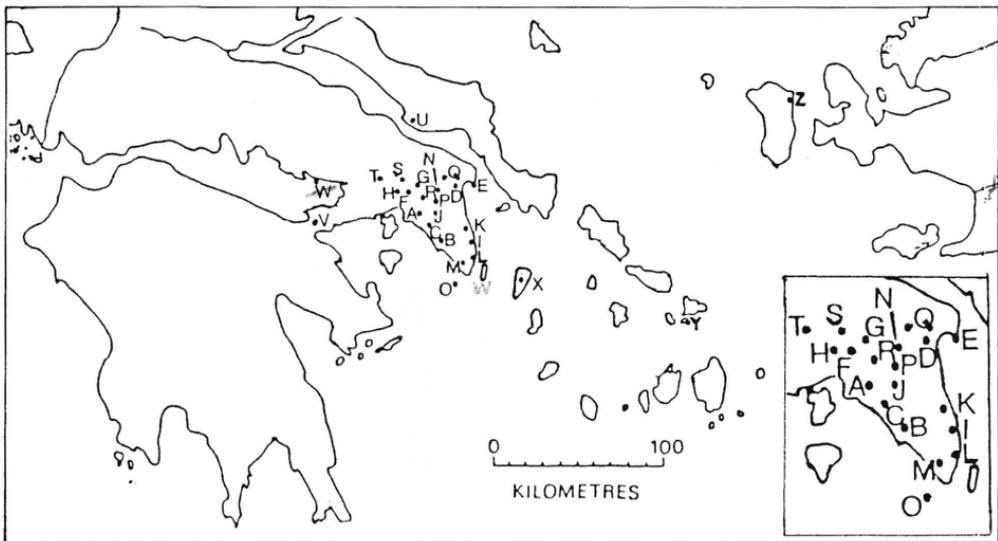


Fig. 10. Map showing sites in Greece at which pottery hives or fragments of them have been found.

E = extension ring(s) identified; C = closure(s) identified

- | | |
|---|--|
| A. EC Athens (Table 2 and Jones, Graham & Sackett ⁷² (p. 399 and n. 32)) | M. E Agrileza, also Soureza nearby ⁷⁴ |
| B. EC Vari ⁷² | N. Kastraki ⁵⁵ (Ch. 3, n. 165) |
| C. EC Trachones ⁷² | O. Patroclus Island ⁹³ |
| D. Marathon ⁷³ | P. Hymettus Tower ⁹³ |
| E. Kynosoura ⁸⁶ | Q. Mount Belets ⁹³ |
| F. C Dema Tower ⁹³ | R. Aegaleus Tower ⁹³ |
| G. Yerovouno ⁸⁶ | S. Phyle ⁹³ |
| H. Thriasian Lager ⁸⁶ | T. Eleutheræ ⁹³ |
| I. Koroni ¹⁰⁸ (p. 38, and n. 46) | U. E Eretria ^{65, 107} |
| J. Helioupolis ¹⁰⁹ (p. 335 and Fig. 6) | V. Isthmia ⁵⁷ |
| K. EC Philaïdae (= Brauron) ⁹⁶ (p. 193 and personal communication) | W. Diporto (Makronisos) ⁷⁰ |
| L. E Thorikos ⁷⁵ | X. Keos ⁵⁹ |
| | Y. Delos ⁵⁸ |
| | Z. Delphinion (Chios) ⁵³ |

Round closures were used for these hives, made of coarse pottery similar to that of the hives and rings; examples have been found at several sites (Vari, Trachones, Athens, Dema Tower). They had small holes (c. 2 cm in diameter), either one, or two, or three in line, and it has been conjectured that cords were passed through them to secure the closure. The flight entrance for the bees was sometimes provided by a crescent-shaped notch at its circumference. The short extension rings, and their method of attachment by cords, remain somewhat of a puzzle. One of us (EC) kept bees in a hive copied from the Vari/Trachones reconstruction, and found many problems in harvesting honey combs from it. The attachment of the rings and closures by a cord seems to us more difficult than cementing them with mud, as is done in Greece today.

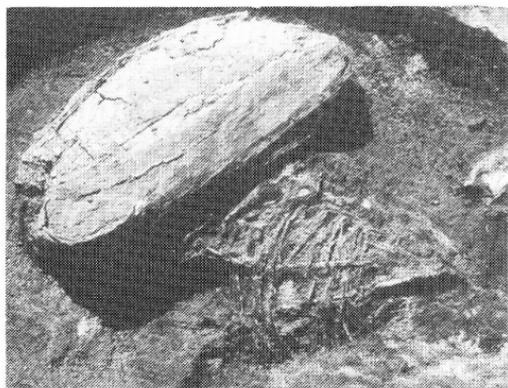
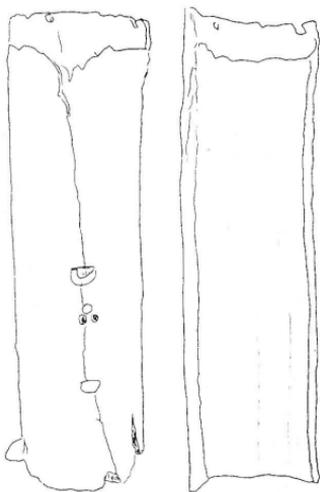


Fig. 11. Log hives of beech from Vehne Moor, 4th-5th century AD. Drawing: H. Diekmann. The front part (*left*) shows two flight entrances; both it and the back part (*right*) have holes for wooden pegs that secured the cover, which is not shown. A previously published photograph of the hive⁸ was printed upside down in error.

Fig. 12. The top part of a wicker hive, as it was found in Feddersen Wierde with a piece of wood that may well have been part of its base, 1st-3rd century AD. Photo: Niedersächsisches Landesinstitut für Marschen- und Wurtenforschung, Wilhelmshaven.

Northern Europe

Beekeeping in Northern Europe during the past thousand years is much better documented than that in the Eastern Mediterranean, and traditional hives of different regions have been well studied; Crane⁸ gives many references. These hives were used upright, not horizontally like the hives of the Classical World.

Two upright log hives, dated to within the period covered by the hives excavated in Greece, have been found in north-west Saxony, both within 30 km of Oldenburg, and west of the Elbe. One hive was found in 1970¹¹⁴ during excavations at Gristede north-west of Oldenburg. It had latterly been used to line a well. Pottery inside it was dated to the second century AD, so the hive would be as old or older. It was 1 m high and 31-44 cm in diameter; a horizontal slit near the base is regarded as the flight entrance hole. The hive is now in the Forschungsstelle für Siedlungsarchäologie in Rastede nearby. The other hive, dated to the 4th-5th century AD, was found in 1939 in a bog at Vehne Moor west of Oldenburg^{62, 68}. It was easily reassembled into a hollow log 1 m high and 30 cm in diameter, with an oak cover which had been attached to it with wooden pegs, indicating that it was constructed as a separate hive, and was not part of a tree such as that found in the Oder (below). Fig. 11 shows the hive, with flight entrances a quarter and half way up, and possibly also at the right of the base. Three round holes (sealed up) had been bored through the wood below the upper entrance. They have been variously

interpreted, but could not be for cross-sticks (spiles) to support the combs, since there were no corresponding holes at the back of the hive. The hive had four such holes (not shown), and two spiles were found with it, together with a piece of 'mummified' drone comb, and bees identified by Goetze as *Apis mellifera mellifera*. The hive is now in the Staatliches Museum für Naturkunde und Vorgeschichte in Oldenburg. It is very similar to log hives extant.

A much earlier oak log, found in a Bronze Age settlement at Berlin-Lichtefelde and dated to about 1100 BC, seems too large to have been made as a hive, but it may have been used as one. It is 145 cm high and 80 cm in diameter, and weighs about 300 kg⁶⁷. It had a hole that might have been a flight entrance, and fairly near the bottom (i.e. the hive top) was a grid on which the vessels were piled. The grid consisted of fairly substantial pieces of wood and also brushwood. The vessel has been fully described^{76, 83, 92}.

The precursor of the upright log hive was a cavity in the living tree, tended by a 'forest beekeeper' who fitted a long narrow door through which he removed the honey combs. Part of a hollow tree trunk, shown by carbon dating to be from the first century BC, was taken from the river Oder near Opeln south-east of Breslau (Wrocław), and studied by F. Sprotte⁸⁸. A hole 47 × 12 cm had been cut for a door, 5 m above the roots of the tree. The presence of a ridge of what appeared to be propolis on its edge, and other evidence cited, suggest that the door was about 3 cm thick, and in two parts, characteristics typical of such tree hives in Poland today. The flight hole was 4 cm² in area⁸.

West of the belt of forest in Northern Europe, hives were traditionally baskets made of woven wicker and, later, of coiled straw or other plant stems; they are known as skeps. What is believed to be part of a woven wicker hive (Fig. 12) was dug up in the 1970s by Haarnagel in the Feddersen Wierde, a peat bog near Wilhelmshaven on the North Sea coast of Lower Saxony. The wicker construction has a characteristic common to many wicker hives, as we know them from illustrations and from more recent examples: a short stick or 'crown piece' at the apex; this is discussed by Ruttner¹⁰¹ in his description of the hive. From the level of the dig, the hive has been dated to the 1st to 3rd century AD. It is now in the Institut für Marschen- und Wurtenforschung, Wilhelmshaven.

No coiled-straw hive is known from ancient times, but remains of one dated to the 12th century were found at the Coppergate site in York, England, in 1980, together with a large number of honeybees⁸¹. It would be valuable if earlier use of coiled-straw hives could be established. Schier's conclusion¹⁰³, after presenting much evidence, is that they were used in Lower Germany by the first centuries AD.

No other vessels that can be attested as ancient hives are known from Northern Europe. Several museums in England have pots that have been tentatively regarded as hives but, as our experience of ancient hives has grown over the years, we have become more and more reluctant to believe that this can have been their function. Discussion of them is therefore postponed to Section 7.

The New World

Direct archaeological evidence about hives used in the New World may seem unlikely, since no honeybees (*Apis* spp.) were native there. But stingless bees (*Meliponini*) were kept in hives in tropical America well before the Spanish conquest, and the Maya people on the Yucatán peninsula, which separates the Gulf of Mexico from the Caribbean Sea,

TABLE 3. Stone discs found at different Maya sites; most are likely to have been end-closures for log hives.

The period of sites is indicated by:

LPe	Late Preclassic	}	c. 300 BC—AD 300
EC	Early Classic		
C	Classic		
LC	Late Classic		
Po	Postclassic	}	AD 900—1520
LPo	Late Postclassic		

Ref. No.	Site	Hive closures		Period	Reference
		No.	Material		
1	Aguada Grande, Cozumel, Mexico	c. 73 c. 30	coral/limestone	LPo	D. A. Freidel ⁶⁶ H. Wallace ^{110a}
2	Buena Vista, Cozumel, Mexico	87	coral/limestone	LPo	D. A. Freidel ⁶⁶
3	San Gervasio, Cozumel, Mexico	37	coral/limestone	LPo	D. A. Freidel ⁶⁶
	also other sites, giving a total for Cozumel,	255			H. Wallace ^{110a, 110}
4	Tulum, Quintana Roo, Mexico	1	?	?	A. B. Rubio*
5	Mayapan, Yucatán, Mexico	55	inferior quality stone	Po	T. Proskouriakoff*
6	Chan Chen, Corozal, Belize	37	limestone	LPe or LPo	R. V. Sidrys ¹⁰⁵
7	Cerros, 15 km SE of Chan Chen, Belize	101	limestone	LPe	D. A. Freidel ⁶⁶
8	Santa Rita Corozal, Belize	1	limestone	LC/Po	R. V. Sidrys ¹⁰⁵
10-9	Barton Ramie, Belize	?	misc. ground stone	C	R. V. Sidrys ¹⁰⁵
10-10	Uaxactún, Central Peten, Guatemala	6	v. chalky decomposed limestone	C	E. B. Ricketson*
9-11	Altar de Sacrificios, Guatemala	?	soft limestone/ pumice/sandstone	LC	R. V. Sidrys ¹⁰⁵
12	Ticomán [nr Mexico City], Mexico	2	stone	LPe	G. C. Vaillant*

* reference in Wallace¹¹⁰

were beekeepers on a large scale. A number of excavations of pre-conquest sites have now brought to light parts of hives the Maya used. Thanks to information and help from Dr J. M. Andresen, these finds are reported briefly here.

At the time of the Spanish conquest, the Maya kept the stingless bee *Melipona beecheii* in horizontal log hives¹⁰⁴, as they still do today. The hive used for the bees is a short section of hollow log, with an entrance hole midway between the ends; carefully fitted wooden stoppers are used to close the ends, and any remaining cracks are sealed with mortar made of clay¹¹¹. In some areas, instead of a wooden stopper, a stone disc is cut to

fit into each end of the log¹⁰⁵. It is these stone discs that have been found during excavations at various Maya sites, although their function was not established for some time. D. A. Freidel, doing archaeological work on Cozumel Island off the east coast of the Yucatán peninsula for his PhD thesis (1976), found large numbers of them, and he was able to show that they were similar to the stone end closures of present-day hives used on the island for *Melipona beecheii*⁶⁶. The local term for the disc is *panucho*.

Reports by Spaniards who landed on Cozumel in 1518 referred to 'many beehives, much wax and honey. The beehives are like those of Spain except smaller'. In 1528-30: 'large apiaries containing one or two thousand individual hives laid horizontally in stacks... Their ends were stopped shut using a disc-shaped stone and clay seal'¹¹⁰. The hives of Spain referred to in 1518 would have been horizontal cylinders; an engraving from 1720 shows an apiary of such hives, some used upright, and others horizontally, Roman fashion⁸.

Several hundred of the closures have now been excavated at 12 sites (Fig. 13). Their dates range from the Late Preclassic to the Late Postclassic period, spanning the 1500 years or so before the Spanish conquest. Some from the Late Preclassic period are shown in Fig. 14. All are in the Maya area except no. 12, and this was on a trade route from the Maya area in Preclassic times¹¹³.

In Table 3 the sites are numbered arbitrarily from east to west, starting with Cozumel where the largest numbers of discs have been found. Fig. 15 shows the locations of a group of 12 discs found at Buena Vista, that could be matched in pairs for size and shape,

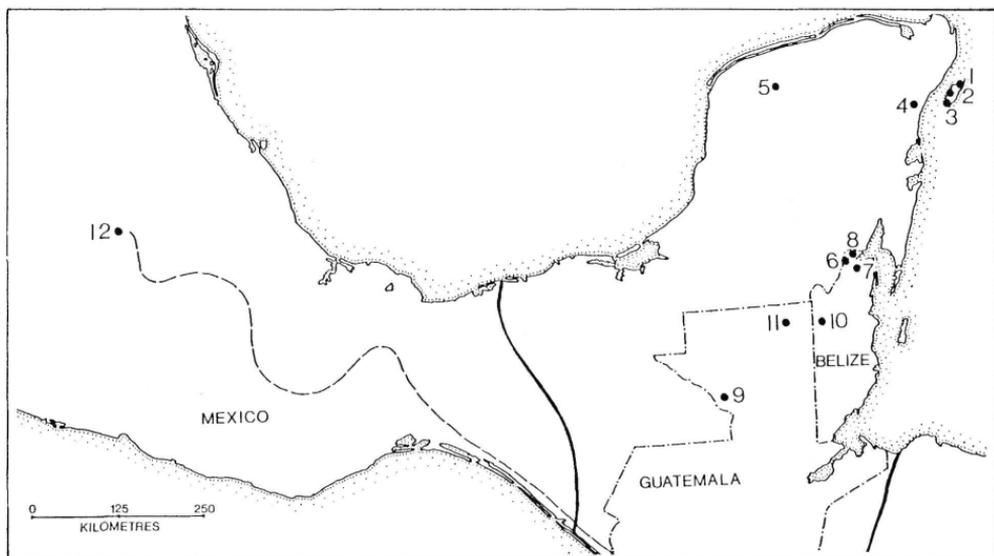


Fig. 13. Map showing sites listed in Table 3, at which stone discs resembling Maya hive closures have been found.

The two full lines indicate the approximate extent of Classic Maya culture¹¹³, and the broken line to the west shows an Olmec trade route.

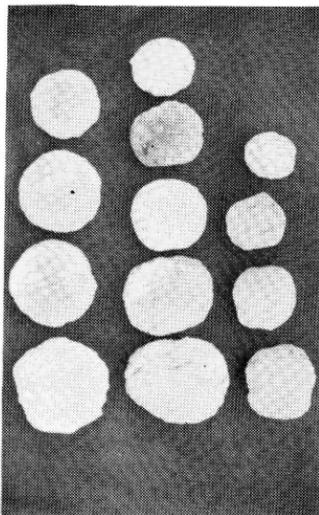


Fig. 14. Thirteen limestone discs dated to 300 BC to AD 300, found at Chan Chen, North Belize (site 6 in Table 3)¹⁰⁵. Photo: J. R. Andresen. Most discs have diameters between 8 and 10 cm and are 3-4 cm thick.

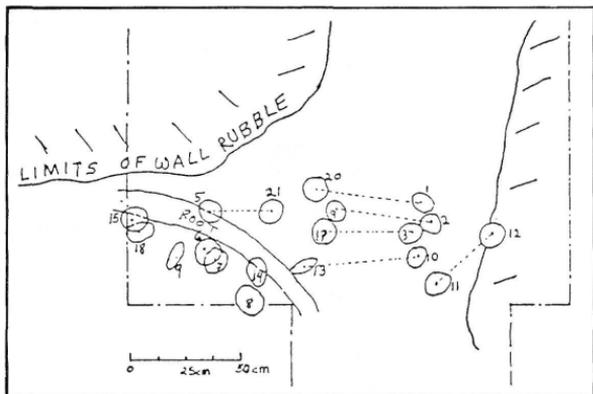


Fig. 15. Plan of part of the excavated area at Buena Vista, Cozumel, showing locations at which stone discs were found. Dotted lines join 12 together in pairs, likely to be the two ends of the same hive. Most discs were 12-15 cm in diameter. Others on the left had been disturbed¹¹⁰.

the two of each pair being separated by a distance of about 50 cm, the usual length of a log hive used today.

Wallace¹¹⁰ and Sidrys¹⁰⁵ give many background details about early beekeeping on Cozumel and on the mainland, and they present in full the reasoning that leads to the identification of the discs as hive closures. Referring especially to discs found on Cozumel, Wallace¹¹⁰ includes the following points as contributory evidence. The largest numbers were found (in clusters) in areas where early Spanish reports had mentioned apiaries. Discs not found in large clusters were often broken, and near house remains or midden deposits. At different sites, discs varied in size with the probable size of tree trunks that were available in the area. Discs are of soft stone, and some show wear-surfaces on the outside circumference, such as might have been produced if the discs were repeatedly removed from inside a log and replaced.

It is unlikely that any of the wooden logs used for hives still survive from early times, but a good representation of four of them in baked clay, dated to about AD 1400, can be seen on a statue of the Maya bee god Ah Mucan Cab found on Cozumel (Fig. 16). Circular closures are indicated clearly, though in a stylized way, whereas in practice a closure would be shaped to fit the hole in the log.



Fig. 16. Statue of the Maya bee god Ah Mucan Cab from Cozumel Island, now in the Museum in Mérida, Mexico.

Two of the four Maya hives, with central flight holes and end closures, can be seen. Photo: R. Darchen.

6. Evidence from hives still in use

We have been impressed, again and again, by the immutability of traditional hives over hundreds or even thousands of years. Their method of construction, material, size and shape often seem to have remained unchanged over very long periods. Beekeepers interested in the history of their craft are perhaps accustomed to this, but in archaeology in general such a characteristic is rare; indeed changes of construction and design often give valuable clues as to the age of an object found.

The fullest information on hives of the Classical Ancient World is provided by Roman authors (Section 4), but some or all the hives they described were very probably used much earlier, in Greece and other countries and islands of the Eastern Mediterranean. In addition, mud hives were probably used in various parts of the Near East as well as in Egypt in ancient times, as they are today (Section 2).

Roman authors describe nine types of hives, and give dimensions of many of them. They also explain how the hives were placed; all were laid horizontally, often on a platform (or embedded in a wall), and sometimes two or three rows one above another. The list below follows the order used by Crane⁸, where further details of the different

hives are given:

1. log hives
2. hives of cork (bark of the cork oak *Quercus suber*)
3. hives of wooden boards
4. hives of woven wicker
5. hives made by binding together thick stems of fennel (ferula, *Foeniculum vulgare*)
6. hives made from animal dung
7. hives of baked clay (earthenware, pottery)
8. brick hives
9. transparent hives, made from (or, more probably, with insets of) horn or mica
10. (not described by Roman authors) hives of unbaked clay (mud)

Of these types, 6 and 10 would become integrated with the earth around them, and are therefore unlikely to survive as entities. Types 1–5 are biodegradable and likely to survive only in an acid environment such as peat bog which preserves log and wicker hives in Northern Europe. No examples of 8 and 9 are known, and all surviving hives from the Classical World (Section 5) are of type 7.

Table 4 lists regions in which traditional hives, currently or recently in use, conform with the Roman descriptions, and cites published photographs of such hives in different regions. It shows that almost every type of hive from the Ancient World has been found in use within the past few years, although not necessarily in what was the the ancient centre of the culture concerned, but in some less advanced outlying region of it, or in a

TABLE 4. Known types of ancient hives of the Classical World, with areas where similar hives are in current or recent use; all were laid horizontally.

Use of materials cited in brackets is not attested in the Ancient World.

<i>Hive type</i>	<i>Some regions where type is in current or recent use</i>	<i>Fig. no. in Crane⁸</i>
1. log	tropical Africa; many other regions, e.g. W. Asia; C. America; Turkey	47, 49, 50; 44, 45; 51, 52; —
2. cork bark (other bark)	North Africa tropical E. Africa	— 55, 56
3. board (hewn wood)	widespread in E. Mediterranean Arabia	37, 58 48
4. woven wicker (woven cane) (coiled straw)	N. Africa; W. Africa; Turkey N. Africa; Ethiopia Mediterranean/Spain Kashmir; E. Asia W. Africa; C. Africa	40; 59, 61; — 39; 42 63, 80 30, 31; 62 64; —
5. ferula	Sicily	41
6. dung	Ethiopia (with mud and straw)	35
7. baked clay	E. Mediterranean; N. Africa; Spain; Kashmir	24, 29, 70, 71, 72, 73, 74; 33; 76, 77, 78; 27, 28
8. brick	none known	—
9. mica/horn	none known	—
10. mud	Egypt; Kashmir; Turkey	21; 32; —