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## BEEKEEPING IN THE WORLD OF ANCIENT ROME

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Ancient Rome left an important beekeeping legacy, based largely on passages in certain surviving Latin texts on agriculture and natural history written between about 200 BC and AD 400. No pictures of beekeeping in Roman times survive, and no Roman hives have been excavated — which is not surprising, since the hives Roman writers favoured were of (biodegradable) plant materials. Roman descriptions were based on two thousand years of previous beekeeping, which has been brought to life for us in the past few decades by discoveries of pictures that show men harvesting combs from hives in Ancient Egypt, and of hives from Ancient Greece that have been excavated<sup>3</sup>.

In addition, recent studies in remoter parts of the Mediterranean region and beyond have identified hives in current use which are very similar to those the Romans described. Figures 1 to 6 show some examples, and others are described in *The archaeology of beekeeping* published in 1983<sup>2</sup>.

Roman books on beekeeping and other branches of agriculture provide almost our only written descriptions of earlier practices in the Mediterranean region. Greek books on beekeeping were written by Aristomachus of Soli and Philascus of Thasos, but they are lost, and surviving Greek writings on *bees* gave little information on *beekeeping* before Roman times. However, soon after 146 BC Roman authors were able to refer to a Latin translation of an earlier Phoenician book — which is also lost, and known only from Roman references to it. It was written by the Carthaginian Mago, about whose life we know nothing except that he lived and worked before Carthage fell to the Romans in 146 BC. In 1870 Mahaffy<sup>6</sup> collected together the little that was known about Mago's works, and he quoted the following Roman comments on them.

Pliny wrote: 'Kings also have written on agriculture, ... and the Carthaginian Mago, whose work the Senate so honoured, that when after the conquest of Carthage it presented the libraries of the city to the neighbouring kings ..., it ordered this work in 28 books to be translated into Latin by men skilled in the Punic [Phoenician] language ... (*Naturalis historia* XVIII.5). Varro said in *Res rusticae*: 'All the writers [on agriculture] hitherto cited are surpassed in reputation by Mago... who wrote in Punic, and embraced the scattered subjects [of agriculture] in 28 books, which Cassius Dionysius of Utica translated into Greek in 20 books, ... [and] inserted many things from the Greek authors, and also omitted eight books of Mago's work. Diophanes in Bithynia contracted these 20 books into six, and sent them to King

Deiotarus' (I.1.10). Columella's *De re rustica* corroborated these statements, and said that Mago was honoured as the father of agriculture (I.1.10 and 13).

The major surviving Roman writings on beekeeping are in the books listed below, and all except the last two are available (in Latin with English) in Heinemann's Loeb Classical Library.

Varro (116 to 27 BC)	<i>Res rusticae</i> , Book III.16.1–38
Virgil (70 to 19 BC)	<i>Georgics</i> , Book IV
Columella c. AD 60	<i>De re rustica</i> , Book IX.2–16
Pliny (the Elder) (AD 23 to 79)	<i>Naturalis historia</i> , Book XI.4–16; XXI, some of 43–49; some later references
Aelian (died c. AD 220)	<i>De natura animalium</i> , scattered references
Palladius (AD 300s)	<i>Opus agriculturae</i> , scattered references

These books have been the subject of a number of commentaries<sup>1,4,5,9</sup>, but very few are indexed by subject, so searching for beekeeping passages, and especially for specific subjects within them, is very time-consuming. I had to examine them in detail for the book I am writing on the history of beekeeping, and it seems useful to make the main passages available at length. In dealing with the Latin texts I have relied much on the help of Professor A J Graham, and some of the translations are by him.

One book on agriculture was written before those listed above, by Marcus Porcius Cato (234–149 BC). He did not mention beekeeping — although it had been long established in North Africa and Greece, where he served in the course of a distinguished military career — but Mago's book was not translated into Latin until after 146 BC.

## Varro's writings

Marcus Terentius Varro (a contemporary and acquaintance of Cato's great-grandson) was born in Rome in 116 BC; he studied in Athens and later served as Roman legate in Spain, and he may have travelled and fought in other countries to the east of Rome. He observed and recorded wherever he went. He was one of the greatest of Roman scholars, and has been credited with writing 620 books. Of this immense output, only his book on agriculture (*Res rusticae*) survived in its entirety; it appeared in 37 BC, ten years before he died at the age of 90. Varro was able to spend his last years in the quiet of his country estates, reading and writing in his study beside a stream, and enjoying the birds and their singing. A monograph by Tilly<sup>8</sup> gave further information.

Book III of Varro's *Res rusticae*, about rearing small livestock on the home farm, was presented in the form of a conversation between a group of friends in Rome who were awaiting the results of an election. In Chapter 16, paragraph 1, the talk turned to beekeeping because Axius, one of the group, resisted a suggestion by Appius that they should move on to the subject of fish ponds: 'Just because you were



FIG. 1. Hives used in Gharb, Morocco, 1963. On the right of the modern Maroka hive: woven hive, mentioned by Varro, Virgil, Columella and Pliny; cork bark cut from a tree to make a hive mentioned by the four writers (Virgil said it was sewn together, *Georgic IV.33*); earthenware hive mentioned by Varro and Columella, with an extension (not mentioned by Roman writers).

accustomed in your youth not to drink honey-wine at home for the sake of thrift, are we to overlook honey?'. The following paragraphs are related to beekeeping.

10–12. As to the gain from beekeeping, Seius 'has his apiaries let out for an annual rental of 5000 pounds [2200 kg] of honey, ... brothers named Veianius ... never received less than 10 000 sesterces from their honey, ... they preferred to wait until they could bring in the buyer at the time they wanted, rather than to rush into market at an unfavourable time.'

15–17. 'Some make hives round out of withies\*, some make them of wood and bark, some from a hollow tree, some of earthenware [fig. 1], and others again from the fennel plant, making them rectangular, about three feet long and one foot across except that, when the bees are too few to fill them, they reduce the size, so that they do not lose heart in a wide empty space. All these vessels are called *alvi* from the nourishment (*alimonia*) of the honey, and it seems that they make them most narrow in the middle [fig. 2], in order to imitate the shape of the bees. The wicker hives [not those of earthenware<sup>4</sup>] they smear with cow dung within and without, so that the bees are not frightened by their roughness. They place the hives on ledges on a wall in such a way that they do not shake and do not touch each other, when they have been placed in the row. They make similarly a second and third row below, leaving a space between the rows, and they say that one should rather reduce this number than add a fourth row. In the middle of the hives they make small holes right and left, by which bees may go in. At the ends, where the beekeepers may take out the comb, they place lids<sup>†</sup>. The best hives are made of bark

\*Withies or withes were tough flexible branches, especially of willow or osier, plaited or woven to make wicker

<sup>†</sup>'Ends' is used for *extrema* and 'lids' or 'closures' for *opercula*; both are plural<sup>3</sup>

[fig. 1], the worst of earthenware, because those ones are most affected by the cold of winter and the heat of summer.'

18. 'In the spring season and summer the beekeeper should inspect the hives about three times a month, smoking them gently, and should clean the hive of dirt and eject grubs. He should especially see that there are not several rulers, for they cause harm by the quarrels they make.' A confused passage follows about three kinds of leaders, of which the black one, not the striped, should be killed if the two are in the same hive.

20. 'In purchasing [bees], the buyer should see whether they are well or sick. The signs of health are their being thick in the swarm, sleek, and building uniformly smooth comb. ...'

21. 'If they [the bees] are to be transferred to another place, it should be done carefully, and the proper time should be observed for doing it, and a suitable place be provided to which to move them ... And even if you move them from one hive into another at the same place, the operation should not be carried out carelessly, but the hive into which the bees are going should be smeared with balm, which has a strong attraction for them, and combs full of honey should be placed inside not far from the entrance ...'

28. When colonies need food, 'about ten pounds of ripe figs are boiled in six congii of water, and after they are boiled they are rolled into lumps and placed near the hives. Other apiarists have water sweetened with honey placed near the hives in vessels, and drop clean pieces of wool into it through which they can suck, for the double purpose of keeping them from surfeiting themselves with the drink and from

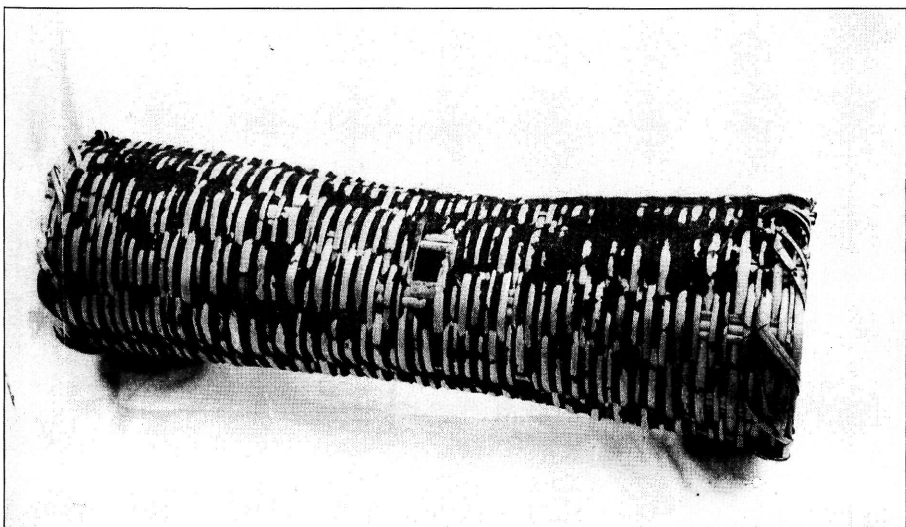


FIG. 2. Woven hive of split cane 'most narrow in the middle', Ethiopia, 1972 (IBRA Collection B72/14). Varro mentioned such a hive.



FIG. 3. *Ferula* hive, one of a stack in an apiary, Syracuse province, Sicily, 1993 (photo: R Chevet). Varro, Columella and Pliny mentioned such hives.

falling into the water. A vessel is placed near each hive and is kept filled. Others pound raisins and figs together, soak them in boiled wine, and put pellets made of this mixture in a place where they can come out to feed even in winter.'

31. When a swarm has settled, 'a hive, smeared on the inside with ... enticing substances, is brought up and placed near by; and then by means of a light smoke blown around them they are induced to enter. ...'

33. 'Some authorities hold that in taking off honey nine-tenths should be removed and one-tenth left; ... Others leave more. ... If you do not take off honey every year, or not the same amount, you will by this method have bees which are busier and more profitable.'

35. 'Care should be taken that the weaker bees are not overwhelmed by the stronger [robbed out by them?], for in this case their output is lessened; and so the weaker are separated and placed under another king [he does not say how]. Those which often fight one another should be sprinkled with honey-water. When this is done they not only stop fighting but swarm over one another, licking the water, ...'

## Virgil's writings

Publius Vergilius Maro, 46 years younger than Varro, was born near Mantua and lived until 19 BC. He was educated in Italy, and later had a villa in Naples and a country house near Nola. His treatise on agriculture, the *Georgics*, prepared at the request of Maecenas, was written a few years after Varro's book and appeared about 30 BC; it consisted of four books in verse. The Fourth *Georgic* was devoted to beekeeping, and several scholars<sup>1,4,9</sup> tracked down the sources of beekeeping information available to Virgil. Although he gave very little new information about bees or beekeeping, he wrote most eloquently about them. His passage on the division of labour in the hive was based on the Greek *Historia animalium* (IX. 623–625).

For some preside

O'er getting of the food, and duty-bound

Are busy in the fields; others indoors

Fix tears of daffodils and tough bark-glue

For bases to the combs, then hang thereto

The sticky wax; and some escort abroad

The grown-up sons, the city's hope and crown;

And others pack the honeyed excellence

Close, with pure nectar plumping every cell;

And some by lot are warders of the gate,

And scan the clouds in turn and watch for showers,

Or else relieve home-comers of their load,

Or all unite and chase the lazy drones

Across the border ...

(lines 189–202, translated by T F Royde)

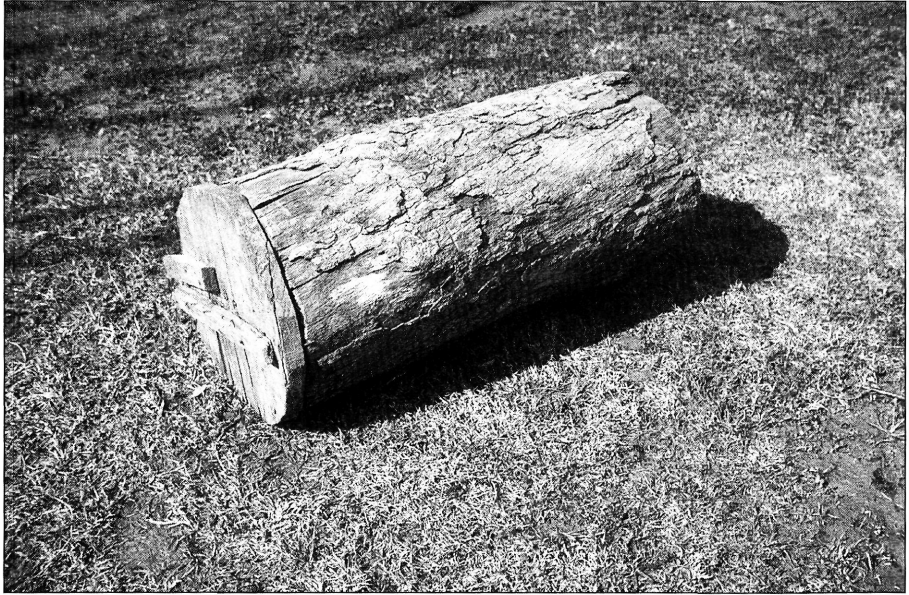


FIG. 4. Horizontal log hive in Kashmir, India, 1980. Varro and Columella mentioned such hives.

Virgil also mentioned bees in his *Eclogues* and *Aeneid*. He was one of the greatest of the Latin poets, and his poetry about bees has been especially admired and loved by generations of beekeepers and more general readers.

## Columella's writings

Lucius Junius Moderatus Columella, a Spaniard who learned agriculture in the south of Spain, lived a century after Varro and Virgil. By that time the Roman Empire had greatly added to its territories: the rest of Spain; Gaul, the Low Countries and parts of Britain beyond; eastern Europe as far north as the Danube; the rest of Anatolia, the eastern Mediterranean seaboard, and Egypt.

Columella wrote more methodically and professionally than other Roman beekeeping authors, and with a greater attempt at completeness. By his time, several Roman sources could be called on, including two books — now lost — which dealt with bees and beekeeping: an encyclopaedic work by Celsus (AD 1–68) and *De agricultura* by Gaius Julius Hyginus, a contemporary of Virgil.

*De re rustica* consists of nine books, and Columella devoted almost all the final one (IX) to beekeeping. He used no chapter titles, and those below are based on Fraser's<sup>4</sup>.

### Chapter 2. Authorities and origins

Columella acknowledged his debt to Hyginus who wrote with great care, and 'industriously collected the opinions of ancient authors dispersed in their different



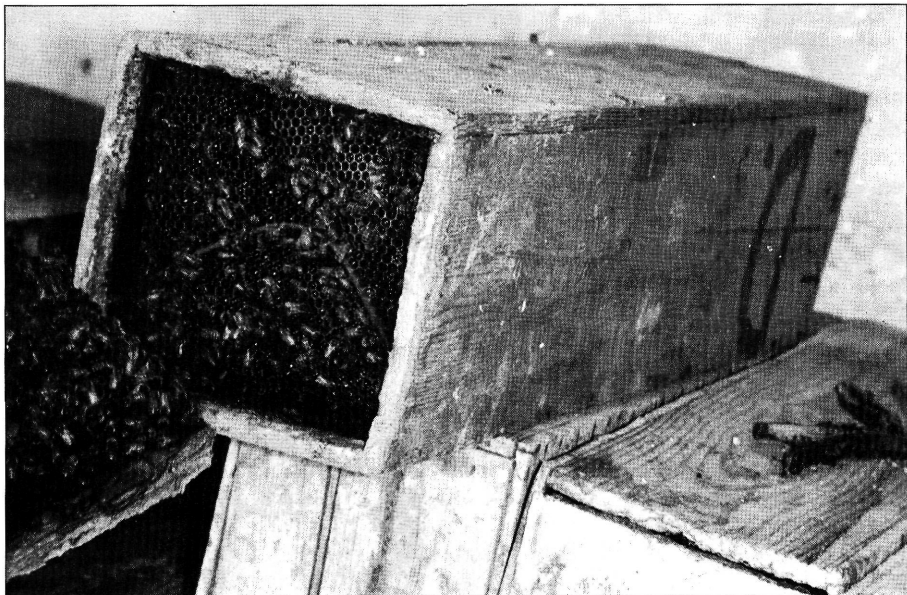


FIG. 5. Hive made of wooden boards, in the apiary shown in figure 3 (photo: R Chevet). Columella mentioned such hives.

writings', to Virgil who wrote ornately and 'embellished the subject with the flowers of poetry', and to Celsus who wrote elegantly and 'applied the method of both the above-mentioned authors'. A considerable amount of his information was, however, not taken directly from these authors.

### Chapter 3. Races of bees

This is based on Aristotle and other writers.

### Chapter 4. Bee plants

The following is an extract from a long passage listing plants to grow for bees.

4-5. 'A thousand seeds, which flourish in uncultivated turf or are turned up in the furrow, produce flowers which are much loved by bees, ... Moreover, countless herbs of a baser kind spring up on cultivated land and pasture ...'

6-7. '...thyme yields honey with the best flavour; the next best are Greek savory, wild thyme and marjoram. In the third class, but still of high quality, are rosemary and our Italian savory, which I have called *satureia*. Next the flowers of the tamarisk and jujube-tree [*Ziziphus jujuba*] and the other kinds of forage which I suggested have only a mediocre flavour. The honey which is considered of the poorest quality is the woodland honey which comes from dirty feeding-grounds and is produced from broom-trees and strawberry-trees, and the farmhouse honey which comes from vegetables.'

## Chapter 5. The apiary

Columella advised that very high walls should not be placed round hives. However:

3. 'If, through fear of robbers, a rather lofty wall is thought desirable, passages through it should be made for the bees in the form of a row of little windows three feet above the ground, and there should be an adjoining cottage in which the keepers may live and the apparatus may be stored. The store-house should be chiefly occupied by hives ready for the use of new swarms and also by health-giving herbs and any other remedies which may be applied to bees when they are sick.'

Columella understood that bees need water to rear brood: 'without which neither combs nor honey nor even young bees can be formed' (IX.5.5).

## Chapter 6. Hives

The passage about hive materials was similar to Varro's (15–17), but more detailed.

1–2. 'Bee hives are to be made according to the character of the region. If there is an abundance of cork trees, we shall certainly make the most useful hives from their bark, because they will not be cold in winter nor hot in summer. If there are plenty of fennel stalks, good vessels for bee hives can be constructed out of them [fig. 3], because they have similar natural properties to cork. If neither of these materials is available, they can be woven out of withies by means of basket-work. If this material too is not available, they will be made out of wood, either a hollow tree [fig. 4] or from wood cut into boards [fig. 5]. The earthenware hives have the worst properties, because they are burnt by the summer heats, and frozen by winter's cold.'

Columella agreed with Celsus in his disapproval of hives of dung (see fig. 6) because they could catch fire, but suggested protecting them with a (fireproof) brick wall. Brick hives were acceptable to Celsus, although they could not be moved, but — to Columella — mobility was essential for the good of the bees: 'the question arises as to what ought to be done for the sake of the bees themselves, when it is advisable that they should be sent to another district because they are suffering from disease or from the barrenness and poverty of the locality' (IX.6.2–4).

## Chapter 7. Stands for hives

Unlike Varro and Virgil, Columella explained how hives (of any type) were to be arranged.

1. 'A platform made of stone is constructed across the whole apiary, three feet high and three feet wide. It is carefully smoothed over with plaster ...'

2. 'On it are placed the hives ... [each] walled round except at the back [and front]; or again — as is the virtually universal practice among those who take trouble in the matter — they are arranged in a row and held firm by bricks or concrete, in such a way that the individual hives are contained by two narrow walls, and both ends are left free. For the hives must sometimes be opened at the front, from which the bees issue forth, and much more frequently at the back, through which the colony is repeatedly tended.'

3. 'But if no walls are interposed between the hives, they must be positioned in such a way that there is a small distance between them and, when they are being inspected, the one which is being handled does not cause the next one to vibrate — as it will if they are touching — and frighten the neighbouring bees, which fear every movement as a disaster, since their works are weak, being made of wax. Three hives placed one above the other is plenty, since even then the beekeeper does not inspect the top row with sufficient ease.'

4. 'The fronts of the hives, which provide the bees with their entrance, should be lower than the backs, so that rainwater does not flow in, and, if it has chanced to penetrate, does not stand in the hives but flows out through the entrance. For these reasons it is useful to protect the hive with a roof above, or otherwise to cover them with leafy branches smeared with Carthaginian clay. This covering will keep off the cold, rain and heat. ...'

5. '... For that reason also [i.e. fear of the cold] the holes which provide entry and exit must be very narrow, in order that they admit as little cold as possible. It is sufficient if they are bored no larger than to accommodate a single bee. ...'

### Chapter 8. Buying and collecting bees

Bees are obtained as colonies, either purchased or 'without being paid for'. If they cannot be inspected, and the bees are 'all silent and at peace within their dwelling-place', the purchaser should apply his lips to the flight entrance hole and blow into it, so that he can estimate the number of bees in the hive by the sudden noise they make (IX.8.2). If the bees have to be brought from a long distance, great care is needed:

3–4. '...that they are not disturbed by the roughness of the road, and they will be best carried on the shoulders and at night; for they must be given rest in the day-time, and liquids which they like must be poured into the hives, so that they may be fed while remaining shut up. Then when they have arrived at their destination, if day-light has come on, the hive must be neither opened nor placed in position until evening comes, so that the bees may go forth quietly in the morning after a whole night's rest, ...'

If the beekeeper is near woodlands, he can check whether few or many bees visit a source of water there 'from the second hour [8 am]'. If few, 'the place will not produce much honey'. If many, it is likely to provide good bee forage, and also to contain wild colonies.

### Chapter 9. Swarms

Instructions are given for preventing the escape of swarms from the beekeeper's own colonies: '... it is the duty of a good overseer in spring-time to keep an eye upon the hives until about the eighth hour of the day [3–4 pm]' (IX.9.3).

If a swarm settles on a branch in a single cluster, 'there is only one king-bee in it'. If there are two or more clusters, 'there are several chiefs'. Having then smeared your hand with juice of herbs attractive to bees, 'you will gently insert your fingers and, after separating the bees from one another, you will search until you find the author

of the quarrel' [and remove/kill him] (IX.9.8).

### Chapter 10. King-bees [queens]

The beekeeper chooses one leader to remain — on the basis of his bodily appearance, described in detail — but 'he too must be despoiled of his wings' to keep 'the vagrant chieftain as though in fetters chained ... and, for this reason, does not allow even the people under his sway to wander further than he is able.' (IX.10.3).

### Chapter 11. Requeening and uniting colonies

In spring, if a colony has young brood but is not doing well, a new ruler is chosen\*. On the other hand, if the non-thriving colony has no brood, it is united with one or two others, 'but only after they have been sprinkled with sweet liquid'; then you can shut them up for three days (with food) 'until they are accustomed to live together' (IX.11.1). [Varro used honey-water to stop bees fighting.]

One paragraph referred to 'people who prefer to get rid of a king-bee that is old, but this is harmful; for the crowd of older bees, who form a kind of senate, do not think fit to obey the juniors ...' (IX.11.2). The chapter ended with instructions for remedying a colony condition (which is not clear), and these show knowledge of worker and queen brood: '... you must examine any combs which it contains. You must then next cut away, from the wax which holds the seeds [brood comb containing eggs], that part in which the offspring of the kingly race comes to life [queen cell]. It is easy to see this, since almost at the very end of the wax there appears as it were the nipple of a breast projecting somewhat and with a wider cavity than the rest of the holes [cells], in which the young bees of the common kind [workers] are enclosed' (IX.11.2–4). In modern language, a queen cell, larger than a worker cell, projects like a nipple from the edge of the comb, and is to be cut out.

### Chapter 12. Restless swarms

This explains how to deal with swarms that will not remain in the hive in which the beekeeper puts them.

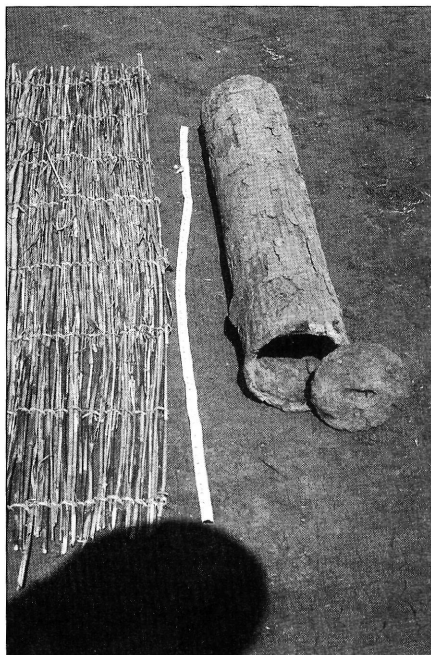


FIG. 6. Hive of sun-dried Nile mud, near Cairo, Egypt, 1978.

Other — less cohesive — mud was often mixed with dung, which includes plant remains. Dung was not often used alone, but dung hives were mentioned by Celsus (Columella, IX.6.2)

\*Reading with the MSS *novus rex eligitur*, not *eligitus*

## Chapter 13. Bee diseases

Disorders are discussed and remedies offered for them: starvation, lack of brood rearing, dysentery, poisoning from plants, and possibly European and American foul-brood and infestation by tracheal mites. Treatments are offered, but could not be based on an understanding of the pathogens involved. Przychodzki<sup>7</sup> studied the knowledge of bee diseases in Roman times.

## Chapter 14. The year's work

This was described 'according to the excellent system set forth by ... Hyginus'.

From the first equinox, about 24 March:

1. Wax moth larvae and adults [*Galleria mellonella*?] are killed; they drop off the combs 'if you mix ox's marrow with dung' and apply smoke from the burning mixture to the hive.

3–4. 'Very great care must be taken by the man in charge ... when he must handle the hives, that the day before he has abstained from sexual relations, and does not approach them when drunk and only after washing himself, and that he abstain from all edibles which have a strong flavour, ...'

From the rising of the Pleiades (about 8 May) to end of June:

4. Larger bees are born 'which some people think are king-bees'.

5. The hives generally swarm. This is the time when they 'must be very strictly watched, so that the young brood may not escape.'

For 30 days from the end of June:

5. Honey combs are gathered in according to instructions in Chapter 15 below. [Varro (III.16.34) collected honey combs three times in the season.]

6. Democritus, Mago and Virgil said [incorrectly] that bees could be generated from a slain bullock, but Columella decided not to deal further with this subject.

Until the autumn equinox:

7. Every 10 days, hives are opened and fumigated [it is not stated how], and then cooled (and cleaned) by pouring very cold water into empty parts of them.

9. When the mallows flower, wax moths are dealt with as in spring; a light-trap for adult moths 'in the shape of a milestone is placed amongst the hives in the evening', and this attracts and then destroys them.

Until the autumn equinox, 24 September:

10. Bees have been making their best honey — thyme, marjoram, savory — and the second harvest is taken [see 5 above for the first]; hornets may attack the bees.

For 40 days after the autumn equinox:

11. Bees store their winter food 'from the tamarisk flowers and woodland shrubs'; none of this is extracted.

13. On a very sunny day in late autumn, after cleaning the hive, the end-closures are moved inward 'close to the honey-combs to prevent there being any empty space within, so that the narrow quarters of the hives may warm up more easily during the winter.' Hives are further protected by heaping vegetation on top of them.

15. Dried figs, pounded and soaked in water, must or wine, are placed 'in little troughs at the very entrance to the hives; ... soak clean wool in these liquids' for the bees to stand on.

17. In mid-February 'pour sweet liquids through the entrance of the porch [flight entrance] by means of small pipes', to keep the bees from starving. [Varro's methods of feeding (III.16.28) were similar in principle.]

18–19. Celsus was quoted as saying that hives (in the many places where bee forage was lacking after spring) should be migrated to late-flowering areas, as in Greece.

20. Instructions for moving hives to better pasture (migration) were quoted from Celsus, who said that 'the hives ... should only be moved at night and without being shaken.'

## Chapter 15. Honey and honey harvesting

1. Honey is ripe when the bees expel drones from the hives [this occurs during a dearth of forage after a honey flow].

3. Columella agrees with Mago that people who say that drones should be exterminated are wrong.

4. Two iron knives, 1½ feet long or more, are used for getting honey combs out of a hive. One, for cutting combs away, is flat in front and very sharp. The other, for scraping away pieces of comb, is oblong with a broad edge on both sides and a curved scraper at one end.

5–6. This passage describes the smoker which is used at the opened back of the hive, so that 'the bees ... move to the front part of their abode and sometimes outside the porch' [the entrance].

8–9. '... at the first harvesting of honey, when the country still provides plenty of food, one-fifth of the honey-combs must be left [Varro left less, III.16.23]; at the later harvesting, when the winter is already causing apprehension, a third part should be left. ... If the hanging waxen cells run lengthwise [built along the hive], the combs must be cut with the iron tool which resembles a knife and must be received by putting your two arms underneath them, and so removed; but if they run crosswise ... then you must use the scraping instrument, so that they may be cut down by the pressure exerted on the side which faces you.'

10. '... old and defective honey-combs ought to be removed, and those which are soundest and full of honey should be left, as also those which contain young bees, so that they may be preserved for propagating a swarm.'

11. If combs near the hive entrance are removed, the hive should be turned round so that its other end contains the entrance; then next time the older combs there

will be taken; this allows for regular renewal of combs. Or, if the hive is fixed, the harvest should be taken sometimes from the back and sometimes from the front.

12. Honey is extracted the same day, while still warm. Combs are piled into a conical basket (like a wine strainer), and left for the honey to run out into a basin. Cells containing brood or 'red impurities' [pollen?] are first separated off, as they would give the honey a bad flavour.

13. Strained honey is stored in earthenware vessels, which are closed after the honey has stood for a few days and any surface froth skimmed off. Meanwhile the combs are strained again, this time squeezing them to release more honey, which is of second quality and should be stored separately.

### Chapter 16. Extracting beeswax

1. The well squeezed combs are washed and thrown into a brass vessel, water is added, and the vessel heated over a fire until the wax has melted and risen to the top; it is then poured off and strained through straw or rushes. The process is repeated to clean the wax further, and this time the wax is poured into suitable moulds, with some water which makes it easy to remove the wax when it has solidified.

### Pliny the Elder's writings

Pliny (AD 23–79) was a contemporary of Columella. He was said by his nephew, Pliny the Younger (in a letter to Baebius Macer, III.5) to be a compulsive writer, always accompanied by two slaves: one to read to him and one to write down anything he considered of note. He tried to extract what was useful from as many books as possible, but in his writings he arranged subjects indiscriminately.

In Book XI of *Naturalis historia*, which was largely copied from Aristotle's works, Pliny named the Greek beekeeping authors whose books were lost — Aristomachus of Soli and Philascus of Thasos — but said almost nothing about beekeeping methods. He was, however, the only writer who mentioned transparent hives, 'on the suburban estate of a certain ex-consul in Rome, who had hives made of the transparent horn of a lantern' (XI.16.49). A second entry described the hives differently: 'Many too have made hives of transparent stone, so that they might look on the bees working inside'. (XXI.47.80)

Pliny's passage on the building and use of combs (XI.10.23–24) was based on Columella's. (IX.15.6–8)

Book XXI contains a miscellany of jumbled fact and fiction. It includes one important statement on hive management:

'It is very advantageous ... for the lid at the back to be movable, so that it can be pushed forward into the hive, in case the hive is large or the bees' labour unproductive, to prevent the bees from abandoning their task through desperation. The lid can be pulled back little by little in such a way that the bees do not notice the addition to their work.' (XXI.47.80)

The following information was not included by other Roman authors. Beekeepers in Hostila, a village on the Padus (Po), placed their hives on boats when bee forage failed there, and took them five miles upstream by night. At dawn the bees started foraging, and when the hives were so heavy that the boats 'had sunk low in the water under the mere weight', they were taken back to Hostila and the honey extracted. 'In Spain too for a like reason they carry the hives about on mules.' (XXI.43)

## Writings by Aelian and Palladius

Aelian Claudius lived a century after Pliny, and died about AD 220. He taught in Rome, and he knew Greek so well that he wrote *De natura animalium* in that language. The book presented passages from Greek and other authors as moral tales, a few of which included notes about bees and beekeeping that contained something new.

**I.11.** Beekeepers can foretell bad weather from the behaviour of bees. Rain and snow do bees more harm than cold, especially if the hives leak.

**I.58.** Aelian alone discusses ways for getting rid of creatures listed by other Roman authors as harmful to bees: wasps, swallows, serpents, lizards, bee-eaters and frogs.

**II.53.** Herodotus (400s BC) is mistaken in saying that it was too cold in Scythia for bees to live. This information came from a man who 'had personal knowledge' that Scythians brought honey combs for sale to the Mysians in Anatolia — an example of honey trade in the Ancient World.

Rutilius Taurus Aemilianus Palladius lived in the 300s; nothing is known about his life except that he wrote *Opus agriculturae*, a succinct month-by-month account of practical agriculture. The beekeeping material is copied from authors already dealt with — especially Columella — although he does not name them. His passage on hives reads: 'The best hives will be those made out of bark taken from the cork tree, because they do not let in the cold or the heat; but they can also be made from the stalks of the fennel plant. If these are lacking, make them of sprigs of willow or of wood, either a hollow trunk or boards (as for barrels). The worst hives are of earthenware, because they are freezing in winter and boiling in summer.' (I.37.6–8)

## Characteristics of the beekeeping known in Ancient Rome

Large quantities of honey and beeswax were produced in Ancient Egypt, Greece and Rome, and different qualities of honey were recognized and kept separate. In all three regions, beekeeping seems to have been a respected occupation, and the supposed origin of bees was a highly honoured one. Roman knowledge about bees was largely based on that of Ancient Greece. However, it seems to me likely that the *beekeeping practices* described by Roman authors were derived in the main from the western Mediterranean region — particularly North Africa, including Carthage — rather than directly from Greece.



Roman writers, for instance Columella (IX.7.2) and Pliny (XI.10.24), make it clear that the hives they knew were opened and worked from either back or front end, as they probably were in Ancient Egypt, North Africa and Sicily. (In Crete, and Greece however, hives could probably be opened only at the front end from which the bees flew.) I think it likely that Egyptian-type beekeeping was in use farther west along the North African coast long before the Romans conquered it. But in a less dry climate, plant materials could be used to make hives that were lighter in weight and less breakable than Egyptian ones of mud or pottery, and whose thermal properties were more suitable for the bees. Hives of *Ferula* stems, used in both North Africa and Sicily, were mentioned by four major Roman writers.

Apart from the transparent hive which Pliny (XI.16.49) said was used in Rome, no location was given for a specific type of hive, and no single beekeeping operation was associated with a particular hive; the different types were usually described together.

Columella (IX.14.13) and Pliny (XXI.47) referred to a hive being made temporarily smaller (shorter) by pushing in its back end closure. It seems likely that all hives were horizontal tubes, perhaps all about 3 feet long and 1 foot across. The material used determined the cross-section of hives: round (log, cork, woven plant stems, earthenware), or square (*Ferula*, wooden boards). From their writings, it seems unlikely that any of the authors had seen in operation two advances developed elsewhere: the use of a honey extension as in Ancient Greece; and making new colonies by transferring combs and bees from one hive to another, as in Egypt, North Africa and Sicily in later centuries, and probably also before Roman times<sup>2,3</sup>.

Like later beekeepers, those in Antiquity loved their bees and wanted to do things for them. Roman writers stressed the need to grow plants for bees; to remove filth from hives; to protect the bees from harmful influences, including 'enemies' — and they described at length supposed enemies large enough to be seen, such as frogs and swallows.

Romans conquered parts of Britain from AD 43, Thrace 46, Germania 83, and Dacia (now Romania, etc.) 106. Yet Roman writers made no reference to upright hives such as skeps, which were almost certainly in use in some of these areas. Knowledge probably travelled very slowly and, around AD 60 when Columella wrote the most detailed account of Roman beekeeping, the existence of these upright hives may not have been known in Rome. If they had been known, one might expect at least one later Roman author to mention the relatively primitive use of inverted baskets as hives in the north. More beekeeping operations were possible with the horizontal hives described by Roman writers than with inverted basket hives, and Romans had no need to kill the bees before harvesting honey from them.

In conclusion, it seems likely that Roman descriptions of beekeeping were based on what was then practised — and may have been practised for many centuries — using horizontal hives in lands bordering the Mediterranean that became Roman provinces.

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