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ANCIENT APICULTURE

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1. Definitions

The term apiculture is commonly used to mean the keeping of colonies of (social) bees in man-made hives for the production of honey and/or beeswax. This is referred to here as 'true apiculture', to distinguish it from more primitive ways of obtaining honey and beeswax:

(a) Finding colonies of social bees nesting in the wild, and taking honey and/or beeswax from them (honey hunting). Honey hunting preceded true apiculture, probably in all regions. Similar honey-hunting behaviour is known also in higher primates, including chimpanzees' use of tools to extract honey, so it is likely that *Homo* species practised it from their earliest existence.

(b) Tending colonies of honeybees nesting wild in hollow trees (forest apiculture). This was an intermediate phase between honey hunting and true apiculture, in the forests of northern Europe.

Many artefacts used in the above activities are described and illustrated in *The archaeology of beekeeping* (Crane, 1983), which was the first book on the subject. Unsupported statements in the present article are covered more fully in the book, with references. Its Bibliography includes 324 sources, from many countries, and supplementary sources are quoted at the end of this article.

Subjects are dealt with below in the following order: Bees used in apiculture, Fossil bees, Honey hunting, Forest apiculture, True apiculture, Bee products (beeswax, honey, and mead made by fermenting honey). An Appendix lists diagnostic features which may help archaeologists to recognize hives.

Bees used in apiculture

F1

Fig. 1 indicates the native distribution of the bees involved, all of which form permanent colonies. True apiculture, using man-made hives, is biologically restricted to cavity-nesting bees, either honeybees (members of the genus Apis) or stingless bees (members of the subfamily Meliponinae). In the wild, they nest in cavities in trees or, where these are scarce, in cavities in rocks or below ground, and only occasionally in more exposed situations.

(i) Apis mellifera, native to the classical world of the Middle East, the African continent and Madagascar, and Europe (except the far north) with the off-shore islands Britain and Ireland. It builds a multiple-comb nest.

(ii) Apis cerana, slightly smaller, native to tropical Asia and the eastern parts of temperate Asia through China to Korea, Japan and what is now the far east of the USSR. It also builds a multiple-comb nest.

(iii) Various species of Meliponinae, native widely in tropical and subtropical parts of the land masses America, Africa and Asia, but not on geologically recent islands in the Pacific and other oceans. The two main genera used for apiculture are Trigona and Melipona, the latter being the larger bees. Nests which are built in cavities in trees or underground, vary according to species, but most are more amorphous than honeybee nests.

There are two further Apis species, both native to tropical Asia, and these build a single-comb nest in the open:

(iv) Apis dorsata, the largest species, which produces high honey yields.

(v) Apis florea, the smallest species, which extends into China and as far west as Oman, where a type of 'management' is practised (see later).

Honey hunting has been practised with all five types of bees, and forest beekeeping with European Apis mellifera; evidence should be sought for Apis cerana. Four of the five types are found in tropical Asia. None of them are native in North or South America outside the tropics, or in the far north of the Old World. In all these regions bumble bees (Bombus spp.) build summer colonies and store honey. Only the mated queens overwinter, and they found a new colony next spring. Nests of some species have been hunted, and even 'kept' in little 'bumble houses' in the Hargita Mountains of Transylvania in eastern Europe, but their importance in apiculture is very minor compared with honeybees and stingless bees. In Central and South America various Indian tribes collected honey from nests of social wasps, especially species of Polybia and Nectarina (Vellard, 1939). There are also ants that store honey, but they do not build storage cells, and honey is stored within the bodies of young workers known as 'repletes'. Honey-filled repletes are relished by native peoples in Central Australia and Mexico. Crane (1975) gives information on these minor sources of honey, which are not considered further here.

Until the 1600s the region occupied by bees used in apiculture remained unchanged from those indicated in Fig. 1, and the map thus shows which bees could have been hunted or kept by man in the different regions in ancient times. The earliest known record of the transport of European Apis mellifera to North America is dated to 1622.

Fossil bees

A monograph by Zeuner and Manning on fossil bees in general (Apoidea) was published in 1976.

F2

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Considerations on fossil Apis (Fig. 2) have been updated to 1983 by Culliney, who compiled the information presented in Table 1, and the bees listed there were all found in continental Europe except the last. These were in East African copal, a resin similar to amber, of Pleistocene age, and the specimens in amber reported from Yarmouth, England, may in fact have come from Africa, and be later (Pliocene). In 1979 a fossilized comb from the late Tertiary or early Quaternary, judged by its cell size to be that of Apis mellifera or an immediate ancestor, was reported from Malaysia; see Culliney (1983).

The most recent review of fossil Meliponinae is by Wille (1977). Known fossils range from Eocene to Recent. They do not include any Melipona, but the following species of Trigona are represented (Zeuner & Manning, 1976):

Eocene (Baltic amber); Trigona (Hypotrigona) eocenica Kelner-Pillault 1970

Oligocene (Dominican Republic); Trigona (Hypotrigona) dominicana Wille & Chandler 1964 (The name Trigona (Proplebeia) dominicana was proposed by C.D. Michener in 1982)

Miocene (Sicilian amber); Trigona (Tetragona) succini (Tosi 1896)

Middle Miocene (Mexico); Trigona (Nogueirapis) silacea Wille 1959

Pleistocene (East African copal); Trigona (Trigona) erythra Schletterer 1891

probably Pleistocene (Burmese amber: Hukong valley); Trigona (Tetragona) iridipennis Smith 1854

late Pleistocene (East African copal); Trigona (Hypotrigona) gribodoi Magretti 1884

Honey hunting

Equipment and methods are known from many areas, especially in the tropics where honey hunting was practised in the recent past. It is still the only way of harvesting honey from Apis dorsata, and is carried out widely throughout the range of this bee, also less widely with other bees. Most of the equipment is of vegetable origin and thus bio-degradable, and none is known from the distant past.

Artefacts that could provide archaeological evidence include:

(i) aids to climbing up (or down) to the nest - ladders of wood or tree branches; lianas; ropes of plant fibres (always very strong, since a man's life depended on this); pegs driven into a tree trunk.

(ii) knives or other implements for cutting honey comb(s) from a bees' nest.

(iii) a long pole fitted with a knife (latterly of metal), or with sharp tines, for cutting off pieces of Apis dorsata comb; this often has to be done from some distance, as when climbing down to a nest under a rock overhang.

(iv) a vessel to contain the honey combs. Types in use today include gourds, baskets, skin bags, and barrels hollowed out from wood.

(v) a smoker, but this would be just a bunch of smouldering vegetation. Pottery smokers are mentioned under True apiculture.

(vi) rock art, which is the richest source of evidence. Many rock paintings, and a few engravings, show honey hunters at work with their equipment, and also bees' nests (Fig. 3). The earliest example is dated to 6000 BC or before.

F3

A few bee-related rock paintings are known from Spain (e.g. Fig. 3a) and other regions, but by far the greatest number have been found in Southern Africa (Table 2, Fig. 3b; Pager, 1971, 1973; Woodhouse, 1982). In these, the frequent association between flying bees and groups of 'formlings' (Fig. 3a, 3b) and of catenary curves has led to the interpretation of formlings as multiple-comb honeybee nest viewed from below, and of catenary curves as the combs viewed from the side. In 1985 a register of bee-related rock art sites in Southern Africa was started, and it is likely to include at least several hundred records.

The above paintings all relate to Apis mellifera (see Fig. 1). Nests of Apis dorsata are portrayed in central India (Mathpal, 1984), and those of stingless bees in aboriginal rock art of northern Australia. No bee-related rock art has so far been identified in the Americas.

Forest apiculture

In the forests of northern Europe, including Russia, tree cavities provided many nesting sites for wild honeybees (Apis mellifera). By the early Middle Ages, honey hunters had progressed to 'forest beekeepers', improving their access to a nest by enlarging the bees' entrance hole into a vertical slit (about 50 x 10 cm) and protecting the slit with a 'door' consisting of a thick piece of wood; in Poland the door was in two halves to give separate access to the upper or lower part of the nest. Artefacts that do or could provide archaeological evidence on forest beekeeping, include:

(i) part of a tree trunk with such a slit; one was taken from the river Oder in 1901 which, from carbon dating, was growing in the first century BC (Crane, 1983).

(ii) ownership marks incised on a tree trunk near the base.

(iii) aids to climbing the trees (as under Honey hunting above).

(iv) a wooden seat of a type that could be carried up the tree, for use when working the bees.

(v) head of a short-handled axe (Imkerbeil) of characteristic shape, used to hollow out a tree cavity and to lever off the wooden door.

(vi) a bear trap, to be sprung by a bear on reaching the nest.

Useful reference material includes engravings published in the 18th century (and a few earlier woodcuts), actual objects in museum collections from the 19th century, and photographs taken then and more recently. There are also many manuscript records from medieval times (Galton, 1971).

True apiculture

The earliest attested use of man-made hives for bees consists of four representations of honey-harvesting scenes in Egypt. One was in a sun temple (2400 BC), and three are still in situ in tombs on the West Bank at Luxor, two dated to 1450 BC (Fig. 4) and one to 650 BC. All the hives shown are laid horizontally, and are either cylindrical or cigar-shaped; they are stacked one above the other, and the beekeeper is shown removing honey combs from one end (Crane & Graham, 1985). In Egypt today, traditional beekeepers use long thin cylinders of sun-dried mud, several hundred being stacked together, for instance in 10 rows with 40 hives to a row.

From Ancient Greece, there is direct evidence in the form of baked clay hives (Fig. 5) that have been excavated (Crane & Graham, 1985). All are thimble-shaped cylinders tapering slightly to one end which is closed, and widest at the other (open) end, from which honey was harvested. With some of the hives, remains of 'extension rings' of the same material were found; it is presumed that these were inserted at the wide end of the hive, to enlarge it

during the honey flow. The open end of the hive (or of the extension ring) was closed with a disc of the same material, a notch in the rim providing a flight hole for the bees. Very similar hives (but without extension rings) are still in use on Antiparos, and from these we know that the excavated hives would have been laid horizontally. Seven hives excavated in the Agora at Athens have an external diameter at the mouth between 34 and 39 cm. The length was about 40 cm in the 4th century BC, and 60 cm in Roman times.

In Crete and Greece today, quite a different traditional hive is also F 6 used, which was first recorded in 1682 (Fig. 6). Made of woven wicker or of baked clay, it is shaped like a large upright flower-pot. Across the top is a series of parallel wooden bars at the correct spacing, from which the bees build their combs: any one of these can be lifted out easily, with its comb, from the inward-sloping hive. This hive was the forerunner of the modern movable-frame hive used today, which was devised in 1851; it may or may not have been known in antiquity, and it is possible that future archaeological finds will establish this. (Somewhat similar vessels from Ancient Greece have been called hives, but it now seems likely (Crane & Graham, 1985) that they were a type of a clepsydra (water clock), a small hole being made at the bottom to let out water, not bees.)

No hives from Ancient Roman times have been excavated (or at any rate identified as such), and no depictions of hives or apiculture are known, but Roman authors described their hives in some detail. A common size was 3 ft long and 1 ft across, with a circular or square cross-section. The hives were laid horizontally, parallel to each other, either on a platform or embedded in a wall. Nine types are referred to, made of: a log, cork bark, wooden boards, woven wicker, fennel stalks (Foeniculum vulgare), dung, baked clay, bricks, and a transparent material - mica or horn. Examples of all types except the last have been found in current use somewhere in southern Europe or the African continent, although not in mainland Italy.

Hives of baked clay (terracotta, earthenware) are the most likely to have survived, but they were not favoured in Roman times, being widely regarded as too cold in winter and too hot in summer.

Bees were also kept in hives in pre-Columbian America, and most is known about Mayan apiculture, in Yucatán and neighbouring regions. Horizontal log hives were (and are) used there for Melipona beecheii, with a flight hole half-way along, not at an end as in the classical world. A statue of the bee god Ah Mucan Cab from Cozumel Island off the east coast, dated to the 800s AD, shows four such hives, which look similar to those in use today. At Chan Chen, a post-classic site (AD 1000-1500) in Belize, Sidrys (1983) and his colleagues found 33 discs of soft limestone mortar, of the type and size (8-10 cm diameter) still used in the neighbourhood as end-plugs for log hives that house Melipona beecheii. They also found fragments of an 'incensario' in the shape of Ah Mucan Cab, which they suggest might have been used for a bee ceremony, or possibly even for smoking bees.

Other types of hive are also used now for stingless bees in various parts of their range in America, and they may or may not have originated in pre-Columbian times. A small gourd is used widely, sometimes hung under a porch roof. A lidded pot, shaped like a miniature upright soup tureen, is used in Hidalgo, Mexico, and pottery could survive. But only the small flight entrance hole at the side would differentiate it from a general-purpose pot, unless beeswax could be identified by chromatography, as was done with some of the thimble-shaped hives from Ancient Greece (Fig. 4).

In Europe, the Alps - with mountain ranges to the west and east - separated two broad areas of apicultural development. To the south, traditional hives were roughly cylindrical in shape, and laid horizontally. They stood on a platform, were embedded in a wall, or were suspended - in a tree or under the eaves of a house. Similar hives and hive sites were used throughout the range of Apis mellifera in Africa and of Apis cerana in tropical Asia.

In the forest apiculture north of the mountain ranges, honeybee colonies were housed in living trees. When tree cavities became scarce (or for other reasons) upright log hives were attached, high up, to tree trunks that had no cavities. Later, these hives were kept on the ground, where they were much easier to tend. For protection they were grouped together in apiaries. To the west of the Elbe, outside the forests, upright basket hives - skeps - were used, mouth down. They were first made of woven wicker, but from about AD 0, the more weather-resistant lipwork was used, with coiled straw - or, locally, grass, sedges or reeds. There are many stylized representations of the above hives in medieval manuscripts and early books (Fig. 7), but very few are known from antiquity. In north Germany an upright beechwood log hive from AD 400-500 was found near Oldenburg, and part of a woven wicker skep from AD 0-200 near Wilhelmshavn. The earliest attested remains of part of a coiled-straw skep, found with a number of honeybees in York, England, has been dated to the 12th century.

In Asia, horizontal hives are the norm in traditional apiculture south of the Himalayas. Both these and squarish hives made of boards are found in China, farther north. In Korea traditional hives are upright logs, as in Russia, and in Japan they show similarities with both Chinese and Korean hives. No hives from antiquity are known from Asia.

Most traditional hives were made of plant materials, and their survival is possible only in an acid environment. On the other hand primitive smokers of baked clay are known in North Africa, and if they were also used in antiquity some could have survived. Characteristic smokers are vessels about 25 cm long or high, on legs because they become hot in use; there is an opening through which the operator blows, and elsewhere are one or more small holes through which smoke is directed into the hive. But a more primitive open type, similar to that shown near the top of Fig. 4, is used in at least one Saharan oasis.

Structures for sheltering hives

In Britain and Ireland, records have been made since 1952 of nearly 900 sites with surviving structures for sheltering hives. A number can be dated, and these show that the structures were built in every century from the 12th to the 19th. They are made of stone, brick or cob, or occasionally of wood, and most face south or south-east. They are of the following types:

(a) a simple (often lean-to) roofed shelter with one or more shelves on which skeps stood;

(b) an alcove, an architectural feature in a garden, with one or several shelves for skeps;

(c) bee boles, recesses constructed in a wall when it was built, each having space for one skep, or occasionally for 2 or 3;

(d) a winter bee house, a windowless building with thick walls that incorporate a number of recesses like bee boles (up to 46 are recorded), in which skeps of bees were kept through the winter, at an even temperature and protected from the weather.

(e) a bee house, a building in which skeps were kept permanently. Each skep, usually standing on a shelf lining the wall(s), was provided with a flight hole through the wall.

There are also a few sets of bee boles in France, and a set for 98 hives was found near Mycenae in Greece, but has since been demolished. Stone walls with recesses like shallow bee boles are used in northern Oman for sheltering and managing the single-comb colonies of the smallest of the honeybees, Apis florea (Whitcombe, 1984). Each end of the branch or palm-frond which supports the comb is placed in a notch in a side wall, near the top of the recess. It is not known when such recesses were first used.

A rich variety of further sites and shelters for hives still survive in remoter parts of Europe, the Middle East and North Africa (see Crane, 1983), and this suggests the possibility of future archaeological finds of this nature provided their identity can be established.

Bee products

Beeswax and honey are more likely to survive for long periods, and to be identified, than most traditional equipment used for keeping bees.

Beeswax comb is destroyed by wax moths quite quickly, but beeswax blocks are resistant to decay in most natural environments. In the Ancient World beeswax was used widely for sculpturing, and many small statues, cult objects and votive offerings are known from early times. Beeswax was used as an adhesive, also for filling incised hieroglyphs, and as a binder for charcoal black pigment. It was used in encaustic paintings. Beeswax was necessary for casting metals by the cire-perdue (lost-wax) method, which was known before 1000 BC to the Sumerians and in the Indus valley and in Egypt. Sometimes the wax statue would itself be kept, and retain its original freshness after two thousand years or more. In West Africa Ashanti gold weights were made by this method, and - in parts of pre-Columbian America where stingless bees occur - fine gold jewellery. Blocks of beeswax survive from a Late Bronze Age foundry, and beeswax candles from the 1st century AD or earlier. Many other beeswax objects were made in antiquity, and further examples will surely be found.

Honey is a supersaturated solution of sugars, and can survive for a long period in an airtight container at a cool temperature. It has been found in tombs of Ancient Egypt and at Roman sites. Honey contains pollen grains from flowers visited by the bees, and the shape and size of the

grains may help to identify the plant sources of the honey, although not always to the specific level. So it may be possible to determine the origin of samples of honey from antiquity. One Bronze Age burial from about 1000 BC in Scotland contained a deposit of plant material, some in a beaker and some outside it. The main pollen was Tilia cordata, a lime that grew in England and Denmark at the time, but not in Scotland. The second most frequent pollen was meadowsweet (Filipendula), a plant that is not a honey source but was used for flavouring mead. So the beaker may have contained mead made from imported honey.

Storage and transport jars for honey (some with a figure of a bee on each handle), and also smaller containers, have survived from the Ancient World.

Appendix: Diagnostic features of hives

The archaeology of apiculture is a very young subject, and its growth will depend greatly on the ability of site archaeologists to recognize artefacts that might be related to apiculture.

A purpose-built hive for Apis mellifera is likely to be characterized by:

(a) Its material(s) and construction: rigid, bee-proof, weatherproof, giving some thermal insulation, almost any material except metal.

(b) Capacity commonly 40-50 litres, although some hives are nearly twice as large and some skeps only half; small hives were favoured in skep beekeeping to encourage early swarming.

(c) Entrance hole(s) for bees, commonly 1-2 cm across; entrances may be provided in the hive (Figs. 6, 7) or in its closure (Fig. 5), or by irregularities in construction, especially at the junction of two surfaces, e.g. between a hive and its closure or stand. Both hives

and certain other containers may have small holes for ventilation, or for cord used to secure two parts together (as in Fig. 4). Some types of clepsydra have a small hole through which water escapes. A bee cannot pass through a hole less than 6 mm, but most flight holes are larger than this.

(d) Means of access by the beekeeper when removing honey combs. This can be provided by standing an open-mouthed hive on a base, as in Fig. 7 (lifting it up to take the combs), or by incorporating a large removable closure (Figs. 4, 5). Alternatively some primitive hives made of disposable material such as mud (with or without cow dung) are broken into to reach the honey combs, and immediately repaired by applying more mud.

(e) On the top part of the inner walls of horizontal hives, there may be 'combing' (in baked clay) or parallel grooves (in hewn wood); the purpose is to encourage the bees to build their combs in a certain direction.

(f) Hives of baked clay could retain vestiges of beeswax on the inner walls, where combs were attached to them, and confirmation of beeswax, e.g. by chromatography, is a valuable diagnostic aid.

Hives for Apis cerana have similar characteristics, except that they are smaller; the size is likely to be about two-thirds linear that of Apis mellifera hives, and the capacity 10-15 litres or possibly more. Hives for stingless bees are smaller still; the size varies according to species, but 2-3 litres is usual.

References

Publications marked * are supplementary to those cited in the second reference.

Crane, E., 1975. Honey: A Comprehensive Survey. London : Heinemann & International Bee Research Association, 608 p.

Crane, E., 1983. The Archaeology of Beekeeping. London : Duckworth, 360 p.

*Crane, E., and Graham, A.J., 1985. Bee hives of the Ancient World. Bee World, 66(1), 23-41; (4), in press.

*Culliney, T.W., 1983 Origin and evolutionary history of the honeybees Apis. Bee World, 64(1), 29-38.

Galton, D., 1971. Survey of a Thousand Years of Beekeeping in Russia. London : Bee Research Association, 90 p.

*Maa, T., 1953. An enquiry into the systematics of the tribus Apidini or honey bees (Hym.). Treubia, 21(3), 525-640.

Mathpal, Y., 1984. Newly discovered rock paintings in central India showing honey collection. Bee World, 65(3), 121-126.

Pager, H., 1971. Ndedema. Graz, Austria : Akademische Druck- u. Verlagsanstalt, 375 p.

Pager, H., 1973. Rock paintings in Southern Africa showing bees and honey hunting. Bee World, 54(2), 61-68.

Sidrys, R.V., 1983. Archaeological excavations in northern Belize, South America. Monograph, Institute of Archaeology, University of California, Los Angeles, No. 17, 434 p.

Vellard, J. 1939. Une Civilisation du Miel: les Indiens guayakis du Paraguay. Paris : Librairie Gallimard, 189 p.

Whitcombe, R.P., 1984. The Biology of Apis spp. in Oman with special reference to Apis florea Fab. University of Durham, UK, PhD Thesis, 500 p.

Wille, A., 1977. A general review of the fossil stingless bees. Revista Biologia Tropicale, 25(1), 43-46.

Woodhouse, H.C., 1982. Bees: as the bushmen saw and thought them. Lantern 32(1), 30-37.

*Zeuner, F.E., and Manning, F.J., 1976. A monograph on fossil bees (Hymenoptera: Apidae). Bulletin of the British Museum (Natural History) Geology, 27(3), 149-268.