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TRADITIONAL MANAGEMENT OF *APIS CERANA* USING MOVABLE-COMB HIVES IN VIETNAM

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Introduction

Systems of movable-comb beekeeping, using hives that have top-bars but not complete frames, are fairly widely used today for *Apis mellifera*. They were based on Sir George Wheler's 1682¹² description of such a hive in Greece, but we do not know when this was first developed, or where. The Greek hives, shaped like a round waste-paper basket, are furnished with bars of appropriate lengths across the open top. The top-bars are curved on the underside and spaced at the bees' natural comb spacing, so that bees build a comb down from each top-bar. The use of these hives may have arisen by accident — rather than through logical argument as to their benefits — when a traditional horizontal pottery hive was stood upright on its closed end, with the open top covered, as suggested by Ifantidis⁷.

The present article describes traditional beekeeping with top-bar hives in Vietnam. We assume that it was developed independently of that practised in Greece; nevertheless the supposed circumstances could have been similar to those Ifantidis suggested. If an empty log had been stood upright with a separate cover over its open top, a swarm of *A. cerana* occupying it would have built its combs down from the cover; provided the bees did not attach the combs to the side walls (which the bees in northern Vietnam seem disinclined to do), the combs could all be lifted up with the cover. A cover might subsequently have been made of several pieces of wood, and finally of a number of parallel strips.

This article describes beekeeping based on various types of top-bar hive in Vietnam in the past and present, and figure 1 shows where they were found. Two French publications^{10,11} describe use of the hive sixty years ago, and we found it in current use in several

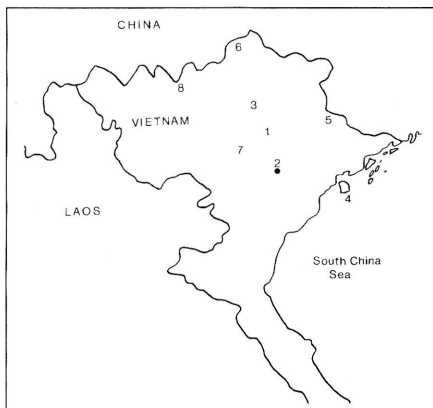


FIG. 1. Map of northern Vietnam showing places referred to in the text.

1. Dai Tu, Bac Thai province. 2. Bac Son, Ha Noi district. 3. Chiem Hoa, Ha Giang province. 4. Cat Ba (island). 5. Lang Son. 6. Dong Van, Tuyen Quang province. 7. Phu Tho (former province). 8. Xuan Giao and Xuan Quang, Lao Cai province.

provinces in the north: Bac Thai, Ha Noi district, Ha Giang, Cat Ba island, Lang Son, Ha Bac and Vinh Phu.

Movable-comb beekeeping with top-bar hives in Vietnam in the 1930s and earlier

Toumanoff's 1933 paper¹⁰ was on beekeeping by Annamese people in Tonkin, which comprised the mountainous north part of Vietnam that borders on China. Log hives were placed either horizontally or upright, and the latter 'had transverse bars (*baguettes*), usually five, resting in small grooves (*petites échancrures*) cut into the trunk. The combs were suspended from these top-bars.' To harvest honey, after light smoking each comb was lifted out by its top-bar, the upper part containing honey cut away and the remaining lower part tied to the top-bar with two strands of straw, and replaced in the hive. Toumanoff commented with surprise that no bees were killed during the operation. His figure 5 shows a beekeeper with an opened upright top-bar log hive, and his figures 8–10 show a comb about 40 cm long lifted out of such a hive by its top-bar (compare fig. 3 here).

The longer paper by Toumanoff and Nanta¹¹ described results of an enquiry into the circumstances of beekeeping in most of the provinces of Tonkin. The enquiry was made by means of a questionnaire sent to all provinces, in collaboration with the Institute Pasteur d'Indochine in Hanoi. Replies showed that most hives were logs from 60 to 100 cm in length and 20 to 50 cm in diameter, placed either horizontally or upright. Ends of horizontal hives were closed by discs of wood, or sometimes of coiled straw, and cracks were sealed with a mixture of clay and buffalo

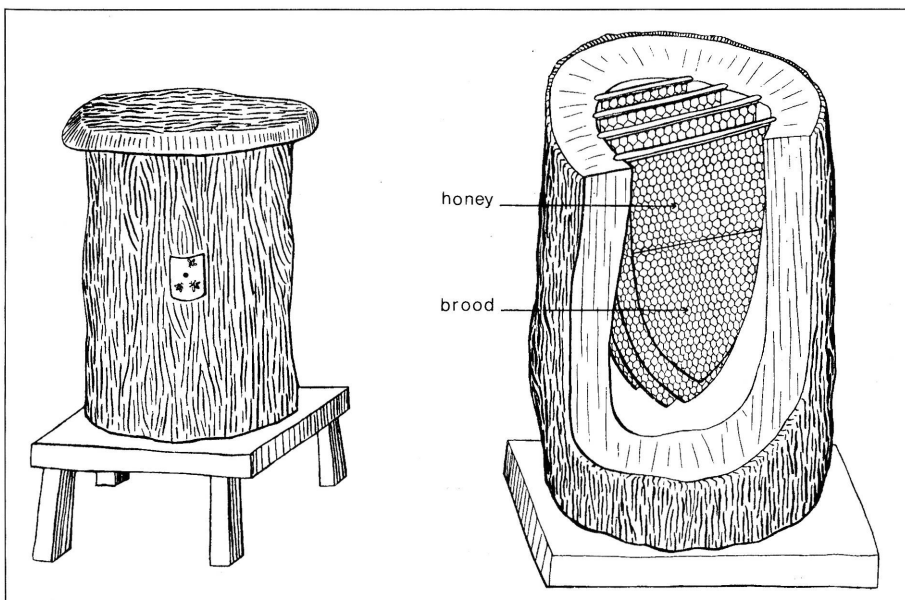


FIG. 2. Top-bar log hive in north Vietnam¹¹.

dung. The paragraph on horizontal hives includes the sentence 'Inside these hives 2 to 8 top-bars were placed, from which combs were built', but it is puzzling how the beekeeper got access to them. Drawings of some upright hives, reproduced in figure 2 here, show combs and top-bars. At the top were grooves, aligned (*des échancrures sont disposées...*) to accommodate the ends of parallel top-bars; the bars were covered with a flat round piece of wood, smeared with dung or mud. (The bars shown in fig. 2 are not resting in such grooves.) All hives were protected against ants; horizontal ones were hung up, and upright ones were on stands whose legs stood in water.

Top-bar box hives had been used much earlier in Ha Noi and, according to a report by Faraut in 1907³, one beekeeper had 42 of them. The hive Faraut described was a square wooden box, 35 cm across and 45–50 cm high, with a volume of 55–60 litres. The top, and the side containing 3–9 flight entrance holes, were removable. On the inner face of two opposite sides, 50 mm below the top, a horizontal wooden strip was fixed to support the ends of movable top-bars that carried the combs (*lamelles mobiles porte-rayons*); these were made of split bamboo 25–50 mm wide. Top-bars were primed with pieces of old brood comb and honey comb, and the bees continued to build their combs in the same direction. Beekeepers multiplied colonies by dividing strong ones or by making artificial swarms, and they knew how to control swarming by judicious removal of sealed queen cells. They also removed sealed drone brood, which they ate as a delicacy*.

Beekeeping must have been important in Tonkin in 1907; the province of Phu Tho, for example, had 4 000 to 4 500 hives, an average of 24–27 per village and 3–4 per beekeeping family.

Present movable-comb beekeeping in Vietnam

Observations reported here were made between 1989 and 1992 in three areas in the wooded hills (0–800 m) north of Hanoi and the Red River at 22–23°N, and also in Cat Ba island off the coast east of Hai Phong at 21°N (fig. 1).

Bac Thai

Figure 3 shows one of the top-bar log hives used by beekeepers of the Nung tribe in Dai Tù village. Three generations of one family keep bees in such hives, but they have no memory of an earlier generation doing so. Typical internal dimensions of the hives are: height 42 cm, top and bottom diameters 18 and 17 cm. All logs we saw had been made roughly round in cross-section internally, and had top-bars of varying lengths whose ends fitted into grooves cut into the top surface of the hive wall; the spacing was rather irregular (15–40 mm). The flight entrance, about 10 mm in diameter, was near the bottom of the hive, and higher up a rectangular

* **Note added in proof:** an even earlier reference than Faraut's³ to these top-bar hives in Vietnam was published in 1887 by Rialan, Vice-Resident of Thai Nguyen province^{9a}. He described the hives and their use in his province — which is now Bac Thai where we also found them. He also described tethering the queen, and attaching her to a central top-bar when hiving a swarm. He was puzzled that the 'natives' did not use the top-bar hives to divide colonies when they found queen cells, and so increase their number.

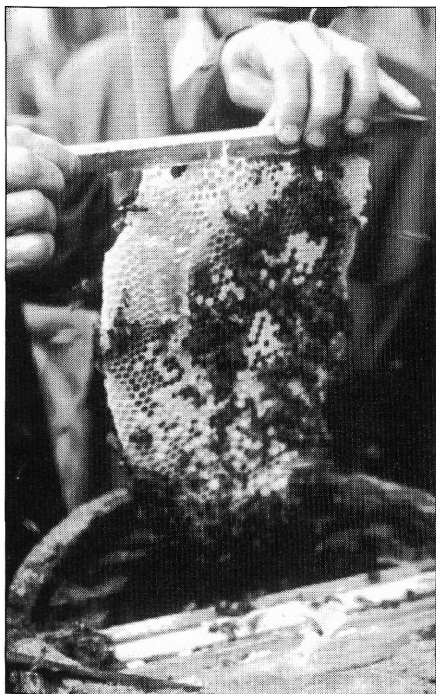


FIG. 3. Top-bar log hive used by a Nung beekeeper in Dai Tù, Bac Thai province, showing comb lifted out, and grooves to take ends of top-bars.



FIG. 4. Empty top-bar log hive with rectangular side door (Ha Noi district).

door about 30 x 10 cm had sometimes been cut, for monitoring the colony inside. All hives were on stands well off the ground.

Bees were found to do better in upright logs than in horizontal ones, and swarms to build up even better if left in the smaller upright logs used as bait hives which are referred to below.

Ha Noi

In Bac Son, Ha Noi district (30 km north of Ha Noi), three families keep bees in upright log hives fitted with top-bars of bamboo about 15 mm wide and of varying lengths (fig. 4); the top-bars rest on a rebated internal ledge. The hive diameter is about 30 cm and, as in Bac Thai, some hives have a side door.

One beekeeper showed us a disused top-bar log hive said to be at least three generations old, which had cut-out grooves giving a comb spacing of 27–34 mm. He now uses only top-bar box hives (40 x 28 x 25 cm) made of wooden boards which he had to buy; this is due less to the advantage of equal-length top bars than to the lack of logs resulting from deforestation. The top-bars rest on rebates 5–10 cm below the top of the hive, leaving a space between them and the roof. During

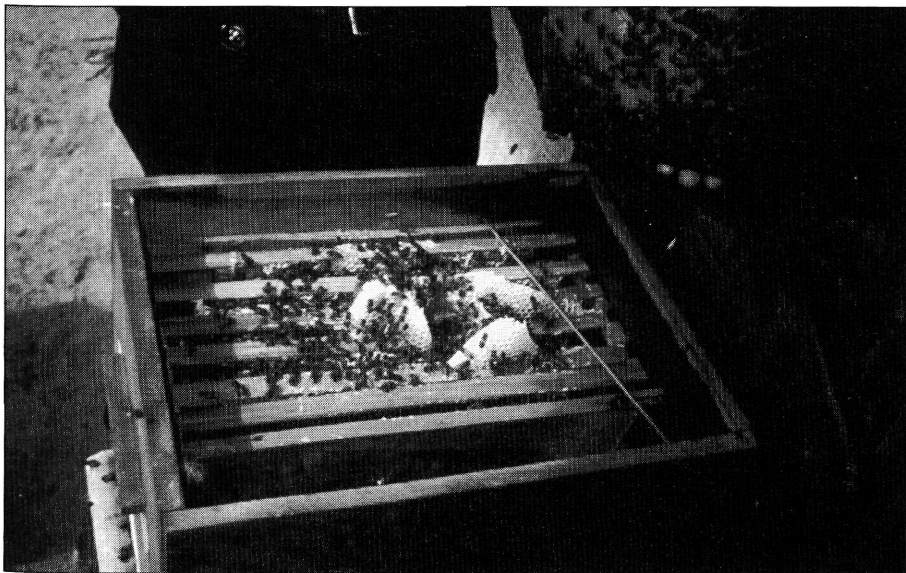


FIG. 5. Top-bar box hive with shallow space for honey combs above the top-bars (Ha Noi district).

dearth periods an inner cover is placed on the bars; during the flow it is removed so that the bees build combs and store honey in the space above the bars (fig. 5, and fig. 8 which shows the rebate more clearly).

Another beekeeper, who saw frame-hive beekeeping at a state beekeeping enterprise, had devised a frame hive using an extra large horizontal log from a coconut palm, closed at each end by a wooden disc. The interior of the hive was shaped to provide space for wooden frames 40 x 20 cm, aligned along its length, and the hive had a removable cover (fig. 6). According to the beekeeper, similar hives are used elsewhere, but with top-bars.

Tuyen Quang

A beekeeper in Chiêm Hoa, Tuyen Quang province, has a larger upright hardwood log hive with equal-length bamboo top-bars (see Cat Ba below), and a shallow honey-storage space above like that just described; it stands on four short wooden legs (fig. 7). Near Dong Vang, a beekeeper uses box hives with top-bars.

Cat Ba

In Cat Ba island off the coast east of Hai Phong (21°N), top-bar hives seem to have been used for not much more than ten years, but we could not find out who had started the practice. The large upright logs used have a diameter between 35 and 60 cm, and a height between 40 and 60 cm, and all are covered with a flat stone or wooden board(s) as a cover. Some have top-bars about 20 mm wide placed with a gap of about 10 mm between them, and others have full-width (self-spacing)

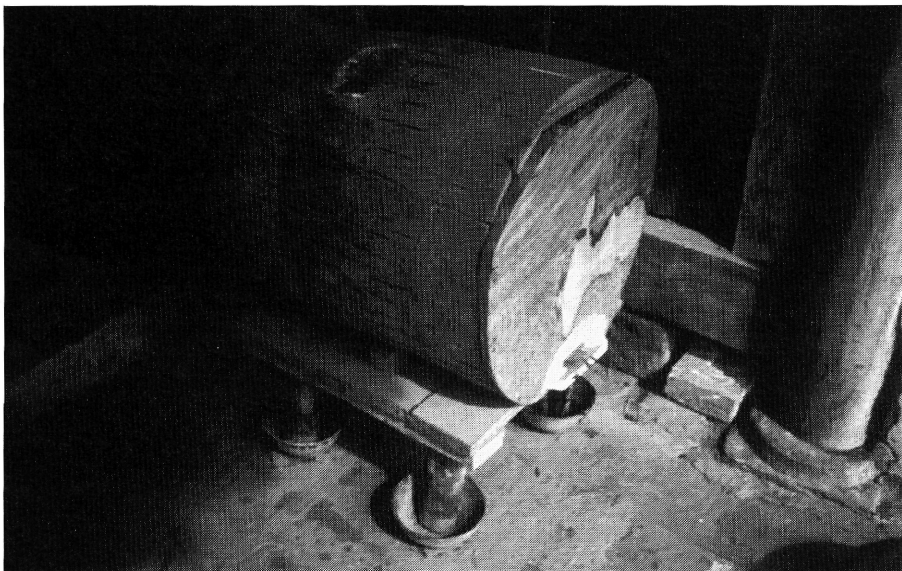


FIG. 6. Horizontal coconut log hive with removable cover, containing movable frames parallel to its length (Ha Noi district).

top-bars, usually 27–30 mm. One beekeeper inserts fillets of wood less than 8 mm wide between such top-bars that support honey storage combs during the flow, to increase their spacing.

The internal cross-section of the above logs is round, but in some others it has been made rectangular so that all top-bars are of the same length and rest on two parallel rebates (fig. 8).

During the past 5 years, some of the beekeepers have made top-bar box hives, after seeing movable-frame hives brought from the mainland by migratory beekeepers. Although in Cat Ba a beekeeper has no more than 15 hives in all, he may have a great variety: horizontal fixed-comb, upright fixed-comb, round top-bar, square top-bar, movable-frame box.

Lang Son

In this province on the mainland, 5 km east of the provincial town and near the Chinese border, we found a beekeeper using frames 25 cm square in a horizontal log hive. He used to fit bamboo top-bars but he made frames instead after he saw them in apiaries of migratory beekeepers. The frames are made of bamboo, cut to length with a knife so that they fit tightly in place. The spacing between the frames is judged by experience; each top-bar is fitted with a piece of comb, and the top-bars are usually inserted closely against each other.

Lao Cai

In 1992, Mung and some other peoples in parts of Xuan Giao and Xuan Quang in Lao Cai province were also found to place top-bars across the top of their upright log hives, but often in rather a random way without understanding their function. Perhaps they had copied the system from elsewhere, but had not been taught how to operate it properly.

Present-day traditional beekeeping knowledge and skills

In all the places visited, beekeepers who use top-bar hives also use a variety of fixed-comb hives. Both they, and beekeepers using only fixed-comb hives, have a wide knowledge of the behaviour of *Apis cerana* colonies, especially their swarming, nesting and absconding.

Beekeepers obtain colonies to populate hives by locating wild nests or swarms in the forest, and transport brood combs, honey combs, and bees from a colony in separate containers. Just before the swarming season, they set up bait hives near the forest: horizontal or upright logs or wooden boxes with a capacity about 15–25 litres, i.e. smaller than the permanent hives. Bait hives are placed in trees or on rocks, about 2–4 m above the ground, and are checked frequently; as soon as one is occupied the swarm is taken home. A great effort is made to find the queen and to put her in a cage, usually made of bamboo; Faraut⁴ also reported this in 1909. Some beekeepers know the technique of tethering the queen by a hair, and they may cut her wings as well, as also reported by Toumanoff and Nanta in 1933¹¹.

In Bac Thai and Ha Giang, bait hives are hung near the base of a large forest tree

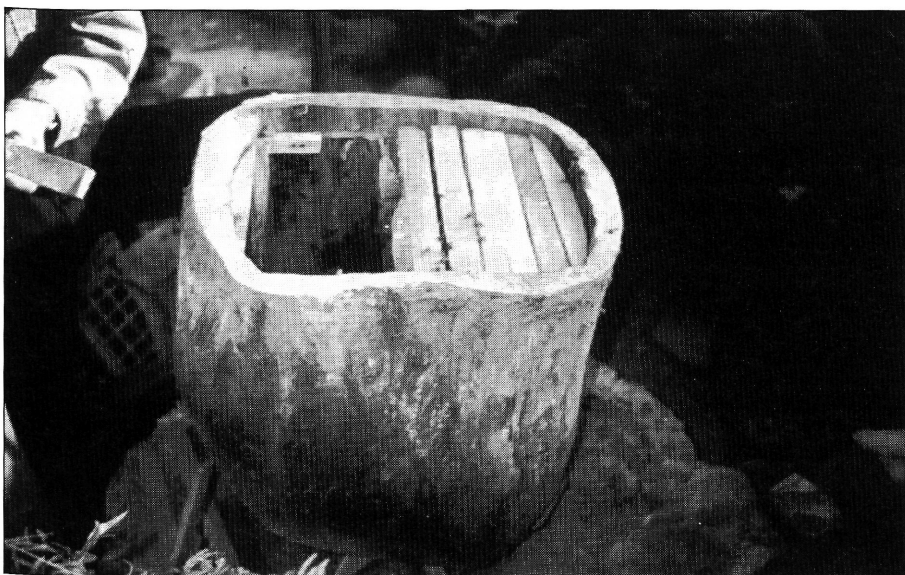


FIG. 7. Top-bar log hive with equal-length top-bars resting on two parallel rebates (Chiêm Hoa).

when scout bees are seen flying in the vicinity. A few of the bees are caught with an insect net, and one is put into the hive through the entrance hole and enclosed there for 20–30 minutes, after which it is allowed to fly back to the swarm it came from. Beekeepers say that, usually an hour or so later, some hundreds of bees appear and inspect the interior of the hive, and the whole swarm should arrive the same afternoon and settle in it. This practice often leads to competition games among beekeepers, a reward going to the one who catches most swarms in his bait hives.

Although the queen's wings are sometimes cut to prevent a hived swarm leaving, techniques for catching swarms in transit are well developed. In the Bac Thai family, it is the task of the beekeeper's wife to keep a look-out for swarms from colonies near the house. She has a 6-metre bamboo pole with a piece of cloth fixed at the top, which she swings into the flying swarm when it issues; this is said to make the swarm settle nearby immediately. In order to attract swarms, a horizontal disc or a helmet is often hung on a piece of rope in a tree, at a height of 2–3 m (Toumanoff¹⁰, fig. 12 shows such a disc). Another common practice to make a flying swarm settle is to throw water, sand or dust into it.



FIG. 8. Hive similar to that in fig. 7, but with a shallow honey-storage space above the top-bars; a queen cage rests on the right-hand top-bar (Cat Ba).

Harvesting and treatment of hive products

In the north of Vietnam, traditional beekeepers harvest honey once or twice a year, not at the end of a honey flow but at its peak — so that the bees can produce more honey afterwards. Sugar is fed only occasionally. The harvest is generally 2–10 kg.

A beekeeper using top-bar hives removes each comb and shakes the bees from it. He puts it on a flat surface and cuts off the upper part containing sealed honey, and then attaches the top-bar to the lower part of the comb containing brood, by threading two lengths of straw through the brood comb and tying them over the top-bar, as described by Toumanoff in 1933¹⁰.

In hives where the combs are long (more than 50 cm) and narrow (less than 25 cm), beekeepers in Bac Thai sometimes reinforce combs as follows. Before a top-bar is put into a hive, the two ends of a string of straw or jute are passed through holes

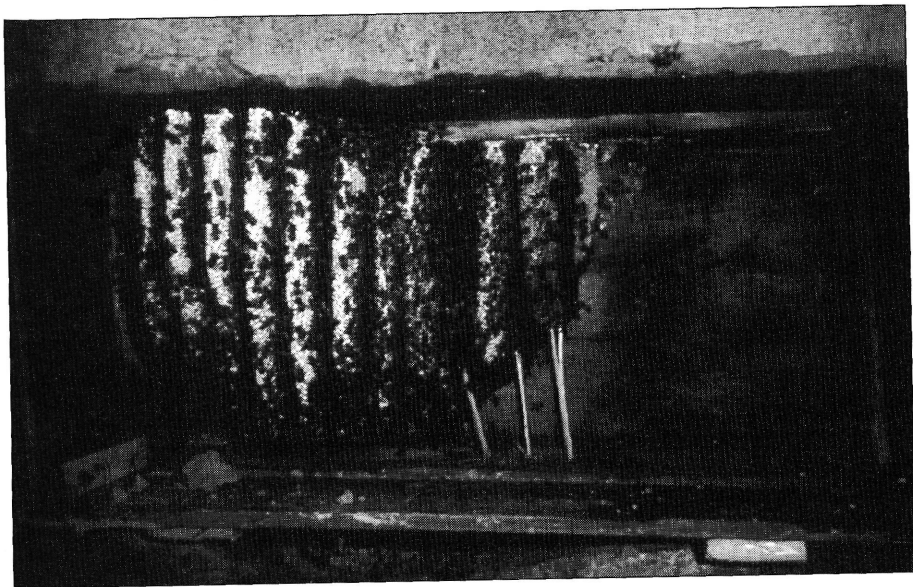


FIG. 9. Forked bamboo sticks used to support brood combs replaced in a fixed-comb box-hive; the bees have already re-attached the combs (Cat Ba).

widely spaced along the top-bar, and secured by knots above so that the string hangs in a curve extending 40 cm below. The comb built from the top-bar incorporates the curved string, and after the honey comb is cut out, the brood comb is pulled up on to the top-bar by the two ends of the string, and new knots tied to secure it in place.

The practice of re-attaching brood comb, after cutting out and harvesting the honey comb above it, is also followed with fixed-comb hives. In Cat Ba it is done with a horizontal log hive, by inserting two supporting bamboo sticks horizontally from one end of the log hive. In a box hive that has a removable side door giving access to combs, a forked bamboo stick is inserted to support each brood comb in contact with the original attachment position of the comb (fig. 9). Owners of *A. cerana* nests in rocks in Quang Ninh province are reported to do the same.

With the hives mentioned above that have a honey storage space above top-bars (as in figs 5 and 8), most honey is stored in this space, in combs built downwards from the cover or upwards from the top-bars. Such combs are scraped off with a knife — which causes minimal disturbance to the colony — sometimes several times in a season.

The shape of some individual log hives has led beekeepers, for instance in Cat Ba island, to divide the interior into two compartments. The bees build combs and rear brood in one, and during the honey flow they are allowed access to the other for honey storage.

Honey combs are usually squeezed by hand to separate the honey and wax. Honey is nowadays stored in bottles, and is used especially as a medicine. *A. cerana* honey

fetches up to five times as much as *A. mellifera* honey and is easily sold. Wax is used for candles, and for such purposes as treating cracked hooves of cows or buffalo. But there is no local market for it, and beekeepers often do not bother to collect it. Brood is eaten in some families, who collect it during two periods; when swarming is expected, the 'big brood' (drone) is cut out and cooked with beans, and at the end of the harvest period, before the longer dearth, 'excess' worker brood is cut out and eaten.

Possible origins of beekeeping and of movable-comb hives in Vietnam

Hive beekeeping

In the 8th century AD, Pham Lé, Great Minister for the land of the Viêt, wrote an account in Chinese of the people's use of hive bees (*A. cerana*), which was published in 1909 in a French translation by Faraut⁵. According to this account, the annals of the country of Nam Tàm say that the bee soldiers (i.e. workers) and chiefs (i.e. drones) show entire fidelity to their king (i.e. queen). Faraut gives Annamite terms as *quàn*, *con tuong* and *chua*, respectively. Pollen from orchid flowers — perhaps pollinia? — is collected as special food for the king. Drones are produced in the third and fourth months (March/April); they do not sting, and they are charged with fermenting the honey collected by workers. In the seventh and eighth month (September/October) 'they disappear, their further existence being harmful to the colony; there is no more honey to be harvested until next summer'. People in the forests populate hives (baskets or boxes made weathertight with clay) by collecting bees from tree or rock cavities. 'One side and the covers (*couvercles*) of the — presumably horizontal — hive are arranged so that they can be removed easily, to harvest the honey or to inspect (*visiter*) the bees.' Honey is extracted by pressing combs, and wax by heating. Honey is stored in porcelain jars.

In a 1902 account of hive beekeeping in French colonies, Fougères⁶ reported that it was practised on a very small scale in Indochina, mainly in Tonkin and Annam. About a dozen other articles published between 1773 and 1950 mentioned traditional *A. cerana* beekeeping in Vietnam. Most referred to both horizontal and upright log hives, and some box hives as well, but none to the use of top-bars.

Toumanoff and Nanta¹¹ concluded that beekeeping must be very old in Tonkin because colony management was well developed, and because the beekeepers knew much about the bees' life history and behaviour. The care they gave to their colonies 'was comparable to that of good beekeepers in Europe'.

Vietnam borders on China in the north, and on Laos and Cambodia in the west, with Thailand and Burma beyond. In China bees may have been kept in hives by AD 200, but no early references are known to it in the other countries mentioned, except Vietnam. In Thailand beekeeping is not old, but both horizontal and upright log hives are now used. Laotians in Sekong province, which borders on the central highlands of Vietnam, practise a form of organized tree beekeeping⁸, as do some minority groups of hill people in northern Vietnam; for example the Dao in Tuyen Quang province tend colonies in trees and in recesses cut in rock which are closed by a piece of wood secured with cow dung⁹. The practice of tethering a queen by

a thread or hair round her petiole, to keep a swarm or colony in a desired place, occurs in Vietnam, Thailand, Burma and parts of Nepal; see Crane².

Movable-comb hives

Unless further evidence is found, the origin of the traditional top-bar hives in Vietnam, as in Greece¹, must remain obscure. When questioned, beekeepers in Vietnam said that they learned to use top-bar hives from their father or grandfather. Pham Lé's description quoted above suggests that beekeeping had started well before AD 700.

A fairly early origin of the movable-comb beekeeping is suggested by the present widely scattered distribution among remote inland hill tribes of the same type of top-bar hive. (The use of the hives in Cat Ba island is recent, and came from mainland Vietnam.) Top-bar hives similar to those in north Vietnam are probably used across the border in Yunnan, China. Several Chinese beekeeping books show a picture of an upright barrel hive with top-bars, from which bees are being driven into a basket held above, but the text gives no information about the hive. It seems less likely that top-bar hives were traditional in other countries of south-east Asia, but this should also be looked into.

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