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The Petroglyphs of Anatolia

By Aysen Akpinar

On the Tirsin Plateau and in the Gevaruk Valley in Turkey amid contorted mountains and sub-polar ice fields, primitive man left a glorious record of life there 9,000 years ago.

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Tajmil – and Jiddah

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In Jiddah these days, tajmil is the way to go. That's Arabic for green landscapes, flowering shrubs, bubbling fountains and – a unique addition – a memorable collection of eye-catching modern sculpture.

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A College on the Bosphorus

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He built Maine's first steam engine, baked bread for British troops in the Crimea, washed clothes for Florence Nightingale and founded what is today's University of the Bosphorus.

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From the pen of a master – Aftab Ahmad of Pakistan, ceramicist, photographer and calligrapher – more magnificent examples of the shahada, the Muslim profession of faith.

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The Bedouin Bee

By Robert P. Whitcombe

Because they flee readily to new nests, Omani colonies of Apis florea, the Little Honeybee, have been called the Bedouins of the bees – though skilled beekeepers have been managing them for centuries.

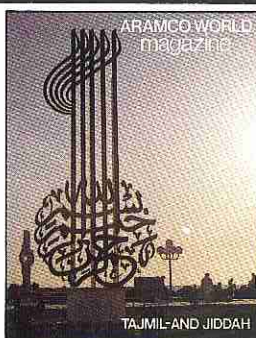
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WHITCOMBE

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Cover: Silhouetted against the sky, this striking bronze sculpture – one of some 300 monumental works scattered through Jiddah, western gateway to Saudi Arabia – enlarges and enlivens a sampling of Arabic calligraphy. The Jiddah sculptures, ranging in subject from the profound to the whimsical, are part of an extraordinary program of civic beautification called *tajmil*. The calligraphy reads "In the name of God, the Merciful, the Compassionate." Back cover: Another example of Jiddah's striking sculptural displays. Photographs by M.S. Shabeeb.

◀ This handsome vase, inscribed with the word *Allah* in cursive script, is a graceful example of the decorative beauty that ceramicists like Aftab Ahmad can achieve.



The Bedouin Bee

WRITTEN AND PHOTOGRAPHED BY ROBERT P. WHITCOMBE

Bees have been making honey for the people of Southern Arabia for well over 2,000 years. Eratosthenes (276-196 B.C.) produced a geography in three books which is no longer extant, but it was the source of reference for Strabo 200 years later when he wrote of Arabia that the "country is in general fertile, and abounds in particular with places for making honey." A little later Pliny the Elder, in discussing Aelius Gallus and his unsuccessful military expedition to Arabia in 25 B.C. stated that among the "discoveries he reported on his return are ... that the Sabei are the most wealthy, owing to the fertility of their forests in producing scents, their gold mines, their irrigated agricultural land and their production of honey and wax."

More recent explorers too have marveled at the honey that the land of the Queen of Sheba has been yielding for so many years. Husband and wife travelers Theodore and Mabel Bent, while journeying in the Hadhramaut (South Yemen) at the end of the 19th century wrote that ... "the honey ... is most plentiful and tastes like orange flowers ... It is packed for exportation in large round tin boxes, stopped up round the edges with mud. It is used in paying both taxes and tribute." Honey from southern Arabia was sent to Muslim populations as far away as Zanzibar and North India and in this century much was exported to Java, since large numbers of Hadhramis were living in the East Indies.

The honey, however, was not all exported; it was popular with the Arabs at home too. "Honey may also be considered as forming one of the principal articles of food with all classes ... [and] repeated references to honey are made in the Koran as a wholesome, nutritious food. It was one of the few luxuries in which Mohammed indulged." Thus wrote Lieut. J. R. Wellsted of the Royal Navy on visiting the Red Sea coast of Saudi Arabia in 1830-1831 while conducting a maritime survey from the East India Company's ship the "Palmyra." And honey is still a local favorite today, with hollowed-log hives providing a sweetener and medicine for the people and an income for the beekeeper in many Southern Arabian villages. (See *Aramco World*, May-June 1981).


But how, in the country neighboring the Yemens and Saudi Arabia, did the Omanis manage for honey? The observant Lieutenant Wellsted traveled widely in the mountains and plains of northern Oman

and the Bents adventured into the Jabal Qara – the hills of Dhofar in the south of Oman which are clothed with dense woodlands and verdant grassland when the summer monsoon lifts every September – yet neither described the activities of any bees or beekeepers. It is only in the last 10 years that the origins of Oman's own supply of honey have become properly known, revealing some remarkable skills that have been developed by a number of specialist beekeepers.

In fact, local histories in Arabic divulge that it was back in the 17th century that Imam Saif ibn Sultan, who ruled from 1688-1711, "started" apiculture in Oman. The honeybees he introduced must have been brought to the fertile gardens of his fortress capital, Rustaq, where their descendants are still found today in cylindrical hives hollowed out of date palm trunks. These honeybees belong to an Arabian race of the western hive bee, *Apis mellifera* – a native of Europe, Africa and the Middle East and the world's major honey producer – having been taken by man to North and South America, Australia and to many other countries.

Though it is now known that this Arabian race of the hive bee, *Apis mellifera jemenitica*, occurs wild in the plains and hills of Dhofar, Imam Saif almost certainly brought his bees to northern Oman from beekeepers in Yemen – and probably by a quick sea journey rather than the long overland route across the edge of the Empty Quarter. The wild colonies that were found in Dhofar were not "kept" but hunted, even in the last few years, by the Jabalis who sometimes risked their lives trying to reach nests in steep cliff sides. And in the past, honey cannot have been their only prize, as beeswax, along with hides, sheep skins, frankincense, myrrh and bitter aloes, was recorded as one of the hill products of "Dhofar District" in Lorimer's 1908 *Gazetteer of the Persian Gulf, Oman and Central Arabia*. The Dhofaris, in taking the wax combs and honey, would frequently have destroyed the wild nests in the process. They did not transfer their wild bees into hives of any sort like the pots, logs etc. of the Yemenis, whose example Imam Saif followed in northern Oman.

As Imam Saif's bees swarmed and multiplied, they were taken from Rustaq to other villages of the Central Jabal al-Akhdar, the Green Mountain, a limestone massif that rises to approximately 3,000 meters (10,000



Above: Barbed sting of *Apis florea*.

Left: *Apis florea* queen with colony prior to mating flight.

feet). It is the center of the Hajar Range, Oman's backbone, which stretches from the Strait of Hormuz in the north to Ras al-Hadd, the easternmost point of Arabia, in the south-east (See *Aramco World*, May-June 1983). Yet the bees did not spread from this enclave of approximately 50 by 65 kilometers (31 by 40 miles) to other regions of Oman, such as the Dhahira to the north-west and the Sharqiya to the east, where there are many oases irrigated by *aflaj* (aqueducts carrying water below and above ground from distant springs), nor to the strip of date gardens that borders the Batina coast for some 320 kilometers (200 miles).

The reason for the restricted distribution of *Apis mellifera jemenitica* in northern Oman is not altogether clear – maybe it is partly historical and there has not been time for the bees to spread naturally or be taken by beekeepers to outlying regions, maybe lower rainfall away from the Jabal al-Akhdar meant fewer flowers and less suitable conditions. In any case, one fact the early local historians presumably overlooked was that most of these regions of northern Oman already had their own source of honey, albeit a small one, and that the Omanis had probably been managing bees long before Imam Saif came on the scene. Roderic Dutton of Durham University stumbled across this source in 1975; while conducting farm surveys near Ibri in the Dhahira region, he discovered a man named Humaid Sulaiman al-Shimili keeping a small colony of bees in the corner of a ruined building. Since they were different from any bees he had seen in the UK, he contacted honeybee scientists at Rothamsted Experimental Station in England and so started the Oman Beekeeping Project.

The bees were identified as *Apis florea*, the "Little Honeybee," not much larger than a house-fly and more colorful than *Apis mellifera*, with an orange-red abdomen tipped by distinctive black and white bands. Found in tropical regions from south-east Asia through to India, Pakistan and Southern Iran, it was not thought to be a species that could be managed for honey production. Yet here it was being kept in remote Oman by a man whose main profession was well-digging. Beekeeping instructors were recruited to show the villagers and tribesmen of the Jabal al-Akhdar and Dhofar how they could keep their *Apis mellifera* in modern Langstroth hives and I was appointed by the Oman Ministry of Agriculture and Fisheries as a Research Biologist. I was to find out more about the ways in which the Omanis managed *Apis florea*, to see if better methods could be devised and to study the ecology and behavior of the bees.

Compared to *Apis mellifera*, which has attracted the attention of scientists for hun-



Above: Hollowed-out date trunk hive for *Apis mellifera jemenitica* in the Jabal al-Akhdar.
Right: The mountain haunts of the wild *Apis florea* in northern Oman.

dreds of years, little was known about *Apis florea*. Now, however, nearly three years' research in Oman has revealed many fascinating details of its natural history – but has also shown that there are other problems of its biology and management still needing to be resolved.

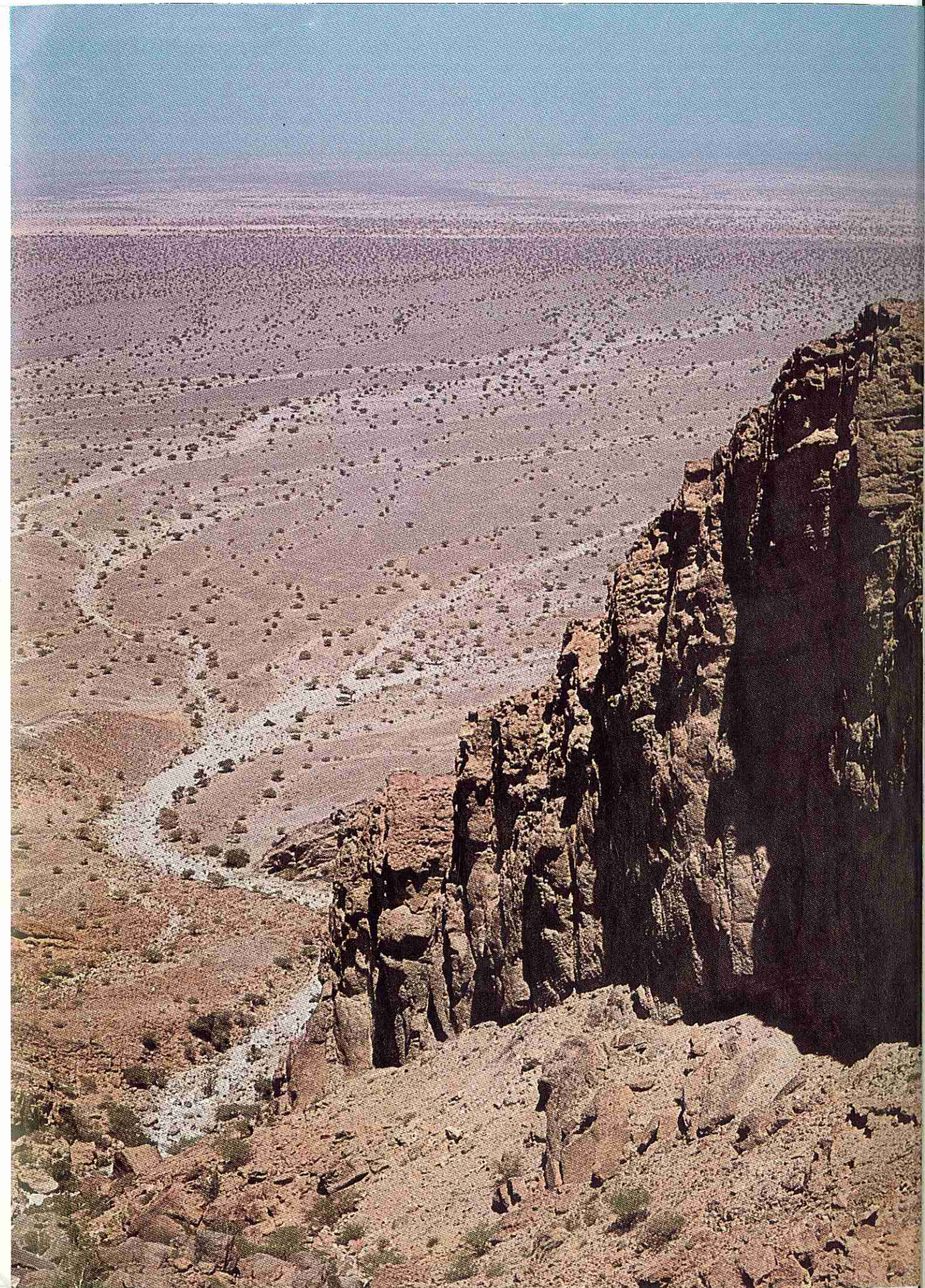
Unlike *Apis mellifera*, which in the wild nests in hollow tree trunks and similar cavities with small entrances, *Apis florea* builds its nest on the branches of trees and bushes or occasionally in small caves, buildings and even wells – but never in sites with a restricted entrance. While in Oman, I measured the characteristics of the natural nest-sites of *Apis florea* and, somewhat to my surprise, found that they were not selecting these trees and bushes at random. In cultivated areas, only rarely did they nest in the most abundant tree, the date palm; most of the nests that I found were in citrus bushes or thorny trees such as "karat," *Acacia nilotica* and "sidr," *Ziziphus spina-christi*. Furthermore, the nest sites within the trees had not been chosen at random either, for I found the nests occurred more frequently in the south-east quadrant of trees than they did in any of the other quadrants.

Honeybees, unlike solitary insects, by clustering together in colonies have adopted a "warm-blooded" way of life. The brood nest of hive bees, where the workers rear eggs laid by the queen through larval and pupal stages to produce more adult bees, is maintained at a nearly constant temperature of 34°-35°C (93°-95°F), only two or three degrees below human blood temperature. In this stable thermal environment, the bees are able to rear their

young from eggs to adult very rapidly in approximately 21 days, despite fluctuating temperatures outside the hive. Using just simple mercury thermometers (sophisticated thermoprobes can be used to measure the temperature of individual bees, but these were not readily available in Oman), inserted into the brood nests of colonies of *Apis florea*, I was able to show that they too maintained a fairly stable colony temperature of 33°-34°C (91°-93°F).

Since Arabia, of course, is hot, having a nest in a shady tree exposed to breezes must help *Apis florea* cope with temperatures that reach 45°C (113°F). Active cooling is brought about by the worker bees themselves, by fetching water from pools and irrigation channels and evaporating it at the nest with "fanning" wings. On the other hand it is often forgotten that temperatures in Arabia, on winter nights, can fall below 10°C (50°F); maybe only cool by the standards of temperate regions, but pretty chilly for a creature of the tropics that keeps its nest at 33°C (91°F) and copes with temperatures considerably higher.

Therefore, I concluded, the little bees were choosing to nest in the SE quadrant of trees in order to benefit from the sun's warming rays early in the morning, but they preferred to nest in leafy citrus trees rather than lofty, scantily-fronded date palms so that a roasting from the full strength of the sun could be avoided. The honeycomb of *Apis florea* must give further protection from both rain and the mid-day sun; when viewed in cross-section, it can be seen that it encircles the supporting stick and the extended honey cells protrude well



beyond the vertical brood comb below.

One other indication that the little bees *Apis florea* found cooler weather more difficult to cope with than did the hive bees *Apis mellifera* was that the former did not start foraging till a little later in the day, when it was warmer. At the beginning of summer, *Apis mellifera* bees used to leave their hives at the crack of dawn, but *Apis florea* sometimes started almost two hours later after the sun had warmed them up. Little Bee foragers appeared to tolerate the higher temperatures quite well and often continued right through the day, while the flower-visiting activities of *Apis mellifera* would decline rapidly from their dawn peak. In fact, to keep themselves cool when they have to fly on hot days, *Apis mellifera* honeybees are known to "dribble" over their bodies some of the nectar or water they have gathered, so it evaporates as they buzz along – an insect equivalent of sweating.

However, nesting in the open has its disadvantages for *Apis florea* – exposure to predators of the animal and human kind being particularly serious. *Apis florea* workers, like other honeybees, do have a painful barbed sting with which to ward off intruders, but the sting is relatively small and the

bees are not always able to drive it through clothes or into tougher parts of the skin – though I know to my cost they are well able to find sensitive spots such as the nose and ears.

Predators in Oman included hornets, ants, spiders, toads and blue-cheeked, European and little green bee-eaters – lovely birds. Unlike *Apis mellifera*, which stay to

Below: Replacing comb of wild *Apis florea* in cave after removing honey.



defend the narrow entrances to their nests, *Apis florea*, if their nests are attacked, have evolved an alternative strategy of flight instead of fight. The whole colony absconds to another nest site, some workers returning over the next few days to salvage any wax and honey that may have been left behind.

Their new homes are often quite difficult to find again, concealment being another advantage, to a creature with a small nest, of choosing a fairly leafy tree. Though very useful to the bees, this habit of absconding has proved to be one of the main factors deterring attempts in other countries to domesticate *Apis florea*. Even quite minor interference, that would be readily tolerated by colonies of *Apis mellifera*, can induce colonies of Little Bees to desert their nests. A few attempts at hiving this species have been recorded in India, but they have been remarkably unsuccessful.

So how do the Omanis succeed in managing *Apis florea*? I traveled practically the length and breadth of northern Oman to discover how widespread these little bees were, the extent to which they were kept and how it was done. I found colonies of *Apis florea* in villages of almost every region, in the sand and gravel plains and in remote

mountain wadis, provided there were some flowers and a source of water – a rocky pool or well – nearby. I gathered that many people lucky enough to find a wild colony would help themselves to the honey. A healthy colony might yield one kilo, worth as much as \$60 these days because of its scarcity and the medicinal properties ascribed to it. But such robbing was usually to the detriment of the bees and made them abscond. This behavior earned them the reputation of being like the Bedouins, never staying long anywhere, but moving from place to place.

In most regions, however, I also came across several specialists who treated the colonies much more gently and kept them in carefully selected sites. Humaid Sulaiman, mentioned before, sited his bees in shady spots in trees in his garden, in crannies in ruined buildings and even made artificial caves of rock – copying the sites used by wild colonies in the mountains where he would go searching for them. Goat herdsman living in the mountains would take the honeycomb from colonies in natural caves, but using sticks would carefully prop the brood comb up again in the same position against the cave roof so that the bees would remain and make more honey for them.

Some brave villagers actually kept colonies in their houses, usually just inside a window so that the bees had free access to the flowers in the world outside. I remember in particular the comings and goings of the foragers from two such colonies, installed safely above head level in the main reception room of a small house that clung to a mountainside fringe with gardens of date palms and bitter-orange trees. The foragers' work continued unabated as I sat drinking coffee with their owner, and there was no sign of conflict in this unusual co-habitation of man and insect. These were the bees that the villagers claimed were the true Omani ones, not those kept in hives in the Jabal al-Akhdar, which they considered were foreign and recently introduced – some 300 years ago!

Most Omanis had not seen the larger *Apis mellifera* and many had never even heard of their existence. The Little Bees had presumably crossed the Strait of Hormuz from Iran hundreds, possibly thousands of years earlier, either aided by man or when the sea level was lower. They had spread throughout northern Oman, but did not cross the 700-kilometer desert barrier to Dhofar (428 miles).

The master of the craft of handling the "genuine" Omani honeybee, *Apis florea*, was Nasr Ahmad al-Ghaythi. I found him living in a small remote oasis in the eastern region of Oman, clearly proud of his skills in producing honey from these little insects, but unaware that he probably owned

and managed more colonies of these bees than anyone else in the sultanate – and possibly in the world.

Now apiaries of 20 colonies of *Apis mellifera* are frequent in other countries where beekeeping is an industry, with thousands of hives belonging to one company. Omanis of the Jabal al-Akhdar have apiaries of over 100 log hives – far too many for one site in an arid country. But in an area where numbers of livestock, including bees, are all important, it is not easy to convince beekeepers that 20 strong colonies of *Apis mellifera* might produce more honey than 100 weak ones.

Nevertheless, having only ever seen half a dozen or so *Apis florea* colonies being kept by one man before and knowing that, until recently, an apiary of Little Bees was altogether unheard of, my excitement mounted as I walked round Nasr's garden counting up to 30 colonies. Most of the colonies were attached to sticks and resting in specially excavated recesses in the mud and stone wall that surrounded his garden. They evoked the "bee boles" of past European beekeepers who sometimes installed their traditional "skep" hives in special alcoves in the walled gardens of country houses. Often having more colonies than

wall recesses, Nasr also put his bees in the citrus trees and young date palms growing in his garden.

Nasr showed me his technique for removing honey from a colony. The essential items of equipment were a length of strong date frond, stripped of its leaflets and split down the middle, a strip of old rag and a knife – simplicity itself compared to the paraphernalia (smokers, hive tools, protective veils, frames etc) of modern *Apis mellifera* beekeeping; he picked up a colony by one end of the stick to which its comb was attached, slowly turned it upside down and wedged the other end of the stick into a little hole in the wall. Using his bare hands, both now free, he brushed the bees gently down away from the brood comb, so that they hung in a cluster below the honeycomb and the brood comb (upside down) was exposed and protruding above the stick. He then cut the brood comb away from the honeycomb and wedged it in the new split date stick tying the ends together with the strip of rag.

All he had to do now was brush the bees carefully back onto their brood comb and return them to their old site, leaving a white waxen comb, free of bees and glistening with honey, encircling the original stick. It



Modern Langstroth hives.



Master beekeeper Nasr Ahmad al-Ghaythi removing *Apis florea* brood comb.

looked delicious enough to eat on the spot, but Nasr usually strained the honey first into large soft-drink bottles for his customers, who came for many miles to obtain this delicacy. He had even sold some in the United Arab Emirates where it fetched a particularly good price.

Similar methods involving a split *zoor* (the mid-rib of the palm frond) to support the single comb of *Apis florea* were used by the other specialists, but Nasr, with his slow, steady movements and carefully made nest recesses, must have had the edge on them for skill and dedication. He did sometimes lose colonies through absconding—after he had taken their honey—especially in the hot summer months, but he had devised a way of splitting colonies into two which helped compensate for these losses. I also found there was one other trick up his sleeve that must have suited the bees and enabled him to maintain consistently high colony numbers in his apiary.

On a visit to his garden in autumn, I was surprised to find all his colonies had disappeared. Nasr delighted in my puzzlement and took me off across the plains surrounding his village to a shallow wadi a few kilometers away, where the thorny samur (*Acacia tortilis*) and other trees grew abundantly. Above our heads in their branches were tied his *Apis florea* colonies, still attached to their date sticks.

As winter was approaching and the scorching summer temperatures had subsided, Nasr had brought the colonies from the shade of his garden to these more sparsely foliated thorn trees so they could be warmed by the winter sun. Though he has had no formal education, Nasr had seen that *Apis florea* colonies found "thermo-regulation" a problem at lower temperatures. He had gone to the trouble of making as many as 10 journeys to his "out-apiary," carrying two or three colonies at a time on his white donkey in the evening after the bees had stopped foraging. He frequently came out to the site to check and provide the bees with water—in a little shallow trough he had made, next to a well, filled with twigs and cloth so that the bees could drink without drowning. One could only marvel at his patience and ingenuity.

The Omani ingenuity also stretched to their understanding (or misunderstanding!) of the honeybee's biology. Only in the last dozen years or so, since the accession of Sultan Qaboos in 1970, have children had the benefit of a scientific education. So their fathers had assumed that the queen bee was male and called her the "shaikh," there being only one in each colony, as the Europeans had called her the "king" until the last 300-400 years.

The worker bees, which are sterile females, were sometimes called the *sha'ab*



Above: *Apis florea* use the sticky exudate of dates as a substitute for nectar.

or "people," and the drones (males) *kha-dim*, or "servant." Nasr, in fact, seemed to think it was the drones that made the honey, as they were reared when the colonies gained in strength during the main flowering seasons, the time when most honey was gathered. When the drones took off from the top of the colony and flew into the air—in reality to wait for newly emerged queens with which to mate—he thought they were flying towards the sun for nectar, the drink of the gods, and on their return filled the comb and fed the workers with fresh honey.

Nasr's observations, though misinterpreted, were remarkably accurate, as worker bees do extend their tongues as though feeding from the drones—though in fact it is the drones with their short tongues that are receiving food offered by the workers.

While picking up many useful hints from Nasr and other Omani *Apis florea* keepers, I was also experimenting myself to see if some of the drawbacks of managing this honeybee could be overcome in the new ways. The two main problems were absconding and extracting honey from the combs without wasting the wax. Bees need to visit literally thousands of flowers to make the hexagonal cells of their beautiful wax comb. If the comb could be returned to them intact (rather than squashed, strained of honey and discarded), the bees could devote their efforts to refilling it with honey instead of construction—to the advantage of the beekeeper.

The Reverend Lorenzo Langstroth, back in the 1850's in the United States, became the father of modern beekeeping by devising for *Apis mellifera* a hive that made bees build their combs in rectangular wooden frames. The honeycombs, in separate frames, could be removed individually from the hives without disturbing the brood reared in other frames below. The honeycombs could be spun round in a centrifugal honey extractor and returned to the hive, still in their frames and intact.

So I set about trying similar hives and frames for *Apis florea*—but with mixed results. The extra disturbance of tying the combs in frames (rather than quickly wedging them in a split stick) did not always go down very well with the bees, some of which showed their disregard for my efforts by absconding. Nevertheless, I persevered and managed to demonstrate that the bees could indeed be induced to build their honey and brood combs one above the other in separate frames—but I lacked a "Little-Bee-sized" extractor to put the frames to the test and a drought set in so that I was loath to rob my protégées of their scant stores of honey.

The other problem, absconding, was rather more difficult. As well as being a response to predators, absconding, particularly in summer, seemed to be part of the natural cycle for many colonies every year. Nasr was to some extent simulating this by moving his colonies between trees in the open plain and his shady garden. To prevent these nomadic bees absconding, I tried incorporating mesh entrances to the hives. The workers could wriggle in and out for their foraging trips, but were deterred from deserting altogether because the larger queen was imprisoned. Queen bees produce pheromones (scents) which help bind the colony together and without their queen, the vital egg-laying "machine," the workers of the colony are doomed.

As with the frames, the hives with meshes met with mixed success too. The hindrance to their comings and goings probably irritated the worker bees so the mesh itself may have been an inducement to them to abscond, which they sometimes did, probably puzzled that their queen stayed behind in the hive instead of joining them. In some instances, the worker bees never returned and neither they nor the imprisoned queen would have survived. However, on other occasions the bees, to my relief, must have sensed the folly of their ways for, having tried to establish a new home in a nearby bush or tree, would return to their experimental hive and queen to settle in again and start rearing a brood.

So on leaving Oman, my experiments to design a hive for *Apis florea* had proved inconclusive, but there was sufficient indication that further research would be worthwhile. I should have realized though, on meeting a man like Nasr, that it would take more than two or three years to improve upon Omani methods, developed over many generations, to restrict the wanderings of this little "Bedouin bee."

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